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Analysis of co-firing biomass with South African coal in pulverised coal boilers

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APPENDIX A

Data Logs for the tests (nos. 11 - 18) conducted in September 2007.

TEST 11 COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 07:39	169	180	438	1184	34
26/09/2007 07:40	169	177	426	1183	36
26/09/2007 07:41	169	174	415	1184	36
26/09/2007 07:42	169	170	419	1184	38
26/09/2007 07:43	169	173	408	1184	36
26/09/2007 07:44	169	165	455	1186	36
26/09/2007 07:45	169	175	421	1182	38
26/09/2007 07:46	169	177	450	1182	34
26/09/2007 07:47	169	173	385	1181	38
26/09/2007 07:48	169	180	454	1181	38
26/09/2007 07:49	169	179	470	1180	38
26/09/2007 07:50	169	176	459	1178	38
26/09/2007 07:51	169	168	434	1180	36
26/09/2007 07:52	169	168	403	1181	36
26/09/2007 07:53	169	177	464	1183	34
26/09/2007 07:54	169	170	409	1182	36
26/09/2007 07:55	169	171	404	1181	36
26/09/2007 07:56	169	167	412	1181	34
26/09/2007 07:57	169	168	409	1181	34
26/09/2007 07:58	169	172	456	1182	34
26/09/2007 07:59	169	169	389	1183	36
26/09/2007 08:00	169	170	443	1182	41
26/09/2007 08:01	169	181	415	1182	36
26/09/2007 08:02	169	167	428	1181	34
26/09/2007 08:03	169	177	451	1180	36
26/09/2007 08:04	169	178	387	1180	36
AVERAGE	**169**	**173**	**427**	**1182**	**36**

TEST 13 10% SAW DUST 90% COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 10:48	153	157	460	1172	33
26/09/2007 10:49	152	161	487	1174	41
26/09/2007 10:50	152	158	440	1175	37
26/09/2007 10:51	152	158	501	1175	35
26/09/2007 10:52	152	152	398	1174	37
26/09/2007 10:53	152	153	439	1176	35
26/09/2007 10:54	152	179	439	1175	33
26/09/2007 10:55	152	155	360	1176	33
26/09/2007 10:56	152	158	430	1175	33
26/09/2007 10:57	152	157	409	1173	35
26/09/2007 10:58	152	153	446	1174	37
26/09/2007 10:59	152	158	439	1176	35
26/09/2007 11:00	152	152	370	1174	35
26/09/2007 11:01	152	154	437	1173	37
26/09/2007 11:02	152	156	381	1174	29
26/09/2007 11:03	152	160	361	1174	43
26/09/2007 11:04	152	150	374	1173	37
26/09/2007 11:05	152	149	448	1175	35
26/09/2007 11:06	152	156	445	1174	37
26/09/2007 11:07	152	159	409	1173	35
26/09/2007 11:08	152	152	391	1177	41
26/09/2007 11:09	152	159	417	1174	41
26/09/2007 11:10	152	155	393	1173	35
26/09/2007 11:11	152	160	414	1177	35
26/09/2007 11:12	152	163	455	1177	33
26/09/2007 11:13	152	156	478	1173	29
26/09/2007 11:14	152	156	490	1179	29
26/09/2007 11:15	152	156	460	1174	33
26/09/2007 11:16	152	155	403	1172	33
AVERAGE	**152**	**157**	**427**	**1175**	**35**

TEST 14 15%SAW DUST 85%COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 11:34	144	147	459	1167	29
26/09/2007 11:35	144	147	442	1167	29
26/09/2007 11:36	144	150	429	1164	35
26/09/2007 11:37	144	150	434	1170	37
26/09/2007 11:38	144	148	414	1168	37
26/09/2007 11:39	144	147	367	1171	29
26/09/2007 11:40	144	153	467	1169	33
26/09/2007 11:41	144	145	397	1169	35
26/09/2007 11:42	144	144	386	1170	33
26/09/2007 11:43	144	156	393	1170	33
26/09/2007 11:44	144	150	418	1168	33
26/09/2007 11:45	144	148	387	1168	33
26/09/2007 11:46	144	152	387	1167	33
26/09/2007 11:47	144	139	384	1167	37
26/09/2007 11:48	144	146	380	1166	35
26/09/2007 11:49	144	137	424	1166	35
26/09/2007 11:50	144	148	443	1167	35
26/09/2007 11:51	144	154	430	1167	35
26/09/2007 11:52	144	147	461	1166	37
26/09/2007 11:53	144	153	393	1165	35
26/09/2007 11:54	144	149	420	1167	35
26/09/2007 11:55	144	146	415	1165	33
26/09/2007 11:56	144	155	474	1164	37
26/09/2007 11:57	144	144	486	1167	33
26/09/2007 11:58	144	156	391	1167	33
26/09/2007 11:59	144	151	414	1168	33
26/09/2007 12:00	144	161	395	1165	33
26/09/2007 12:01	144	147	371	1166	33
26/09/2007 12:02	144	147	361	1165	37
AVERAGE	**144**	**149**	**415**	**1167**	**34**

TEST 15 20%SAW DUST 80%COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 12:48	136	140	428	1168	35
26/09/2007 12:49	136	143	455	1167	37
26/09/2007 12:50	136	138	412	1167	33
26/09/2007 12:51	136	141	389	1168	37
26/09/2007 12:52	136	132	400	1168	35
26/09/2007 12:53	136	135	417	1167	33
26/09/2007 12:54	136	143	461	1168	35
26/09/2007 12:55	136	141	486	1169	37
26/09/2007 12:56	136	140	384	1168	35
26/09/2007 12:57	136	146	391	1170	37
26/09/2007 12:58	136	137	446	1167	35
26/09/2007 12:59	136	150	449	1166	37
26/09/2007 13:00	136	137	444	1167	35
26/09/2007 13:01	136	140	426	1167	37
26/09/2007 13:02	136	134	416	1168	37
26/09/2007 13:03	136	138	389	1169	35
26/09/2007 13:04	136	134	362	1169	33
26/09/2007 13:05	136	140	438	1169	35
26/09/2007 13:06	136	149	453	1166	35
26/09/2007 13:07	136	133	377	1167	35
26/09/2007 13:08	136	138	428	1168	33
26/09/2007 13:09	136	142	448	1170	41
26/09/2007 13:10	136	139	398	1168	35
26/09/2007 13:11	136	141	366	1168	33
26/09/2007 13:12	136	130	397	1168	35
26/09/2007 13:13	136	132	440	1167	28
26/09/2007 13:14	136	140	456	1167	37
AVERAGE	**136**	**139**	**421**	**1168**	**35**

TEST 16 10%GRASS 90%COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 14:21	152	155	381	1170	35
26/09/2007 14:22	152	151	412	1168	37
26/09/2007 14:23	152	159	452	1168	33
26/09/2007 14:24	152	152	393	1172	37
26/09/2007 14:25	152	157	376	1169	33
26/09/2007 14:26	152	153	392	1170	35
26/09/2007 14:27	152	151	445	1170	37
26/09/2007 14:28	152	156	397	1170	37
26/09/2007 14:29	152	155	377	1170	35
26/09/2007 14:30	152	154	384	1169	35
26/09/2007 14:31	152	159	468	1171	33
26/09/2007 14:32	152	156	429	1170	35
26/09/2007 14:33	152	152	394	1172	33
26/09/2007 14:34	152	151	422	1171	33
26/09/2007 14:35	152	156	450	1170	37
26/09/2007 14:36	152	150	368	1171	33
26/09/2007 14:37	152	161	477	1171	33
26/09/2007 14:38	152	161	391	1171	37
26/09/2007 14:39	152	157	407	1170	33
26/09/2007 14:40	152	158	397	1167	35
26/09/2007 14:41	152	154	375	1169	35
26/09/2007 14:42	152	157	387	1171	37
26/09/2007 14:43	152	149	414	1171	35
26/09/2007 14:44	152	156	459	1171	33
AVERAGE	**152**	**155**	**410**	**1170**	**35**

TEST 17 15%GRASS 85%COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 15:16	144	145	460	1170	37
26/09/2007 15:17	144	142	400	1173	33
26/09/2007 15:18	144	146	439	1169	35
26/09/2007 15:19	144	141	475	1171	33
26/09/2007 15:20	144	147	430	1170	35
26/09/2007 15:21	144	150	382	1171	33
26/09/2007 15:22	144	144	444	1172	33
26/09/2007 15:23	144	143	360	1169	35
26/09/2007 15:24	144	148	406	1170	33
26/09/2007 15:25	144	152	441	1173	35
26/09/2007 15:26	144	136	448	1172	35
26/09/2007 15:27	144	144	407	1171	35
26/09/2007 15:28	144	144	448	1169	35
26/09/2007 15:29	144	141	374	1171	37
26/09/2007 15:30	144	148	445	1170	35
26/09/2007 15:31	144	143	429	1172	41
26/09/2007 15:32	144	144	359	1169	35
26/09/2007 15:33	144	153	447	1170	35
26/09/2007 15:34	144	146	374	1170	35
26/09/2007 15:35	144	146	396	1170	35
26/09/2007 15:36	144	147	462	1170	35
26/09/2007 15:37	144	149	460	1172	37
26/09/2007 15:38	144	144	387	1171	35
26/09/2007 15:39	144	144	394	1171	35
26/09/2007 15:40	144	148	469	1171	35
26/09/2007 15:41	144	143	431	1172	35
26/09/2007 15:42	144	145	365	1168	35
26/09/2007 15:43	144	143	409	1171	35
AVERAGE	**144**	**145**	**419**	**1171**	**35**

TEST 18 20%GRASS 80%COAL			FUEL AND AIR FLOWS		
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow
26/09/2007 16:05	136	135	375	1167	33
26/09/2007 16:06	136	136	402	1170	35
26/09/2007 16:07	136	138	427	1170	33
26/09/2007 16:08	136	139	484	1172	37
26/09/2007 16:09	136	138	430	1172	35
26/09/2007 16:10	136	138	429	1172	35
26/09/2007 16:11	136	140	488	1170	35
26/09/2007 16:12	136	138	420	1169	35
26/09/2007 16:13	136	143	397	1168	33
26/09/2007 16:14	136	133	361	1172	33
26/09/2007 16:15	136	137	407	1169	35
26/09/2007 16:16	136	140	365	1170	35
26/09/2007 16:17	136	138	389	1167	33
26/09/2007 16:18	136	134	385	1170	35
26/09/2007 16:19	136	144	466	1167	37
26/09/2007 16:20	136	135	405	1170	35
26/09/2007 16:21	136	144	385	1169	35
26/09/2007 16:22	136	136	447	1169	35
26/09/2007 16:23	136	142	382	1167	35
26/09/2007 16:24	136	135	399	1170	35
26/09/2007 16:25	136	143	454	1171	35
26/09/2007 16:26	136	137	396	1167	35
26/09/2007 16:27	136	136	408	1170	37
26/09/2007 16:28	136	133	496	1171	33
26/09/2007 16:29	136	144	420	1172	35
26/09/2007 16:30	136	137	390	1172	35
26/09/2007 16:31	136	138	414	1171	35
26/09/2007 16:32	136	140	419	1171	37
AVERAGE	**136**	**138**	**416**	**1170**	**35**

TEST 11 COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 07:39	1339	1388	1280	1118	1281	199	1054
26/09/2007 07:40	1339	1389	1279	1117	1281	198	1054
26/09/2007 07:41	1340	1390	1279	1118	1282	197	1054
26/09/2007 07:42	1338	1385	1279	1119	1280	196	1055
26/09/2007 07:43	1336	1387	1280	1119	1281	204	1055
26/09/2007 07:44	1335	1383	1280	1120	1280	206	1054
26/09/2007 07:45	1335	1383	1279	1119	1279	204	1055
26/09/2007 07:46	1334	1380	1278	1119	1278	201	1055
26/09/2007 07:47	1336	1381	1277	1117	1278	199	1055
26/09/2007 07:48	1336	1385	1276	1118	1279	199	1055
26/09/2007 07:49	1336	1383	1277	1119	1279	200	1056
26/09/2007 07:50	1335	1384	1277	1120	1279	200	1056
26/09/2007 07:51	1334	1379	1277	1119	1277	202	1056
26/09/2007 07:52	1333	1378	1277	1119	1277	202	1056
26/09/2007 07:53	1331	1372	1277	1117	1274	204	1056
26/09/2007 07:54	1329	1369	1276	1115	1272	204	1056
26/09/2007 07:55	1329	1367	1274	1113	1271	204	1056
26/09/2007 07:56	1326	1359	1273	1111	1267	203	1056
26/09/2007 07:57	1327	1366	1272	1110	1269	204	1057
26/09/2007 07:58	1326	1365	1271	1110	1268	203	1057
26/09/2007 07:59	1326	1366	1270	1109	1268	204	1057
26/09/2007 08:00	1324	1362	1269	1108	1266	205	1057
26/09/2007 08:01	1323	1361	1269	1107	1265	205	1057
26/09/2007 08:02	1322	1359	1267	1105	1263	205	1057
26/09/2007 08:03	1322	1361	1266	1105	1264	205	1057
26/09/2007 08:04	1323	1364	1266	1105	1265	204	1057
AVERAGE	**1331**	**1375**	**1275**	**1114**	**1274**	**202**	**1056**

TEST 13 10%SAWDUST 90%COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 10:48	1289	1340	1227	1074	1233	211	1056
26/09/2007 10:49	1290	1339	1228	1076	1233	209	1056
26/09/2007 10:50	1289	1337	1229	1077	1233	207	1056
26/09/2007 10:51	1287	1332	1230	1075	1231	207	1056
26/09/2007 10:52	1289	1331	1229	1074	1231	207	1057
26/09/2007 10:53	1289	1336	1230	1075	1233	209	1057
26/09/2007 10:54	1290	1339	1230	1076	1234	210	1057
26/09/2007 10:55	1289	1333	1230	1076	1232	210	1057
26/09/2007 10:56	1291	1336	1230	1076	1233	210	1057
26/09/2007 10:57	1289	1335	1231	1077	1233	210	1057
26/09/2007 10:58	1290	1334	1231	1076	1233	210	1057
26/09/2007 10:59	1290	1334	1231	1077	1233	212	1057
26/09/2007 11:00	1289	1334	1231	1077	1233	212	1057
26/09/2007 11:01	1290	1332	1231	1076	1232	211	1057
26/09/2007 11:02	1289	1331	1231	1076	1232	211	1057
26/09/2007 11:03	1289	1330	1230	1075	1231	211	1057
26/09/2007 11:04	1291	1335	1230	1076	1233	212	1057
26/09/2007 11:05	1292	1339	1231	1077	1235	212	1057
26/09/2007 11:06	1296	1346	1231	1079	1238	213	1057
26/09/2007 11:07	1296	1348	1232	1082	1240	213	1057
26/09/2007 11:08	1293	1342	1233	1082	1238	214	1057
26/09/2007 11:09	1293	1340	1233	1081	1237	213	1057
26/09/2007 11:10	1292	1336	1233	1079	1235	212	1057
26/09/2007 11:11	1290	1333	1233	1078	1234	213	1057
26/09/2007 11:12	1289	1329	1232	1076	1232	212	1057
26/09/2007 11:13	1287	1325	1231	1074	1229	211	1057
26/09/2007 11:14	1287	1323	1230	1073	1228	211	1057
26/09/2007 11:15	1289	1327	1229	1072	1229	211	1057
26/09/2007 11:16	1288	1329	1229	1073	1230	211	1057
AVERAGE	**1290**	**1335**	**1231**	**1076**	**1233**	**211**	**1057**

TEST 14 15%SAWDUST 85%COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 11:34	1304	1372	1245	1107	1257	223	1056
26/09/2007 11:35	1306	1373	1246	1109	1259	222	1056
26/09/2007 11:36	1304	1368	1247	1109	1257	220	1056
26/09/2007 11:37	1304	1364	1247	1105	1255	220	1055
26/09/2007 11:38	1304	1361	1247	1102	1254	219	1056
26/09/2007 11:39	1306	1366	1247	1101	1255	220	1055
26/09/2007 11:40	1307	1373	1247	1104	1258	222	1055
26/09/2007 11:41	1309	1375	1248	1107	1260	222	1055
26/09/2007 11:42	1312	1380	1250	1110	1263	222	1055
26/09/2007 11:43	1314	1385	1251	1113	1266	223	1055
26/09/2007 11:44	1312	1378	1252	1114	1264	224	1055
26/09/2007 11:45	1313	1376	1253	1112	1264	223	1055
26/09/2007 11:46	1314	1380	1253	1112	1265	223	1055
26/09/2007 11:47	1314	1376	1254	1113	1264	225	1055
26/09/2007 11:48	1314	1372	1254	1113	1263	232	1055
26/09/2007 11:49	1316	1374	1253	1112	1264	234	1055
26/09/2007 11:50	1315	1373	1253	1111	1263	228	1055
26/09/2007 11:51	1314	1371	1253	1108	1262	224	1055
26/09/2007 11:52	1315	1373	1252	1107	1262	223	1055
26/09/2007 11:53	1318	1379	1253	1109	1265	223	1055
26/09/2007 11:54	1317	1379	1253	1112	1265	223	1055
26/09/2007 11:55	1316	1375	1254	1111	1264	224	1054
26/09/2007 11:56	1316	1375	1254	1110	1264	223	1054
26/09/2007 11:57	1314	1369	1254	1108	1261	221	1054
26/09/2007 11:58	1316	1372	1253	1108	1262	222	1054
26/09/2007 11:59	1314	1370	1253	1109	1262	223	1054
26/09/2007 12:00	1314	1369	1253	1107	1261	222	1054
26/09/2007 12:01	1314	1366	1252	1105	1259	222	1054
26/09/2007 12:02	1315	1371	1252	1106	1261	223	1054
AVERAGE	**1312**	**1373**	**1251**	**1109**	**1261**	**223**	**1055**

TEST 15 20%SAWDUST 80%COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 12:48	1306	1376	1244	1114	1260	250	1052
26/09/2007 12:49	1306	1374	1242	1114	1259	243	1052
26/09/2007 12:50	1299	1356	1242	1109	1252	248	1051
26/09/2007 12:51	1294	1350	1239	1103	1247	245	1051
26/09/2007 12:52	1292	1348	1236	1099	1244	242	1051
26/09/2007 12:53	1289	1345	1234	1097	1241	240	1050
26/09/2007 12:54	1287	1344	1232	1095	1240	241	1050
26/09/2007 12:55	1285	1345	1230	1094	1239	241	1050
26/09/2007 12:56	1284	1344	1229	1094	1238	239	1050
26/09/2007 12:57	1282	1343	1228	1093	1237	240	1049
26/09/2007 12:58	1281	1343	1226	1092	1236	240	1049
26/09/2007 12:59	1279	1343	1225	1092	1235	239	1049
26/09/2007 13:00	1278	1340	1224	1091	1233	237	1049
26/09/2007 13:01	1277	1341	1224	1090	1233	238	1049
26/09/2007 13:02	1275	1339	1223	1090	1232	237	1049
26/09/2007 13:03	1274	1339	1223	1089	1231	237	1049
26/09/2007 13:04	1274	1339	1222	1089	1231	236	1049
26/09/2007 13:05	1273	1341	1221	1089	1231	236	1048
26/09/2007 13:06	1272	1342	1221	1089	1231	237	1048
26/09/2007 13:07	1271	1341	1220	1090	1231	239	1048
26/09/2007 13:08	1270	1343	1220	1090	1231	237	1048
26/09/2007 13:09	1269	1342	1220	1090	1230	237	1048
26/09/2007 13:10	1267	1337	1219	1089	1228	237	1048
26/09/2007 13:11	1266	1337	1218	1088	1227	238	1048
26/09/2007 13:12	1266	1338	1218	1087	1227	238	1048
26/09/2007 13:13	1265	1338	1217	1088	1227	238	1048
26/09/2007 13:14	1264	1339	1217	1088	1227	239	1048
AVERAGE	**1279**	**1345**	**1226**	**1094**	**1236**	**240**	**1049**

TEST 16 10%GRASS 90%COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 14:21	1148	1282	1159	1049	1160	241	1039
26/09/2007 14:22	1150	1289	1160	1054	1163	239	1039
26/09/2007 14:23	1151	1295	1162	1057	1166	240	1038
26/09/2007 14:24	1150	1295	1163	1060	1167	240	1038
26/09/2007 14:25	1151	1298	1164	1061	1169	240	1038
26/09/2007 14:26	1152	1301	1165	1063	1170	240	1038
26/09/2007 14:27	1154	1304	1166	1065	1172	240	1038
26/09/2007 14:28	1154	1309	1167	1068	1175	242	1038
26/09/2007 14:29	1156	1314	1169	1070	1177	242	1037
26/09/2007 14:30	1157	1319	1170	1072	1180	242	1037
26/09/2007 14:31	1158	1324	1171	1074	1182	243	1037
26/09/2007 14:32	1160	1329	1172	1075	1184	243	1037
26/09/2007 14:33	1160	1330	1173	1077	1185	242	1037
26/09/2007 14:34	1159	1327	1174	1077	1184	244	1037
26/09/2007 14:35	1160	1331	1175	1078	1186	244	1037
26/09/2007 14:36	1160	1333	1175	1080	1187	245	1036
26/09/2007 14:37	1161	1336	1176	1081	1189	245	1036
26/09/2007 14:38	1161	1339	1177	1083	1190	245	1036
26/09/2007 14:39	1159	1336	1177	1083	1189	246	1036
26/09/2007 14:40	1159	1335	1177	1082	1188	246	1035
26/09/2007 14:41	1158	1332	1178	1082	1188	246	1035
26/09/2007 14:42	1158	1331	1178	1081	1187	244	1035
26/09/2007 14:43	1157	1329	1178	1079	1186	245	1035
26/09/2007 14:44	1159	1333	1178	1080	1188	244	1035
AVERAGE	**1156**	**1319**	**1171**	**1072**	**1180**	**243**	**1037**

TEST 17 15%GRASS 85%COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 15:16	1136	1325	1169	1079	1177	254	1030
26/09/2007 15:17	1136	1324	1169	1079	1177	250	1030
26/09/2007 15:18	1135	1323	1170	1078	1177	255	1029
26/09/2007 15:19	1134	1322	1170	1078	1176	249	1029
26/09/2007 15:20	1133	1320	1170	1077	1175	247	1029
26/09/2007 15:21	1132	1319	1170	1077	1175	248	1029
26/09/2007 15:22	1128	1311	1169	1076	1171	247	1029
26/09/2007 15:23	1127	1307	1169	1074	1169	246	1029
26/09/2007 15:24	1127	1310	1168	1074	1170	247	1029
26/09/2007 15:25	1127	1309	1168	1074	1170	249	1029
26/09/2007 15:26	1125	1306	1168	1073	1168	248	1029
26/09/2007 15:27	1126	1311	1167	1073	1169	247	1029
26/09/2007 15:28	1126	1313	1167	1075	1170	247	1028
26/09/2007 15:29	1123	1312	1167	1076	1170	249	1028
26/09/2007 15:30	1123	1311	1167	1076	1169	249	1028
26/09/2007 15:31	1123	1311	1167	1076	1169	248	1028
26/09/2007 15:32	1123	1312	1167	1077	1170	248	1028
26/09/2007 15:33	1124	1316	1167	1077	1171	249	1027
26/09/2007 15:34	1122	1312	1166	1078	1170	249	1027
26/09/2007 15:35	1122	1311	1166	1077	1169	248	1027
26/09/2007 15:36	1120	1310	1166	1076	1168	249	1027
26/09/2007 15:37	1120	1309	1165	1076	1168	248	1027
26/09/2007 15:38	1120	1310	1165	1076	1168	248	1027
26/09/2007 15:39	1117	1308	1164	1076	1166	250	1027
26/09/2007 15:40	1115	1307	1163	1076	1165	250	1026
26/09/2007 15:41	1114	1306	1161	1076	1164	250	1026
26/09/2007 15:42	1113	1305	1160	1075	1163	250	1026
26/09/2007 15:43	1111	1305	1159	1075	1163	250	1026
AVERAGE	**1124**	**1312**	**1167**	**1076**	**1170**	**249**	**1028**

TEST 18 20%GRASS 80%COAL			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
26/09/2007 16:05	1118	1305	1168	1073	1166	249	1025
26/09/2007 16:06	1120	1304	1168	1072	1166	252	1025
26/09/2007 16:07	1118	1303	1168	1072	1165	251	1025
26/09/2007 16:08	1117	1301	1168	1071	1164	247	1025
26/09/2007 16:09	1116	1301	1168	1070	1164	245	1025
26/09/2007 16:10	1116	1302	1168	1069	1164	245	1025
26/09/2007 16:11	1115	1303	1168	1070	1164	246	1025
26/09/2007 16:12	1114	1302	1167	1070	1163	246	1025
26/09/2007 16:13	1115	1305	1167	1070	1164	246	1025
26/09/2007 16:14	1111	1296	1167	1069	1161	245	1025
26/09/2007 16:15	1110	1297	1166	1067	1160	246	1025
26/09/2007 16:16	1111	1297	1165	1067	1160	244	1025
26/09/2007 16:17	1111	1296	1165	1066	1160	243	1025
26/09/2007 16:18	1109	1295	1165	1065	1159	243	1025
26/09/2007 16:19	1109	1293	1164	1064	1158	243	1025
26/09/2007 16:20	1108	1294	1164	1064	1158	244	1025
26/09/2007 16:21	1106	1294	1163	1064	1157	244	1025
26/09/2007 16:22	1106	1291	1163	1063	1156	243	1025
26/09/2007 16:23	1105	1292	1162	1063	1156	243	1025
26/09/2007 16:24	1106	1291	1162	1062	1155	243	1025
26/09/2007 16:25	1106	1292	1162	1062	1156	242	1025
26/09/2007 16:26	1107	1296	1162	1063	1157	243	1025
26/09/2007 16:27	1106	1296	1163	1064	1157	242	1025
26/09/2007 16:28	1105	1293	1163	1063	1156	243	1025
26/09/2007 16:29	1106	1295	1163	1063	1157	242	1025
26/09/2007 16:30	1107	1296	1163	1064	1158	243	1024
26/09/2007 16:31	1105	1297	1164	1064	1158	244	1024
26/09/2007 16:32	1104	1299	1163	1065	1158	246	1024
AVERAGE	**1110**	**1297**	**1165**	**1066**	**1160**	**245**	**1025**

TEST 11 COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 07:39	-20	4.97	4.12	87.67	83.03	14.85	484.04	1155.76	-3.33	1431.13
26/09/2007 07:40	-33	4.97	4.47	86.5	82.24	14.53	492.39	1171.64	-3.45	1348.89
26/09/2007 07:41	-26	4.66	4.17	84.16	78.46	14.82	517.67	1219.78	-3.25	1466.32
26/09/2007 07:42	-13	4.96	3.82	80.66	75.88	15.08	529.11	1115.77	-3.05	1343.88
26/09/2007 07:43	-187	4.97	4.35	84.16	75.42	14.5	518.26	1151.88	-3.48	1438.81
26/09/2007 07:44	-115	5.28	4.73	80.66	80.14	14.5	521.76	1023.58	-3.26	1356.77
26/09/2007 07:45	-38	4.97	4.51	88.84	84.68	14.58	526.69	1115.84	-3.53	1368.38
26/09/2007 07:46	-46	5.12	4.63	86.83	81.55	14.53	537.03	1003.41	-3.22	1387.94
26/09/2007 07:47	-36	4.97	4.99	86	81.51	14.06	533.7	1139.6	-3.48	1399.62
26/09/2007 07:48	-20	4.66	4.23	79.07	72.74	15	567.99	1199.68	-2.98	1403.7
26/09/2007 07:49	-79	4.81	4.6	76.99	71.97	14.43	575.75	1111.7	-2.88	1395.89
26/09/2007 07:50	-82	4.66	4.39	78.15	72.95	14.7	625.49	1087.53	-3.25	1352.89
26/09/2007 07:51	-73	4.97	4.92	76.99	75.88	14.14	577.76	1171.78	-3.22	1380.2
26/09/2007 07:52	-98	4.97	4.12	78.49	74.39	14.97	622.23	1131.92	-3.22	1353.03
26/09/2007 07:53	-101	5.28	4.95	79.49	75.27	14.04	595.78	1151.82	-3.37	1352.89
26/09/2007 07:54	-118	5.59	5.15	83.66	79.1	14.14	627.24	1051.61	-3.48	1360.77
26/09/2007 07:55	-79	5.74	5.11	82.49	78.35	13.62	605.38	1135.73	-3.8	1313.77
26/09/2007 07:56	-133	6.21	5.33	81.49	77.29	13.83	565.07	1079.65	-3.68	1262.9
26/09/2007 07:57	-64	5.59	4.62	83.66	71.69	14.48	642.85	1083.66	-3.79	1356.77
26/09/2007 07:58	-32	5.59	4.83	77.49	72.85	13.94	627.49	1155.82	-3.57	1368.51
26/09/2007 07:59	-154	5.58	5.42	77.49	73.68	13.55	628.99	1131.72	-3.57	1302.09
26/09/2007 08:00	-100	5.9	5.8	75.15	71.59	12.93	596.53	1139.73	-3.48	1251.02
26/09/2007 08:01	-90	5.89	4.97	76.32	72.55	14.14	658.78	1131.79	-3.48	1305.96
26/09/2007 08:02	-78	5.9	5.91	77.15	73.06	13.19	631.66	1051.61	-3.72	1317.58
26/09/2007 08:03	-99	5.74	5.24	76.15	71.3	13.66	658.78	1115.77	-3.57	1368.51
26/09/2007 08:04	-84	5.59	5.48	75.15	70.08	13.68	656.78	1083.72	-3.6	1384.27
AVERAGE	**-77**	**5**	**4.80**	**80.80**	**76.06**	**14.23**	**582**	**1120**	**-3**	**1360**

TEST 13 10%SAWDUST 90%COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 10:48	-77	6.36	5.82	41.1	37.3	13.32	849.05	1147.75	-3.37	1470.45
26/09/2007 10:49	-41	6.67	6.08	38.77	34.89	13.06	780.53	1127.78	-3.37	1372.59
26/09/2007 10:50	-55	6.67	6.27	38.77	35.51	12.72	757.75	1143.81	-3.57	1384.14
26/09/2007 10:51	-72	7.13	7.1	38.77	35.19	12.06	727.21	1071.11	-3.48	1321.65
26/09/2007 10:52	-75	7.29	6.94	38.77	35.71	12.26	718.78	1167.84	-3.77	1325.66
26/09/2007 10:53	-101	6.82	6.09	41.1	37.59	12.92	759.34	1111.83	-3.42	1407.64
26/09/2007 10:54	-83	6.82	6.17	41.1	37.2	12.85	781.7	1103.75	-3.49	1309.97
26/09/2007 10:55	-145	7.13	7.58	42.27	37.97	11.63	722.46	1115.77	-3.61	1384.34
26/09/2007 10:56	-74	6.82	6.4	42.27	38.51	12.71	766.68	1099.61	-3.69	1364.64
26/09/2007 10:57	-94	6.97	6.3	41.1	36.31	12.81	773.44	991.53	-3.37	1329.53
26/09/2007 10:58	-99	6.98	7.13	39.94	36.65	12.01	716.2	1187.8	-3.53	1321.65
26/09/2007 10:59	-127	6.98	5.99	39.94	35.95	13.17	727.8	1119.71	-3.3	1309.9
26/09/2007 11:00	-98	7.13	6.75	38.77	35.86	12.32	752.08	1131.92	-3.49	1223.85
26/09/2007 11:01	-125	7.28	7.15	39.77	36.15	11.96	722.62	943.33	-3.57	1392.15
26/09/2007 11:02	-123	7.29	6.32	37.77	35.29	12.48	767.93	1043.67	-3.42	1310.1
26/09/2007 11:03	-88	7.29	7.13	38.77	35.52	11.88	751.41	1103.75	-3.57	1317.71
26/09/2007 11:04	-106	6.97	6.46	37.77	34.15	12.71	793.3	1103.82	-3.42	1259.1
26/09/2007 11:05	-108	6.82	5.93	36.6	32.86	13.16	779.78	1108.89	-3.26	1286.34
26/09/2007 11:06	-87	6.36	5.81	36.6	33.55	13.24	828.6	1231.73	-3.22	1458.5
26/09/2007 11:07	-105	6.51	5.21	35.43	32.34	13.94	813.25	1155.96	-3.14	1423.39
26/09/2007 11:08	-115	6.81	6.19	36.43	33.35	12.73	800.81	1135.86	-3.43	1267.11
26/09/2007 11:09	-115	6.97	7.07	36.43	33.28	11.84	780.62	1055.69	-3.65	1403.9
26/09/2007 11:10	-55	7.13	6.72	37.43	32.97	12.68	754.67	1087.6	-3.57	1353.03
26/09/2007 11:11	-92	7.29	6.76	37.43	33.05	12.25	750.49	1079.72	-3.57	1294.35
26/09/2007 11:12	-77	7.59	7.33	36.26	33.01	12	727.13	1139.73	-3.65	1309.97
26/09/2007 11:13	-106	7.75	7.71	36.26	32.77	11.42	738.14	1047.61	-3.52	1262.97
26/09/2007 11:14	-100	7.91	7.43	36.26	32.89	11.74	715.11	1095.74	-3.65	1337.41
26/09/2007 11:15	-95	7.59	7.6	35.1	32.11	11.75	773.02	1071.71	-3.57	1306.16
26/09/2007 11:16	-85	7.45	6.18	34.01	30.81	12.36	718.28	1095.74	-3.42	1364.71
AVERAGE	**-94**	**7**	**6.61**	**38.31**	**34.78**	**12.48**	**760**	**1104**	**-3**	**1340**

TEST 14 15%SAWDUST 85%COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 11:34	-116	4.51	4.34	45.28	41.69	14.53	691.33	935.45	-2.51	1094.67
26/09/2007 11:35	-118	4.5	4.91	46.61	42.51	14.26	683.9	995.4	-2.59	1067.24
26/09/2007 11:36	-148	4.97	4.31	46.61	42.02	14.86	689.83	1043.67	-2.27	1204.29
26/09/2007 11:37	-102	5.28	5.95	48.86	45.85	13.2	660.45	1023.58	-3.02	1270.91
26/09/2007 11:38	-129	5.58	5.95	47.7	43.07	13.14	649.44	1079.52	-2.93	1282.46
26/09/2007 11:39	-136	5.43	5.38	45.44	41.75	13.84	680.48	1099.68	-3.05	1333.53
26/09/2007 11:40	-133	4.81	4.53	41.94	38.88	14.5	725.96	987.46	-2.64	1216.24
26/09/2007 11:41	-110	4.97	4.74	41.94	38.52	14.35	728.55	1019.37	-2.47	1313.97
26/09/2007 11:42	-142	4.66	4.12	44.02	39.97	14.89	736.64	1058.76	-2.44	1259.1
26/09/2007 11:43	-173	4.2	3.97	42.94	40.02	15.12	758.59	1099.61	-2.44	1180.79
26/09/2007 11:44	-86	4.81	4.82	42.94	40.79	14.22	657.78	1007.55	-2.37	1169.11
26/09/2007 11:45	-117	4.97	4.95	46.61	43.66	14.04	678.31	1087.6	-2.79	1273.85
26/09/2007 11:46	-110	4.66	4.84	46.61	42.73	14.18	717.03	931.45	-2.78	1129.85
26/09/2007 11:47	-136	4.97	5.04	44.11	40.57	14.14	652.11	935.32	-2.58	1125.78
26/09/2007 11:48	-163	5.58	5.6	45.19	41.7	13.71	644.77	967.36	-2.97	1098.48
26/09/2007 11:49	-55	5.59	6.18	47.78	44.85	12.82	661.62	951.48	-3.2	1235.73
26/09/2007 11:50	-89	5.43	4.72	47.78	44.71	14.4	670.3	1083.86	-2.98	1223.85
26/09/2007 11:51	-211	5.43	5.14	48.86	45.21	13.77	653.78	1027.51	-2.84	1341.34
26/09/2007 11:52	-113	5.13	5.71	46.61	42.36	13.25	701.84	959.35	-3.1	1141.47
26/09/2007 11:53	-147	4.97	4.75	43.11	39.93	14.73	731.22	947.34	-2.65	1282.4
26/09/2007 11:54	-173	4.82	4.44	43.11	40.37	14.67	704.93	963.43	-2.57	1223.92
26/09/2007 11:55	-171	5.12	5.37	44.11	41.11	13.6	655.28	1003.48	-2.87	1129.85
26/09/2007 11:56	-128	5.12	4.98	45.11	41.27	14.03	651.69	1003.55	-2.96	1274.25
26/09/2007 11:57	-99	5.59	5.4	44.11	40.22	13.57	610.47	1019.44	-2.84	1220.04
26/09/2007 11:58	-131	5.28	5.2	44.11	40.97	13.93	677.39	895.27	-2.94	1220.04
26/09/2007 11:59	-139	5.28	4.66	42.11	38.51	14.25	667.05	959.35	-2.77	1188.8
26/09/2007 12:00	-125	5.44	5.65	44.11	41	13.27	652.03	972.97	-3.12	1169.11
26/09/2007 12:01	-143	5.58	6.11	42.94	40.68	12.85	616.48	935.32	-2.84	1184.8
26/09/2007 12:02	-124	5.28	5	42.94	39.48	14.08	661.87	999.48	-2.88	1149.35
AVERAGE	**-130**	**5**	**5.06**	**44.95**	**41.53**	**14.01**	**678**	**1000**	**-3**	**1207**

TEST 15 20%SAWDUST 80%COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 12:48	-400	6.2	5.88	57.54	53.6	13.35	609.38	959.35	-3.63	1039.93
26/09/2007 12:49	-133	6.05	6.46	55.21	51.81	12.56	584.85	927.24	-3.53	1184.8
26/09/2007 12:50	-332	7.29	6.91	54.21	50.62	11.63	550.89	851.34	-3.3	1129.92
26/09/2007 12:51	-374	7.61	7.69	57.38	53.37	11.52	597.2	830.64	-4.11	1094.54
26/09/2007 12:52	-295	7.61	8.15	55.21	50.51	10.98	561.32	911.29	-3.98	1090.67
26/09/2007 12:53	-345	7.6	7.44	52.04	47.39	11.79	580.93	883.32	-3.73	1098.48
26/09/2007 12:54	-336	7.61	7.44	49.87	45.28	11.75	601.46	919.37	-3.92	1063.16
26/09/2007 12:55	-355	7.6	8.04	47.78	43.58	11.09	552.97	851.21	-3.83	1102.42
26/09/2007 12:56	-315	7.61	6.83	45.28	42.3	12.19	612.89	943.33	-3.65	1161.5
26/09/2007 12:57	-447	7.61	7.45	45.28	42.36	11.66	583.93	907.28	-3.91	1102.42
26/09/2007 12:58	-316	7.61	7.9	45.28	41.27	11.22	562.49	935.32	-3.6	1129.92
26/09/2007 12:59	-326	7.62	6.98	44.11	40.26	12.14	603.21	931.38	-3.69	1169.11
26/09/2007 13:00	-258	7.61	7.77	44.11	40.16	11.55	568.66	919.37	-3.46	1125.78
26/09/2007 13:01	-262	7.61	7.16	42.94	39.98	11.8	592.03	963.23	-3.42	1106.09
26/09/2007 13:02	-283	7.61	6.86	42.94	39.04	12.39	596.87	927.24	-3.34	1173.11
26/09/2007 13:03	-268	7.61	7.84	41.77	38.45	11.12	572.67	911.89	-3.89	1172.91
26/09/2007 13:04	-265	7.6	7.04	41.77	37.66	12.14	586.77	935.25	-3.66	1125.72
26/09/2007 13:05	-287	7.45	6.78	40.6	37.54	12.34	603.21	975.31	-3.77	1118.04
26/09/2007 13:06	-284	7.3	7.28	40.6	37.08	11.69	590.19	943.33	-3.72	1188.8
26/09/2007 13:07	-296	7.61	7.29	39.6	36.35	12.16	573.83	911.42	-3.61	1149.35
26/09/2007 13:08	-249	7.3	6.95	40.77	36.81	12.03	581.26	975.44	-3.46	1110.23
26/09/2007 13:09	-319	7.3	7.12	39.77	36.45	11.83	587.44	995.34	-3.45	1188.74
26/09/2007 13:10	-273	7.61	7.71	39.77	36.29	11.46	560.82	975.44	-3.46	1157.36
26/09/2007 13:11	-323	7.6	7.36	39.77	36.57	11.81	563.32	919.3	-3.52	1110.23
26/09/2007 13:12	-290	7.6	7.55	39.77	35.86	11.69	561.57	971.5	-3.32	1196.61
26/09/2007 13:13	-373	7.45	6.74	39.77	36.01	12.44	592.53	1007.42	-3.43	1176.99
26/09/2007 13:14	-277	7.6	7.57	38.77	36.07	11.59	551.47	891.33	-3.57	1161.5
AVERAGE	**-307**	**7**	**7.27**	**45.26**	**41.58**	**11.85**	**581**	**929**	**-4**	**1134**

TEST 16 10%GRASS 90%COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 14:21	-282	9.15	8.19	79.91	72.78	11.1	503.32	831.31	-4.26	922.44
26/09/2007 14:22	-334	8.68	7.57	72.81	64.06	11.56	522.6	771.16	-4.08	961.62
26/09/2007 14:23	-329	8.53	7.86	65.72	61.01	11.24	524.77	855.28	-4.07	1039.93
26/09/2007 14:24	-367	8.68	7.98	60.88	56.17	11.09	525.6	767.02	-4.08	961.69
26/09/2007 14:25	-339	8.52	7.86	59.88	54.98	11.25	524.68	795.2	-4.08	1043.74
26/09/2007 14:26	-341	8.22	7.8	55.21	50.42	11.36	539.2	823.23	-3.97	1008.55
26/09/2007 14:27	-415	8.22	7.49	52.12	47.9	11.73	549.05	823.17	-3.61	1028.05
26/09/2007 14:28	-375	7.91	7.27	50.87	46.34	11.73	561.32	815.16	-3.68	1032.05
26/09/2007 14:29	-328	7.91	7.24	49.62	44.67	11.94	559.31	871.3	-3.65	1028.05
26/09/2007 14:30	-319	7.92	7.07	48.61	43.75	11.94	569.75	811.15	-3.72	1031.92
26/09/2007 14:31	-353	7.92	7.39	47.45	42.65	11.79	549.05	819.09	-3.72	1004.62
26/09/2007 14:32	-290	7.61	7.26	46.11	42.1	11.89	551.3	847.33	-3.45	996.74
26/09/2007 14:33	-373	7.61	6.88	44.94	40.97	12.18	560.32	827.17	-3.45	1008.49
26/09/2007 14:34	-323	7.91	7.36	44.94	41.11	11.84	558.81	791.12	-3.6	1012.49
26/09/2007 14:35	-421	7.61	7.19	44.94	40.91	12.12	577.34	811.22	-3.57	981.12
26/09/2007 14:36	-342	7.92	7.49	42.94	38.8	11.69	559.65	819.09	-3.57	1012.49
26/09/2007 14:37	-346	7.61	7.04	42.94	39.75	12.08	596.87	843.33	-3.6	1000.68
26/09/2007 14:38	-403	7.61	6.97	41.77	37.97	12.24	576.42	831.31	-3.48	1000.74
26/09/2007 14:39	-411	7.61	7.63	41.77	38.26	11.47	574.59	795.26	-3.57	1031.92
26/09/2007 14:40	-304	7.91	7.79	41.77	38.09	11.41	563.99	903.14	-3.72	1000.88
26/09/2007 14:41	-402	8.07	7.15	41.77	37.66	12	566.91	787.12	-3.53	988.86
26/09/2007 14:42	-375	8.22	8.18	41.77	37.93	11.06	542.04	783.05	-3.77	973.44
26/09/2007 14:43	-320	8.21	7.9	41.77	37.54	11.37	541.54	791.12	-3.8	942.2
26/09/2007 14:44	-295	7.91	7.23	40.6	36.33	12.1	561.99	771.23	-3.73	1016.43
AVERAGE	**-349**	**8**	**7.49**	**50.05**	**45.51**	**11.67**	**553**	**816**	**-4**	**1001**

TEST 17 15%GRASS 85%COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 15:16	-334	8.22	7.98	50.87	46.84	11.2	515.92	827.31	-3.93	934.32
26/09/2007 15:17	-438	8.37	7.98	50.87	46.13	11.11	526.77	819.03	-3.87	1000.68
26/09/2007 15:18	-298	8.68	7.77	49.62	44.78	11.22	478.7	747.13	-4	898.87
26/09/2007 15:19	-399	8.52	7.67	49.62	44.75	11.65	522.1	779.24	-3.93	996.94
26/09/2007 15:20	-411	8.52	8.17	47.28	43.15	11.02	510.25	791.26	-3.77	988.93
26/09/2007 15:21	-395	8.53	8.14	46.03	40.97	11.15	518.59	799.13	-3.89	914.76
26/09/2007 15:22	-317	8.84	8.64	44.94	40.71	10.65	491.22	771.23	-3.97	910.75
26/09/2007 15:23	-411	8.84	8.42	43.77	39.55	10.8	499.32	803.27	-4	985.19
26/09/2007 15:24	-382	8.83	8.4	42.61	38.72	10.76	511.5	795.26	-3.92	1016.43
26/09/2007 15:25	-418	8.84	8.38	41.44	37.27	10.79	510.33	859.28	-3.74	953.81
26/09/2007 15:26	-328	9.15	8.17	41.44	36.9	11.21	506.74	767.22	-3.65	949.87
26/09/2007 15:27	-348	8.68	8.36	40.27	37.12	10.84	520.01	799	-3.97	961.62
26/09/2007 15:28	-349	8.53	7.67	39.1	35.5	11.45	539.12	791.12	-3.77	1000.68
26/09/2007 15:29	-424	8.83	7.91	39.1	35.24	11.35	529.61	783.18	-3.8	942.06
26/09/2007 15:30	-327	8.83	8.37	39.1	35.04	10.77	511.92	799	-3.88	953.95
26/09/2007 15:31	-353	8.83	8.03	39.1	34.96	10.96	514.34	827.31	-3.68	985.19
26/09/2007 15:32	-393	8.53	7.74	37.93	34.59	11.52	533.36	843.26	-3.75	1016.43
26/09/2007 15:33	-391	8.22	8	36.76	33.92	11.12	540.87	839.32	-3.6	1024.24
26/09/2007 15:34	-368	8.53	7.89	35.6	32.53	11.33	541.71	803.27	-3.6	957.48
26/09/2007 15:35	-368	8.68	8.2	36.76	33.6	10.81	524.77	819.09	-3.8	961.49
26/09/2007 15:36	-420	8.84	8	36.76	33.32	11.15	531.86	791.12	-3.68	914.76
26/09/2007 15:37	-325	8.68	8.08	36.76	32.62	10.92	523.85	811.22	-3.57	961.62
26/09/2007 15:38	-327	8.52	8.21	35.6	32.53	11.03	528.69	777.24	-3.68	934.32
26/09/2007 15:39	-418	8.84	8.13	35.6	32.31	11.14	524.93	823.17	-3.63	906.88
26/09/2007 15:40	-409	8.99	8.34	35.6	31.96	10.9	512.92	759.01	-3.63	990
26/09/2007 15:41	-436	8.99	8.33	35.6	32.07	10.86	524.77	738.92	-3.68	906.88
26/09/2007 15:42	-480	8.99	8.33	35.6	32.19	10.67	515.09	743.06	-3.68	954.08
26/09/2007 15:43	-387	8.98	8.3	35.6	31.71	10.78	533.03	775.23	-3.8	957.55
AVERAGE	**-381**	**9**	**8.13**	**40.69**	**36.82**	**11.04**	**519**	**796**	**-4**	**960**

TEST 18 20%GRASS 80%COAL			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
26/09/2007 16:05	-211	8.84	8	40.27	35.74	11.26	552.81	763.15	-3.72	930.25
26/09/2007 16:06	-262	8.84	8.37	39.1	35.13	10.91	520.09	711.08	-3.83	938.12
26/09/2007 16:07	-218	8.84	7.88	39.1	35.9	11.29	552.14	747.13	-3.85	910.62
26/09/2007 16:08	-293	9.15	8.31	39.1	35.11	10.87	539.04	759.15	-3.75	875.71
26/09/2007 16:09	-251	8.99	8.17	37.93	34.38	10.93	538.79	718.96	-3.75	926.31
26/09/2007 16:10	-297	8.99	8.21	36.76	33.05	11.04	545.71	723.16	-3.8	906.82
26/09/2007 16:11	-279	8.99	7.84	35.6	31.56	11.45	548.97	735.11	-3.77	895.07
26/09/2007 16:12	-286	9.15	8.29	34.43	31.52	10.92	539.45	743.06	-3.77	875.64
26/09/2007 16:13	-287	8.83	8.39	34.43	31.09	10.92	533.86	723.16	-3.77	910.75
26/09/2007 16:14	-404	9.46	7.99	34.43	30.55	11.37	498.98	706.81	-3.68	848.33
26/09/2007 16:15	-345	9.15	8.99	34.43	30.86	10.38	525.94	698.93	-3.79	852.07
26/09/2007 16:16	-317	9.31	8.59	33.34	30.15	10.72	526.1	718.96	-3.6	863.89
26/09/2007 16:17	-356	9.32	8.38	33.34	29.56	10.72	521.76	739.05	-3.61	856.01
26/09/2007 16:18	-377	9.46	8.57	33.34	29.76	10.72	527.6	739.05	-3.72	844.46
26/09/2007 16:19	-329	9.3	8.57	33.34	29.01	10.69	518.09	678.84	-3.73	871.57
26/09/2007 16:20	-371	9.3	8.34	32.18	28.98	10.95	524.43	747	-3.77	891.13
26/09/2007 16:21	-337	9.31	8.56	32.18	28.31	10.75	529.94	726.9	-3.72	879.58
26/09/2007 16:22	-203	9.46	8.78	32.18	27.97	10.54	515.42	735.11	-3.63	871.57
26/09/2007 16:23	-286	9.46	8.28	32.18	28.24	10.95	537.12	727.04	-3.68	844.46
26/09/2007 16:24	-225	9.45	8.72	32.18	28.27	10.52	518.84	659.81	-3.77	840.52
26/09/2007 16:25	-275	9.3	8.49	32.18	28.15	10.7	535.37	731.17	-3.77	879.44
26/09/2007 16:26	-166	8.99	8.28	32.18	28	11.12	545.3	723.16	-3.65	910.75
26/09/2007 16:27	-270	9.14	8.45	30.84	27.68	10.75	554.39	779.04	-3.61	836.45
26/09/2007 16:28	-212	9.3	8.29	30.84	27.42	10.91	558.15	698.86	-3.57	848.2
26/09/2007 16:29	-283	9.15	8.45	30.84	27.68	10.87	551.8	751.13	-3.8	996.74
26/09/2007 16:30	-295	9.14	8.21	30.84	26.9	11.1	559.65	755.07	-3.68	848.33
26/09/2007 16:31	-292	9.14	7.89	29.59	26.87	11.43	567.08	759.15	-3.45	895.13
26/09/2007 16:32	-359	9.14	8.55	29.59	26.93	10.75	564.32	767.09	-3.73	887.25
AVERAGE	**-289**	**9**	**8.35**	**33.81**	**30.17**	**10.91**	**538**	**731**	**-4**	**883**

APPENDIX B

Tables of averages from the data logs of the first tests (nos. 11 – 18).

Test	**Test 11 100%Coal**
Date	26-Sep-07
Test Duration	07:39 to 08:05
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	173
Load		MW	1.02
Grind size - passing 75 microns		%	77.98
Fuel Co-firing Shares			
Townlands		%	100
AIR			
Total Air flow		kg/hr	1645
Combustion Air \ Primary Air			2.85
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	29.83
Primary Air Flow		kg/hr	427
Primary Air Temperature		ºC	94
Secondary Air Flow		kg/hr	1182
Secondary Air Temperature		ºC	301
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		ºC	168
Overfire air Flow		kg/hr	36
Overfire air Temperature		ºC	207

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-77	
Gas Temp P4	0.254	ºC	1331	
Gas Temp P10	0.730	ºC	1375	
Gas Temp PD	1.142	ºC	1275	
Gas Temp P28	3.109	ºC	1114	
Average gas Temperature		ºC	1274	
Average Wall Temperature		ºC	1056	
Covective Exit Temperature		ºC	202	
Oxygen (Ziconia) wet basis		%	5.29	
Oxygen (dry basis)		%	4.80	
Carbon Monoxide		ppm	76	**82**
CO2		%	14.23	**14.23**
SO2		ppm	582	**628**
NO		ppm	1120	**1210**
NOx		ppm	1360	**1470**
NO2		ppm	241	**260**
N2O		ppm	-3	**-4**
Combustion Efficiency RTD P	0.730	%	95.96	
Combustion Efficiency RTD P	1.682	%	98.72	
Combustion Efficiency RTD P	2.189	%	98.94	
Rate of Slag Formation		g/hr	NM	

Test	**Test 13 10%Sawdust 90%Coal**
Date	26-Sep-07
Test Duration	10:48 to 11:16
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	157
Sawdust Flow		kg/hr	20
Load		MW	1.02
Grind size - passing 75 microns		%	78.11
Fuel Co-firing Shares			
Coal		%	90
Sawdust		%	10
AIR			
Total Air flow		kg/hr	1637
Combustion Air \ Primary Air			2.84
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	46.23
Primary Air Flow		kg/hr	427
Primary Air Temperature		℃	94
Secondary Air Flow		kg/hr	1175
Secondary Air Temperature		℃	301
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	182
Overfire air Flow		kg/hr	35
Overfire air Temperature		℃	216

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-94	
Gas Temp P4	0.262	℃	1290	
Gas Temp P10	0.753	℃	1335	
Gas Temp PD	1.179	℃	1231	
Gas Temp P28	3.209	℃	1076	
Average gas Temperature		℃	1233	
Average Wall Temperature		℃	1057	
Covective Exit Temperature		℃	211	
Oxygen (Ziconia) wet basis		%	7.06	
Oxygen (dry basis)		%	6.61	
Carbon Monoxide		ppm	35	**33**
CO2		%	12.48	**12.48**
SO2		ppm	760	**729**
NO		ppm	1104	**1059**
NOx		ppm	1340	**1286**
NO2		ppm	236	**227**
N2O		ppm	-3	**-3**
Combustion Efficiency RTD P	0.753	%	97.82	
Combustion Efficiency RTD P	1.736	%	99.52	
Combustion Efficiency RTD P	2.260	%	99.71	
Rate of Slag Formation		g/hr	NM	

Test	**Test 14 15%Sawdust 85%Coal**
Date	26-Sep-07
Test Duration	11:34 to 12:02
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	149
Sawdust Flow		kg/hr	30
Load		MW	1.03
Grind size - passing 75 microns		%	84.24
Fuel Co-firing Shares			
Coal		%	85
Sawdust		%	15
AIR			
Total Air flow		kg/hr	1616
Combustion Air \ Primary Air			2.90
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	31.95
Primary Air Flow		kg/hr	415
Primary Air Temperature		℃	94
Secondary Air Flow		kg/hr	1167
Secondary Air Temperature		℃	297
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	181
Overfire air Flow		kg/hr	34
Overfire air Temperature		℃	215

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-130	
Gas Temp P4	0.260	℃	1312	
Gas Temp P10	0.748	℃	1373	
Gas Temp PD	1.171	℃	1251	
Gas Temp P28	3.189	℃	1109	
Average gas Temperature		℃	1261	
Average Wall Temperature		℃	1055	
Covective Exit Temperature		℃	223	
Oxygen (Ziconia) wet basis		%	5.10	
Oxygen (dry basis)		%	5.06	
Carbon Monoxide		ppm	42	**44**
CO2		%	14.01	**14.01**
SO2		ppm	678	**721**
NO		ppm	1000	**1063**
NOx		ppm	1207	**1283**
NO2		ppm	207	**220**
N2O		ppm	-3	**-3**
Combustion Efficiency RTD P	0.748	%	96.40	
Combustion Efficiency RTD P	1.725	%	98.61	
Combustion Efficiency RTD P	2.245	%	99.08	
Rate of Slag Formation		g/hr	NM	

Test	**Test 15 20%Sawdust 80%Coal**
Date	26-Sep-07
Test Duration	12:48 to 13:14
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	139
Sawdust Flow		kg/hr	43
Load		MW	1.03
Grind size - passing 75 microns		%	85.30
Fuel Co-firing Shares			
Coal		%	80
Sawdust		%	20
AIR			
Total Air flow		kg/hr	1624
Combustion Air \ Primary Air			2.86
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	53.30
Primary Air Flow		kg/hr	421
Primary Air Temperature		°C	94
Secondary Air Flow		kg/hr	1168
Secondary Air Temperature		°C	303
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		°C	181
Overfire air Flow		kg/hr	35
Overfire air Temperature		°C	216

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-307	
Gas Temp P4	0.264	°C	1279	
Gas Temp P10	0.758	°C	1345	
Gas Temp PD	1.186	°C	1226	
Gas Temp P28	3.228	°C	1094	
Average gas Temperature		°C	1236	
Average Wall Temperature		°C	1049	
Covective Exit Temperature		°C	240	
Oxygen (Ziconia) wet basis		%	7.44	
Oxygen (dry basis)		%	7.27	
Carbon Monoxide		ppm	42	**38**
CO2		%	11.85	**11.85**
SO2		ppm	581	**532**
NO		ppm	929	**850**
NOx		ppm	1134	**1038**
NO2		ppm	206	**188**
N2O		ppm	-4	**-3**
Combustion Efficiency RTD P	0.758	%	97.22	
Combustion Efficiency RTD P	1.746	%	99.23	
Combustion Efficiency RTD P	2.273	%	99.32	
Rate of Slag Formation		g/hr	NM	

Test	**Test 16 10%Grass 90%Coal**
Date	26-Sep-07
Test Duration	14:21 to 14:44
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	155
Grass Flow		kg/hr	22
Load		MW	1.02
Grind size - passing 75 microns		%	83.17
Fuel Co-firing Shares			
Coal		%	90
Grass		%	10
AIR			
Total Air flow		kg/hr	1615
Combustion Air \ Primary Air			2.94
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	55.87
Primary Air Flow		kg/hr	410
Primary Air Temperature		℃	94
Secondary Air Flow		kg/hr	1170
Secondary Air Temperature		℃	299
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	182
Overfire air Flow		kg/hr	35
Overfire air Temperature		℃	217

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-349	
Gas Temp P4	0.275	℃	1156	
Gas Temp P10	0.791	℃	1319	
Gas Temp PD	1.238	℃	1171	
Gas Temp P28	3.371	℃	1072	
Average gas Temperature		℃	1180	
Average Wall Temperature		℃	1037	
Covective Exit Temperature		℃	243	
Oxygen (Ziconia) wet basis		%	8.06	
Oxygen (dry basis)		%	7.49	
Carbon Monoxide		ppm	46	**41**
CO2		%	11.67	**11.67**
SO2		ppm	553	**497**
NO		ppm	816	**734**
NOx		ppm	1001	**901**
NO2		ppm	185	**167**
N2O		ppm	-4	**-3**
Combustion Efficiency RTD P	0.791	%	97.24	
Combustion Efficiency RTD P	1.823	%	97.46	
Combustion Efficiency RTD P	2.373	%	98.30	
Rate of Slag Formation		g/hr	NM	

Test	**Test 17 15%Grass 85%Coal**
Date	26-Sep-07
Test Duration	15:16 to 15:43
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	145
Grass flow		kg/hr	32
Load		MW	1.01
Grind size - passing 75 microns		%	82.24
Fuel Co-firing Shares			
Coal		%	85
Grass		%	15
AIR			
Total Air flow		kg/hr	1625
Combustion Air \ Primary Air			2.88
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	63.65
Primary Air Flow		kg/hr	419
Primary Air Temperature		℃	93
Secondary Air Flow		kg/hr	1171
Secondary Air Temperature		℃	304
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	182
Overfire air Flow		kg/hr	35
Overfire air Temperature		℃	217

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-381	
Gas Temp P4	0.275	℃	1124	
Gas Temp P10	0.792	℃	1312	
Gas Temp PD	1.239	℃	1167	
Gas Temp P28	3.373	℃	1076	
Average gas Temperature		℃	1170	
Average Wall Temperature		℃	1028	
Covective Exit Temperature		℃	249	
Oxygen (Ziconia) wet basis		%	8.71	
Oxygen (dry basis)		%	8.13	
Carbon Monoxide		ppm	37	**32**
CO2		%	11.04	**11.04**
SO2		ppm	519	**445**
NO		ppm	796	**682**
NOx		ppm	960	**823**
NO2		ppm	164	**141**
N2O		ppm	-4	**-3**
Combustion Efficiency RTD P	0.792	%	97.76	
Combustion Efficiency RTD P	1.824	%	99.20	
Combustion Efficiency RTD P	2.375	%	99.48	
Rate of Slag Formation		g/hr	NM	

Test	**Test 18 20%Grass 80%Coal**
Date	26-Sep-07
Test Duration	16:05 to 16:32
Test Description	Combustion Performance
Operator	Priven Rajoo

FUEL		SI Units	
Coal Flow		kg/hr	138
Grass Flow		kg/hr	43
Load		MW	1.02
Grind size - passing 75 microns		%	82.10
Fuel Co-firing Shares			
Coal		%	80
Grass		%	20
AIR			
Total Air flow		kg/hr	1621
Combustion Air \ Primary Air			2.90
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	66.55
Primary Air Flow		kg/hr	416
Primary Air Temperature		℃	94
Secondary Air Flow		kg/hr	1170
Secondary Air Temperature		℃	300
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	183
Overfire air Flow		kg/hr	35
Overfire air Temperature		℃	218

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-289	
Gas Temp P4	0.278	℃	1110	
Gas Temp P10	0.799	℃	1297	
Gas Temp PD	1.251	℃	1165	
Gas Temp P28	3.407	℃	1066	
Average gas Temperature		℃	1160	
Average Wall Temperature		℃	1025	
Covective Exit Temperature		℃	245	
Oxygen (Ziconia) wet basis		%	9.18	
Oxygen (dry basis)		%	8.35	
Carbon Monoxide		ppm	30	**25**
CO2		%	10.91	**10.91**
SO2		ppm	538	**453**
NO		ppm	731	**616**
NOx		ppm	883	**744**
NO2		ppm	152	**128**
N2O		ppm	-4	**-3**
Combustion Efficiency RTD P	0.799	%	97.70	
Combustion Efficiency RTD P	1.842	%	99.09	
Combustion Efficiency RTD P	2.398	%	99.55	
Rate of Slag Formation		g/hr	NM	

APPENDIX C

Gas temperature and combustion efficiency curve fitting data for the first tests (nos. 11-18).

	Curve fitting coefficients for exponential fit y = a*exp(bx)+c*exp(dx) trendlines								
a		1436		98.07			1392		98.91
b		-0.08332		0.00404			-0.08225		0.003548
c		-1186		-98.07			-1142		-98.91
d		-10.96		-5.082			-10.53		-5.694
R^2		0.9982		1			0.991		1
		TEST 11 COAL (BASELINE)					**TEST 13 10% SAWDUST**		
	Flue Gas		Combustion			Flue Gas		Combustion	
Time[s]	Temp [K]	Trendline	Efficiency	Tendline		Temp [K]	Trendline	Efficiency	Tendline
0.000	250	250.00	0	0.00		250	250.00	0	0.00
0.125		1119.75		46.16			1071.55		50.41
0.250	1331	1329.82		70.64		1290	1281.56		75.17
0.375		1372.37		83.63			1327.70		87.35
0.500		1372.46		90.54			1330.01		93.35
0.625		1361.88		94.22			1320.67		96.31
0.750	1375	1348.69	95.96	96.20		1335	1308.30	97.82	97.79
0.875		1334.95		97.27			1295.23		98.54
1.000		1321.18		97.86			1282.06		98.93
1.125		1307.51		98.19		1231	1268.97		99.14
1.250	1275	1293.96		98.40			1255.99		99.27
1.375		1280.56		98.53			1243.15		99.35
1.500		1267.29		98.62			1230.43		99.42
1.625		1254.16	98.72	98.69			1217.85		99.47
1.750		1241.17		98.75			1205.39	99.52	99.52
1.875		1228.31		98.81			1193.06		99.57
2.000		1215.58		98.86			1180.86		99.61
2.125		1202.99	98.94	98.91			1168.78		99.66
2.250		1190.52		98.96			1156.82	99.71	99.70
2.375		1178.19		99.01			1144.99		99.75
2.500		1165.98		99.07			1133.28		99.79
2.625		1153.90		99.12			1121.69		99.84
2.750		1141.94		99.17			1110.22		99.88
2.875		1130.11		99.22			1098.86		99.92
3.000		1118.40		99.27			1087.62		99.97
3.125	1114	1106.81		99.32			1076.49		100.00
3.250		1095.35		99.37		1076	1065.48		

	Curve fitting coefficients for exponential fit y = a*exp(bx)+c*exp(dx) trendlines								
a		1421		97.09			1389		98.97
b		-0.08024		0.009051			-0.07631		0.001528
c		-1171		-97.09			-1139		-98.97
d		-10.35		-5.719			-9.996		-5.228
R^2		0.996		1			0.9847		1
		TEST 14 15% SAWDUST					**TEST 15 20% SAWDUST**		
	Flue Gas		Combustion			Flue Gas		Combustion	
Time[s]	Temp [K]	Trendline	Efficiency	Tendline		Temp [K]	Trendline	Efficiency	Tendline
0.000	250	250.00	0	0.00		250	250.00	0	0.00
0.125		1085.68		49.70			1049.32		47.50
0.250	1312	1304.71		74.07		1279	1269.16		72.22
0.375		1354.73		86.05			1322.99		85.09
0.500		1358.49		91.97			1329.31		91.80
0.625		1349.68		94.92			1322.10		95.29
0.750	1373	1337.51	96.4	96.42		1345	1311.10	97.2	97.12
0.875		1324.52		97.21			1299.10		98.08
1.000		1311.40		97.65			1286.90		98.59
1.125	1251	1298.34		97.93		1226	1274.72		98.86
1.250		1285.39		98.12			1262.63		99.02
1.375		1272.56		98.27			1250.64		99.10
1.500		1259.86		98.40			1238.77		99.16
1.625		1247.29		98.52			1227.01		99.20
1.750		1234.84	98.61	98.64			1215.36	99.22	99.22
1.875		1222.52		98.75			1203.82		99.25
2.000		1210.32		98.86			1192.40		99.27
2.125		1198.24		98.97			1181.08		99.29
2.250		1186.28	99.08	99.09			1169.86	99.31	99.31
2.375		1174.44		99.20			1158.76		99.33
2.500		1162.72		99.31			1147.76		99.35
2.625		1151.11		99.42			1136.86		99.37
2.750		1139.63		99.54			1126.07		99.39
2.875		1128.25		99.65			1115.38		99.41
3.000		1116.99		99.76			1104.79		99.42
3.125	1109	1105.85		99.88			1094.30		99.44
3.250		1094.81		99.99		1094	1083.91		99.46

	Curve fitting coefficients for exponential fit y = a*exp(bx)+c*exp(dx) trendlines								
a		1343		96.65			1333		98.29
b		-0.07004		0.006272			-0.06657		0.005078
c		-1093		-96.65			-1084		-98.29
d		-7.04		-6.96			-6.525		-5.893
R^2		0.9638		1			0.9625		1

		TEST 16 10% GRASS					**TEST 17 15% GRASS**		
	Flue Gas		Combustion			Flue Gas		Combustion	
Time[s]	Temp [K]	Trendline	Efficiency	Tendline		Temp [K]	Trendline	Efficiency	Tendline
0.000	250	250.00	0	0.00		250	249.00	0	0.00
0.125		877.94		56.23			842.43		51.30
0.250	1156	1131.64		79.84		1124	1098.88		75.89
0.375		1230.19		89.77			1206.30		87.69
0.500		1264.43		93.98			1247.85		93.38
0.625		1272.06		95.78			1260.31		96.13
0.750	1319	1268.71	97.24	96.58		1312	1259.96	97.76	97.48
0.875		1260.86		96.96			1253.98		98.16
1.000		1251.20		97.17			1245.56		98.52
1.125		1240.84		97.30			1236.11		98.72
1.250	1171	1230.26		97.39		1167	1226.26		98.85
1.375		1219.63		97.48			1216.27		98.95
1.500		1209.03		97.56			1206.26		99.03
1.625		1198.51		97.64			1196.30		99.10
1.750		1188.07		97.72			1186.40		99.16
1.875		1177.72	97.46	97.79			1176.58	99.2	99.23
2.000		1167.45		97.87			1166.83		99.29
2.125		1157.28		97.95			1157.16		99.36
2.250		1147.19		98.02			1147.57		99.42
2.375		1137.19	98.3	98.10			1138.06	99.48	99.48
2.500		1127.28		98.18			1128.63		99.55
2.625		1117.45		98.25			1119.28		99.61
2.750		1107.71		98.33			1110.01		99.67
2.875		1098.06		98.41			1100.81		99.74
3.000		1088.48		98.49			1091.68		99.80
3.125		1079.00		98.56			1082.64		99.86
3.250		1069.59		98.64			1073.67		99.93
3.375	1072	1060.27		98.72		1076	1064.77		99.99

Curve fitting coefficients for exponential fit					
y = a*exp(bx)+c*exp(dx) trendlines					
a		1324		97.58	
b		-0.0664		0.008319	
c		-1075		-97.58	
d		-6.318		-6.517	
R^2		0.9695		1	
		TEST 18 20% GRASS			
	Flue Gas		Combustion		
Time[s]	Temp [K]	Trendline	Efficiency	Tendline	
0.000	250	249.00	0	0.00	
0.125		825.05		54.47	
0.250	1110	1080.67		78.65	
0.375		1190.87		89.41	
0.500		1235.11		94.24	
0.625		1249.45		96.43	
0.750	1297	1250.27	97.7	97.46	
0.875		1245.00		97.97	
1.000		1237.00		98.25	
1.125		1227.82		98.43	
1.250	1165	1218.15		98.57	
1.375		1208.29		98.69	
1.500		1198.40		98.80	
1.625		1188.54		98.91	
1.750		1178.74		99.01	
1.875		1169.00	99.09	99.11	
2.000		1159.34		99.22	
2.125		1149.76		99.32	
2.250		1140.26		99.42	
2.375		1130.84	99.55	99.53	
2.500		1121.49		99.63	
2.625		1112.22		99.73	
2.750		1103.03		99.84	
2.875		1093.91		99.94	
3.000		1084.87		100.00	
3.125		1075.90			
3.250		1067.01			
3.375	1066	1058.19			

APPENDIX D

Handwritten log sheets and combustible residue data for the first tests (nos. 11-18).

Didn't measure Slag

POWER STATION -

Coal Type: TOWNSVILLE 6%
Fineness:
Coal Flow: 169

Date: 26/09/07
Test: 11
Procedur:

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					BIOMASS FLOW	
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5	kg/hr	
07:39	173	462	96	1185	305	1266	1174	1004	932	895		-32
07:43	177	398	96	1182	307	1267	1175	1002	933	895		-77
07:50	173	443	89	1179	298	1268	1176	1004	934	897		-107
07:52	173	397	94	1180	297	1269	1176	1004	934	897		-56
07:54	176	438	91	1181	298	1269	1176	1004	935	898		-69
07:57	173	409	97	1182	299	1270	1176	1004	935	898		-72
07:59	174	480	96	1182	300	1270	1177	1004	935	898		-124
08:03	171	406	96	1184	303	1271	1177	1004	936	899		-31
08:05	174	391	96	1183	304	1271	1177	1004	936	900		-86

Gas Temperature				O2 Zirconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1340	1391	1279	1119	4,50	3,59	80	14,9	487	1116	—	1439
1335	1383	1275	1119	4,97	4,46	86	14,6	539	1168	—	1388
1334	1379	1277	1119	4,97	4,10	78	15,0	613	1100	—	1329
1331	1373	1276	1115	5,59	4,58	82	14,3	570	1156	—	1361
1328	1366	1272	1110	5,59	4,55	81	14,2	636	1084	—	1369
1326	1365	1270	1109	5,59	5,36	78	13,8	651	1152	—	1224
1323	1361	1269	1107	5,90	5,19	75	13,5	642	1052	—	1361
1321	1360	1265	1105	5,90	5,66	72	13,3	642	1140	—	1396
1320	1359	1263	1103	5,90	5,48	72	13,6	687	1152	—	1408

Conducted By

Name: R.A. Fox

Signature

Didn't measure Slag

90% / 10%

POWER STATION -

Coal Type 90% Townsland : 10% Sawdust
Fineness
Coal Flow 152 / 20,24 - 1310 mass

Date 26/09/07
Test 13
Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					Biomass Flow FF
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5	kg/hr
10:48	158	456	89	1174	295	1259	1167	986	949	920	2024 -95
10:52	157	448	98	1176	305	1259	1167	989	949	920	2024 -102
10:56	151	411	96	1174	303	1258	1167	990	945	921	2024 -127
11:00	154	361	91	1174	301	1258	1167	990	949	921	2024 -104
11:04	155	369	96	1175	301	1257	1167	990	949	922	2024 -111
11:08	159	450	97	1172	302	1257	1167	989	949	922	2024 -113
11:12	153	429	95	1174	303	1256	1166	989	950	922	2024 -61
11:16	158	403	98	1176	305	1256	1166	990	950	923	2024 -125

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1290	1338	1229	1076	6,82	6,26	39	12,9	758	1068	—	1282
1290	1338	1230	1076	6,66	6,17	41	12,9	785	1023	—	1380
1289	1332	1231	1077	7,29	7,20	40	12,0	716	1192	—	1322
1289	1332	1231	1076	7,29	6,18	38	12,3	755	1044	—	1298
1294	1346	1231	1079	6,36	5,81	36	13,5	853	1200	—	1369
1289	1330	1232	1077	7,59	7,16	36	11,9	722	1140	—	1275
1287	1324	1231	1073	7,91	7,40	36	11,7	724	954	—	1361
1288	1329	1229	1073	7,28	6,90	34	12,2	762	1112	—	1236

Conducted By P. RATTOO (Name) RATTOO (Signature)

Slag 8,47g in 30 minutes

POWER STATION -

Coal Type 85% TOWNSVILLE; 15% SAWDUST
Fineness
Coal Flow 144 / 30,36 - BIOMASS

Date 26/09/07
Test 14
Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					BIOMASS FLOW
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5	kg/hr
11:34	145	448	95	1169	292	1254	1164	987	950	924	30,36
11:38	146	389	90	1172	301	1253	1164	985	950	925	30,36
11:42	146	458	89	1169	303	1252	1163	984	950	925	30,36
11:46	147	425	96	1167	299	1252	1163	983	951	925	30,36
11:50	150	375	88	1167	296	1251	1162	983	951	925	30,36
11:54	149	452	87	1166	295	1251	1162	982	951	926	30,36
11:58	148	450	96	1167	293	1251	1162	981	951	926	30,36
12:02	146	443	94	1164	291	1251	1162	981	951	926	30,36

FP
-111
-154
-113
-96
-134
-171
-124
-144

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1305	1370	1247	~~1159~~	5,28	5,17	48	13,0	650	1024	—	1282
1307	1373	1247	1104	4,81	4,56	41	14,6	719	1015	—	1313
1313	1382	1252	1114	4,67	4,24	43	14,2	658	1008	—	1149
1314	1372	1254	1113	5,74	5,86	48	13,3	657	951	—	1236
1316	1375	1254	1109	4,97	4,75	43	14,6	730	1012	—	1247
1316	1375	1254	1111	5,12	5,25	45	13,9	653	1003	—	1247
1314	1369	1253	1108	5,44	5,52	45	13,9	648	935	—	1224
1315	1374	1252	1110	5,12	5,48	44	13,9	670	1064	—	1165

Conducted By P. RATTO — Name — Signature

Slag 9,28g in 30 minutes

POWER STATION -

Coal Type 80% TOWNSEND, 20% SPRINGSTON Date 26/09/07
Fineness Test 15
Coal Flow 136 / 40, 49 - 136 BIOMASS Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					BIOMASS FLOW/FUEL
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5	kg/hr
12:48	140	410	96	1167	301	1251	1157	969	952	928	40,49 - 36 2
12:52	140	407	95	1168	302	1251	1156	966	952	928	40,49 - 362
12:56	142	442	96	1165	302	1250	1154	963	952	927	40,69 - 362
13:01	142	447	91	1169	303	1250	1153	961	952	929	40,69 - 362
13:04	142	441	97	1169	304	1250	1153	959	952	928	40,49 - 362
13:08	140	448	98	1169	304	1250	1153	958	952	928	40,49 - 36 L
13:11	145	443	96	1167	304	1249	1153	957	952	9207	40,69 - 362
13:14	145	465	98	1168	303	1246	1153	957	952	929	40,69 - 362

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1299	1355	1241	1108	7,30	8.26	56	10,9	565	843	—	1095
1289	1346	1234	1096	7.61	7.66	50	11,6	598	903	—	1063
1282	1343	1225	1093	7.61	7.35	45	11.8	575	939	—	1067
1272	1342	1223	1090	7.45	7.12	43	12,4	591	913	—	1173
1273	1341	1221	1089	7.30	7.29	40	11.8	569	955	—	1161
1271	1341	1220	1090	7.29	6.92	40	12.2	581	979	—	1189
1266	1337	1215	1088	7.60	7.31	39	11.8	571	939	—	1197
1264	1339	1217	1088	7.60	7.44	48	40	545	903	—	1161

Conducted By P. RATTOO (Name) (Signature)

Slag 15,67g in 30 minutes

POWER STATION -

Coal Type 90% Townsland, 10% Grass
Fineness
Coal Flow 152 / 21,56 Biomass

Date 26/09/07
Test 16
Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					Biomass Flow	
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5		
14:21	153	400	89	1169	297	1230	1138	943	951	930	21,56	-329
14:23	155	404	92	1169	298	1229	1138	943	951	930	21,56	-359
14:26	159	450	97	1168	298	1228	1137	943	951	931	21,56	-325
14:29	157	464	96	1171	298	1228	1136	942	951	931	21,56	-377
14:32	156	376	94	1169	299	1226	1136	942	951	931	21,56	-388
14:35	154	437	89	1171	300	1225	1135	944	951	931	21,56	-311
14:37	158	426	90	1170	300	1224	1134	940	951	931	21,56	-379
14:40	155	415	92	1169	301	1223	1133	939	951	931	21,56	-302
14.44	153	421	90	1171	301	1222	1132	939	950	931	21,56	-340

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1151	1295	1162	1059	8,53	7,60	63	11,5	534	767	—	977
1152	1298	1164	1062	8,52	7,69	56	11,4	538	823	—	1005
1153	1307	1167	1067	8,07	7,42	51	11,8	563	815	—	1032
1156	1316	1169	1071	7,92	7,06	48	11,9	567	859	—	985
1161	1331	1173	1077	7,61	6,97	45	12,1	560	815	—	1009
1160	1331	1175	1078	7,92	6,91	43	12,3	564	819	—	1032
1161	1337	1176	1082	7,61	6,98	41	12,2	576	837	—	1013
1157	1331	1178	1082	8,22	8,20	41	10,9	537	775	—	973

Conducted By P. Kane

1159	1331	1178	1081	7,76	6,92	40	12,4	578	823	—	1028

Name Signature

Slag 16,19g in 30mins

POWER STATION -

Coal Type: 85% TOWNSLAND, 15% GRASS
Fineness:
Coal Flow: 144 | 32,34

Date: 26/09/07
Test: 17
Procedur:

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					BIOMASS FLOW	FP
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5		
15:16	148	408	88	1170	304	1211	1123	934	949	931	32,34	-385
15:20	143	405	89	1169	304	1211	1123	933	949	981	32,34	-441
15:24	145	475	91	1170	305	1210	1121	933	949	931	32,34	-358
15:28	144	365	97	1168	305	1209	1121	932	949	932	32,34	-323
15:32	145	453	91	1172	304	1208	1120	931	949	932	32,34	-359
15:36	149	366	96	1169	304	1207	1119	931	948	932	32,34	-324
15:40	145	383	96	1171	304	1206	1118	929	948	931	32,34	-370
15143	145	413	95	1170	303	1205	1117	927	948	931	32,34	-399

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1135	1323	1170	1078	8,53	8,40	48	10,6	515	791	—	969
1133	1321	1170	1077	8,53	8,07	45	11,3	512	723	—	915
1127	1309	1168	1074	8,84	7,81	41	11,3	512	843	—	954
1126	1313	1167	1075	8,53	7,92	39	11,3	532	827	—	942
1123	1312	1167	1076	8,53	8,07	37	11,1	532	839	—	1009
1120	1310	1166	1076	8,84	8,08	36	11,0	525	827	—	962
1115	1307	1162	1076	8,84	8,42	36	10,9	522	739	—	915
1112	1305	1159	1075	8,83	8,69	35	10,5	530	791	—	946

Conducted By

P. KRATOO
Name

Signature

Slag 9,6g 30minutes

POWER STATION -

Coal Type: 80% Townsland, 20% Grass
Fineness:
Coal Flow: 136 / 43,12 Biomass

Date: 26/09/07
Test: 18
Procedur:

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures					
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5	
16:05	137	453	97	1171	303	1201	1114	930	948	934	-317
16:09	137	458	98	1172	304	1201	1114	930	948	934	-353
16:13	139	413	90	1171	302	1200	1114	930	947	934	-366
16:17	140	459	89	1169	299	1200	1113	930	948	934	-315
16:21	138	443	98	1170	297	1199	1112	930	947	935	-313
16:25	136	400	94	1168	295	1199	1112	930	947	935	-168
16:29	140	459	91	1172	300	1198	1111	930	942	935	-299
16:32	141	452	88	1171	304	1198	1111	929	947	935	-228

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1118	1303	1168	1072	8,84	8,40	39	10,8	542	759	—	848
1116	1302	1168	1070	8,83	8,35	36	10,9	544	735	—	887
1111	1297	1166	1067	9,15	8,67	34	11,1	530	719	—	882
1109	1294	1164	1065	9,46	8,75	32	10,5	518	679	—	837
1106	1293	1163	1063	9,14	8,62	32	10,8	547	715	—	844
1106	1295	1163	1063	9,14	8,05	31	10,7	554	729	—	942
1106	1297	1164	1064	9,14	7,98	30	11,0	564	749	—	907
1102	1292	1163	1063	9,61	8,75	31	9,9	526	727	—	936

Conducted By

P. [illegible]
Name

[illegible]
Signature

Priven Rajoo

Eskom ERID

Date:
10-Oct-2007

Enquiries:M Kgaphola/W Delport
Tel 27 11 629 5254
Fax 27 11 629 5528

Dear Mr. P Rajoo
Laboratory report

RESULTS FOR GPE FURNACE FLUE DUST 2

Date	Test	Port	Coal sample	Combustible residue
26-Sep-07	11	9	Coal	7.2
26-Sep-07	11	15	Coal	2.4
26-Sep-07	11	21	Coal	2.0
26-Sep-07	13	9	Coal&sawdust	4.4
26-Sep-07	13	15	Coal&sawdust	1.0
26-Sep-07	13	21	Coal&sawdust	0.6
26-Sep-07	14	9	Coal&sawdust	7.4
26-Sep-07	14	15	Coal&sawdust	3.0
26-Sep-07	14	21	Coal&sawdust	2.0
26-Sep-07	15	9	Coal&sawdust	6.2
26-Sep-07	15	15	Coal&sawdust	1.8
26-Sep-07	15	21	Coal&sawdust	1.6
26-Sep-07	16	9	Coal & grass	8.3
26-Sep-07	16	15	Coal & grass	5.0
26-Sep-07	16	21	Coal & grass	3.4
26- Sep-07	17	9	Coal & grass	4.6
26- Sep-07	17	15	Coal & grass	1.7
26-Sep-07	17	21	Coal & grass	1.1
26-Sep-07	18	9	Coal & grass	4.9
26-Sep-07	18	15	Coal & grass	2.0
26-Sep-07	18	21	Coal & grass	1.0

Repeats

Date	Test	Port	Coal sample	Combustible residue
26-Sep-07	16	9	Coal & grass	5.4
26-Sep-07	16	21	Coal & grass	8.9

Regards
M Kgaphola
Senoir Technician (Coal & X-Ray Laboratory)

APPENDIX E

Data Logs for the repeat tests (nos.1-4) conducted in August 2008.

TEST 1 COAL (Repeat)			FUEL AND AIR FLOWS				
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow	Purge Air	Total Air Flow
08/08/2008 13:19:00	163	169	376	970	0	149	1495
08/08/2008 13:20:00	163	163	373	970	0	149	1492
08/08/2008 13:21:00	163	162	421	970	0	149	1540
08/08/2008 13:22:00	163	161	399	973	0	149	1521
08/08/2008 13:23:00	163	171	421	971	0	149	1541
08/08/2008 13:24:00	163	165	400	967	0	149	1516
08/08/2008 13:25:00	163	170	400	970	0	149	1519
08/08/2008 13:26:00	163	166	405	969	0	149	1523
08/08/2008 13:27:00	163	166	370	974	0	149	1493
08/08/2008 13:28:00	163	166	404	968	0	149	1521
08/08/2008 13:29:00	163	161	396	972	0	149	1517
08/08/2008 13:30:00	163	164	421	974	0	149	1544
08/08/2008 13:31:00	163	166	405	967	0	149	1521
08/08/2008 13:32:00	163	168	402	971	0	149	1522
08/08/2008 13:33:00	163	165	403	970	0	149	1522
08/08/2008 13:34:00	163	166	407	969	0	149	1525
08/08/2008 13:35:00	163	167	413	968	0	149	1530
08/08/2008 13:36:00	163	161	402	971	0	149	1522
08/08/2008 13:37:00	163	165	405	970	0	149	1524
08/08/2008 13:38:00	163	164	417	974	0	149	1540
08/08/2008 13:39:00	163	164	393	969	0	149	1511
08/08/2008 13:40:00	163	166	391	969	0	149	1509
08/08/2008 13:41:00	163	162	389	972	0	149	1510
08/08/2008 13:42:00	163	167	368	972	0	149	1489
08/08/2008 13:43:00	163	167	388	972	0	149	1509
08/08/2008 13:44:00	163	168	391	971	0	149	1516
08/08/2008 13:45:00	163	167	423	973	0	149	1545
08/08/2008 13:46:00	163	160	364	973	0	149	1486
08/08/2008 13:47:00	163	167	362	968	0	149	1479
08/08/2008 13:48:00	163	165	416	975	0	149	1540
08/08/2008 13:49:00	163	164	401	974	0	149	1524
08/08/2008 13:50:00	163	166	364	974	0	149	1487
08/08/2008 13:51:00	163	164	410	971	0	149	1530
AVERAGE	**163**	**165**	**397**	**971**	**0**	**149**	**1517**

TEST 2 10%SAWDUST 90%COAL (Repeat)			FUEL AND AIR FLOWS				
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow	Purge Air	Total Air Flow
08/08/2008 14:14:00	147	149	359	978	0	153	1490
08/08/2008 14:15:00	147	147	359	969	0	153	1481
08/08/2008 14:16:00	147	149	354	975	0	153	1482
08/08/2008 14:17:00	147	148	353	975	0	153	1481
08/08/2008 14:18:00	147	148	353	973	0	153	1479
08/08/2008 14:19:00	147	145	409	967	0	153	1529
08/08/2008 14:20:00	147	149	415	967	0	153	1535
08/08/2008 14:21:00	147	149	428	967	0	153	1548
08/08/2008 14:22:00	147	148	415	970	0	153	1538
08/08/2008 14:23:00	147	147	412	968	0	153	1533
08/08/2008 14:24:00	147	150	425	967	0	153	1545
08/08/2008 14:25:00	147	149	423	968	0	153	1544
08/08/2008 14:26:00	147	147	412	968	0	153	1533
08/08/2008 14:27:00	147	150	425	968	0	153	1546
08/08/2008 14:28:00	147	149	426	968	0	153	1547
08/08/2008 14:29:00	147	147	418	972	0	153	1543
08/08/2008 14:30:00	147	149	417	969	0	153	1544
08/08/2008 14:31:00	147	147	423	969	0	153	1545
08/08/2008 14:32:00	147	148	423	969	0	153	1545
08/08/2008 14:33:00	147	147	420	969	0	153	1542
08/08/2008 14:34:00	147	149	414	973	0	153	1540
AVERAGE	**147**	**148**	**404**	**970**	**0**	**153**	**1527**

TEST 3 15%SAWDUST 85%COAL (Repeat)			FUEL AND AIR FLOWS				
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow	Purge Air	Total Air Flow
08/08/2008 14:52:00	139	140.1	425	967	0	150	1542
08/08/2008 14:53:00	139	141.7	421	967	0	150	1538
08/08/2008 14:54:00	139	142.9	435	968	0	150	1553
08/08/2008 14:55:00	139	140.2	435	970	0	150	1555
08/08/2008 14:56:00	139	140.8	422	970	0	150	1542
08/08/2008 14:57:00	139	141	437	970	0	150	1557
08/08/2008 14:58:00	139	140.8	429	975	0	150	1554
08/08/2008 14:59:00	139	138.8	422	975	0	150	1547
08/08/2008 15:00:00	139	140.6	439	976	0	150	1565
08/08/2008 15:01:00	139	140.9	425	972	0	150	1547
08/08/2008 15:02:00	139	139.2	429	972	0	150	1551
08/08/2008 15:03:00	139	140.4	434	976	0	150	1560
08/08/2008 15:04:00	139	140.5	422	975	0	150	1547
08/08/2008 15:05:00	139	139.6	422	972	0	150	1544
08/08/2008 15:06:00	139	142	439	976	0	150	1565
08/08/2008 15:07:00	139	141.2	423	977	0	150	1550
08/08/2008 15:08:00	139	139.2	428	970	0	150	1548
08/08/2008 15:09:00	139	139.7	429	969	0	150	1548
08/08/2008 15:10:00	139	141.4	422	970	0	150	1542
08/08/2008 15:11:00	139	139.6	435	970	0	150	1555
08/08/2008 15:12:00	139	141.4	428	971	0	150	1549
AVERAGE	**139**	**141**	**429**	**972**	**0**	**150**	**1550**

TEST 4 20%SAWDUST 80%COAL (Repeat)			FUEL AND AIR FLOWS				
Time	WeighFeederFeedRateSetpointPot	WeighFeederFeedRateActualExp	FT125 - Primary Air flow	FT208 - Secondary Air Flow	FT210 - Overfire Air Flow	Purge Air	Total Air Flow
08/08/2008 15:29:00	130	132	428	968	0	150	1546
08/08/2008 15:30:00	130	132	430	967	0	150	1547
08/08/2008 15:31:00	130	132	439	969	0	150	1558
08/08/2008 15:32:00	130	131	433	966	0	150	1549
08/08/2008 15:33:00	130	131	431	968	0	150	1549
08/08/2008 15:34:00	130	131	437	973	0	150	1560
08/08/2008 15:35:00	130	132	435	972	0	150	1557
08/08/2008 15:36:00	130	134	432	974	0	150	1556
08/08/2008 15:37:00	130	130	438	970	0	150	1558
08/08/2008 15:38:00	130	130	431	972	0	150	1553
08/08/2008 15:39:00	130	132	432	975	0	150	1557
08/08/2008 15:40:00	130	133	438	973	0	150	1561
08/08/2008 15:41:00	130	129	436	969	0	150	1555
08/08/2008 15:42:00	130	131	432	973	0	150	1555
08/08/2008 15:43:00	130	132	430	969	0	150	1549
08/08/2008 15:44:00	130	130	437	969	0	150	1556
08/08/2008 15:45:00	130	130	432	967	0	150	1549
08/08/2008 15:46:00	130	133	433	969	0	150	1552
08/08/2008 15:47:00	130	131	433	968	0	150	1551
08/08/2008 15:48:00	130	131	430	966	0	150	1546
08/08/2008 15:49:00	130	132	431	971	0	150	1552
AVERAGE	**130**	**131**	**433**	**970**	**0**	**150**	**1553**

TEST 1 COAL (Repeat)			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
08/08/2008 13:19:00	1244	1344	1215	930	1183	177	980
08/08/2008 13:20:00	1243	1345	1215	930	1183	176	980
08/08/2008 13:21:00	1242	1345	1215	931	1183	181	980
08/08/2008 13:22:00	1241	1343	1214	931	1182	176	980
08/08/2008 13:23:00	1240	1344	1214	930	1182	172	980
08/08/2008 13:24:00	1238	1341	1213	929	1180	170	981
08/08/2008 13:25:00	1239	1343	1214	929	1181	169	981
08/08/2008 13:26:00	1240	1345	1214	930	1182	169	981
08/08/2008 13:27:00	1240	1347	1215	931	1183	169	981
08/08/2008 13:28:00	1238	1345	1215	931	1182	169	981
08/08/2008 13:29:00	1238	1344	1215	931	1182	169	981
08/08/2008 13:30:00	1238	1345	1215	931	1182	169	981
08/08/2008 13:31:00	1238	1345	1215	931	1182	169	981
08/08/2008 13:32:00	1237	1344	1215	930	1182	169	981
08/08/2008 13:33:00	1237	1344	1215	930	1182	169	981
08/08/2008 13:34:00	1237	1346	1216	930	1182	170	981
08/08/2008 13:35:00	1237	1346	1216	931	1183	169	981
08/08/2008 13:36:00	1237	1346	1216	931	1183	169	981
08/08/2008 13:37:00	1236	1346	1217	931	1183	169	981
08/08/2008 13:38:00	1236	1346	1217	932	1183	170	981
08/08/2008 13:39:00	1237	1347	1218	933	1184	170	981
08/08/2008 13:40:00	1237	1347	1218	933	1184	170	981
08/08/2008 13:41:00	1236	1347	1218	934	1184	169	981
08/08/2008 13:42:00	1236	1348	1218	934	1184	170	981
08/08/2008 13:43:00	1237	1348	1219	934	1185	169	981
08/08/2008 13:44:00	1236	1348	1219	935	1185	170	981
08/08/2008 13:45:00	1236	1347	1219	935	1184	169	981
08/08/2008 13:46:00	1236	1348	1219	935	1185	169	981
08/08/2008 13:47:00	1237	1350	1220	936	1186	170	981
08/08/2008 13:48:00	1236	1349	1220	936	1185	170	981
08/08/2008 13:49:00	1238	1352	1221	937	1187	170	981
08/08/2008 13:50:00	1238	1353	1222	938	1188	170	981
08/08/2008 13:51:00	1237	1352	1222	939	1188	170	981
AVERAGE	**1238**	**1346**	**1217**	**932**	**1183**	**170**	**981**

TEST 2 10%SAWDUST 90%COAL (Repeat)			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
08/08/2008 14:14:00	1256	1366	1241	957	1205	178	981
08/08/2008 14:15:00	1257	1371	1244	960	1208	179	981
08/08/2008 14:16:00	1257	1372	1244	962	1209	180	981
08/08/2008 14:17:00	1257	1373	1244	963	1209	177	981
08/08/2008 14:18:00	1256	1372	1244	963	1209	175	981
08/08/2008 14:19:00	1256	1371	1243	962	1208	175	981
08/08/2008 14:20:00	1257	1374	1244	963	1210	177	982
08/08/2008 14:21:00	1259	1375	1245	964	1211	178	982
08/08/2008 14:22:00	1257	1373	1245	964	1210	178	981
08/08/2008 14:23:00	1256	1371	1244	963	1209	178	981
08/08/2008 14:24:00	1255	1369	1243	962	1207	179	981
08/08/2008 14:25:00	1252	1365	1241	961	1205	178	981
08/08/2008 14:26:00	1252	1364	1240	960	1204	178	981
08/08/2008 14:27:00	1253	1364	1240	960	1204	178	981
08/08/2008 14:28:00	1251	1363	1239	960	1203	178	982
08/08/2008 14:29:00	1250	1362	1239	960	1203	178	982
08/08/2008 14:30:00	1252	1363	1239	960	1204	178	982
08/08/2008 14:31:00	1251	1364	1239	961	1204	178	981
08/08/2008 14:32:00	1251	1363	1239	961	1204	178	981
08/08/2008 14:33:00	1252	1364	1239	960	1204	178	981
08/08/2008 14:34:00	1251	1363	1239	961	1204	178	982
AVERAGE	**1254**	**1368**	**1242**	**961**	**1206**	**178**	**981**

TEST 3 15%SAWDUST 85%COAL (Repeat)			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
08/08/2008 14:52:00	1266	1381	1251	974	1218	186	982
08/08/2008 14:53:00	1267	1381	1252	975	1219	186	982
08/08/2008 14:54:00	1265	1379	1251	974	1217	183	982
08/08/2008 14:55:00	1264	1377	1251	973	1216	182	982
08/08/2008 14:56:00	1264	1376	1250	973	1216	181	982
08/08/2008 14:57:00	1265	1376	1250	973	1216	180	982
08/08/2008 14:58:00	1264	1377	1250	972	1216	180	982
08/08/2008 14:59:00	1263	1374	1249	971	1214	179	982
08/08/2008 15:00:00	1265	1376	1250	971	1216	180	983
08/08/2008 15:01:00	1264	1375	1250	971	1215	179	983
08/08/2008 15:02:00	1263	1374	1249	971	1214	179	983
08/08/2008 15:03:00	1266	1376	1250	971	1216	179	983
08/08/2008 15:04:00	1267	1378	1251	972	1217	179	982
08/08/2008 15:05:00	1267	1379	1252	973	1218	180	983
08/08/2008 15:06:00	1270	1382	1253	974	1220	180	983
08/08/2008 15:07:00	1269	1382	1254	974	1220	180	983
08/08/2008 15:08:00	1270	1383	1254	974	1220	180	983
08/08/2008 15:09:00	1277	1391	1257	977	1226	181	983
08/08/2008 15:10:00	1278	1396	1260	981	1229	181	983
08/08/2008 15:11:00	1277	1396	1262	983	1230	181	983
08/08/2008 15:12:00	1278	1395	1262	984	1230	182	983
AVERAGE	**1268**	**1381**	**1253**	**974**	**1219**	**181**	**982**

TEST 4 20%SAWDUST 80%COAL (Repeat)			GAS AND WALL TEMPERATURES				
Time	TE401A Gas temp 0.4m	TE401B Gas temp 1.15m	TE 401C Gas temp 1.8m	TE402 Gas temp furnace exit	Average Gas Temperature	TE403 Outlet gas convective	Average Wall Temperature
08/08/2008 15:29:00	1283	1401	1267	993	1236	192	984
08/08/2008 15:30:00	1285	1403	1267	993	1237	192	984
08/08/2008 15:31:00	1283	1402	1268	993	1237	189	984
08/08/2008 15:32:00	1283	1401	1268	993	1236	187	985
08/08/2008 15:33:00	1284	1402	1268	992	1237	187	985
08/08/2008 15:34:00	1282	1400	1267	992	1235	186	985
08/08/2008 15:35:00	1280	1396	1266	991	1233	186	985
08/08/2008 15:36:00	1279	1393	1265	989	1232	186	985
08/08/2008 15:37:00	1276	1389	1263	988	1229	186	985
08/08/2008 15:38:00	1277	1388	1262	986	1228	186	985
08/08/2008 15:39:00	1279	1390	1263	988	1230	187	985
08/08/2008 15:40:00	1279	1394	1265	991	1232	187	985
08/08/2008 15:41:00	1281	1396	1267	993	1234	187	985
08/08/2008 15:42:00	1285	1402	1270	996	1238	188	985
08/08/2008 15:43:00	1286	1406	1272	1000	1241	188	985
08/08/2008 15:44:00	1286	1406	1274	1002	1242	188	985
08/08/2008 15:45:00	1287	1407	1275	1004	1243	189	985
08/08/2008 15:46:00	1287	1409	1276	1006	1245	189	985
08/08/2008 15:47:00	1288	1409	1276	1005	1245	189	985
08/08/2008 15:48:00	1287	1407	1275	1004	1243	188	985
08/08/2008 15:49:00	1287	1405	1275	1002	1242	188	985
AVERAGE	**1283**	**1400**	**1269**	**995**	**1237**	**188**	**985**

TEST 1 COAL (Repeat)			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
08/08/2008 13:19:00	-174	7.74	5.86	32.18	28.29	12.95	469.27	1313.77	0.16	1477.26
08/08/2008 13:20:00	-146	7.74	5.97	31.01	26.79	13.07	476.53	1321.65	0.12	1469.59
08/08/2008 13:21:00	-190	8.04	6.51	31.01	26.87	12.64	447.91	1225.32	-0.1	1414.64
08/08/2008 13:22:00	-183	7.9	6.4	32.09	28.54	12.34	455.59	1329.59	-0.22	1508.64
08/08/2008 13:23:00	-223	7.75	5.97	32.09	26.84	12.83	471.61	1313.84	0.05	1531.81
08/08/2008 13:24:00	-173	7.9	6.67	29.84	25.03	12.73	444.91	1301.56	-0.04	1422.66
08/08/2008 13:25:00	-232	7.9	6.25	28.67	24.1	12.78	466.94	1293.68	0.1	1485.21
08/08/2008 13:26:00	-210	7.75	6.25	28.67	23.75	13.03	475.78	1374.06	0.05	1485.21
08/08/2008 13:27:00	-235	7.75	5.88	27.5	23.24	13.1	483.63	1317.58	0.12	1528.07
08/08/2008 13:28:00	-229	8.05	5.89	27.5	23.44	13.1	485.05	1337.87	0.12	1477.46
08/08/2008 13:29:00	-217	8.05	6.45	27.5	23.86	12.59	466.1	1313.84	-0.19	1481.14
08/08/2008 13:30:00	-236	7.89	5.81	27.5	23.09	12.82	473.78	1273.65	0.05	1485.28
08/08/2008 13:31:00	-181	7.9	6.37	27.5	23.19	12.77	471.61	1313.77	0.08	1481.2
08/08/2008 13:32:00	-223	8.04	6.1	27.5	22.6	13	481.96	1329.73	-0.11	1453.56
08/08/2008 13:33:00	-209	8.03	6.36	27.5	23.55	12.64	470.61	1305.76	0	1477.4
08/08/2008 13:34:00	-156	7.89	6.05	27.5	23.2	12.64	479.71	1261.57	0	1496.82
08/08/2008 13:35:00	-234	7.89	6.42	27.59	23.2	12.57	477.95	1291.14	-0.04	1477.4
08/08/2008 13:36:00	-207	8.04	6.03	27.59	22.87	12.81	477.95	1269.51	0.16	1492.75
08/08/2008 13:37:00	-244	8.03	6	26.5	22.72	12.68	481.37	1321.52	0.08	1485.21
08/08/2008 13:38:00	-215	8.03	6.26	26.5	22.97	12.78	475.2	1273.65	-0.19	1465.71
08/08/2008 13:39:00	-245	7.88	5.87	26.5	22.77	12.85	477.87	1269.51	-0.07	1477.2
08/08/2008 13:40:00	-205	8.03	5.97	26.5	22.37	12.98	486.55	1293.68	0.28	1512.51
08/08/2008 13:41:00	-221	8.02	6.17	26.5	22.69	12.98	483.46	1269.45	0.07	1469.52
08/08/2008 13:42:00	-251	7.87	5.91	26.5	22.68	12.78	479.62	1277.72	0.08	1508.64
08/08/2008 13:43:00	-165	8.02	6.18	26.5	22.77	13.09	483.04	1313.77	0.16	1492.89
08/08/2008 13:44:00	-200	8.02	5.96	26.5	22.57	12.88	486.8	1341.74	0	1500.5
08/08/2008 13:45:00	-154	8.02	6.34	26.5	22.87	12.87	480.71	1305.7	0	1485.21
08/08/2008 13:46:00	-241	8.02	6.26	26.5	22.65	12.77	478.2	1341.61	-0.11	1453.7
08/08/2008 13:47:00	-226	8.01	5.85	26.5	22.42	12.89	483.29	1273.78	0.21	1504.63
08/08/2008 13:48:00	-210	8.02	6.11	26.5	22.22	13.12	486.21	1273.65	0	1485.21
08/08/2008 13:49:00	-204	8.02	6.11	26.5	22.93	12.38	499.23	1297.62	-0.04	1539.82
08/08/2008 13:50:00	-209	7.87	5.85	26.5	22.37	13.07	492.64	1325.79	0.25	1524.13
08/08/2008 13:51:00	-221	8.01	5.89	26.5	22.22	13.17	492.97	1313.84	0.21	1516.32
AVERAGE	**-208**	**8**	**6**	**28**	**24**	**13**	**477**	**1302**	**0**	**1487**

TEST 2 10%SAWDUST 90%COAL (Repeat)			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
08/08/2008 14:14:00	-164	7.43	5.95	36.76	33.18	12.93	443.74	1473.93	-0.2	1676.6
08/08/2008 14:15:00	-135	7.42	3.9	36.76	31.76	14.94	468.27	1489.95	1.07	1680.54
08/08/2008 14:16:00	-181	7.57	5.15	36.76	32.82	14.06	441.57	1389.68	0.44	1696.1
08/08/2008 14:17:00	-242	7.57	4.9	39.1	34.28	13.91	448.5	1506.04	0.25	1664.85
08/08/2008 14:18:00	-210	7.72	4.97	38.02	33.46	14.11	450.75	1449.96	0.36	1668.79
08/08/2008 14:19:00	-220	7.72	5.64	35.68	32.13	13.48	445.49	1465.92	0.12	1617.99
08/08/2008 14:20:00	-221	7.72	5.07	35.68	30.86	13.63	450.67	1469.85	0.25	1672.73
08/08/2008 14:21:00	-160	7.57	5.31	35.68	31.1	13.73	451.08	1477.93	0.26	1692.36
08/08/2008 14:22:00	-181	7.87	5.12	35.68	31.25	14.07	450.08	1446.02	0.4	1617.92
08/08/2008 14:23:00	-188	7.87	5.71	35.68	32.27	13.1	434.48	1446.15	-0.22	1626
08/08/2008 14:24:00	-187	7.86	5.83	35.68	32.05	13.25	435.23	1430.07	-0.15	1641.56
08/08/2008 14:25:00	-193	8.15	5.94	35.68	31.65	13.26	437.48	1377.99	-0.19	1563.18
08/08/2008 14:26:00	-169	7.86	6.06	35.68	31.85	12.57	425.63	1434.14	-0.23	1614.05
08/08/2008 14:27:00	-146	7.86	5.94	34.51	31.01	13.11	435.98	1441.88	-0.1	1645.16
08/08/2008 14:28:00	-178	8	5.51	34.51	30.71	13.42	437.81	1425.93	0.18	1641.69
08/08/2008 14:29:00	-186	8	6.07	34.51	30.68	12.76	426.38	1429.87	-0.25	1629.54
08/08/2008 14:30:00	-200	7.86	5.97	33.43	30.12	12.98	433.73	1454.1	-0.15	1622.13
08/08/2008 14:31:00	-186	7.87	5.54	33.43	29.67	13.25	440.4	1442.02	0.08	1621.93
08/08/2008 14:32:00	-206	7.86	6.02	33.43	29.97	13.07	435.48	1438.14	-0.15	1664.79
08/08/2008 14:33:00	-165	7.87	5.76	32.43	29.07	13.22	438.23	1433.94	0	1637.55
08/08/2008 14:34:00	-151	7.86	5.57	33.43	29.19	13.22	440.9	1446.15	0	1598.23
AVERAGE	**-184**	**8**	**6**	**35**	**31**	**13**	**442**	**1446**	**0**	**1643**

TEST 3 15%SAWDUST 85%COAL (Repeat)			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
08/08/2008 14:52:00	-177	7.42	4.26	35.6	32.19	14.59	435.98	1546.09	0.21	1727.87
08/08/2008 14:53:00	-181	7.42	4.79	36.85	33.18	14.26	432.22	1530.27	0.3	1723.8
08/08/2008 14:54:00	-182	7.55	4.73	36.85	32.71	14.16	428.55	1516.65	0.28	1692.29
08/08/2008 14:55:00	-162	7.69	4.98	36.76	33.94	13.57	426.8	1498.03	-0.11	1715.99
08/08/2008 14:56:00	-137	7.55	5.62	35.68	32.51	13.51	422.04	1505.9	-0.25	1720.06
08/08/2008 14:57:00	-182	7.55	4.71	34.43	31.03	14.21	436.23	1509.98	0.01	1723.74
08/08/2008 14:58:00	-187	7.7	4.77	34.43	30.54	13.96	435.14	1510.04	0.16	1687.02
08/08/2008 14:59:00	-178	7.84	5.6	34.43	30.56	13.46	425.05	1502.1	-0.15	1668.59
08/08/2008 15:00:00	-138	7.69	5.15	34.43	30.68	13.46	423.8	1494.09	-0.19	1688.42
08/08/2008 15:01:00	-159	7.69	4.92	33.26	29.74	13.75	427.05	1506.24	0.21	1707.85
08/08/2008 15:02:00	-175	7.69	5.19	33.26	29.57	13.62	423.63	1494.02	-0.19	1692.49
08/08/2008 15:03:00	-205	7.54	5.42	32.09	29.1	13.49	423.63	1541.95	-0.15	1739.56
08/08/2008 15:04:00	-156	7.55	4.64	31.01	28.21	14.21	433.73	1541.95	0.05	1743.23
08/08/2008 15:05:00	-184	7.55	4.87	32.26	28.29	13.92	429.64	1530.14	0.01	1751.11
08/08/2008 15:06:00	-150	7.39	4.88	31.26	27.8	13.92	440.07	1562.25	0	1760.05
08/08/2008 15:07:00	-190	7.69	4.68	31.26	27.89	14.39	437.73	1566.32	0.25	1735.55
08/08/2008 15:08:00	-178	7.54	5.04	32.26	28.37	13.78	428.13	1554.3	0.08	1801.17
08/08/2008 15:09:00	-203	7.1	4.38	32.26	28.24	14.02	426.8	1498.16	0.01	1751.04
08/08/2008 15:10:00	-138	7.1	3.02	31.09	27.23	15.68	446.66	1518.12	0.79	1739.42
08/08/2008 15:11:00	-113	7.25	3.78	32.18	28.29	15.12	441.15	1566.19	0.52	1755.04
08/08/2008 15:12:00	-160	7.39	4.46	32.18	28.75	14.64	437.81	1582.14	0.44	1798.17
AVERAGE	**-168**	**8**	**5**	**34**	**30**	**14**	**432**	**1527**	**0**	**1730**

TEST 4 20%SAWDUST 80%COAL (Repeat)			FURNACE PRESSURE AND GASEOUS EMISSIONS							
Time	FurnacePressureGauge	GasOxygenAnalyser - Ziconia	GasAnalysis_O2	GasAnalysis_CO_lo	GasAnalysis_CO_hi	GasAnalysis_CO2	GasAnalysis_SO2	GasAnalysis_NO	GasAnalysis_N2O	GasAnalysis_Nox
08/08/2008 15:29:00	-142	7.54	4.04	34.85	31.23	14.97	408.94	1562.05	0.4	1790.36
08/08/2008 15:30:00	-201	7.4	4.73	35.85	32.87	14.51	402.02	1622.26	0.18	1751.04
08/08/2008 15:31:00	-179	7.68	3.65	34.85	30.87	15.18	410.78	1566.12	0.44	1759.18
08/08/2008 15:32:00	-174	7.69	4.74	36.01	32.87	13.94	398.84	1574.33	0.05	1809.72
08/08/2008 15:33:00	-237	7.53	4.67	35.01	31.92	14.06	401.35	1566.32	0.18	1751.11
08/08/2008 15:34:00	-172	7.83	4.24	35.01	31.06	14.49	406.77	1586.28	0.25	1699.97
08/08/2008 15:35:00	-201	7.68	5.3	35.26	31.66	13.66	397.26	1574.26	0	1762.86
08/08/2008 15:36:00	-209	7.83	5.6	35.26	31.56	13.51	394.17	1566.19	-0.15	1778.54
08/08/2008 15:37:00	-171	8	5.17	35.26	30.83	13.9	396.51	1566.19	-0.19	1782.08
08/08/2008 15:38:00	-221	7.85	5.9	35.26	30.94	13.3	387.75	1538.21	-0.27	1762.86
08/08/2008 15:39:00	-208	7.7	5.19	34.18	29.82	13.76	396.17	1514.11	-0.19	1719.66
08/08/2008 15:40:00	-195	7.56	3.75	32.84	29.39	14.88	406.86	1530.14	0.48	1774.54
08/08/2008 15:41:00	-177	7.55	4.64	33.68	29.96	14.38	404.02	1522.06	0.01	1684.55
08/08/2008 15:42:00	-137	7.25	3.83	32.51	29.3	14.83	411.78	1466.05	0.5	1699.97
08/08/2008 15:43:00	-189	7.26	3.08	32.51	28.73	15.28	421.88	1465.92	0.96	1519.99
08/08/2008 15:44:00	-193	7.25	3.86	33.43	29.87	15.18	418.12	1337.87	0.74	1657.18
08/08/2008 15:45:00	-180	7.41	3.68	33.43	29.7	15.48	412.95	1534.34	0.52	1747.17
08/08/2008 15:46:00	-174	7.4	3.25	33.43	30.23	15.14	412.86	1366.04	0.6	1629.54
08/08/2008 15:47:00	-170	7.4	4.31	34.51	30.68	14.94	407.36	1462.11	0.45	1755.18
08/08/2008 15:48:00	-161	7.4	4.11	34.51	30.9	14.98	408.77	1586.28	0.44	1782.22
08/08/2008 15:49:00	-168	7.69	4.27	35.6	32	14.23	405.02	1558.11	0.22	1766.73
AVERAGE	**-184**	**8**	**4**	**34**	**31**	**15**	**405**	**1527**	**0**	**1733**

APPENDIX F

Tables of averages from the data logs of the repeat tests (nos. 1-4).

Test	**Test 1 100%Coal (Repeat)**
Date	08-Aug-08
Test Duration	13:19 to 13:51
Test Description	Combustion Performance
Operator	Bonny Nyangwa

FUEL		SI Units	
Coal Flow		kg/hr	165
Load		MW	1.01
Grind size - passing 75 microns		%	76.15
Fuel Co-firing Shares			
Townlands		%	100
AIR			
Total Air flow		kg/hr	1517
Combustion Air \ Primary Air			2.45
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	41.41
Primary Air Flow		kg/hr	397
Primary Air Temperature		ºC	93
Secondary Air Flow		kg/hr	971
Secondary Air Temperature		ºC	301
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		ºC	172
Overfire air Flow		kg/hr	0
Overfire air Temperature		ºC	195

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-208	
Gas Temp P4	0.254	ºC	1238	
Gas Temp P10	0.730	ºC	1346	
Gas Temp PD	1.142	ºC	1217	
Gas Temp P28	3.109	ºC	932	
Average gas Temperature		ºC	1183	
Average Wall Temperature		ºC	981	
Covective Exit Temperature		ºC	170	
Oxygen (Ziconia) wet basis		%	NM	
Oxygen (dry basis)		%	6.12	
Carbon Monoxide		ppm	24	**23**
CO2		%	12.84	**12.84**
SO2		ppm	477	**473**
NO		ppm	1302	**1292**
NOx		ppm	1487	**1475**
NO2		ppm	184	**183**
N2O		ppm	0	**0**
Combustion Efficiency RTD P	0.730	%	90.80	
Combustion Efficiency RTD P	1.682	%	98.43	
Combustion Efficiency RTD P	2.189	%	98.76	
Rate of Slag Formation		g/hr	75	

Test	**Test 2 10%Sawdust 90%Coal (Repeat)**
Date	08-Aug-08
Test Duration	14:14 to 14:34
Test Description	Combustion Performance
Operator	Bonny Nyangwa

FUEL		SI Units	
Coal Flow		kg/hr	148
Sawdust Flow		kg/hr	20
Load		MW	1.01
Grind size - passing 75 microns		%	76.12
Fuel Co-firing Shares			
Coal		%	90
Sawdust		%	10
AIR			
Total Air flow		kg/hr	1527
Combustion Air \ Primary Air			2.40
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	35.89
Primary Air Flow		kg/hr	404
Primary Air Temperature		℃	93
Secondary Air Flow		kg/hr	970
Secondary Air Temperature		℃	301
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	173
Overfire air Flow		kg/hr	0
Overfire air Temperature		℃	195

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-184	
Gas Temp P4	0.262	℃	1254	
Gas Temp P10	0.753	℃	1368	
Gas Temp PD	1.179	℃	1242	
Gas Temp P28	3.209	℃	961	
Average gas Temperature		℃	1206	
Average Wall Temperature		℃	981	
Covective Exit Temperature		℃	178	
Oxygen (Ziconia) wet basis		%	NM	
Oxygen (dry basis)		%	5.52	
Carbon Monoxide		ppm	31	**32**
CO2		%	13.43	**13.43**
SO2		ppm	442	**456**
NO		ppm	1446	**1493**
NOx		ppm	1643	**1695**
NO2		ppm	196	**203**
N2O		ppm	0	**0**
Combustion Efficiency RTD P	0.753	%	90.29	
Combustion Efficiency RTD P	1.736	%	98.40	
Combustion Efficiency RTD P	2.260	%	98.96	
Rate of Slag Formation		g/hr	NM	

Test	**Test 3 15%Sawdust 85%Coal (Repeat)**
Date	08-Aug-08
Test Duration	14:52 to 15:12
Test Description	Combustion Performance
Operator	Bonny Nyangwa

FUEL		SI Units	
Coal Flow		kg/hr	141
Sawdust Flow		kg/hr	30
Load		MW	1.01
Grind size - passing 75 microns		%	77.58
Fuel Co-firing Shares			
Coal		%	85
Sawdust		%	15
AIR			
Total Air flow		kg/hr	1550
Combustion Air \ Primary Air			2.27
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	29.47
Primary Air Flow		kg/hr	429
Primary Air Temperature		℃	93
Secondary Air Flow		kg/hr	972
Secondary Air Temperature		℃	304
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	173
Overfire air Flow		kg/hr	0
Overfire air Temperature		℃	195

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-168	
Gas Temp P4	0.260	℃	1268	
Gas Temp P10	0.748	℃	1381	
Gas Temp PD	1.171	℃	1253	
Gas Temp P28	3.189	℃	974	
Average gas Temperature		℃	1219	
Average Wall Temperature		℃	982	
Covective Exit Temperature		℃	181	
Oxygen (Ziconia) wet basis		%	NM	
Oxygen (dry basis)		%	4.76	
Carbon Monoxide		ppm	30	**32**
CO2		%	14.08	**14.08**
SO2		ppm	432	**468**
NO		ppm	1527	**1655**
NOx		ppm	1730	**1874**
NO2		ppm	202	**219**
N2O		ppm	0	**0**
Combustion Efficiency RTD P	0.748	%	90.31	
Combustion Efficiency RTD P	1.725	%	98.27	
Combustion Efficiency RTD P	2.245	%	98.67	
Rate of Slag Formation		g/hr	NM	

Test	**Test 4 20%Sawdust 80%Coal (Repeat)**
Date	08-Aug-08
Test Duration	15:29 to 15:49
Test Description	Combustion Performance
Operator	Bonny Nyangwa

FUEL		SI Units	
Coal Flow		kg/hr	131
Sawdust Flow		kg/hr	43
Load		MW	1.01
Grind size - passing 75 microns		%	78.18
Fuel Co-firing Shares			
Coal		%	80
Sawdust		%	20
AIR			
Total Air flow		kg/hr	1553
Combustion Air \ Primary Air			2.24
Secondary Air \ Tertiary Air			0.00
Swirl Number SA			1
Excess Air		%	26.52
Primary Air Flow		kg/hr	433
Primary Air Temperature		℃	93
Secondary Air Flow		kg/hr	970
Secondary Air Temperature		℃	301
Tertiary Air Flow		kg/hr	0
Tertiary Air Temperature		℃	173
Overfire air Flow		kg/hr	0
Overfire air Temperature		℃	195

FLUE GAS		**SI Units**		Normalised to 6% O2
Furnace Pressure		Pa	-184	
Gas Temp P4	0.264	℃	1283	
Gas Temp P10	0.758	℃	1400	
Gas Temp PD	1.186	℃	1269	
Gas Temp P28	3.228	℃	995	
Average gas Temperature		℃	1237	
Average Wall Temperature		℃	985	
Covective Exit Temperature		℃	188	
Oxygen (Ziconia) wet basis		%	NM	
Oxygen (dry basis)		%	4.38	
Carbon Monoxide		ppm	31	**34**
CO2		%	14.50	**14.50**
SO2		ppm	405	**449**
NO		ppm	1527	**1693**
NOx		ppm	1733	**1921**
NO2		ppm	206	**228**
N2O		ppm	0	**0**
Combustion Efficiency RTD P	0.758	%	93.63	
Combustion Efficiency RTD P	1.746	%	97.82	
Combustion Efficiency RTD P	2.273	%	98.49	
Rate of Slag Formation		g/hr	NM	

APPENDIX G

Curve fitting data for the repeat tests (nos. 1-4).

	Curve fitting coefficients for exponential fit y = a*exp(bx)+c*exp(dx) trendlines							
a		1481		98.38		1500		97.63
b		-0.1342		0.001746		-0.1319		0.005817
c		-1231		-98.38		-1250		-97.63
d		-6.616		-3.096		-6.73		-3.143
R^2		1.00		1.00		0.99		1.00

	TEST 1 COAL (BASELINE) -REPEAT					**TEST 2 10% SAWDUST - REPEAT**			
	Flue Gas		Combustion			Flue Gas		Combustion	
Time[s]	Temp [K]	Trendline	Efficiency	Tendline		Temp [K]	Trendline	Efficiency	Tendline
0.000	250	250.00	0	0.00		250	250.00	0	0.00
0.125		917.97		31.59			936.51		31.79
0.250	1238	1196.67		53.05		1254	1218.96		53.27
0.375		1305.33		67.63			1327.41		67.80
0.500		1339.84		77.54			1361.06		77.63
0.625		1342.15		84.28			1362.68		84.29
0.750	1346	1330.58	90.80	88.86		1368	1350.68	90.48	88.81
0.875		1313.15		91.98			1333.03		91.89
1.000		1293.36		94.10			1313.15		93.99
1.125		1272.75		95.55			1292.50		95.43
1.250	1217	1251.97		96.54		1242	1271.72		96.42
1.375		1231.31		97.22			1251.08		97.12
1.500		1210.90		97.69			1230.69		97.61
1.625		1190.79		98.02			1210.59		97.97
1.750		1171.00		98.24			1190.81		98.23
1.875		1151.53	98.43	98.41			1171.34	98.43	98.43
2.000		1132.37		98.52			1152.19		98.59
2.125		1113.54		98.61			1133.35		98.72
2.250		1095.01	98.76	98.67			1114.82		98.83
2.375		1076.80		98.73			1096.59	98.98	98.93
2.500		1058.89		98.77			1078.66		99.02
2.625		1041.27		98.80			1061.02		99.11
2.750		1023.95		98.83			1043.67		99.19
2.875		1006.92		98.86			1026.60		99.26
3.000		990.17		98.89			1009.81		99.34
3.125		973.69		98.91			993.30		99.42
3.250		957.50		98.94			977.06		99.49
3.375	932.00	941.57		98.96		961.00	961.08		99.56
3.500		925.91		98.98			945.36		99.64
3.625		910.50		99.00			929.91		99.71
3.750		895.36		99.03			914.70		99.78
3.875		880.46		99.05			899.74		99.86
4.000		865.82		99.07			885.03		99.93

	Curve fitting coefficients for exponential fit y = a*exp(bx)+c*exp(dx) trendlines								
a		1511		98.07			1526		95.77
b		-0.1332		0.002808			-0.1317		0.01208
c		-1261		-98.07			-1276		-95.77
d		-6.988		-3.196			-7.121		-4.459
R^2		1.00		1.00			0.98		1.00

	TEST 3 15% SAWDUST - REPEAT					**TEST 4 20% SAWDUST - REPEAT**			
	Flue Gas		Combustion			Flue Gas		Combustion	
Time[s]	Temp [K]	Trendline	Efficiency	Tendline		Temp [K]	Trendline	Efficiency	Tendline
0.000	250	250.00	0	0.00		250	250.00	0	0.00
0.125		959.60		32.33			977.15		41.07
0.250	1268	1241.72		54.03		1283	1261.45		64.65
0.375		1345.62		68.59			1364.13		78.21
0.500		1375.34		78.37			1392.48		86.05
0.625		1374.31		84.94			1390.53		90.60
0.750	1381	1360.67	90.6	89.35		1400	1376.36	93.88	93.26
0.875		1341.98		92.33			1357.39		94.85
1.000		1321.40		94.33			1336.67		95.83
1.125		1300.24		95.69			1315.43		96.45
1.250	1253	1279.04		96.61		1269	1294.20		96.86
1.375		1258.04		97.24			1273.17		97.17
1.500		1237.31		97.67			1252.42		97.40
1.625		1216.90		97.97			1231.99		97.60
1.750		1196.82	98.32	98.19			1211.88	97.91	97.78
1.875		1177.06		98.34			1192.09		97.94
2.000		1157.63		98.46			1172.63		98.10
2.125		1138.51		98.55			1153.48		98.25
2.250		1119.71		98.62			1134.65		98.40
2.375		1101.22	98.71	98.68			1116.12	98.87	98.56
2.500		1083.04		98.73			1097.90		98.70
2.625		1065.16		98.77			1079.97		98.85
2.750		1047.57		98.82			1062.34		99.00
2.875		1030.27		98.85			1045.00		99.15
3.000		1013.26		98.89			1027.93		99.30
3.125		996.53		98.93			1011.15		99.45
3.250		980.07		98.97		995	994.64		99.60
3.375	974.00	963.89		99.00			978.40		99.76
3.500		947.97		99.04			962.42		99.91
3.625		932.32		99.07			946.71		100.00
3.750		916.93		99.11			931.25		100.00
3.875		901.79		99.14			916.05		100.00
4.000		886.90		99.18			901.09		100.00

APPENDIX H

Handwritten log sheets for repeat tests (nos. 1-4).

POWER STATION -

Coal Type: Townlands
Fineness:
Coal Flow: 163

Date: 8/5/08
Test: 1 for Biomass Test
Procedur:

O2 - 6.36

slagging Probe duration.

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures				
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5
13:19	168	387	91	969+155	300	1117	1066	1085	776 3	871
13:23	166	370	94	972+144	300	1118	1066	1084	764	870
13:29	163	372	90	971+153	299	1118	1067	1082	766	870
13:31	161	398	92	968+147	298	1119	1068	1081	768	870
13:32	165	396	93	968+144	298	1119	1068	1081	768	869
13:35	167	376	95	971+147	298	1120	1069	1080	767	869
13:38	161	405	95	970+148	298	1120	1070	1079	767	869
13:39	166	385	91	970+145	300	1121	1070	1079	767	868
13:41	166	390	93	971+152	302	1121	1070	1078	767	868
13:51	167	380	92	972+150	310	1123	1072	1078	766	867

Gas Temperature				O2 Zirconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1243	1346	1215	931		6.37	31	12.6	467	1226	0	1391
1239	1342	1214	930	—	6.09	29	13.1	451	1342	0	1422
1240	1347	1216	931	—	5.90	27	13.1	485	1338	0	1470
1238	1345	1215	931	—	5.77	27	13.1	483	1274	0	1481
1237	1344	1215	930	—	6.36	28	12.7	472	1318	0	1524
1237	1345	1216	931	—	6.03	27	12.8	479	1310	0	1481
1237	1347	1218	933	—	5.89	26	13.1	488	1269	0	1469
1236	1347	1218	934	—	6.23	27	12.9	478	1302	0	1528
1237	1348	1219	934	—	6.21	26	12.7	481	1342	0	1493
1276	1350	1222	940	—	6.01	26	12.8	468	1286	0	1462

Conducted By Name Signatures

POWER STATION -

Coal Type 10%SA & 90% Townlands
Fineness
Coal Flow 147

Date 8/8/08
Test TEST 2 10%SA 90% Townlands
Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures				
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5
14:14	~~352~~ 149	~~352~~ 352	95	972+158	311	1126	1076	1075	763	866
14:17	149	406	95	972+153	305	1126	1076	1075	764	866
14:20	149	420	88	973+153	302	1127	1076	1075	763	866
14:23	148	422	86	969+153	297	1127	1077	1075	863	865
14:26	146	424	87	971+148	296	1127	1078	1075	864	865
14:29	148	413	87	968+152	297	1128	1078	1075	762	865
14:33	148	420	87	972+153	296	1128	1079	1075	761	865
14:34	149	427	92	973+153	297	1128	1079	1075	760	865

Gas Temperature				O2 Ziconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1257	1372	1244	962	—	5.29	39	13.5	438	1498	—	1677
1257	1382	1244	962	—	5.42	36	13.4	447	1468	0	1673
1259	1375	1245	964	—	5.32	35	13.6	447	1486	0	1651
1256	1370	1243	962	—	5.85	36	13.2	434	1450	—	1642
1252	1364	1240	960	—	5.94	34	13.2	436	1442	—	1634
1251	1363	1239	960	—	5.95	34	13.0	433	1458	—	1822
1252	1364	1239	960	—	5.85	33	13.3	439	1446	—	1641
1251	1368	1238	960	—	6.08	33	13.0	433	1414	—	1634

Conducted By

Name

Signature

POWER STATION -

Coal Type 15% SA + 85% Townlands Date 8/8/08
Fineness Test 3
Coal Flow 139 Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures				
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5
14:52	140	433	90	971+152	292	1131	1081	1079	755	865
14:55	140	423	91	968+151	296	1131	1081	1078	755	865
14:58	142	421	91	971+151	301	1132	1082	1078	755	865
15:01	139	434	94	972+149	305	1132	1082	1078	756	865
15:04	141	431	94	977+147	309	1132	1082	1078	756	865
15:07	141	431	95	971+149	313	1133	1083	1078	756	865
15:10	141	423	95	968+152	310	1133	1083	1078	755	865
15:12	141	425	97	967+145	305	1133	1083	1078	756	865

Gas Temperature				O2 Zlconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1265	1379	1252	974	—	4.73	37	14.2	429	1534	0	1708
1264	1376	1250	973	—	5.15	35	13.8	433	1510	0	1724
1264	1375	1249	971	—	5.63	34	13.4	422	1498	—	1720
1263	1374	1249	971	—	5.24	33	13.6	424	1526	—	1716
1267	1379	1252	973	—	4.9	31	14.0	430	1550	—	1751
1270	1383	1254	974	—	4.94	32	13.7	428	1554	—	1751
1278	1396	1262	983	—	3.78	32	15.1	440	1582	—	1794
1276	1393	1262	985	—	4.15	29	14.8	435	1590	—	1818

Conducted By

Name Signature

POWER STATION -

Coal Type 20% SA + 80% Townlands Date 8/8/08
Fineness Test 4
Coal Flow 130 Procedur

PC Time	Coal Flow	Primary Air		Secondary Air		Wall Temperatures				
	kg/hr	kg/hr	Temp	kg/hr	Temp	1	2	3	4	5
15:29	130	423	87	971+156	299	1135	1085	1078	758	866
15:32	131	426	92	970+152	302	1125	1086	1076	760	866
15:35	130	431	97	971+152	303	1136	1086	1076	762	866
15:38	133	426	89	974+152	304	1136	1086	1076	761	866
15:41	131	429	89	969+146	304	1136	1086	1076	761	866
15:44	131	425	90	969+152	302	1136	1086	1076	760	866
15:47	130	438	89	968+145	299	1136	1087	1076	761	866
15:49	132	429	96	968+146	297	1137	1087	1076	761	866

Gas Temperature				O2 Zlconia	O2	CO	CO2	SO2	NO	N2O	NOx
0.6m	1.2m	1.8m	4.5m	%	%	ppm	%	ppm	ppm	ppm	ppm
1285	1403	1268	994	—	4.58	37	14.2	401	1506	—	1732
1280	1394	1265	990	—	5.16	35	14.0	396	1540	—	1779
1276	1389	1263	988	—	5.34	35	13.9	393	1570	—	1787
1277	1388	1262	987	—	5.29	33	13.8	396	1514	—	1735
1283	1400	1268	996	—	3.96	33	14.9	413	1461	—	1608
1286	1407	1274	1004	—	3.68	33	15.5	414	1408	—	1747
1287	1408	1276	1004	—	4.09	35	15.1	408	1586	—	1738
1285	1403	1273	1000	—	4.82	35	14.2	400	1574	—	1770

Conducted By

Name

Signature

APPENDIX I

Printout of the output from the DTF program.

****

100TL001
07-31-2008

****

PROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):

VM	=	0.00	(%)
FC	=	0.00	(%)
ASH	=	0.00	(%)
AVERAGE PARTICLE DIAMETER	=	0.00	(microns)
PARTICLE DENSITY	=	0.00	(g/cm3)

****
COMBUSTION CALCULATIONS
****

PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION TESTS (DRY BASIS)

VM	=	0.01	(%)
FC	=	57.46	(%)
ASH	=	42.53	(%)
AVERAGE PARTICLE DIAMETER	=	34.29	(microns)
PARTICLE DENSITY	=	1.62	(g/cm3)
SURFACE AREA	=	80.0	(m2/g)
OXYGEN CONCENTRATION OF REACTANT GAS	=	3.00	(%v/v)

PARAMETERS FOR : 976.0 (Deg.C) 92.0 (cm)

GAS DENSITY	=	0.273295	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.078761	(J/m/s/K)
GAS VISCOSITY	=	0.506901E-04	(Kg/m/s)
GAS VELOCITY	=	0.396092	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.204387E-01	(m/s)
REYNOLDS NUMBER	=	149.486	
DIFFUSION COEFFICIENT	=	0.232825E-03	(m2/s)
RESIDENCE TIME	=	2.2087	(s)
COMBUSTION EFFICIENCY	=	69.224	(%)

PARAMETERS FOR : 876.0 (Deg.C) 132.0 (cm)

GAS DENSITY	=	0.297076	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.073787	(J/m/s/K)
GAS VISCOSITY	=	0.477020E-04	(Kg/m/s)
GAS VELOCITY	=	0.364384	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.217186E-01	(m/s)
REYNOLDS NUMBER	=	158.851	
DIFFUSION COEFFICIENT	=	0.201194E-03	(m2/s)
RESIDENCE TIME	=	3.2447	(s)

COMBUSTION EFFICIENCY = 90.911 (%)

PARAMETERS FOR : 1183.0 (Deg.C) 52.0 (cm)

GAS DENSITY	= 0.234446	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.088791	(J/m/s/K)
GAS VISCOSITY	= 0.566777E-04	(Kg/m/s)
GAS VELOCITY	= 0.461727	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.182799E-01	(m/s)
REYNOLDS NUMBER	= 133.694	
DIFFUSION COEFFICIENT	= 0.304481E-03	(m2/s)
RESIDENCE TIME	= 1.0833	(s)
COMBUSTION EFFICIENCY	= 73.027	(%)

PARAMETERS FOR : 1186.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.233964	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.088934	(J/m/s/K)
GAS VISCOSITY	= 0.567627E-04	(Kg/m/s)
GAS VELOCITY	= 0.462678	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.182525E-01	(m/s)
REYNOLDS NUMBER	= 133.494	
DIFFUSION COEFFICIENT	= 0.305580E-03	(m2/s)
RESIDENCE TIME	= 1.9150	(s)
COMBUSTION EFFICIENCY	= 96.604	(%)

PARAMETERS FOR : 1095.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.249525	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.084568	(J/m/s/K)
GAS VISCOSITY	= 0.541626E-04	(Kg/m/s)
GAS VELOCITY	= 0.433824	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.191286E-01	(m/s)
REYNOLDS NUMBER	= 139.903	
DIFFUSION COEFFICIENT	= 0.273014E-03	(m2/s)
RESIDENCE TIME	= 2.7981	(s)
COMBUSTION EFFICIENCY	= 98.614	(%)

PARAMETERS FOR : 1397.0 (Deg.C) 52.0 (cm)

GAS DENSITY	= 0.204407	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098838	(J/m/s/K)
GAS VISCOSITY	= 0.626288E-04	(Kg/m/s)
GAS VELOCITY	= 0.529581	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.165432E-01	(m/s)
REYNOLDS NUMBER	= 120.991	
DIFFUSION COEFFICIENT	= 0.387051E-03	(m2/s)
RESIDENCE TIME	= 0.9522	(s)
COMBUSTION EFFICIENCY	= 93.701	(%)

PARAMETERS FOR : 1399.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.204162	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098931	(J/m/s/K)
GAS VISCOSITY	= 0.626834E-04	(Kg/m/s)
GAS VELOCITY	= 0.530215	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.165288E-01	(m/s)
REYNOLDS NUMBER	= 120.885	
DIFFUSION COEFFICIENT	= 0.387863E-03	(m2/s)
RESIDENCE TIME	= 1.6838	(s)
COMBUSTION EFFICIENCY	= 100	(%)

PARAMETERS FOR : 1303.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.216597	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.094462	(J/m/s/K)
GAS VISCOSITY	= 0.600420E-04	(Kg/m/s)
GAS VELOCITY	= 0.499776	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.172558E-01	(m/s)
REYNOLDS NUMBER	= 126.203	
DIFFUSION COEFFICIENT	= 0.349738E-03	(m2/s)
RESIDENCE TIME	= 2.4574	(s)
COMBUSTION EFFICIENCY	= 100	(%)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 1

PARTICLE TEMPERATURE	= 987.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1362E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3180E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1422E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1422E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 2

PARTICLE TEMPERATURE	= 888.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1570E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.2987E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1657E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1657E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1201.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3024E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3567E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3304E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3304E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1205.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3269E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3573E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3598E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3598E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1111.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2514E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3404E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2714E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2714E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1425.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.5854E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3954E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.6872E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.6872E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1425.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.5499E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3957E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.6386E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.6386E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1322.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3767E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3785E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4184E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4184E-01	(g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT

OVERALL CORRELATION COEFFICIENT = 0.9558225

CHAR COMBUSTION KINETICS

ACTUAL VS. CALCULATED lnK

NO.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-1.950204	-1.677607	-0.27	7.935248	1260.2
2	-1.797275	-2.056432	0.26	8.611781	1161.2
3	-1.107365	-1.032596	-0.07	6.783340	1474.2
4	-1.022217	-1.022318	0.00	6.764985	1478.2
5	-1.304088	-1.279562	-0.02	7.224390	1384.2
6	-0.375176	-0.531580	0.16	5.888588	1698.2
7	-0.448492	-0.531580	0.08	5.888588	1698.2
8	-0.871342	-0.744483	-0.13	6.268807	1595.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED

A = 15.890718 (Kg/m2/s/atm)
E = 46.556541 (KJ/mol)

****
********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
****

SAMPLE IDENTITY : 100TL001
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR = 15.8907 (kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR = 1.5891 (g/cm2/s/atm)
ACTIVATION ENERGY = 46.5565 (KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
****

********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS TEMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.209	68.200
1149.2	132.000	3.245	84.600
1456.2	52.000	1.083	70.600
1459.2	92.000	1.915	90.300
1368.2	132.000	2.798	92.500
1670.2	52.000	0.952	87.300
1672.2	92.000	1.684	94.400
1576.2	132.000	2.457	96.500

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1260.2	69.224	2.044	39.609
1161.2	90.911	2.172	36.438
1474.2	73.027	1.828	46.173
1478.2	96.604	1.825	46.268
1384.2	98.614	1.913	43.382
1698.2	93.701	1.654	52.958
1698.2	100.000	1.653	53.022
1595.2	100.000	1.726	49.978

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.486	13.615E-02	317.970E-02	14.225E-02
158.851	15.704E-02	298.682E-02	16.575E-02
133.694	30.242E-02	356.720E-02	33.043E-02
133.494	32.688E-02	357.271E-02	35.980E-02
139.903	25.138E-02	340.427E-02	27.142E-02
120.991	58.542E-02	395.356E-02	68.717E-02
120.885	54.986E-02	395.711E-02	63.859E-02
126.203	37.675E-02	378.548E-02	41.839E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	1.137071
600	2.606264
700	5.037503
800	8.611415
900	13.434937
1000	19.545773
1100	26.924997
1200	35.511860
1300	45.217598
1400	55.936886
1500	67.556625
1600	79.962349

```
OXYGEN CONCENTRATION     =  3.00   (%v/v)
AVERAGE FUEL FEED RATE   =  0.1200 (g/min.)
AVERAGE GAS FLOW RATE    = 20.00   (l/min.)

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10SD90TL
07-31-2008

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PROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
VM                                          =    0.00 (%)
FC                                          =    0.00 (%)
ASH                                         =    0.00 (%)
AVERAGE PARTICLE DIAMETER                   =    0.00 (microns)
PARTICLE DENSITY                            =    0.00 (g/cm3)


************************************************
            COMBUSTION CALCULATIONS
************************************************

PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)
VM                                          =    0.01 (%)
FC                                          =   56.82 (%)
ASH                                         =   43.17 (%)
AVERAGE PARTICLE DIAMETER                   =   34.91 (microns)
PARTICLE DENSITY                            =    1.73 (g/cm3)
SURFACE AREA                                =   80.0  (m2/g)
OXYGEN CONCENTRATION OF REACTANT GAS        =    3.00 (%v/v)


PARAMETERS FOR :  976.0 (Deg.C)     92.0 (cm)

GAS DENSITY                                 =    0.273295      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.078761      (J/m/s/K)
GAS VISCOSITY                               =    0.506901E-04  (Kg/m/s)
GAS VELOCITY                                =    0.396092      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.226231E-01  (m/s)
REYNOLDS NUMBER                             =  149.486
DIFFUSION COEFFICIENT                       =    0.232825E-03  (m2/s)
RESIDENCE TIME                              =      2.1972    (s)
COMBUSTION EFFICIENCY                       =   74.192         (%)


PARAMETERS FOR :  876.0 (Deg.C)    132.0 (cm)

GAS DENSITY                                 =    0.297076      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.073787      (J/m/s/K)
GAS VISCOSITY                               =    0.477020E-04  (Kg/m/s)
GAS VELOCITY                                =    0.364384      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.240399E-01  (m/s)
REYNOLDS NUMBER                             =  158.851
DIFFUSION COEFFICIENT                       =    0.201194E-03  (m2/s)
RESIDENCE TIME                              =      3.2270    (s)
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COMBUSTION EFFICIENCY = 91.625 (%)

PARAMETERS FOR : 1183.0 (Deg.C) 52.0 (cm)

GAS DENSITY	= 0.234446	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.088791	(J/m/s/K)
GAS VISCOSITY	= 0.566777E-04	(Kg/m/s)
GAS VELOCITY	= 0.461727	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.202336E-01	(m/s)
REYNOLDS NUMBER	= 133.694	
DIFFUSION COEFFICIENT	= 0.304481E-03	(m2/s)
RESIDENCE TIME	= 1.0789	(s)
COMBUSTION EFFICIENCY	= 73.735	(%)

PARAMETERS FOR : 1186.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.233964	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.088934	(J/m/s/K)
GAS VISCOSITY	= 0.567627E-04	(Kg/m/s)
GAS VELOCITY	= 0.462678	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.202033E-01	(m/s)
REYNOLDS NUMBER	= 133.494	
DIFFUSION COEFFICIENT	= 0.305580E-03	(m2/s)
RESIDENCE TIME	= 1.9073	(s)
COMBUSTION EFFICIENCY	= 80.607	(%)

PARAMETERS FOR : 1095.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.249525	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.084568	(J/m/s/K)
GAS VISCOSITY	= 0.541626E-04	(Kg/m/s)
GAS VELOCITY	= 0.433824	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.211730E-01	(m/s)
REYNOLDS NUMBER	= 139.903	
DIFFUSION COEFFICIENT	= 0.273014E-03	(m2/s)
RESIDENCE TIME	= 2.7864	(s)
COMBUSTION EFFICIENCY	= 99.355	(%)

PARAMETERS FOR : 1397.0 (Deg.C) 52.0 (cm)

GAS DENSITY	= 0.204407	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098838	(J/m/s/K)
GAS VISCOSITY	= 0.626288E-04	(Kg/m/s)
GAS VELOCITY	= 0.529581	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.183113E-01	(m/s)
REYNOLDS NUMBER	= 120.991	
DIFFUSION COEFFICIENT	= 0.387051E-03	(m2/s)
RESIDENCE TIME	= 0.9491	(s)
COMBUSTION EFFICIENCY	= 76.418	(%)

PARAMETERS FOR : 1399.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.204162	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098931	(J/m/s/K)
GAS VISCOSITY	= 0.626834E-04	(Kg/m/s)
GAS VELOCITY	= 0.530215	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.182954E-01	(m/s)
REYNOLDS NUMBER	= 120.885	
DIFFUSION COEFFICIENT	= 0.387863E-03	(m2/s)
RESIDENCE TIME	= 1.6783	(s)
COMBUSTION EFFICIENCY	= 91.838	(%)

PARAMETERS FOR : 1303.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.216597	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.094462	(J/m/s/K)
GAS VISCOSITY	= 0.600420E-04	(Kg/m/s)
GAS VELOCITY	= 0.499776	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.191001E-01	(m/s)
REYNOLDS NUMBER	= 126.203	
DIFFUSION COEFFICIENT	= 0.349738E-03	(m2/s)
RESIDENCE TIME	= 2.4492	(s)
COMBUSTION EFFICIENCY	= 96.001	(%)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 1

PARTICLE TEMPERATURE	= 989.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1664E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3123E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1758E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1758E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 2

PARTICLE TEMPERATURE	= 890.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1754E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.2934E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1866E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1866E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1203.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3354E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3504E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3710E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3710E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1200.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2223E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3509E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2373E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2373E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1113.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2940E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3344E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3223E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3223E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1417.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.4053E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3883E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4525E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4525E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1416.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3396E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3887E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3721E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3721E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1318.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2704E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3718E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2916E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2916E-01	(g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT

OVERALL CORRELATION COEFFICIENT = 0.8424598

CHAR COMBUSTION KINETICS

ACTUAL VS. CALCULATED lnK

NO.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-1.738420	-1.549777	-0.19	7.922675	1262.2
2	-1.678801	-1.753377	0.07	8.596974	1163.2
3	-0.991652	-1.202988	0.21	6.774150	1476.2
4	-1.438477	-1.207153	-0.23	6.787945	1473.2
5	-1.132137	-1.335788	0.20	7.213966	1386.2
6	-0.792919	-0.944014	0.15	5.916460	1690.2
7	-0.988659	-0.945072	-0.04	5.919962	1689.2
8	-1.232266	-1.055161	-0.18	6.284565	1591.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED

A	=	2.321978	(Kg/m2/s/atm)
E	=	25.104784	(KJ/mol)

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********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
****

SAMPLE IDENTITY : 10SD90TL
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR	=	2.3220	(kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR	=	0.2322	(g/cm2/s/atm)
ACTIVATION ENERGY	=	25.1048	(KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
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********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS TEMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.197	71.900
1149.2	132.000	3.227	85.600
1456.2	52.000	1.079	71.600
1459.2	92.000	1.907	76.400
1368.2	132.000	2.786	93.500
1670.2	52.000	0.949	73.400
1672.2	92.000	1.678	85.800
1576.2	132.000	2.449	89.900

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1262.2	74.192	2.262	39.609
1163.2	91.625	2.404	36.438
1476.2	73.735	2.023	46.173
1473.2	80.607	2.020	46.268
1386.2	99.355	2.117	43.382
1690.2	76.418	1.831	52.958
1689.2	91.838	1.830	53.022
1591.2	96.001	1.910	49.978

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.486	16.643E-02	312.323E-02	17.580E-02
158.851	17.544E-02	293.377E-02	18.660E-02
133.694	33.545E-02	350.385E-02	37.096E-02
133.494	22.226E-02	350.926E-02	23.729E-02
139.903	29.400E-02	334.381E-02	32.234E-02
120.991	40.529E-02	388.335E-02	45.252E-02
120.885	33.957E-02	388.683E-02	37.208E-02
126.203	27.042E-02	371.825E-02	29.163E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	4.674994
600	7.311882
700	10.431714
800	13.929029
900	17.704330
1000	21.670841
1100	25.756363
1200	29.902658
1300	34.063843
1400	38.204430
1500	42.297466
1600	46.322891

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OXYGEN CONCENTRATION     =  3.00   (%v/v)
AVERAGE FUEL FEED RATE   =  0.1200 (g/min.)
AVERAGE GAS FLOW RATE    = 20.00   (l/min.)

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15SD85TL
07-31-2008

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PROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
VM                                          =    0.00 (%)
FC                                          =    0.00 (%)
ASH                                         =    0.00 (%)
AVERAGE PARTICLE DIAMETER                   =    0.00 (microns)
PARTICLE DENSITY                            =    0.00 (g/cm3)


************************************************
            COMBUSTION CALCULATIONS
************************************************

PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)
VM                                          =    0.01 (%)
FC                                          =   57.51 (%)
ASH                                         =   42.48 (%)
AVERAGE PARTICLE DIAMETER                   =   36.15 (microns)
PARTICLE DENSITY                            =    1.74 (g/cm3)
SURFACE AREA                                =   80.0  (m2/g)
OXYGEN CONCENTRATION OF REACTANT GAS        =    3.00 (%v/v)


PARAMETERS FOR :  976.0 (Deg.C)     92.0 (cm)

GAS DENSITY                                 =    0.273295      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.078761      (J/m/s/K)
GAS VISCOSITY                               =    0.506901E-04  (Kg/m/s)
GAS VELOCITY                                =    0.396092      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.243991E-01  (m/s)
REYNOLDS NUMBER                             =  149.486
DIFFUSION COEFFICIENT                       =    0.232825E-03  (m2/s)
RESIDENCE TIME                              =      2.1879      (s)
COMBUSTION EFFICIENCY                       =   74.747         (%)


PARAMETERS FOR :  876.0 (Deg.C)    132.0 (cm)

GAS DENSITY                                 =    0.297076      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.073787      (J/m/s/K)
GAS VISCOSITY                               =    0.477020E-04  (Kg/m/s)
GAS VELOCITY                                =    0.364384      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.259271E-01  (m/s)
REYNOLDS NUMBER                             =  158.851
DIFFUSION COEFFICIENT                       =    0.201194E-03  (m2/s)
RESIDENCE TIME                              =      3.2127      (s)
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COMBUSTION EFFICIENCY = 82.694 (%)

PARAMETERS FOR : 1183.0 (Deg.C) 52.0 (cm)

GAS DENSITY	=	0.234446	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.088791	(J/m/s/K)
GAS VISCOSITY	=	0.566777E-04	(Kg/m/s)
GAS VELOCITY	=	0.461727	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.218220E-01	(m/s)
REYNOLDS NUMBER	=	133.694	
DIFFUSION COEFFICIENT	=	0.304481E-03	(m2/s)
RESIDENCE TIME	=	1.0754	(s)
COMBUSTION EFFICIENCY	=	76.495	(%)

PARAMETERS FOR : 1186.0 (Deg.C) 92.0 (cm)

GAS DENSITY	=	0.233964	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.088934	(J/m/s/K)
GAS VISCOSITY	=	0.567627E-04	(Kg/m/s)
GAS VELOCITY	=	0.462678	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.217893E-01	(m/s)
REYNOLDS NUMBER	=	133.494	
DIFFUSION COEFFICIENT	=	0.305580E-03	(m2/s)
RESIDENCE TIME	=	1.9010	(s)
COMBUSTION EFFICIENCY	=	84.192	(%)

PARAMETERS FOR : 1095.0 (Deg.C) 132.0 (cm)

GAS DENSITY	=	0.249525	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.084568	(J/m/s/K)
GAS VISCOSITY	=	0.541626E-04	(Kg/m/s)
GAS VELOCITY	=	0.433824	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.228351E-01	(m/s)
REYNOLDS NUMBER	=	139.903	
DIFFUSION COEFFICIENT	=	0.273014E-03	(m2/s)
RESIDENCE TIME	=	2.7770	(s)
COMBUSTION EFFICIENCY	=	98.537	(%)

PARAMETERS FOR : 1397.0 (Deg.C) 52.0 (cm)

GAS DENSITY	=	0.204407	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.098838	(J/m/s/K)
GAS VISCOSITY	=	0.626288E-04	(Kg/m/s)
GAS VELOCITY	=	0.529581	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.197488E-01	(m/s)
REYNOLDS NUMBER	=	120.991	
DIFFUSION COEFFICIENT	=	0.387051E-03	(m2/s)
RESIDENCE TIME	=	0.9466	(s)
COMBUSTION EFFICIENCY	=	84.315	(%)

PARAMETERS FOR : 1399.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.204162	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098931	(J/m/s/K)
GAS VISCOSITY	= 0.626834E-04	(Kg/m/s)
GAS VELOCITY	= 0.530215	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.197316E-01	(m/s)
REYNOLDS NUMBER	= 120.885	
DIFFUSION COEFFICIENT	= 0.387863E-03	(m2/s)
RESIDENCE TIME	= 1.6740	(s)
COMBUSTION EFFICIENCY	= 87.973	(%)

PARAMETERS FOR : 1303.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.216597	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.094462	(J/m/s/K)
GAS VISCOSITY	= 0.600420E-04	(Kg/m/s)
GAS VELOCITY	= 0.499776	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.205995E-01	(m/s)
REYNOLDS NUMBER	= 126.203	
DIFFUSION COEFFICIENT	= 0.349738E-03	(m2/s)
RESIDENCE TIME	= 2.4426	(s)
COMBUSTION EFFICIENCY	= 96.340	(%)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 1

PARTICLE TEMPERATURE	= 990.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1763E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3016E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1872E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1872E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 2

PARTICLE TEMPERATURE	= 888.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1445E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.2833E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1522E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1522E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1206.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3732E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3384E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4195E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4195E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1202.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2533E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3389E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2737E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2737E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1114.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2852E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3229E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3128E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3128E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1422.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.5102E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3750E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.5905E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.5905E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1416.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3171E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3754E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3464E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3464E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1319.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2867E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3591E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3115E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3115E-01	(g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT

OVERALL CORRELATION COEFFICIENT = 0.8709846

CHAR COMBUSTION KINETICS

ACTUAL VS. CALCULATED lnK

NO.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-1.675481	-1.591890	-0.08	7.916403	1263.2
2	-1.882435	-1.862630	-0.02	8.611781	1161.2
3	-0.868774	-1.141814	0.27	6.760411	1479.2
4	-1.295628	-1.148951	-0.15	6.778742	1475.2
5	-1.162184	-1.316377	0.15	7.208766	1387.2
6	-0.526751	-0.806434	0.28	5.899009	1695.2
7	-1.060236	-0.814592	-0.25	5.919962	1689.2
8	-1.166209	-0.955010	-0.21	6.280618	1592.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED
A = 4.438421 (Kg/m2/s/atm)
E = 32.371498 (KJ/mol)

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********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
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SAMPLE IDENTITY : 15SD85TL
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR = 4.4384 (kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR = 0.4438 (g/cm2/s/atm)
ACTIVATION ENERGY = 32.3715 (KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
****

********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS TEMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.188	71.700
1149.2	132.000	3.213	77.500
1456.2	52.000	1.075	72.900
1459.2	92.000	1.901	78.700
1368.2	132.000	2.777	92.400
1670.2	52.000	0.947	78.800
1672.2	92.000	1.674	81.900
1576.2	132.000	2.443	90.000

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1263.2	74.747	2.440	39.609
1161.2	82.694	2.593	36.438
1479.2	76.495	2.182	46.173
1475.2	84.192	2.179	46.268
1387.2	98.537	2.284	43.382
1695.2	84.315	1.975	52.958
1689.2	87.973	1.973	53.022
1592.2	96.340	2.060	49.978

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.486	17.628E-02	301.610E-02	18.722E-02
158.851	14.446E-02	283.314E-02	15.222E-02
133.694	37.320E-02	338.366E-02	41.947E-02
133.494	25.327E-02	338.889E-02	27.373E-02
139.903	28.518E-02	322.911E-02	31.280E-02
120.991	51.018E-02	375.014E-02	59.052E-02
120.885	31.711E-02	375.351E-02	34.637E-02
126.203	28.667E-02	359.070E-02	31.155E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	2.885446
600	5.136734
700	8.122399
800	11.792205
900	16.065821
1000	20.850302
1100	26.051500
1200	31.580723
1300	37.358063
1400	43.313683
1500	49.387829
1600	55.530201

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OXYGEN CONCENTRATION     =  3.00   (%v/v)
AVERAGE FUEL FEED RATE   =  0.1252 (g/min.)
AVERAGE GAS FLOW RATE    = 20.00   (l/min.)

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20SD80TL
07-31-2008

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PROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
VM                                          =    0.00 (%)
FC                                          =    0.00 (%)
ASH                                         =    0.00 (%)
AVERAGE PARTICLE DIAMETER                   =    0.00 (microns)
PARTICLE DENSITY                            =    0.00 (g/cm3)


************************************************
            COMBUSTION CALCULATIONS
************************************************


PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)
VM                                          =    0.01 (%)
FC                                          =   59.03 (%)
ASH                                         =   40.96 (%)
AVERAGE PARTICLE DIAMETER                   =   20.79 (microns)
PARTICLE DENSITY                            =    1.74 (g/cm3)
SURFACE AREA                                =   80.0  (m2/g)
OXYGEN CONCENTRATION OF REACTANT GAS        =    3.00 (%v/v)


PARAMETERS FOR :  976.0 (Deg.C)    92.0 (cm)

GAS DENSITY                                 =    0.273295      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.078761      (J/m/s/K)
GAS VISCOSITY                               =    0.506901E-04  (Kg/m/s)
GAS VELOCITY                                =    0.396092      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.806985E-02  (m/s)
REYNOLDS NUMBER                             =  149.486
DIFFUSION COEFFICIENT                       =    0.232825E-03  (m2/s)
RESIDENCE TIME                              =      2.2763    (s)
COMBUSTION EFFICIENCY                       =   77.533         (%)


PARAMETERS FOR :  876.0 (Deg.C)   132.0 (cm)

GAS DENSITY                                 =    0.297076      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.073787      (J/m/s/K)
GAS VISCOSITY                               =    0.477020E-04  (Kg/m/s)
GAS VELOCITY                                =    0.364384      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.857524E-02  (m/s)
REYNOLDS NUMBER                             =  158.851
DIFFUSION COEFFICIENT                       =    0.201194E-03  (m2/s)
RESIDENCE TIME                              =      3.3488    (s)
```

COMBUSTION EFFICIENCY = 93.541 (%)

PARAMETERS FOR : 1183.0 (Deg.C) 52.0 (cm)

GAS DENSITY	=	0.234446	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.088791	(J/m/s/K)
GAS VISCOSITY	=	0.566777E-04	(Kg/m/s)
GAS VELOCITY	=	0.461727	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.721749E-02	(m/s)
REYNOLDS NUMBER	=	133.694	
DIFFUSION COEFFICIENT	=	0.304481E-03	(m2/s)
RESIDENCE TIME	=	1.1089	(s)
COMBUSTION EFFICIENCY	=	83.555	(%)

PARAMETERS FOR : 1186.0 (Deg.C) 92.0 (cm)

GAS DENSITY	=	0.233964	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.088934	(J/m/s/K)
GAS VISCOSITY	=	0.567627E-04	(Kg/m/s)
GAS VELOCITY	=	0.462678	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.720668E-02	(m/s)
REYNOLDS NUMBER	=	133.494	
DIFFUSION COEFFICIENT	=	0.305580E-03	(m2/s)
RESIDENCE TIME	=	1.9601	(s)
COMBUSTION EFFICIENCY	=	92.078	(%)

PARAMETERS FOR : 1095.0 (Deg.C) 132.0 (cm)

GAS DENSITY	=	0.249525	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.084568	(J/m/s/K)
GAS VISCOSITY	=	0.541626E-04	(Kg/m/s)
GAS VELOCITY	=	0.433824	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.755258E-02	(m/s)
REYNOLDS NUMBER	=	139.903	
DIFFUSION COEFFICIENT	=	0.273014E-03	(m2/s)
RESIDENCE TIME	=	2.8664	(s)
COMBUSTION EFFICIENCY	=	99.581	(%)

PARAMETERS FOR : 1397.0 (Deg.C) 52.0 (cm)

GAS DENSITY	=	0.204407	(Kg/m3)
GAS THERMAL CONDUCTIVITY	=	0.098838	(J/m/s/K)
GAS VISCOSITY	=	0.626288E-04	(Kg/m/s)
GAS VELOCITY	=	0.529581	(m/s)
PARTICLE FREE-FALL VELOCITY	=	0.653179E-02	(m/s)
REYNOLDS NUMBER	=	120.991	
DIFFUSION COEFFICIENT	=	0.387051E-03	(m2/s)
RESIDENCE TIME	=	0.9699	(s)
COMBUSTION EFFICIENCY	=	79.143	(%)

PARAMETERS FOR : 1399.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.204162	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098931	(J/m/s/K)
GAS VISCOSITY	= 0.626834E-04	(Kg/m/s)
GAS VELOCITY	= 0.530215	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.652610E-02	(m/s)
REYNOLDS NUMBER	= 120.885	
DIFFUSION COEFFICIENT	= 0.387863E-03	(m2/s)
RESIDENCE TIME	= 1.7152	(s)
COMBUSTION EFFICIENCY	= 100	(%)

PARAMETERS FOR : 1303.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.216597	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.094462	(J/m/s/K)
GAS VISCOSITY	= 0.600420E-04	(Kg/m/s)
GAS VELOCITY	= 0.499776	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.681316E-02	(m/s)
REYNOLDS NUMBER	= 126.203	
DIFFUSION COEFFICIENT	= 0.349738E-03	(m2/s)
RESIDENCE TIME	= 2.5048	(s)
COMBUSTION EFFICIENCY	= 99.416	(%)

KINETIC PARAMETERS:

TEMPERATURE NUMBER	1
PROBE POSITION	1

PARTICLE TEMPERATURE	= 982.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1038E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.5244E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1059E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1059E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:

TEMPERATURE NUMBER	1
PROBE POSITION	2

PARTICLE TEMPERATURE	= 882.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1078E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.4926E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1102E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1102E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:

TEMPERATURE NUMBER	2
PROBE POSITION	1

PARTICLE TEMPERATURE	= 1193.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2458E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.5884E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2565E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2565E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1193.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1755E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.5893E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1809E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1809E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1103.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1764E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.5615E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1822E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1822E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1406.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2529E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.6521E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2632E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2632E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1410.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3515E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.6527E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3715E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3715E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1310.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1974E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.6244E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2038E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2038E-01	(g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT

OVERALL CORRELATION COEFFICIENT = 0.9046037

CHAR COMBUSTION KINETICS

ACTUAL VS. CALCULATED lnK

NO.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-2.244929	-2.045496	-0.20	7.966858	1255.2
2	-2.205400	-2.323744	0.12	8.656510	1155.2
3	-1.360511	-1.582925	0.22	6.820352	1466.2
4	-1.710038	-1.582925	-0.13	6.820352	1466.2
5	-1.702915	-1.762882	0.06	7.266386	1376.2
6	-1.335015	-1.233876	-0.10	5.955217	1679.2
7	-0.990145	-1.228166	0.24	5.941065	1683.2
8	-1.590629	-1.379568	-0.21	6.316322	1583.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED

A	=	3.218210	(Kg/m2/s/atm)
E	=	33.545448	(KJ/mol)

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********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
****

SAMPLE IDENTITY : 20SD80TL
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR	=	3.2182	(kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR	=	0.3218	(g/cm2/s/atm)
ACTIVATION ENERGY	=	33.5454	(KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
****

********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS TEMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.276	72.400
1149.2	132.000	3.349	86.400
1456.2	52.000	1.109	77.100
1459.2	92.000	1.960	84.900
1368.2	132.000	2.866	93.200
1670.2	52.000	0.970	73.600
1672.2	92.000	1.715	94.100
1576.2	132.000	2.505	93.000

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1255.2	77.533	0.807	39.609
1155.2	93.541	0.858	36.438
1466.2	83.555	0.722	46.173
1466.2	92.078	0.721	46.268
1376.2	99.581	0.755	43.382
1679.2	79.143	0.653	52.958
1683.2	100.000	0.653	53.022
1583.2	99.416	0.681	49.978

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.486	10.384E-02	524.444E-02	10.594E-02
158.851	10.779E-02	492.631E-02	11.021E-02
133.694	24.581E-02	588.357E-02	25.653E-02
133.494	17.547E-02	589.266E-02	18.086E-02
139.903	17.643E-02	561.484E-02	18.215E-02
120.991	25.295E-02	652.081E-02	26.315E-02
120.885	35.151E-02	652.666E-02	37.152E-02
126.203	19.736E-02	624.358E-02	20.380E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	1.742956
600	3.168431
700	5.093989
800	7.496187
900	10.328066
1000	13.531128
1100	17.043623
1200	20.805714
1300	24.762295
1400	28.864321
1500	33.069153
1600	37.340374

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OXYGEN CONCENTRATION     =  3.00    (%v/v)
AVERAGE FUEL FEED RATE   =  0.1246  (g/min.)
AVERAGE GAS FLOW RATE    = 20.00    (l/min.)

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10GS90TL
07-31-2008

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PROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
VM                                          =   0.00 (%)
FC                                          =   0.00 (%)
ASH                                         =   0.00 (%)
AVERAGE PARTICLE DIAMETER                   =   0.00 (microns)
PARTICLE DENSITY                            =   0.00 (g/cm3)


************************************************
            COMBUSTION CALCULATIONS
************************************************


PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)
VM                                          =   0.01 (%)
FC                                          =  57.10 (%)
ASH                                         =  42.89 (%)
AVERAGE PARTICLE DIAMETER                   =  35.12 (microns)
PARTICLE DENSITY                            =   1.72 (g/cm3)
SURFACE AREA                                =  80.0  (m2/g)
OXYGEN CONCENTRATION OF REACTANT GAS        =   3.00 (%v/v)


PARAMETERS FOR :  976.0 (Deg.C)    92.0 (cm)

GAS DENSITY                                 =   0.273295     (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =   0.078761     (J/m/s/K
GAS VISCOSITY                               =   0.506901E-04 (Kg/m/s)
GAS VELOCITY                                =   0.396290     (m/s)
PARTICLE FREE-FALL VELOCITY                 =   0.227638E-01 (m/s)
REYNOLDS NUMBER                             = 149.561
DIFFUSION COEFFICIENT                       =   0.232825E-03 (m2/s)
RESIDENCE TIME                              =     2.1954   (s)
COMBUSTION EFFICIENCY                       =  73.633       (%)


PARAMETERS FOR :  876.0 (Deg.C)   132.0 (cm)

GAS DENSITY                                 =   0.297076     (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =   0.073787     (J/m/s/K
GAS VISCOSITY                               =   0.477020E-04 (Kg/m/s)
GAS VELOCITY                                =   0.364566     (m/s)
PARTICLE FREE-FALL VELOCITY                 =   0.241894E-01 (m/s)
REYNOLDS NUMBER                             = 158.930
DIFFUSION COEFFICIENT                       =   0.201194E-03 (m2/s)
RESIDENCE TIME                              =     3.2243   (s)
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COMBUSTION EFFICIENCY                    =  82.321        (%)


PARAMETERS FOR : 1183.0 (Deg.C)    52.0 (cm)

GAS DENSITY                              =    0.234446      (Kg/m3)
GAS THERMAL CONDUCTIVITY                 =    0.088791      (J/m/s/K)
GAS VISCOSITY                            =    0.566777E-04  (Kg/m/s)
GAS VELOCITY                             =    0.461957      (m/s)
PARTICLE FREE-FALL VELOCITY              =    0.203594E-01  (m/s)
REYNOLDS NUMBER                          =  133.761
DIFFUSION COEFFICIENT                    =    0.304481E-03  (m2/s)
RESIDENCE TIME                           =      1.0781    (s)
COMBUSTION EFFICIENCY                    =   71.616         (%)


PARAMETERS FOR : 1186.0 (Deg.C)    92.0 (cm)

GAS DENSITY                              =    0.233964      (Kg/m3)
GAS THERMAL CONDUCTIVITY                 =    0.088934      (J/m/s/K)
GAS VISCOSITY                            =    0.567627E-04  (Kg/m/s)
GAS VELOCITY                             =    0.462909      (m/s)
PARTICLE FREE-FALL VELOCITY              =    0.203289E-01  (m/s)
REYNOLDS NUMBER                          =  133.561
DIFFUSION COEFFICIENT                    =    0.305580E-03  (m2/s)
RESIDENCE TIME                           =      1.9059    (s)
COMBUSTION EFFICIENCY                    =   94.441         (%)


PARAMETERS FOR : 1095.0 (Deg.C)   132.0 (cm)

GAS DENSITY                              =    0.249525      (Kg/m3)
GAS THERMAL CONDUCTIVITY                 =    0.084568      (J/m/s/K)
GAS VISCOSITY                            =    0.541626E-04  (Kg/m/s)
GAS VELOCITY                             =    0.434041      (m/s)
PARTICLE FREE-FALL VELOCITY              =    0.213046E-01  (m/s)
REYNOLDS NUMBER                          =  139.973
DIFFUSION COEFFICIENT                    =    0.273014E-03  (m2/s)
RESIDENCE TIME                           =      2.7843    (s)
COMBUSTION EFFICIENCY                    =   94.936         (%)


PARAMETERS FOR : 1397.0 (Deg.C)    52.0 (cm)

GAS DENSITY                              =    0.204407      (Kg/m3)
GAS THERMAL CONDUCTIVITY                 =    0.098838      (J/m/s/K)
GAS VISCOSITY                            =    0.626288E-04  (Kg/m/s)
GAS VELOCITY                             =    0.529846      (m/s)
PARTICLE FREE-FALL VELOCITY              =    0.184251E-01  (m/s)
REYNOLDS NUMBER                          =  121.051
DIFFUSION COEFFICIENT                    =    0.387051E-03  (m2/s)
RESIDENCE TIME                           =      0.9484    (s)
COMBUSTION EFFICIENCY                    =   91.456         (%)
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PARAMETERS FOR : 1399.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.204162	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098931	(J/m/s/K)
GAS VISCOSITY	= 0.626834E-04	(Kg/m/s)
GAS VELOCITY	= 0.530480	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.184091E-01	(m/s)
REYNOLDS NUMBER	= 120.946	
DIFFUSION COEFFICIENT	= 0.387863E-03	(m2/s)
RESIDENCE TIME	= 1.6772	(s)
COMBUSTION EFFICIENCY	= 94.837	(%)

PARAMETERS FOR : 1303.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.216597	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.094462	(J/m/s/K)
GAS VISCOSITY	= 0.600420E-04	(Kg/m/s)
GAS VELOCITY	= 0.500026	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.192188E-01	(m/s)
REYNOLDS NUMBER	= 126.266	
DIFFUSION COEFFICIENT	= 0.349738E-03	(m2/s)
RESIDENCE TIME	= 2.4475	(s)
COMBUSTION EFFICIENCY	= 97.422	(%)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 1

PARTICLE TEMPERATURE	= 989.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1645E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3105E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1737E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1737E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 2

PARTICLE TEMPERATURE	= 887.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1370E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.2916E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1437E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1437E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1202.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3201E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3483E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3525E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3525E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1205.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3266E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3488E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3604E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3604E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1110.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2278E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3324E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2446E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2446E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1426.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.5939E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3860E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.7020E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.7020E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1418.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3767E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3864E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4174E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4174E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1319.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2898E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3696E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3145E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3145E-01	(g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT

OVERALL CORRELATION COEFFICIENT = 0.9272757

CHAR COMBUSTION KINETICS

ACTUAL VS. CALCULATED lnK

NO.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-1.750359	-1.676019	-0.07	7.922675	1262.2
2	-1.939764	-2.012794	0.07	8.619205	1160.2
3	-1.042726	-1.122921	0.08	6.778742	1475.2
4	-1.020639	-1.116269	0.10	6.764985	1478.2
5	-1.408309	-1.340920	-0.07	7.229613	1383.2
6	-0.353885	-0.690852	0.34	5.885123	1699.2
7	-0.873605	-0.704312	-0.17	5.912961	1691.2
8	-1.156877	-0.882076	-0.27	6.280618	1592.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED
A = 8.624756 (Kg/m2/s/atm)
E = 40.200615 (KJ/mol)

****
********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
****

SAMPLE IDENTITY : 10GS90TL
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR = 8.6248 (kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR = 0.8625 (g/cm2/s/atm)
ACTIVATION ENERGY = 40.2006 (KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
****

********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS TEMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.195	71.300
1149.2	132.000	3.224	77.500
1456.2	52.000	1.078	70.000
1459.2	92.000	1.906	88.200
1368.2	132.000	2.784	88.700
1670.2	52.000	0.948	85.300
1672.2	92.000	1.677	88.600
1576.2	132.000	2.448	91.300

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1262.2	73.633	2.276	39.629
1160.2	82.321	2.419	36.457
1475.2	71.616	2.036	46.196
1478.2	94.441	2.033	46.291
1383.2	94.936	2.130	43.404
1699.2	91.456	1.843	52.985
1691.2	94.837	1.841	53.048
1592.2	97.422	1.922	50.003

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.561	16.451E-02	310.455E-02	17.371E-02
158.930	13.699E-02	291.623E-02	14.374E-02
133.761	32.010E-02	348.290E-02	35.249E-02
133.561	32.662E-02	348.828E-02	36.036E-02
139.973	22.780E-02	332.382E-02	24.456E-02
121.051	59.395E-02	386.012E-02	70.196E-02
120.946	37.674E-02	386.359E-02	41.744E-02
126.266	28.981E-02	369.601E-02	31.447E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	1.658809
600	3.395067
700	5.997546
800	9.528898
900	13.990502
1000	19.338495
1100	25.499704
1200	32.384762
1300	39.897816
1400	47.943157
1500	56.429440
1600	65.272110

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5GS85TL
7-31-2008

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'ROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
'M                                          =   0.00 (%)
'C                                          =   0.00 (%)
ASH                                         =   0.00 (%)
AVERAGE PARTICLE DIAMETER                   =   0.00 (microns)
PARTICLE DENSITY                            =   0.00 (g/cm3)


************************************************
            COMBUSTION CALCULATIONS
************************************************

PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)                           =   0.10 (%)
VM                                          =  57.83 (%)
FC                                          =  42.07 (%)
ASH                                         =  26.70 (microns)
AVERAGE PARTICLE DIAMETER                   =   1.72 (g/cm3)
PARTICLE DENSITY                            =  80.0  (m2/g)
SURFACE AREA                                =   3.00 (%v/v)
OXYGEN CONCENTRATION OF REACTANT GAS

PARAMETERS FOR :  976.0 (Deg.C)    92.0 (cm)

GAS DENSITY                                 =   0.273295      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =   0.078761      (J/m/s/K)
GAS VISCOSITY                               =   0.506901E-04  (Kg/m/s)
GAS VELOCITY                                =   0.396290      (m/s)
PARTICLE FREE-FALL VELOCITY                 =   0.131570E-01  (m/s)
REYNOLDS NUMBER                             = 149.561
DIFFUSION COEFFICIENT                       =   0.232825E-03  (m2/s)
RESIDENCE TIME                              =     2.2469      (s)
COMBUSTION EFFICIENCY                       =  78.766         (%)

PARAMETERS FOR :  876.0 (Deg.C)    132.0 (cm)

GAS DENSITY                                 =   0.297076      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =   0.073787      (J/m/s/K)
GAS VISCOSITY                               =   0.477020E-04  (Kg/m/s)
GAS VELOCITY                                =   0.364566      (m/s)
PARTICLE FREE-FALL VELOCITY                 =   0.139810E-01  (m/s)
REYNOLDS NUMBER                             = 158.930
DIFFUSION COEFFICIENT                       =   0.201194E-03  (m2/s)
RESIDENCE TIME                              =     3.3036      (s)
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5GS85TL
7-31-2008

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'ROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
'M                                          =    0.00 (%)
'C                                          =    0.00 (%)
ASH                                         =    0.00 (%)
AVERAGE PARTICLE DIAMETER                   =    0.00 (microns)
PARTICLE DENSITY                            =    0.00 (g/cm3)


**************************************************
            COMBUSTION CALCULATIONS
**************************************************

PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)                           =    0.10 (%)
VM                                          =   57.83 (%)
FC                                          =   42.07 (%)
ASH                                         =   26.70 (microns)
AVERAGE PARTICLE DIAMETER                   =    1.72 (g/cm3)
PARTICLE DENSITY                            =   80.0  (m2/g)
SURFACE AREA                                =    3.00 (%v/v)
OXYGEN CONCENTRATION OF REACTANT GAS

PARAMETERS FOR :  976.0 (Deg.C)    92.0 (cm)

GAS DENSITY                                 =    0.273295      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.078761      (J/m/s/K)
GAS VISCOSITY                               =    0.506901E-04  (Kg/m/s)
GAS VELOCITY                                =    0.396290      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.131570E-01  (m/s)
REYNOLDS NUMBER                             =  149.561
DIFFUSION COEFFICIENT                       =    0.232825E-03  (m2/s)
RESIDENCE TIME                              =      2.2469      (s)
COMBUSTION EFFICIENCY                       =   78.766         (%)

PARAMETERS FOR :  876.0 (Deg.C)    132.0 (cm)

GAS DENSITY                                 =    0.297076      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.073787      (J/m/s/K)
GAS VISCOSITY                               =    0.477020E-04  (Kg/m/s)
GAS VELOCITY                                =    0.364566      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.139810E-01  (m/s)
REYNOLDS NUMBER                             =  158.930
DIFFUSION COEFFICIENT                       =    0.201194E-03  (m2/s)
RESIDENCE TIME                              =      3.3036      (s)
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)MBUSTION EFFICIENCY	= 92.204	(%)

ARAMETERS FOR : 1183.0 (Deg.C) 52.0 (cm)

AS DENSITY	= 0.234446	(Kg/m3)
AS THERMAL CONDUCTIVITY	= 0.088791	(J/m/s/K)
AS VISCOSITY	= 0.566777E-04	(Kg/m/s)
AS VELOCITY	= 0.461957	(m/s)
'ARTICLE FREE-FALL VELOCITY	= 0.117673E-01	(m/s)
:EYNOLDS NUMBER	= 133.761	
)IFFUSION COEFFICIENT	= 0.304481E-03	(m2/s)
:ESIDENCE TIME	= 1.0977	(s)
:OMBUSTION EFFICIENCY	= 83.063	(%)

PARAMETERS FOR : 1186.0 (Deg.C) 92.0 (cm)

GAS DENSITY	= 0.233964	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.088934	(J/m/s/K)
GAS VISCOSITY	= 0.567627E-04	(Kg/m/s)
GAS VELOCITY	= 0.462909	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.117497E-01	(m/s)
REYNOLDS NUMBER	= 133.561	
DIFFUSION COEFFICIENT	= 0.305580E-03	(m2/s)
RESIDENCE TIME	= 1.9404	(s)
COMBUSTION EFFICIENCY	= 98.289	(%)

PARAMETERS FOR : 1095.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.249525	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.084568	(J/m/s/K)
GAS VISCOSITY	= 0.541626E-04	(Kg/m/s)
GAS VELOCITY	= 0.434041	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.123137E-01	(m/s)
REYNOLDS NUMBER	= 139.973	
DIFFUSION COEFFICIENT	= 0.273014E-03	(m2/s)
RESIDENCE TIME	= 2.8365	(s)
COMBUSTION EFFICIENCY	= 99.509	(%)

PARAMETERS FOR : 1397.0 (Deg.C) 52.0 (cm)

GAS DENSITY	= 0.204407	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.098838	(J/m/s/K)
GAS VISCOSITY	= 0.626288E-04	(Kg/m/s)
GAS VELOCITY	= 0.529846	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.106494E-01	(m/s)
REYNOLDS NUMBER	= 121.051	
DIFFUSION COEFFICIENT	= 0.387051E-03	(m2/s)
RESIDENCE TIME	= 0.9621	(s)
COMBUSTION EFFICIENCY	= 85.136	(%)

ARAMETERS FOR : 1399.0 (Deg.C) 92.0 (cm)

AS DENSITY	= 0.204162	(Kg/m3)
AS THERMAL CONDUCTIVITY	= 0.098931	(J/m/s/K)
AS VISCOSITY	= 0.626834E-04	(Kg/m/s)
AS VELOCITY	= 0.530480	(m/s)
ARTICLE FREE-FALL VELOCITY	= 0.106401E-01	(m/s)
EYNOLDS NUMBER	= 120.946	
IFFUSION COEFFICIENT	= 0.387863E-03	(m2/s)
ESIDENCE TIME	= 1.7013	(s)
OMBUSTION EFFICIENCY	= 96.573	(%)

PARAMETERS FOR : 1303.0 (Deg.C) 132.0 (cm)

GAS DENSITY	= 0.216597	(Kg/m3)
GAS THERMAL CONDUCTIVITY	= 0.094462	(J/m/s/K)
GAS VISCOSITY	= 0.600420E-04	(Kg/m/s)
GAS VELOCITY	= 0.500026	(m/s)
PARTICLE FREE-FALL VELOCITY	= 0.111081E-01	(m/s)
REYNOLDS NUMBER	= 126.266	
DIFFUSION COEFFICIENT	= 0.349738E-03	(m2/s)
RESIDENCE TIME	= 2.4839	(s)
COMBUSTION EFFICIENCY	= 98.466	(%)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 1

PARTICLE TEMPERATURE	= 985.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1374E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.4084E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1422E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1422E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 1
PROBE POSITION 2

PARTICLE TEMPERATURE	= 885.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.1327E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3836E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1375E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.1375E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1198.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3115E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.4581E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3342E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3342E-01	(g/cm2/s/atm)

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INETIC PARAMETERS:
EMPERATURE NUMBER          2
ROBE POSITION              2

ARTICLE TEMPERATURE                    = 1200.0       (Deg.C)
VERALL REACTION RATE COEFFICIENT       = 0.2928E+00   (Kg/m2/s/atm)
IFFUSIONAL REACTION RATE COEFFICIENT   = 0.4588E+01   (Kg/m2/s/atm)
URFACE REACTION RATE COEFFICIENT       = 0.3128E+00   (Kg/m2/s/atm)
URFACE REACTION RATE COEFFICIENT       = 0.3128E-01   (g/cm2/s/atm)

INETIC PARAMETERS:
EMPERATURE NUMBER          2
ROBE POSITION              3

ARTICLE TEMPERATURE                    = 1107.0       (Deg.C)
VERALL REACTION RATE COEFFICIENT       = 0.2240E+00   (Kg/m2/s/atm)
IFFUSIONAL REACTION RATE COEFFICIENT   = 0.4372E+01   (Kg/m2/s/atm)
URFACE REACTION RATE COEFFICIENT       = 0.2361E+00   (Kg/m2/s/atm)
URFACE REACTION RATE COEFFICIENT       = 0.2361E-01   (g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER         3
PROBE POSITION             1

PARTICLE TEMPERATURE                   = 1412.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT      = 0.3741E+00   (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT  = 0.5077E+01   (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT      = 0.4039E+00   (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT      = 0.4039E-01   (g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER         3
PROBE POSITION             2

PARTICLE TEMPERATURE                   = 1412.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT      = 0.3037E+00   (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT  = 0.5082E+01   (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT      = 0.3231E+00   (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT      = 0.3231E-01   (g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER         3
PROBE POSITION             3

PARTICLE TEMPERATURE                   = 1313.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT      = 0.2316E+00   (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT  = 0.4862E+01   (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT      = 0.2432E+00   (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT      = 0.2432E-01   (g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT
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VERALL CORRELATION COEFFICIENT = 0.8959631

HAR COMBUSTION KINETICS

CTUAL VS. CALCULATED lnK

O.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-1.950582	-1.757624	-0.19	7.947863	1258.2
2	-1.984417	-2.012729	0.03	8.634088	1158.2
3	-1.096060	-1.329853	0.23	6.797173	1471.2
4	-1.162311	-1.326423	0.16	6.787945	1473.2
5	-1.443657	-1.496455	0.05	7.245327	1380.2
6	-0.906651	-1.008973	0.10	5.934014	1685.2
7	-1.129934	-1.008973	-0.12	5.934014	1685.2
8	-1.414072	-1.146655	-0.27	6.304376	1586.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED

A = 3.310191 (Kg/m2/s/atm)
E = 30.908945 (KJ/mol)

****
********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
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SAMPLE IDENTITY : 15GS85TL
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR = 3.3102 (kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR = 0.3310 (g/cm2/s/atm)
ACTIVATION ENERGY = 30.9089 (KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
****

********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS EMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.247	74.200
1149.2	132.000	3.304	85.600
1456.2	52.000	1.098	77.500
1459.2	92.000	1.940	92.000
1368.2	132.000	2.837	93.400
1670.2	52.000	0.962	79.200
1672.2	92.000	1.701	90.100
1576.2	132.000	2.484	92.200

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1258.2	78.766	1.316	39.629
1158.2	92.204	1.398	36.457
1471.2	83.063	1.177	46.196
1473.2	98.289	1.175	46.291
1380.2	99.509	1.231	43.404
1685.2	85.136	1.065	52.985
1685.2	96.573	1.064	53.048
1586.2	98.466	1.111	50.003

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.561	13.741E-02	408.359E-02	14.219E-02
158.930	13.271E-02	383.588E-02	13.746E-02
133.761	31.147E-02	458.125E-02	33.419E-02
133.561	29.280E-02	458.833E-02	31.276E-02
139.973	22.397E-02	437.200E-02	23.606E-02
121.051	37.412E-02	507.744E-02	40.387E-02
120.946	30.375E-02	508.200E-02	32.305E-02
126.266	23.157E-02	486.157E-02	24.315E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	2.701763
600	4.686030
700	7.257909
800	10.361128
900	13.920246
1000	17.854244
1100	22.084728
1200	26.540236
1300	31.158075
1400	35.884670
1500	40.675110
1600	45.492310

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XYGEN CONCENTRATION     =  3.00    (%v/v)
VERAGE FUEL FEED RATE   =  0.1101  (g/min.)
VERAGE GAS FLOW RATE    = 20.01    (l/min.)

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20GS80TL
07-31-2008

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PROXIMATE ANALYSIS OF FEEDSTOCK COAL (DRY BASIS):
VM                                          =    0.00 (%)
FC                                          =    0.00 (%)
ASH                                         =    0.00 (%)
AVERAGE PARTICLE DIAMETER                   =    0.00 (microns)
PARTICLE DENSITY                            =    0.00 (g/cm3)


************************************************
            COMBUSTION CALCULATIONS
************************************************


PROXIMATE ANALYSIS OF CHAR FOR COMBUSTION
TESTS (DRY BASIS)
VM                                          =    0.01 (%)
FC                                          =   57.41 (%)
ASH                                         =   42.58 (%)
AVERAGE PARTICLE DIAMETER                   =   30.97 (microns)
PARTICLE DENSITY                            =    1.76 (g/cm3)
SURFACE AREA                                =   80.0  (m2/g)
OXYGEN CONCENTRATION OF REACTANT GAS        =    3.00 (%v/v)


PARAMETERS FOR :  976.0 (Deg.C)    92.0 (cm)

GAS DENSITY                                 =    0.273295      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.078761      (J/m/s/K)
GAS VISCOSITY                               =    0.506901E-04  (Kg/m/s)
GAS VELOCITY                                =    0.396290      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.181135E-01  (m/s)
REYNOLDS NUMBER                             =  149.561
DIFFUSION COEFFICIENT                       =    0.232825E-03  (m2/s)
RESIDENCE TIME                              =      2.2201    (s)
COMBUSTION EFFICIENCY                       =   80.921        (%)


PARAMETERS FOR :  876.0 (Deg.C)   132.0 (cm)

GAS DENSITY                                 =    0.297076      (Kg/m3)
GAS THERMAL CONDUCTIVITY                    =    0.073787      (J/m/s/K)
GAS VISCOSITY                               =    0.477020E-04  (Kg/m/s)
GAS VELOCITY                                =    0.364566      (m/s)
PARTICLE FREE-FALL VELOCITY                 =    0.192479E-01  (m/s)
REYNOLDS NUMBER                             =  158.930
DIFFUSION COEFFICIENT                       =    0.201194E-03  (m2/s)
RESIDENCE TIME                              =      3.2622    (s)
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PARAMETERS FOR : 1399.0 (Deg.C)     92.0 (cm)

GAS DENSITY                                  =    0.204162      (Kg/m3)
GAS THERMAL CONDUCTIVITY                     =    0.098931      (J/m/s/K)
GAS VISCOSITY                                =    0.626834E-04  (Kg/m/s)
GAS VELOCITY                                 =    0.530480      (m/s)
PARTICLE FREE-FALL VELOCITY                  =    0.146484E-01  (m/s)
REYNOLDS NUMBER                              =  120.946
DIFFUSION COEFFICIENT                        =    0.387863E-03  (m2/s)
RESIDENCE TIME                               =      1.6888      (s)
COMBUSTION EFFICIENCY                        =   97.423         (%)


PARAMETERS FOR : 1303.0 (Deg.C)    132.0 (cm)

GAS DENSITY                                  =    0.216597      (Kg/m3)
GAS THERMAL CONDUCTIVITY                     =    0.094462      (J/m/s/K)
GAS VISCOSITY                                =    0.600420E-04  (Kg/m/s)
GAS VELOCITY                                 =    0.500026      (m/s)
PARTICLE FREE-FALL VELOCITY                  =    0.152928E-01  (m/s)
REYNOLDS NUMBER                              =  126.266
DIFFUSION COEFFICIENT                        =    0.349738E-03  (m2/s)
RESIDENCE TIME                               =      2.4650      (s)
COMBUSTION EFFICIENCY                        =  100             (%)


KINETIC PARAMETERS:
TEMPERATURE NUMBER            1
PROBE POSITION                1

PARTICLE TEMPERATURE                         =   988.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT            = 0.1736E+00  (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT        = 0.3521E+01  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1826E+00  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1826E-01  (g/cm2/s/atm)


KINETIC PARAMETERS:
TEMPERATURE NUMBER            1
PROBE POSITION                2

PARTICLE TEMPERATURE                         =   887.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT            = 0.1592E+00  (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT        = 0.3307E+01  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1673E+00  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1673E-01  (g/cm2/s/atm)


KINETIC PARAMETERS:
TEMPERATURE NUMBER            2
PROBE POSITION                1

PARTICLE TEMPERATURE                         =  1204.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT            = 0.4008E+00  (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT        = 0.3950E+01  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.4461E+00  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.4461E-01  (g/cm2/s/atm)
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PARAMETERS FOR : 1399.0 (Deg.C)     92.0 (cm)

GAS DENSITY                                  =    0.204162      (Kg/m3)
GAS THERMAL CONDUCTIVITY                     =    0.098931      (J/m/s/K)
GAS VISCOSITY                                =    0.626834E-04  (Kg/m/s)
GAS VELOCITY                                 =    0.530480      (m/s)
PARTICLE FREE-FALL VELOCITY                  =    0.146484E-01  (m/s)
REYNOLDS NUMBER                              =  120.946
DIFFUSION COEFFICIENT                        =    0.387863E-03  (m2/s)
RESIDENCE TIME                               =      1.6888      (s)
COMBUSTION EFFICIENCY                        =   97.423         (%)


PARAMETERS FOR : 1303.0 (Deg.C)    132.0 (cm)

GAS DENSITY                                  =    0.216597      (Kg/m3)
GAS THERMAL CONDUCTIVITY                     =    0.094462      (J/m/s/K)
GAS VISCOSITY                                =    0.600420E-04  (Kg/m/s)
GAS VELOCITY                                 =    0.500026      (m/s)
PARTICLE FREE-FALL VELOCITY                  =    0.152928E-01  (m/s)
REYNOLDS NUMBER                              =  126.266
DIFFUSION COEFFICIENT                        =    0.349738E-03  (m2/s)
RESIDENCE TIME                               =      2.4650      (s)
COMBUSTION EFFICIENCY                        =  100             (%)


KINETIC PARAMETERS:
TEMPERATURE NUMBER            1
PROBE POSITION                1

PARTICLE TEMPERATURE                         =   988.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT            = 0.1736E+00  (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT        = 0.3521E+01  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1826E+00  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1826E-01  (g/cm2/s/atm)


KINETIC PARAMETERS:
TEMPERATURE NUMBER            1
PROBE POSITION                2

PARTICLE TEMPERATURE                         =   887.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT            = 0.1592E+00  (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT        = 0.3307E+01  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1673E+00  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.1673E-01  (g/cm2/s/atm)


KINETIC PARAMETERS:
TEMPERATURE NUMBER            2
PROBE POSITION                1

PARTICLE TEMPERATURE                         =  1204.0       (Deg.C)
OVERALL REACTION RATE COEFFICIENT            = 0.4008E+00  (Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT        = 0.3950E+01  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.4461E+00  (Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT            = 0.4461E-01  (g/cm2/s/atm)
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KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1204.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3456E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3956E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3787E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.3787E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 2
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1108.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.2290E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.3769E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2438E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.2438E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 1

PARTICLE TEMPERATURE	= 1416.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.4241E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.4377E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4696E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4696E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 2

PARTICLE TEMPERATURE	= 1416.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3790E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.4381E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4149E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4149E-01	(g/cm2/s/atm)

KINETIC PARAMETERS:
TEMPERATURE NUMBER 3
PROBE POSITION 3

PARTICLE TEMPERATURE	= 1320.0	(Deg.C)
OVERALL REACTION RATE COEFFICIENT	= 0.3685E+00	(Kg/m2/s/atm)
DIFFUSIONAL REACTION RATE COEFFICIENT	= 0.4191E+01	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4041E+00	(Kg/m2/s/atm)
SURFACE REACTION RATE COEFFICIENT	= 0.4041E-01	(g/cm2/s/atm)

ALL PARTICLE TEMPERATURES REFERRED TO ARE CALCULATED PARTICLE TEMPERATURES

ARRHENIUS KINETIC FIT

OVERALL CORRELATION COEFFICIENT = 0.9354975

CHAR COMBUSTION KINETICS

ACTUAL VS. CALCULATED lnK

NO.	ACTUAL	CALCULATED	DIF.	1/T (K) *10E-04	T (K)
1	-1.700337	-1.557518	-0.14	7.928957	1261.2
2	-1.788174	-1.837510	0.05	8.619205	1160.2
3	-0.807308	-1.087221	0.28	6.769564	1477.2
4	-0.971074	-1.087221	0.12	6.769564	1477.2
5	-1.411414	-1.278082	-0.13	7.240081	1381.2
6	-0.755876	-0.742589	-0.01	5.919962	1689.2
7	-0.879674	-0.742589	-0.14	5.919962	1689.2
8	-0.906157	-0.887286	-0.02	6.276676	1593.2

* = DELETED

RESULTS WITH ZERO COMBUSTION ARE AUTOMATICALLY OMITTED
A = 5.252933 (Kg/m2/s/atm)
E = 33.726597 (KJ/mol)

****
********** CHAR COMBUSTION - ARRHENIUS PARAMETERS **********
****

SAMPLE IDENTITY : 20GS80TL
DATE : 07-31-2008

PRE-EXPONENTIAL FACTOR = 5.2529 (kg/m2/s/atm)
PRE-EXPONENTIAL FACTOR = 0.5253 (g/cm2/s/atm)
ACTIVATION ENERGY = 33.7266 (KJ/mol.)

NOTE:IN PYROLYSIS, GAS TEMPERATURES ARE USED IN CALCULATIONS
IN COMBUSTION, PARTICLE TEMPERATURES ARE USED IN CALCULATIONS
NOTE:CONVERSION CALCULATED FROM CORRECTED ASH TRACER METHOD
****

********** SUMMARY REPORT - CHAR COMBUSTION DATA **********

GAS TEMPERATURE (K)	RESIDENCE DISTANCE (cm)	RESIDENCE TIME (s)	ASH IN CHAR (%)
1249.2	92.000	2.220	76.200
1149.2	132.000	3.262	85.800
1456.2	52.000	1.088	80.200
1459.2	92.000	1.922	91.900
1368.2	132.000	2.809	91.300
1670.2	52.000	0.955	77.800
1672.2	92.000	1.689	91.200
1576.2	132.000	2.465	96.500

PARTICLE TEMPERATURE (K)	CONVERSION EFFICIENCY (%)	FREE FALL VELOCITY (cm/s)	GAS VELOCITY (cm/s)
1261.2	80.921	1.811	39.629
1160.2	92.147	1.925	36.457
1477.2	85.925	1.620	46.196
1477.2	98.061	1.618	46.291
1381.2	97.515	1.695	43.404
1689.2	82.984	1.466	52.985
1689.2	97.423	1.465	53.048
1593.2	100.000	1.529	50.003

REYNOLDS NUMBER	Ko	Kdiff (kg/m^2/s/atm)	Ks
149.561	17.362E-02	352.056E-02	18.262E-02
158.930	15.921E-02	330.701E-02	16.727E-02
133.761	40.079E-02	394.961E-02	44.606E-02
133.561	34.559E-02	395.571E-02	37.868E-02
139.973	22.899E-02	376.921E-02	24.380E-02
121.051	42.410E-02	437.738E-02	46.960E-02
120.946	37.902E-02	438.131E-02	41.492E-02
126.266	36.854E-02	419.128E-02	40.407E-02

PARTICLE TEMP. °C	KS(calculated) * 10E-2 Kg/m2/s/atm
500	2.765897
600	5.044234
700	8.130600
800	11.989774
900	16.547834
1000	21.711489
1100	27.381599
1200	33.461639
1300	39.862434
1400	46.504364
1500	53.318066
1600	60.244144

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OXYGEN CONCENTRATION     =  3.00    (%v/v)
AVERAGE FUEL FEED RATE   =  0.1184  (g/min.)
AVERAGE GAS FLOW RATE    = 20.01    (l/min.)

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APPENDIX J

Printout of the spreadheet that was used to correct the DTF program and summary of reaction kinetics.

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 100% COAL

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		42.53		1		
	Unburned Carbon %		31.8		Density	1620		Avg. Part diameter		3.43E-05		Flow	0.02002	
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-4.69E-05			Ks	4.429E-01				
	Re	1.50E+02			Tp	1,278	K							
						1,004	℃		Overall Reaction Rate Coefficient					
	vg	0.39648708			Heat lost by radiation				Ko	0.442826773				
									q	0.013284803				
									Pgo	0.03				
	ρg	0.273294909			Hr	-266.4357								
	δg	5.07E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3179.508225				
Gas viscosity					Tw	1278.2			φ	2				
	δg	5.06868E-05							D	0.000232825				
					Thermal Conductivity of N2				x	3.43E-05				
Gas Density					λ	0.078755			Tg	1249.2				
	ρg	0.273294909			Tg	1249.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.044E-02			Hc	1.30E+05			D(T,P)	0.000232825				
	x	3.43E-05							D(T0,P0)	0.000217				
	ρp	1620			Heat gain by combusting particle				T	1249.2				
	ρg	0.273294909			Hg	1.30E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001525682	0.0015257						q	1.33E-02	CORRECTED			
	Fo	0.000333667	0.02002						U	0.307758755				
	Po	1							B	0.692241245				
	P1	1.000							So	3.32E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.39648708							So	3.32E+01				
	Rv	0.003848							X	3.43E-05				
Cumulative Residence Time									ρc	1620				
	t	2.206620889												
	L1	0.92							Combustion efficency					
									ε	65.49381623				
									ε	69.22412453	Corrected x1.03+1.7			
									Combut.Ash	68.2				

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash		42.53							
	Unburned Carbon %		15.4		Density	1620		Avg. Part diameter		0.00003429							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	2.91E-11			Ks	1.73E+00							
	Re	1.59E+02			Tp	1,260	K										
						987	℃		Overall Reaction Rate Coefficient								
	vg	0.364747801			Heat lost by radiation				Ko	1.729441842							
									q	0.051883255							
									Pgo	0.03							
	ρg	0.297076227			Hr	31274.14											
	δg	4.77E-05			ε	0.9			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	2.99E+03							
Gas viscosity					Tw	1175.2			φ	2							
	δg	4.76989E-05							D	0.000201194							
					Thermal Conductivity of N2				x	3.43E-05							
Gas Density					λ	0.073782			Tg	1149.2							
	ρg	0.297076227			Tg	1149.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	2.1720050E-02			Hc	4.77E+05			D(T,P)	0.000201194							
	x	3.43E-05							D(T0,P0)	0.000217							
	ρp	1620			Heat gain by combusting particle				T	1149.2							
	ρg	0.297076227			Hg	5.08E+05			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.00140355	0.0014035						q	5.19E-02	CORRECTED						
	Fo	0.000333667	0.02002						U	0.090887515							
	Po	1							B	0.909112485							
	P1	1.000							So	9.82E+00							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.364747801							So	9.82E+00							
	Rv	0.003848							X	3.43E-05							
Cumulative Residence Time									ρc	1620							
	t	3.2416358E+00															
	L1	0.4							Combustion efficency								
									ε	86.52885399							
									ε	90.91124846	Corrected x1.03+1.7						
									Combut.Ash	84.6							

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		42.53							
	Unburned Carbon %		29.4		Density	1620		Avg. Part diameter		3.43E-05							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-3.02E-10			Ks	1.12E+00							
	Re	1.34E+02			Tp	1,515	K										
						1,242	℃		Overall Reaction Rate Coefficient								
	vg	0.462187389			Heat lost by radiation				Ko	1.122267626							
									q	0.033668029							
									Pgo	0.03							
	ρg	0.234445818			Hr	26336.72											
	δg	5.667E-05			ε	0.9			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	3.57E+03							
Gas viscosity					Tw	1476.2			φ	2							
	δg	5.66739E-05							D	0.000304481							
					Thermal Conductivity of N2				x	3.43E-05							
Gas Density					λ	0.088785			Tg	1456.2							
	ρg	0.234445818			Tg	1456.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	1.8281125E-02			Hc	3.03E+05			D(T,P)	0.000304481							
	x	3.43E-05							D(T0,P0)	0.000217							
	ρp	1620			Heat gain by combusting particle				T	1456.2							
	ρg	0.234445818			Hg	3.30E+05			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.001778497	0.0017785						q	3.37E-02	CORRECTED						
	Fo	0.000333667	0.02002						U	0.269727994							
	Po	1							B	0.730272006							
	P1	1.000							So	2.91E+01							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.462187389							So	2.91E+01							
	Rv	0.003848							X	3.43E-05							
Cumulative Residence Time									ρc	1620							
	t	1.082276955															
	L1	0.52							Combustion efficency								
									ε	69.18254185							
									ε	73.02720064	Corrected x1.03+1.7						
									Combut.Ash	70.6							

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		42.53					
	Unburned Carbon %		9.7		Density	1620		Avg. Part diameter		3.43E-05					
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks						
Reynolds	Number Calculation				Particle Temperature at equilibrium				Surface Reaction Rate Coefficient						
					Iter.	-4.88E-07			Ks	9.66E+00					
	Re	1.336E+02			Tp	1,918	K								
						1,645	℃		Overall Reaction Rate Coefficient						
	vg	0.463139567			Heat lost by radiation				Ko	9.634911057					
									q	0.289047332					
									Pgo	0.03					
	ρg	0.233963816			Hr	449740.3									
	δg	5.68E-05			ε	0.9			Diffusional Reaction Rate Coefficient						
					σ	5.67E-08			Kdiff	3.57E+03					
Gas viscosity					Tw	1474.2			φ	2					
	δg	5.67589E-05							D	0.00030558					
					Thermal Conductivity of N2				x	3.43E-05					
Gas Density					λ	0.088928			Tg	1459.2					
	ρg	0.233963816			Tg	1459.2			R	8.21E-05					
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient						
	vp	1.8253755E-02			Hc	2.38E+06			D(T,P)	0.000305580					
	x	3.43E-05							D(T0,P0)	0.000217					
	ρp	1620			Heat gain by combusting particle				T	1459.2					
	ρg	0.233963816			Hg	2.83E+06			P	1.000					
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area						
	F	0.001782161	0.0017822						q	2.89E-01	CORRECTED				
	Fo	0.000333667	0.02002						U	0.033959035					
	Po	1							B	0.966040965					
	P1	1.000							So	3.67E+00					
Linear Velocity of Gas									Initial Surface Area						
	vg	0.463139567							So	3.67E+00					
	Rv	0.003848							X	3.43E-05					
Cumulative Residence Time									ρc	1620					
	t	1.9131983E+00													
	L1	0.4							Combustion efficency						
									ε	92.0505301					
									ε	96.60409653	Corrected x1.03+1.7				
									Combut.Ash	90.3					

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		42.53						
	Unburned Carbon %		7.5		Density	1620		Avg. Part diameter		3.43E-05						
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks							
Reynolds	Number Calculation				Particle Temperature at equilibrium				Surface Reaction Rate Coefficient							
					Iter.	-8.30E-07			Ks	1.82E+01						
	Re	1.40E+02			Tp	2,231	K									
						1,958	℃		Overall Reaction Rate Coefficient							
	vg	0.434256823			Heat lost by radiation				Ko	18.15017852						
									q	0.544505356						
									Pgo	0.03						
	ρg	0.249524923			Hr	1075385										
	δg	5.42E-05			ε	0.9			Diffusional Reaction Rate Coefficient							
					σ	5.67E-08			Kdiff	3.40E+03						
Gas viscosity					Tw	1387.3			φ	2						
	δg	5.4159E-05							D	0.000273014						
					Thermal Conductivity of N2				x	3.43E-05						
Gas Density					λ	0.084562			Tg	1368.2						
	ρg	0.249524923			Tg	1368.2			R	8.21E-05						
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient							
	vp	1.9129850E-02			Hc	4.26E+06			D(T,P)	0.000273014						
	x	3.43E-05							D(T0,P0)	0.000217						
	ρp	1620			Heat gain by combusting particle				T	1368.2						
	ρg	0.249524923			Hg	5.33E+06			P	1.000						
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area							
	F	0.00167102	0.001671						q	5.45E-01	CORRECTED					
	Fo	0.000333667	0.02002						U	0.0138632						
	Po	1							B	0.9861368						
	P1	1.000							So	1.50E+00						
Linear Velocity of Gas									Initial Surface Area							
	vg	0.434256823							So	1.50E+00						
	Rv	0.003848							X	3.43E-05						
Cumulative Residence Time									ρc	1620						
	t	2.7954475E+00														
	L1	0.4							Combustion efficency							
									ε	93.99968961						
									ε	98.61367999	Corrected x1.03+1.7					
									Combut.Ash	92.5						

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		42.53			
	Unburned Carbon %		12.7		Density	1620		Avg. Part diameter		3.43E-05			
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks				
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient				
					Iter.	-8.05E-07			Ks	9.32E+00			
	Re	1.21E+02			Tp	2,057	K						
						1,783	℃		Overall Reaction Rate Coefficient				
	vg	0.530109447			Heat lost by radiation				Ko	9.302125357			
									q	0.279063761			
									Pgo	0.03			
	ρg	0.204406658			Hr	504426							
	δg	6.26E-05			ε	0.9			Diffusional Reaction Rate Coefficient				
					σ	5.67E-08			Kdiff	3.95E+03			
Gas viscosity					Tw	1682.2			φ	2			
	δg	6.26245E-05							D	0.000387051			
					Thermal Conductivity of N2				x	3.43E-05			
Gas Density					λ	0.098831			Tg	1670.2			
	ρg	0.204406658			Tg	1670.2			R	8.21E-05			
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient				
	vp	1.6544366E-02			Hc	2.23E+06			D(T,P)	0.000387051			
	x	3.43E-05							D(T0,P0)	0.000217			
	ρp	1620			Heat gain by combusting particle				T	1670.2			
	ρg	0.204406658			Hg	2.73E+06			P	1.000			
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area				
	F	0.002039861	0.0020399						q	2.79E-01	CORRECTED		
	Fo	0.000333667	0.02002						U	0.062994722			
	Po	1							B	0.937005278			
	P1	1.000							So	6.80E+00			
Linear Velocity of Gas									Initial Surface Area				
	vg	0.530109447							So	6.80E+00			
	Rv	0.003848							X	3.43E-05			
Cumulative Residence Time									ρc	1620			
	t	0.951241879											
	L1	0.52							Combustion efficency				
									ε	89.23426556			
									ε	93.70052779	Corrected x1.03+1.7		
									Combut.Ash	87.3			

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash		42.53				
	Unburned Carbon %		5.6		Density	1620		Avg. Part diameter		3.43E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-5.91E-07			Ks	8.13E+00				
	Re	1.21E+02			Tp	2,012	K							
						1,739	℃		Overall Reaction Rate Coefficient					
	vg	0.530744233							Ko	8.113990865				
									q	0.243419726				
					Heat lost by radiation				Pgo	0.03				
	ρg	0.204162182			Hr	425014.2								
	δg	6.27E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.96E+03				
Gas viscosity					Tw	1684.2			φ	2				
	δg	6.26791E-05							D	0.000387863				
					Thermal Conductivity of N2				x	3.43E-05				
Gas Density					λ	0.098924			Tg	1672.2				
	ρg	0.204162182			Tg	1672.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.6529957E-02			Hc	1.96E+06			D(T,P)	0.000387863				
	x	3.43E-05							D(T0,P0)	0.000217				
	ρp	1620			Heat gain by combusting particle				T	1672.2				
	ρg	0.204162182			Hg	2.38E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002042304	0.0020423						q	2.43E-01	CORRECTED			
	Fo	0.000333667	0.02002						U	0.043900576				
	Po	1							B	0.956099424				
	P1	1.000							So	4.74E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.530744233							So	4.74E+00	*			
	Rv	0.003848							X	3.43E-05				
Cumulative Residence Time									ρc	1620				
	t	1.6821369E+00												
	L1	0.4							Combustion efficency					
									ε	95.6099424				
									ε	95.6099424	Corrected x1.03+1.7			
									Combut.Ash	94.4				

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		42.53						
	Unburned Carbon %		3.5		Density	1620		Avg. Part diameter		3.43E-05						
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks							
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient							
					Iter.	-7.03E-07			Ks	9.87E+00						
	Re	1.26E+02			Tp	2,009	K									
						1,736	℃		Overall Reaction Rate Coefficient							
	vg	0.500274524			Heat lost by radiation				Ko	9.842840835						
									q	0.295285225						
									Pgo	0.03						
	ρg	0.216596879			Hr	507266.8										
	δg	6.00E-05			ε	0.9			Diffusional Reaction Rate Coefficient							
					σ	5.67E-08			Kdiff	3.79E+03						
Gas viscosity					Tw	1587.2			φ	2						
	δg	6.00379E-05							D	0.000349738						
					Thermal Conductivity of N2				x	3.43E-05						
Gas Density					λ	0.094455			Tg	1576.2						
	ρg	0.216596879			Tg	1576.2			R	8.21E-05						
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient							
	vp	1.7257013E-02			Hc	2.38E+06			D(T,P)	0.000349738						
	x	3.43E-05							D(T0,P0)	0.000217						
	ρp	1620			Heat gain by combusting particle				T	1576.2						
	ρg	0.216596879			Hg	2.89E+06			P	1.000						
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area							
	F	0.001925056	0.0019251						q	2.95E-01	CORRECTED					
	Fo	0.000333667	0.02002						U	0.026840767						
	Po	1							B	0.973159233						
	P1	1.000							So	2.90E+00						
Linear Velocity of Gas									Initial Surface Area							
	vg	0.500274524							So	2.90E+00	*					
	Rv	0.003848							X	3.43E-05						
Cumulative Residence Time									ρc	1620						
	t	2.4550367E+00														
	L1	0.4							Combustion efficency							
									ε	97.31592333						
									ε	97.31592333	Corrected x1.03+1.7					
									Combut.Ash	96.5						

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 10% SAWDUST

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		43.17		1		CorrectSurf
	Unburned Carbon %		28.1		Density	1730		Avg. Part diameter		3.49E-05		Flow	0.02	
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	1.94E-04			Ks	6.450E-01				
	Re	1.49E+02			Tp	1,290	K							
						1,017	℃		Overall Reaction Rate Coefficient					
	vg	0.396090989			Heat lost by radiation				Ko	0.644869204				
									q	0.019346076				
									Pgo	0.03				
	ρg	0.273294909			Hr	5016.611								
	δg	5.07E-05			ε	0.88			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3123.040304				
Gas viscosity					Tw	1278.2			φ	2				
	δg	5.06868E-05							D	0.000232825				
					Thermal Conductivity of N2				x	3.49E-05				
Gas Density					λ	0.078755			Tg	1249.2				
	ρg	0.273294909			Tg	1249.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.262E-02			Hc	1.84E+05			D(T,P)	0.000232825				
	x	3.49E-05							D(T0,P0)	0.000217				
	ρp	1730			Heat gain by combusting particle				T	1249.2				
	ρg	0.273294909			Hg	1.89E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001524158	0.0015242						q	1.93E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.258083901				
	Po	1							B	0.741916099				
	P1	1.000							So	2.56E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.396090989							So	2.56E+01				
	Rv	0.003848							X	3.49E-05				
Cumulative Residence Time									ρc	1730				
	t	2.197195367												
	L1	0.92							Combustion efficency					
									ε	70.31193979				
									ε	74.19160992	Corrected x1.03+1.7			
									Combut.Ash	71.9				

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash		43.17							
	Unburned Carbon %		14.4		Density	1730		Avg. Part diameter		0.00003491							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-1.02E-10			Ks	2.0963E+00							
	Re	1.59E+02			Tp	1,285	K										
						1,012	℃		Overall Reaction Rate Coefficient								
	vg	0.364383417			Heat lost by radiation				Ko	2.094791045							
									q	0.062843731							
									Pgo	0.03							
	ρg	0.297076227			Hr	40907.95											
	δg	4.77E-05			ε	0.88			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	2.93E+03							
Gas viscosity					Tw	1175.2			φ	2							
	δg	4.76989E-05							D	0.000201194							
					Thermal Conductivity of N2				x	3.49E-05							
Gas Density					λ	0.073782			Tg	1149.2							
	ρg	0.297076227			Tg	1149.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	2.4041507E-02			Hc	5.74E+05			D(T,P)	0.000201194							
	x	3.49E-05							D(T0,P0)	0.000217							
	ρp	1730			Heat gain by combusting particle				T	1149.2							
	ρg	0.297076227			Hg	6.15E+05			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.001402147	0.0014021						q	6.28E-02	CORRECTED						
	Fo	0.000333333	0.02						U	0.083750352							
	Po	1							B	0.916249648							
	P1	1.000							So	8.32E+00							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.364383417							So	8.32E+00							
	Rv	0.003848							X	3.49E-05							
Cumulative Residence Time									ρc	1730							
	t	3.2269954E+00															
	L1	0.4							Combustion efficency								
									ε	87.22111035							
									ε	91.62496477	Corrected x1.03+1.7						
									Combut.Ash	85.6							

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		43.17									
	Unburned Carbon %		28.4		Density	1730		Avg. Part diameter		3.49E-05									
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks										
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient										
					Iter.	-5.93E-10			Ks	1.28E+00									
	Re	1.34E+02			Tp	1,524	K												
						1,251	℃		Overall Reaction Rate Coefficient										
	vg	0.461725663			Heat lost by radiation				Ko	1.277180995									
									q	0.03831543									
									Pgo	0.03									
	ρg	0.234445818			Hr	31977.05													
	δg	5.667E-05			ε	0.88			Diffusional Reaction Rate Coefficient										
					σ	5.67E-08			Kdiff	3.50E+03									
Gas viscosity					Tw	1476.2			φ	2									
	δg	5.66739E-05							D	0.000304481									
					Thermal Conductivity of N2				x	3.49E-05									
Gas Density					λ	0.088785			Tg	1456.2									
	ρg	0.234445818			Tg	1456.2			R	8.21E-05									
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient										
	vp	2.0234978E-02			Hc	3.43E+05			D(T,P)	0.000304481									
	x	3.49E-05							D(T0,P0)	0.000217									
	ρp	1730			Heat gain by combusting particle				T	1456.2									
	ρg	0.234445818			Hg	3.75E+05			P	1.000									
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area										
	F	0.00177672	0.0017767						q	3.83E-02	CORRECTED								
	Fo	0.000333333	0.02						U	0.262647867									
	Po	1							B	0.737352133									
	P1	1.000							So	2.61E+01									
Linear Velocity of Gas									Initial Surface Area										
	vg	0.461725663							So	2.61E+01									
	Rv	0.003848							X	3.49E-05									
Cumulative Residence Time									ρc	1730									
	t	1.078926277																	
	L1	0.52							Combustion efficency										
									ε	69.86926608									
									ε	73.73521332	Corrected x1.03+1.7								
									Combut.Ash	71.6									

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		43.17							
	Unburned Carbon %		23.6		Density	1730		Avg. Part diameter		3.49E-05							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-2.98E-10			Ks	1.15E+00							
	Re	1.335E+02			Tp	1,519	K										
						1,246	℃		Overall Reaction Rate Coefficient								
	vg	0.46267689			Heat lost by radiation				Ko	1.146111349							
									q	0.03438334							
									Pgo	0.03							
	ρg	0.233963816			Hr	30221.24											
	δg	5.68E-05			ε	0.88			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	3.51E+03							
Gas viscosity					Tw	1474.2			φ	2							
	δg	5.67589E-05							D	0.00030558							
					Thermal Conductivity of N2				x	3.49E-05							
Gas Density					λ	0.088928			Tg	1459.2							
	ρg	0.233963816			Tg	1459.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	2.0204682E-02			Hc	3.06E+05			D(T,P)	0.000305580							
	x	3.49E-05							D(T0,P0)	0.000217							
	ρp	1730			Heat gain by combusting particle				T	1459.2							
	ρg	0.233963816			Hg	3.37E+05			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.001780381	0.0017804						q	3.44E-02	CORRECTED						
	Fo	0.000333333	0.02						U	0.193925531							
	Po	1							B	0.806074469							
	P1	1.000							So	1.93E+01							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.46267689							So	1.93E+01							
	Rv	0.003848							X	3.49E-05							
Cumulative Residence Time									ρc	1730							
	t	1.9072867E+00															
	L1	0.4							Combustion efficency								
									ε	76.53486609							
									ε	80.60744694	Corrected x1.03+1.7						
									Combut.Ash	76.4							

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		43.17							
	Unburned Carbon %		6.5		Density	1730		Avg. Part diameter		3.49E-05							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-5.50E-05			Ks	4.62E+01							
	Re	1.40E+02			Tp	3,153	K										
						2,880	℃		Overall Reaction Rate Coefficient								
	vg	0.433823			Heat lost by radiation				Ko	45.61105391							
									q	1.368331617							
									Pgo	0.03							
	ρg	0.249524923			Hr	4748886											
	δg	5.42E-05			ε	0.88			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	3.34E+03							
Gas viscosity					Tw	1387.3			φ	2							
	δg	5.4159E-05							D	0.000273014							
					Thermal Conductivity of N2				x	3.49E-05							
Gas Density					λ	0.084562			Tg	1368.2							
	ρg	0.249524923			Tg	1368.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	2.1174426E-02			Hc	8.65E+06			D(T,P)	0.000273014							
	x	3.49E-05							D(T0,P0)	0.000217							
	ρp	1730			Heat gain by combusting particle				T	1368.2							
	ρg	0.249524923			Hg	1.34E+07			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.001669351	0.0016694						q	1.37E+00	CORRECTED						
	Fo	0.000333333	0.02						U	0.006445853							
	Po	1							B	0.993554147							
	P1	1.000							So	6.40E-01							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.433823							So	6.40E-01							
	Rv	0.003848							X	3.49E-05							
Cumulative Residence Time									ρc	1730							
	t	2.7864126E+00															
	L1	0.4							Combustion efficency								
									ε	94.71912195							
									ε	99.35541473	Corrected x1.03+1.7						
									Combut.Ash	93.5							

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		43.17							
	Unburned Carbon %		26.6		Density	1730		Avg. Part diameter		3.49E-05							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-7.57E-10			Ks	1.72E+00							
	Re	1.21E+02			Tp	1,748	K										
						1,475	℃		Overall Reaction Rate Coefficient								
	vg	0.529579867			Heat lost by radiation				Ko	1.718630702							
									q	0.051558921							
									Pgo	0.03							
	ρg	0.204406658			Hr	65966.92											
	δg	6.26E-05			ε	0.88			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	3.88E+03							
Gas viscosity					Tw	1682.2			φ	2							
	δg	6.26245E-05							D	0.000387051							
					Thermal Conductivity of N2				x	3.49E-05							
Gas Density					λ	0.098831			Tg	1670.2							
	ρg	0.204406658			Tg	1670.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	1.8312575E-02			Hc	4.39E+05			D(T,P)	0.000387051							
	x	3.49E-05							D(T0,P0)	0.000217							
	ρp	1730			Heat gain by combusting particle				T	1670.2							
	ρg	0.204406658			Hg	5.05E+05			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.002037823	0.0020378						q	5.16E-02	CORRECTED						
	Fo	0.000333333	0.02						U	0.235823685							
	Po	1							B	0.764176315							
	P1	1.000							So	2.34E+01							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.529579867							So	2.34E+01							
	Rv	0.003848							X	3.49E-05							
Cumulative Residence Time									ρc	1730							
	t	0.94909139															
	L1	0.52							Combustion efficency								
									ε	72.47102957							
									ε	76.41763148	Corrected x1.03+1.7						
									Combut.Ash	73.4							

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash		43.17							
	Unburned Carbon %		14.2		Density	1730		Avg. Part diameter		3.49E-05							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-8.15E-09			Ks	4.16E+00							
	Re	1.21E+02			Tp	1,855	K										
						1,582	℃		Overall Reaction Rate Coefficient								
	vg	0.530214019			Heat lost by radiation				Ko	4.160491996							
									q	0.12481476							
									Pgo	0.03							
	ρg	0.204162182			Hr	188742.4											
	δg	6.27E-05			ε	0.88			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	3.89E+03							
Gas viscosity					Tw	1684.2			φ	2							
	δg	6.26791E-05							D	0.000387863							
					Thermal Conductivity of N2				x	3.49E-05							
Gas Density					λ	0.098924			Tg	1672.2							
	ρg	0.204162182			Tg	1672.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	1.8296627E-02			Hc	1.03E+06			D(T,P)	0.000387863							
	x	3.49E-05							D(T0,P0)	0.000217							
	ρp	1730			Heat gain by combusting particle				T	1672.2							
	ρg	0.204162182			Hg	1.22E+06			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.002040264	0.0020403						q	1.25E-01	CORRECTED						
	Fo	0.000333333	0.02						U	0.081617641							
	Po	1							B	0.918382359							
	P1	1.000							So	8.11E+00							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.530214019							So	8.11E+00							
	Rv	0.003848							X	3.49E-05							
Cumulative Residence Time									ρc	1730							
	t	1.6783389E+00															
	L1	0.4							Combustion efficency								
									ε	87.42796883							
									ε	91.83823586	Corrected x1.03+1.7						
									Combut.Ash	85.8							

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		43.17							
	Unburned Carbon %		10.1		Density	1730		Avg. Part diameter		3.49E-05							
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks								
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient								
					Iter.	-2.69E-08			Ks	6.77E+00							
	Re	1.26E+02			Tp	1,885	K										
						1,612	℃		Overall Reaction Rate Coefficient								
	vg	0.499774749			Heat lost by radiation				Ko	6.76251924							
									q	0.202875577							
									Pgo	0.03							
	ρg	0.216596879			Hr	313700.3											
	δg	6.00E-05			ε	0.88			Diffusional Reaction Rate Coefficient								
					σ	5.67E-08			Kdiff	3.72E+03							
Gas viscosity					Tw	1587.2			φ	2							
	δg	6.00379E-05							D	0.000349738							
					Thermal Conductivity of N2				x	3.49E-05							
Gas Density					λ	0.094455			Tg	1576.2							
	ρg	0.216596879			Tg	1576.2			R	8.21E-05							
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient								
	vp	1.9101397E-02			Hc	1.67E+06			D(T,P)	0.000349738							
	x	3.49E-05							D(T0,P0)	0.000217							
	ρp	1730			Heat gain by combusting particle				T	1576.2							
	ρg	0.216596879			Hg	1.99E+06			P	1.000							
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area								
	F	0.001923133	0.0019231						q	2.03E-01	CORRECTED						
	Fo	0.000333333	0.02						U	0.039988262							
	Po	1							B	0.960011738							
	P1	1.000							So	3.97E+00							
Linear Velocity of Gas									Initial Surface Area								
	vg	0.499774749							So	3.97E+00							
	Rv	0.003848							X	3.49E-05							
Cumulative Residence Time									ρc	1730							
	t	2.4492357E+00															
	L1	0.4							Combustion efficency								
									ε	91.46573597							
									ε	96.00117379	Corrected x1.03+1.7						
									Combut.Ash	89.9							

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 15% SAWDUST

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		42.48		1		
	Unburned Carbon %		28.3		Density	1740		Avg. Part diameter		3.62E-05		Flow	0.02	
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	4.30E-04			Ks	6.982E-01				
	Re	1.49E+02			Tp	1,295	K							
						1,021	℃		Overall Reaction Rate Coefficient					
	vg	0.396090989			Heat lost by radiation				Ko	0.698034444				
									q	0.020941033				
									Pgo	0.03				
	ρg	0.273294909			Hr	6918.495								
	δg	5.07E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3015.91527				
Gas viscosity					Tw	1278.2			φ	2				
	δg	5.06868E-05							D	0.000232825				
					Thermal Conductivity of N2				x	3.62E-05				
Gas Density					λ	0.078755			Tg	1249.2				
	ρg	0.273294909			Tg	1249.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.440E-02			Hc	1.98E+05			D(T,P)	0.000232825				
	x	3.62E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1249.2				
	ρg	0.273294909			Hg	2.05E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001524158	0.0015242						q	2.09E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.252532591				
	Po	1							B	0.747467409				
	P1	1.000							So	2.41E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.396090989							So	2.41E+01				
	Rv	0.003848							X	3.62E-05				
Cumulative Residence Time									ρc	1740				
	t	2.187914974												
	L1	0.92							Combustion efficency					
									ε	70.85037913				
									ε	74.74674088	Corrected x1.03+1.7			
									Combut.Ash	71.7				

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash	42.48			
	Unburned Carbon %		22.5		Density	1740		Avg. Part diameter	0.00003615			
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks			
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient			
					Iter.	4.96E-04			Ks	8.35E-01		
	Re	1.59E+02			Tp	1,207	K					
						934	℃		Overall Reaction Rate Coefficient			
	vg	0.364383417			Heat lost by radiation				Ko	0.834739349		
									q	0.02504218		
									Pgo	0.03		
	ρg	0.297076227			Hr	10498.81						
	δg	4.77E-05			ε	0.87			Diffusional Reaction Rate Coefficient			
					σ	5.67E-08			Kdiff	2.83E+03		
Gas viscosity					Tw	1175.2			φ	2		
	δg	4.76989E-05							D	0.000201194		
					Thermal Conductivity of N2				x	3.62E-05		
Gas Density					λ	0.073782			Tg	1149.2		
	ρg	0.297076227			Tg	1149.2			R	8.21E-05		
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient			
	vp	2.5928785E-02	d18notd15		Hc	2.35E+05			D(T,P)	0.000201194		
	x	3.62E-05							D(T0,P0)	0.000217		
	ρp	1740			Heat gain by combusting particle				T	1149.2		
	ρg	0.297076227			Hg	2.45E+05			P	1.000		
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area			
	F	0.001402147	0.0014021						q	2.50E-02	CORRECTED	
	Fo	0.000333333	0.02						U	0.173057427		
	Po	1							B	0.826942573		
	P1	1.000							So	1.65E+01		
Linear Velocity of Gas									Initial Surface Area			
	vg	0.364383417							So	1.65E+01		
	Rv	0.003848							X	3.62E-05		
Cumulative Residence Time									ρc	1740		
	t	3.2127356E+00										
	L1	0.4							Combustion efficency			
									ε	78.55893041		
									ε	82.69425726	Corrected x1.03+1.7	
									Combut.Ash	77.5		

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		42.48				
	Unburned Carbon %		27.1		Density	1740		Avg. Part diameter		3.62E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-8.73E-11			Ks	1.59E+00				
	Re	1.34E+02			Tp	1,542	K							
						1,269	℃		Overall Reaction Rate Coefficient					
	vg	0.461725663			Heat lost by radiation				Ko	1.587739282				
									q	0.047632178				
									Pgo	0.03				
	ρg	0.234445818			Hr	44677.41								
	δg	5.667E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.38E+03				
Gas viscosity					Tw	1476.2			φ	2				
	δg	5.66739E-05							D	0.000304481				
					Thermal Conductivity of N2				x	3.62E-05				
Gas Density					λ	0.088785			Tg	1456.2				
	ρg	0.234445818			Tg	1456.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.1823436E-02			Hc	4.22E+05			D(T,P)	0.000304481				
	x	3.62E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1456.2				
	ρg	0.234445818			Hg	4.66E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.00177672	0.0017767						q	4.76E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.23505189				
	Po	1							B	0.76494811				
	P1	1.000							So	2.24E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.461725663							So	2.24E+01				
	Rv	0.003848							X	3.62E-05				
Cumulative Residence Time									ρc	1740				
	t	1.075382007												
	L1	0.52							Combustion efficency					
									ε	72.54588849				
									ε	76.49481104	Corrected x1.03+1.7			
									Combut.Ash	72.9				

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		42.48				
	Unburned Carbon %		21.3		Density	1740		Avg. Part diameter		3.62E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-9.17E-10			Ks	1.60E+00				
	Re	1.335E+02			Tp	1,545	K							
						1,272	℃		Overall Reaction Rate Coefficient					
	vg	0.46267689			Heat lost by radiation				Ko	1.602191202				
									q	0.048065736				
									Pgo	0.03				
	ρg	0.233963816			Hr	48136.98								
	δg	5.68E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.39E+03				
Gas viscosity					Tw	1474.2			φ	2				
	δg	5.67589E-05							D	0.00030558				
					Thermal Conductivity of N2				x	3.62E-05				
Gas Density					λ	0.088928			Tg	1459.2				
	ρg	0.233963816			Tg	1459.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.1790761E-02			Hc	4.22E+05			D(T,P)	0.000305580				
	x	3.62E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1459.2				
	ρg	0.233963816			Hg	4.71E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001780381	0.0017804						q	4.81E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.158076831				
	Po	1							B	0.841923169				
	P1	1.000							So	1.51E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.46267689							So	1.51E+01				
	Rv	0.003848							X	3.62E-05				
Cumulative Residence Time									ρc	1740				
	t	1.9010305E+00												
	L1	0.4							Combustion efficency					
									ε	80.01194657				
									ε	84.19231691	Corrected x1.03+1.7			
									Combut.Ash	78.7				

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		42.48				
	Unburned Carbon %		7.6		Density	1740		Avg. Part diameter		3.62E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-3.26E-06			Ks	1.96E+01				
	Re	1.40E+02			Tp	2,324	K							
						2,051	℃		Overall Reaction Rate Coefficient					
	vg	0.433823			Heat lost by radiation				Ko	19.49583398				
									q	0.58487502				
									Pgo	0.03				
	ρg	0.249524923			Hr	1255774								
	δg	5.42E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.23E+03				
Gas viscosity					Tw	1387.3			φ	2				
	δg	5.4159E-05							D	0.000273014				
					Thermal Conductivity of N2				x	3.62E-05				
Gas Density					λ	0.084562			Tg	1368.2				
	ρg	0.249524923			Tg	1368.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.2836632E-02			Hc	4.47E+06			D(T,P)	0.000273014				
	x	3.62E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1368.2				
	ρg	0.249524923			Hg	5.73E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001669351	0.0016694						q	5.85E-01	CORRECTED			
	Fo	0.000333333	0.02						U	0.014627621				
	Po	1							B	0.985372379				
	P1	1.000							So	1.40E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.433823							So	1.40E+00				
	Rv	0.003848							X	3.62E-05				
Cumulative Residence Time									ρc	1740				
	t	2.7769564E+00												
	L1	0.4							Combustion efficency					
									ε	93.92554594				
									ε	98.53723787	Corrected x1.03+1.7			
									Combut.Ash	92.4				

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		42.48				
	Unburned Carbon %		21.2		Density	1740		Avg. Part diameter		3.62E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-8.88E-09			Ks	3.26E+00				
	Re	1.21E+02			Tp	1,819	K							
						1,546	℃		Overall Reaction Rate Coefficient					
	vg	0.529579867			Heat lost by radiation				Ko	3.252706458				
									q	0.097581194				
									Pgo	0.03				
	ρg	0.204406658			Hr	144458.3								
	δg	6.26E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.75E+03				
Gas viscosity					Tw	1682.2			φ	2				
	δg	6.26245E-05							D	0.000387051				
					Thermal Conductivity of N2				x	3.62E-05				
Gas Density					λ	0.098831			Tg	1670.2				
	ρg	0.204406658			Tg	1670.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.9750121E-02			Hc	8.11E+05			D(T,P)	0.000387051				
	x	3.62E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1670.2				
	ρg	0.204406658			Hg	9.55E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002037823	0.0020378						q	9.76E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.156849043				
	Po	1							B	0.843150957				
	P1	1.000							So	1.50E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.529579867							So	1.50E+01				
	Rv	0.003848							X	3.62E-05				
Cumulative Residence Time									ρc	1740				
	t	0.946607706												
	L1	0.52							Combustion efficency					
									ε	80.13103366				
									ε	84.3150957	Corrected x1.03+1.7			
									Combut.Ash	78.8				

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash	42.48		
	Unburned Carbon %		18.1		Density	1740		Avg. Part diameter	3.62E-05		
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks		
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient		
					Iter.	-4.47E-09			Ks	2.64E+00	
	Re	1.21E+02			Tp	1,793	K				
						1,520	℃		Overall Reaction Rate Coefficient		
	vg	0.530214019			Heat lost by radiation				Ko	2.636556323	
									q	0.07909669	
									Pgo	0.03	
	ρg	0.204162182			Hr	112995.4					
	δg	6.27E-05			ε	0.87			Diffusional Reaction Rate Coefficient		
					σ	5.67E-08			Kdiff	3.75E+03	
Gas viscosity					Tw	1684.2			φ	2	
	δg	6.26791E-05							D	0.000387863	
					Thermal Conductivity of N2				x	3.62E-05	
Gas Density					λ	0.098924			Tg	1672.2	
	ρg	0.204162182			Tg	1672.2			R	8.21E-05	
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient		
	vp	1.9732921E-02			Hc	6.61E+05			D(T,P)	0.000387863	
	x	3.62E-05							D(T0,P0)	0.000217	
	ρp	1740			Heat gain by combusting particle				T	1672.2	
	ρg	0.204162182			Hg	7.74E+05			P	1.000	
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area		
	F	0.002040264	0.0020403						q	7.91E-02	CORRECTED
	Fo	0.000333333	0.02						U	0.120274756	
	Po	1							B	0.879725244	
	P1	1.000							So	1.15E+01	
Linear Velocity of Gas									Initial Surface Area		
	vg	0.530214019							So	1.15E+01	
	Rv	0.003848							X	3.62E-05	
Cumulative Residence Time									ρc	1740	
	t	1.6739506E+00									
	L1	0.4							Combustion efficency		
									ε	83.67849119	
									ε	87.97252442	Corrected x1.03+1.7
									Combut.Ash	81.9	

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		42.48				
	Unburned Carbon %		10		Density	1740		Avg. Part diameter		3.62E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.10E-07			Ks	7.85E+00				
	Re	1.26E+02			Tp	1,942	K							
						1,669	℃		Overall Reaction Rate Coefficient					
	vg	0.499774749			Heat lost by radiation				Ko	7.832114417				
									q	0.234963433				
									Pgo	0.03				
	ρg	0.216596879			Hr	388640.8								
	δg	6.00E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.59E+03				
Gas viscosity					Tw	1587.2			φ	2				
	δg	6.00379E-05							D	0.000349738				
					Thermal Conductivity of N2				x	3.62E-05				
Gas Density					λ	0.094455			Tg	1576.2				
	ρg	0.216596879			Tg	1576.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.0600867E-02			Hc	1.91E+06			D(T,P)	0.000349738				
	x	3.62E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1576.2				
	ρg	0.216596879			Hg	2.30E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001923133	0.0019231						q	2.35E-01	CORRECTED			
	Fo	0.000333333	0.02						U	0.036602225				
	Po	1							B	0.963397775				
	P1	1.000							So	3.49E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.499774749							So	3.49E+00				
	Rv	0.003848							X	3.62E-05				
Cumulative Residence Time									ρc	1740				
	t	2.4426261E+00												
	L1	0.4							Combustion efficency					
									ε	91.79415855				
									ε	96.33977747	Corrected x1.03+1.7			
									Combut.Ash	90				

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 20% SAWDUST

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		40.96		1		
	Unburned Carbon %		27.6		Density	1740		Avg. Part diameter		2.08E-05		Flow		0.02
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.47E+02			Ks	4.622E-01				
	Re	1.49E+02			Tp	1,268	K							
						995	℃		Overall Reaction Rate Coefficient					
	vg	0.396090989			Heat lost by radiation				Ko	0.462170877				
									q	0.013865126				
									Pgo	0.03				
	ρg	0.273294909			Hr	-4272.921								
	δg	5.07E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	5244.123955				
Gas viscosity					Tw	1278.2			φ	2				
	δg	5.06868E-05							D	0.000232825				
					Thermal Conductivity of N2				x	2.08E-05				
Gas Density					λ	0.078755			Tg	1249.2				
	ρg	0.273294909			Tg	1249.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	8.070E-03			Hc	1.40E+05			D(T,P)	0.000232825				
	x	2.08E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1249.2				
	ρg	0.273294909			Hg	1.36E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001524158	0.0015242						q	1.39E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.224673404				
	Po	1							B	0.775326596				
	P1	1.000							So	3.73E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.396090989							So	3.73E+01				
	Rv	0.003848							X	2.08E-05				
Cumulative Residence Time									ρc	1740				
	t	2.27631848												
	L1	0.92							Combustion efficency					
									ε	73.55253111				
									ε	77.53265957	Corrected x1.03+1.7			
									Combut.Ash	72.4				

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash		40.96				
	Unburned Carbon %		13.6		Density	1740		Avg. Part diameter		0.00002079				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	2.44E-04			Ks	1.67E+00				
	Re	1.59E+02			Tp	1,216	K							
						943	℃		Overall Reaction Rate Coefficient					
	vg	0.364383417			Heat lost by radiation				Ko	1.668925854				
									q	0.050067776				
									Pgo	0.03				
	ρg	0.297076227			Hr	13873.05								
	δg	4.77E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.93E+03				
Gas viscosity					Tw	1175.2			φ	2				
	δg	4.76989E-05							D	0.000201194				
					Thermal Conductivity of N2				x	2.08E-05				
Gas Density					λ	0.073782			Tg	1149.2				
	ρg	0.297076227			Tg	1149.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	8.5757981E-03			Hc	4.76E+05			D(T,P)	0.000201194				
	x	2.08E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1149.2				
	ρg	0.297076227			Hg	4.90E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001402147	0.0014021						q	5.01E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.064589381				
	Po	1							B	0.935410619				
	P1	1.000							So	1.07E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.364383417							So	1.07E+01				
	Rv	0.003848							X	2.08E-05				
Cumulative Residence Time									ρc	1740				
	t	3.3488218E+00												
	L1	0.4							Combustion efficency					
									ε	89.0795945				
									ε	93.54106193	Corrected x1.03+1.7			
									Combut.Ash	86.4				

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		40.96						
	Unburned Carbon %		22.9		Density	1740		Avg. Part diameter		2.08E-05						
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks							
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient							
					Iter.	7.89E-04			Ks	1.50E+00						
	Re	1.34E+02			Tp	1,505	K									
						1,232	℃		Overall Reaction Rate Coefficient							
	vg	0.461725663			Heat lost by radiation				Ko	1.49476578						
									q	0.044842973						
									Pgo	0.03						
	ρg	0.234445818			Hr	19072.91										
	δg	5.667E-05			ε	0.87			Diffusional Reaction Rate Coefficient							
					σ	5.67E-08			Kdiff	5.88E+03						
Gas viscosity					Tw	1476.2			φ	2						
	δg	5.66739E-05							D	0.000304481						
					Thermal Conductivity of N2				x	2.08E-05						
Gas Density					λ	0.088785			Tg	1456.2						
	ρg	0.234445818			Tg	1456.2			R	8.21E-05						
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient							
	vp	7.2179770E-03			Hc	4.20E+05			D(T,P)	0.000304481						
	x	2.08E-05							D(T0,P0)	0.000217						
	ρp	1740			Heat gain by combusting particle				T	1456.2						
	ρg	0.234445818			Hg	4.39E+05			P	1.000						
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area							
	F	0.00177672	0.0017767						q	4.48E-02	CORRECTED					
	Fo	0.000333333	0.02						U	0.164448353						
	Po	1							B	0.835551647						
	P1	1.000							So	2.73E+01						
Linear Velocity of Gas									Initial Surface Area							
	vg	0.461725663							So	2.73E+01						
	Rv	0.003848							X	2.08E-05						
Cumulative Residence Time									ρc	1740						
	t	1.108875258														
	L1	0.52							Combustion efficency							
									ε	79.39395218						
									ε	83.55516469	Corrected x1.03+1.7					
									Combut.Ash	77.1						

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		40.96				
	Unburned Carbon %		15.1		Density	1740		Avg. Part diameter		2.08E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-9.53E-10			Ks	2.22E+00				
	Re	1.335E+02			Tp	1,531	K							
						1,258	℃		Overall Reaction Rate Coefficient					
	vg	0.46267689			Heat lost by radiation				Ko	2.215124508				
									q	0.066453735				
									Pgo	0.03				
	ρg	0.233963816			Hr	37911.69								
	δg	5.68E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	5.89E+03				
Gas viscosity					Tw	1474.2			φ	2				
	δg	5.67589E-05							D	0.00030558				
					Thermal Conductivity of N2				x	2.08E-05				
Gas Density					λ	0.088928			Tg	1459.2				
	ρg	0.233963816			Tg	1459.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	7.2071702E-03			Hc	6.13E+05			D(T,P)	0.000305580				
	x	2.08E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1459.2				
	ρg	0.233963816			Hg	6.51E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001780381	0.0017804						q	6.65E-02	CORRECTED			
	Fo	0.000333333	0.02						U	0.079215937				
	Po	1							B	0.920784063				
	P1	1.000							So	1.31E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.46267689							So	1.31E+01				
	Rv	0.003848							X	2.08E-05				
Cumulative Residence Time									ρc	1740				
	t	1.9601491E+00												
	L1	0.4							Combustion efficency					
									ε	87.66091783				
									ε	92.07840629	Corrected x1.03+1.7			
									Combut.Ash	84.9				

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		40.96				
	Unburned Carbon %		6.8		Density	1740		Avg. Part diameter		2.08E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-3.37E-06			Ks	4.25E+01				
	Re	1.40E+02			Tp	2,624	K							
						2,351	℃		Overall Reaction Rate Coefficient					
	vg	0.433823			Heat lost by radiation				Ko	42.13359035				
									q	1.26400771				
									Pgo	0.03				
	ρg	0.249524923			Hr	2157183								
	δg	5.42E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	5.61E+03				
Gas viscosity					Tw	1387.3			φ	2				
	δg	5.4159E-05							D	0.000273014				
					Thermal Conductivity of N2				x	2.08E-05				
Gas Density					λ	0.084562			Tg	1368.2				
	ρg	0.249524923			Tg	1368.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	7.5530859E-03			Hc	1.02E+07			D(T,P)	0.000273014				
	x	2.08E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1368.2				
	ρg	0.249524923			Hg	1.24E+07			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001669351	0.0016694						q	1.26E+00	CORRECTED			
	Fo	0.000333333	0.02						U	0.004187352				
	Po	1							B	0.995812648				
	P1	1.000							So	6.95E-01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.433823							So	6.95E-01				
	Rv	0.003848							X	2.08E-05				
Cumulative Residence Time									ρc	1740				
	t	2.8664057E+00												
	L1	0.4							Combustion efficency					
									ε	94.93818114				
									ε	99.58126476	Corrected x1.03+1.7			
									Combut.Ash	93.2				

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		40.96			
	Unburned Carbon %		26.4		Density	1740		Avg. Part diameter		2.08E-05			
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks				
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient				
					Iter.	-5.35E-10			Ks	1.21E+00			
	Re	1.21E+02			Tp	1,705	K						
						1,432	℃		Overall Reaction Rate Coefficient				
	vg	0.529579867			Heat lost by radiation				Ko	1.212789237			
									q	0.036383677			
									Pgo	0.03			
	ρg	0.204406658			Hr	22182.81							
	δg	6.26E-05			ε	0.87			Diffusional Reaction Rate Coefficient				
					σ	5.67E-08			Kdiff	6.52E+03			
Gas viscosity					Tw	1682.2			φ	2			
	δg	6.26245E-05							D	0.000387051			
					Thermal Conductivity of N2				x	2.08E-05			
Gas Density					λ	0.098831			Tg	1670.2			
	ρg	0.204406658			Tg	1670.2			R	8.21E-05			
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient				
	vp	6.5322402E-03			Hc	3.34E+05			D(T,P)	0.000387051			
	x	2.08E-05							D(T0,P0)	0.000217			
	ρp	1740			Heat gain by combusting particle				T	1670.2			
	ρg	0.204406658			Hg	3.56E+05			P	1.000			
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area				
	F	0.002037823	0.0020378						q	3.64E-02	CORRECTED		
	Fo	0.000333333	0.02						U	0.208565571			
	Po	1							B	0.791434429			
	P1	1.000							So	3.46E+01			
Linear Velocity of Gas									Initial Surface Area				
	vg	0.529579867							So	3.46E+01			
	Rv	0.003848							X	2.08E-05			
Cumulative Residence Time									ρc	1740			
	t	0.969946384											
	L1	0.52							Combustion efficency				
									ε	75.11488158			
									ε	79.14344291	Corrected x1.03+1.7		
									Combut.Ash	73.6			

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash		40.96				
	Unburned Carbon %		5.9		Density	1740		Avg. Part diameter		2.08E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-2.60E-04			Ks	2.28E-01				
	Re	1.21E+02			Tp	1,680	K							
						1,407	℃		Overall Reaction Rate Coefficient					
	vg	0.530214019			Heat lost by radiation				Ko	0.227876876				
									q	0.006836306				
									Pgo	0.03				
	ρg	0.204162182			Hr	-4244.058								
	δg	6.27E-05			ε	0.87			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	6.53E+03				
Gas viscosity					Tw	1684.2			φ	2				
	δg	6.26791E-05							D	0.000387863				
					Thermal Conductivity of N2				x	2.08E-05				
Gas Density					λ	0.098924			Tg	1672.2				
	ρg	0.204162182			Tg	1672.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	6.5265512E-03			Hc	7.12E+04			D(T,P)	0.000387863				
	x	2.08E-05							D(T0,P0)	0.000217				
	ρp	1740			Heat gain by combusting particle				T	1672.2				
	ρg	0.204162182			Hg	6.69E+04			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002040264	0.0020403						q	6.84E-03	CORRECTED			
	Fo	0.000333333	0.02						U	0.043498671				
	Po	1							B	0.956501329				
	P1	1.000							So	1.66E+02				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.530214019							So	1.66E+02	*			
	Rv	0.003848							X	2.08E-05				
Cumulative Residence Time									ρc	1740				
	t	1.7151854E+00												
	L1	0.4							Combustion efficency					
									ε	95.65013291				
									ε	95.65013291	Corrected x1.03+1.7			
									Combut.Ash	94.1				

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		40.96						
	Unburned Carbon %		7		Density	1740		Avg. Part diameter		2.08E-05						
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks							
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient							
					Iter.	-1.11E-06			Ks	3.40E+01						
	Re	1.26E+02			Tp	2,494	K									
						2,221	℃		Overall Reaction Rate Coefficient							
	vg	0.499774749			Heat lost by radiation				Ko	33.80639806						
									q	1.014191942						
									Pgo	0.03						
	ρg	0.216596879			Hr	1594124										
	δg	6.00E-05			ε	0.87			Diffusional Reaction Rate Coefficient							
					σ	5.67E-08			Kdiff	6.24E+03						
Gas viscosity					Tw	1587.2			φ	2						
	δg	6.00379E-05							D	0.000349738						
					Thermal Conductivity of N2				x	2.08E-05						
Gas Density					λ	0.094455			Tg	1576.2						
	ρg	0.216596879			Tg	1576.2			R	8.21E-05						
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient							
	vp	6.8136193E-03			Hc	8.34E+06			D(T,P)	0.000349738						
	x	2.08E-05							D(T0,P0)	0.000217						
	ρp	1740			Heat gain by combusting particle				T	1576.2						
	ρg	0.216596879			Hg	9.93E+06			P	1.000						
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area							
	F	0.001923133	0.0019231						q	1.01E+00	CORRECTED					
	Fo	0.000333333	0.02						U	0.005837806						
	Po	1							B	0.994162194						
	P1	1.000							So	9.68E-01						
Linear Velocity of Gas									Initial Surface Area							
	vg	0.499774749							So	9.68E-01						
	Rv	0.003848							X	2.08E-05						
Cumulative Residence Time									ρc	1740						
	t	2.5047811E+00														
	L1	0.4							Combustion efficency							
									ε	94.77809832						
									ε	99.41621937	Corrected x1.03+1.7					
									Combut.Ash	93						

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 10% GRASS

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		42.89		1	
	Unburned Carbon %		28.7		Density	1720		Avg. Part diameter		3.51E-05		Flow	0.02001
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp			CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium			Surface Reaction Rate Coefficient					
					Iter.	9.07E-04		Ks	6.240E-01				
	Re	1.50E+02			Tp	1,289	K						
						1,016	℃	Overall Reaction Rate Coefficient					
	vg	0.396289035			Heat lost by radiation			Ko	0.623912637				
								q	0.018717379				
								Pgo	0.03				
	ρg	0.273294909			Hr	4671.181							
	δg	5.07E-05			ε	0.9		Diffusional Reaction Rate Coefficient					
					σ	5.67E-08		Kdiff	3104.366088				
Gas viscosity					Tw	1278.2		φ	2				
	δg	5.06868E-05						D	0.000232825				
					Thermal Conductivity of N2			x	3.51E-05				
Gas Density					λ	0.078755		Tg	1249.2				
	ρg	0.273294909			Tg	1249.2		R	8.21E-05				
Free Fall Velocity					Heat lost by conduction			Diffusion Coefficient					
	vp	2.277E-02			Hc	1.79E+05		D(T,P)	0.000232825				
	x	3.51E-05						D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle			T	1249.2				
	ρg	0.273294909			Hg	1.83E+05		P	1.000				
Volumetric Flow								Rate of Carbon Removal per Unit Surface Area					
	F	0.00152492	0.0015249					q	1.87E-02	CORRECTED			
	Fo	0.0003335	0.02001					U	0.263669941				
	Po	1						B	0.736330059				
	P1	1.000						So	2.62E+01				
Linear Velocity of Gas								Initial Surface Area					
	vg	0.396289035						So	2.62E+01				
	Rv	0.003848						X	3.51E-05				
Cumulative Residence Time								ρc	1720				
	t	2.195419579											
	L1	0.92						Combustion efficency					
								ε	69.77013185				
								ε	73.63300594	Corrected x1.03+1.7			
								Combut.Ash	71.3				

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash		42.89				
	Unburned Carbon %		22.5		Density	1720		Avg. Part diameter		0.00003512				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-2.51E-10			Ks	7.75E-01				
	Re	1.59E+02			Tp	1,201	K							
						928	℃		Overall Reaction Rate Coefficient					
	vg	0.364565609			Heat lost by radiation				Ko	0.774838765				
									q	0.023245163				
									Pgo	0.03				
	ρg	0.297076227			Hr	8919.462								
	δg	4.77E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	2.92E+03				
Gas viscosity					Tw	1175.2			φ	2				
	δg	4.76989E-05							D	0.000201194				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.073782			Tg	1149.2				
	ρg	0.297076227			Tg	1149.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.4190950E-02			Hc	2.19E+05			D(T,P)	0.000201194				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1149.2				
	ρg	0.297076227			Hg	2.28E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001402848	0.0014028						q	2.32E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.176793302				
	Po	1							B	0.823206698				
	P1	1.000							So	1.76E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.364565609							So	1.76E+01				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	3.2243411E+00												
	L1	0.4							Combustion efficency					
									ε	78.19657593				
									ε	82.32066979	Corrected x1.03+1.7			
									Combut.Ash	77.5				

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		42.89				
	Unburned Carbon %		30		Density	1720		Avg. Part diameter		3.51E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-8.08E-10			Ks	1.13E+00				
	Re	1.34E+02			Tp	1,516	K							
						1,243	℃		Overall Reaction Rate Coefficient					
	vg	0.461956526			Heat lost by radiation				Ko	1.127746078				
									q	0.033832382				
									Pgo	0.03				
	ρg	0.234445818			Hr	27418.21								
	δg	5.667E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.48E+03				
Gas viscosity					Tw	1476.2			φ	2				
	δg	5.66739E-05							D	0.000304481				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.088785			Tg	1456.2				
	ρg	0.234445818			Tg	1456.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.0360763E-02			Hc	3.04E+05			D(T,P)	0.000304481				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1456.2				
	ρg	0.234445818			Hg	3.31E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001777609	0.0017776						q	3.38E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.283837732				
	Po	1							B	0.716162268				
	P1	1.000							So	2.82E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.461956526							So	2.82E+01				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	1.078128469												
	L1	0.52							Combustion efficency					
									ε	67.81399305				
									ε	71.61622683	Corrected x1.03+1.7			
									Combut.Ash	70				

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		42.89				
	Unburned Carbon %		11.8		Density	1720		Avg. Part diameter		3.51E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.41E-07			Ks	5.89E+00				
	Re	1.336E+02			Tp	1,753	K							
						1,480	℃		Overall Reaction Rate Coefficient					
	vg	0.462908229			Heat lost by radiation				Ko	5.875606271				
									q	0.176268188				
									Pgo	0.03				
	ρg	0.233963816			Hr	240358.5								
	δg	5.68E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.49E+03				
Gas viscosity					Tw	1474.2			φ	2				
	δg	5.67589E-05							D	0.00030558				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.088928			Tg	1459.2				
	ρg	0.233963816			Tg	1459.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.0330279E-02			Hc	1.49E+06			D(T,P)	0.000305580				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1459.2				
	ρg	0.233963816			Hg	1.73E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001781271	0.0017813						q	1.76E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.055589556				
	Po	1							B	0.944410444				
	P1	1.000							So	5.52E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.462908229							So	5.52E+00				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	1.9058771E+00												
	L1	0.4							Combustion efficency					
									ε	89.95251635				
									ε	94.44104435	Corrected x1.03+1.7			
									Combut.Ash	88.2				

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		42.89				
	Unburned Carbon %		11.3		Density	1720		Avg. Part diameter		3.51E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	9.00E-01			Ks	4.50E+00				
	Re	1.40E+02			Tp	1,611	K							
						1,338	℃		Overall Reaction Rate Coefficient					
	vg	0.434039911			Heat lost by radiation				Ko	4.498257018				
									q	0.134947711				
									Pgo	0.03				
	ρg	0.249524923			Hr	154302.5								
	δg	5.42E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.32E+03				
Gas viscosity					Tw	1387.3			φ	2				
	δg	5.4159E-05							D	0.000273014				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.084562			Tg	1368.2				
	ρg	0.249524923			Tg	1368.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	2.1306050E-02			Hc	1.17E+06			D(T,P)	0.000273014				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1368.2				
	ρg	0.249524923			Hg	1.32E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001670186	0.0016702						q	1.35E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.050640979				
	Po	1							B	0.949359021				
	P1	1.000							So	5.03E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.434039911							So	5.03E+00				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	2.7843300E+00												
	L1	0.4							Combustion efficency					
									ε	90.43249474				
									ε	94.93590208	Corrected x1.03+1.7			
									Combut.Ash	88.7				

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		42.89				
	Unburned Carbon %		14.7		Density	1720		Avg. Part diameter		3.51E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-4.55E-07			Ks	6.96E+00				
	Re	1.21E+02			Tp	1,969	K							
						1,696	℃		Overall Reaction Rate Coefficient					
	vg	0.52978121			Heat lost by radiation				Ko	6.951231645				
									q	0.208536949				
									Pgo	0.03				
	ρg	0.204431138			Hr	358544.8								
	δg	6.26E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.86E+03				
Gas viscosity					Tw	1682.2			φ	2				
	δg	6.2619E-05							D	0.00038697				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.098822			Tg	1670				
	ρg	0.204431138			Tg	1670			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.8428019E-02			Hc	1.68E+06			D(T,P)	0.000386970				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1670				
	ρg	0.204431138			Hg	2.04E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002038598	0.0020386						q	2.09E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.085435336				
	Po	1							B	0.914564664				
	P1	1.000							So	8.49E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.52978121							So	8.49E+00				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	0.948542951												
	L1	0.52							Combustion efficency					
									ε	87.05767833				
									ε	91.45646636	Corrected x1.03+1.7			
									Combut.Ash	85.3				

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash		42.89				
	Unburned Carbon %		11.4		Density	1720		Avg. Part diameter		3.51E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-5.15E-07			Ks	7.31E+00				
	Re	1.21E+02			Tp	1,985	K							
						1,712	℃		Overall Reaction Rate Coefficient					
	vg	0.530479126			Heat lost by radiation				Ko	7.296973517				
									q	0.218909205				
									Pgo	0.03				
	ρg	0.204162182			Hr	381570.4								
	δg	6.27E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.86E+03				
Gas viscosity					Tw	1684.2			φ	2				
	δg	6.26791E-05							D	0.000387863				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.098924			Tg	1672.2				
	ρg	0.204162182			Tg	1672.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.8410365E-02			Hc	1.76E+06			D(T,P)	0.000387863				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1672.2				
	ρg	0.204162182			Hg	2.14E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002041284	0.0020413						q	2.19E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.051626226				
	Po	1							B	0.948373774				
	P1	1.000							So	5.13E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.530479126							So	5.13E+00				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	1.6772871E+00												
	L1	0.4							Combustion efficency					
									ε	90.33693245				
									ε	94.83737736	Corrected x1.03+1.1			
									Combut.Ash	88.6				

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		42.89				
	Unburned Carbon %		8.7		Density	1720		Avg. Part diameter		3.51E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.02E-06			Ks	1.13E+01				
	Re	1.26E+02			Tp	2,074	K							
						1,801	℃		Overall Reaction Rate Coefficient					
	vg	0.500024637			Heat lost by radiation				Ko	11.24021749				
									q	0.337206525				
									Pgo	0.03				
	ρg	0.216596879			Hr	621244.1								
	δg	6.00E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.70E+03				
Gas viscosity					Tw	1587.2			φ	2				
	δg	6.00379E-05							D	0.000349738				
					Thermal Conductivity of N2				x	3.51E-05				
Gas Density					λ	0.094455			Tg	1576.2				
	ρg	0.216596879			Tg	1576.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.9220137E-02			Hc	2.68E+06			D(T,P)	0.000349738				
	x	3.51E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1576.2				
	ρg	0.216596879			Hg	3.30E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001924095	0.0019241						q	3.37E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.025782102				
	Po	1							B	0.974217898				
	P1	1.000							So	2.56E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.500024637							So	2.56E+00				
	Rv	0.003848							X	3.51E-05				
Cumulative Residence Time									ρc	1720				
	t	2.4476367E+00												
	L1	0.4							Combustion efficency					
									ε	92.84363701				
									ε	97.42178976	Corrected x1.03+1.7			
									Combut.Ash	91.3				

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 15% GRASS

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		42.07			1	
	Unburned Carbon %		25.8		Density	1720		Avg. Part diameter		2.67E-05			Flow	0.02001
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	1.48E-04			Ks	6.472E-01				
	Re	1.50E+02			Tp	1,281	K							
						1,008	℃		Overall Reaction Rate Coefficient					
	vg	0.396289035			Heat lost by radiation				Ko	0.647102858				
									q	0.019413086				
									Pgo	0.03				
	ρg	0.273294909			Hr	1284.213								
	δg	5.07E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4083.345956				
Gas viscosity					Tw	1278.2			φ	2				
	δg	5.06868E-05							D	0.000232825				
					Thermal Conductivity of N2				x	2.67E-05				
Gas Density					λ	0.078755			Tg	1249.2				
	ρg	0.273294909			Tg	1249.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.316E-02			Hc	1.89E+05			D(T,P)	0.000232825				
	x	2.67E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1249.2				
	ρg	0.273294909			Hg	1.90E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.00152492	0.0015249						q	1.94E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.212341528				
	Po	1							B	0.787658472				
	P1	1.000							So	2.77E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.396289035							So	2.77E+01				
	Rv	0.003848							X	2.67E-05				
Cumulative Residence Time									ρc	1720				
	t	2.246933498												
	L1	0.92							Combustion efficency					
									ε	74.74863938				
									ε	78.7658472	Corrected x1.031+1.7			
									Combut.Ash	74.2				

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash		42.07				
	Unburned Carbon %		14.4		Density	1720		Avg. Part diameter		0.0000267				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	5.13E-10			Ks	1.70E+00				
	Re	1.59E+02			Tp	1,236	K							
						963	℃		Overall Reaction Rate Coefficient					
	vg	0.364565609			Heat lost by radiation				Ko	1.702324623				
									q	0.051069739				
									Pgo	0.03				
	ρg	0.297076227			Hr	21665.76								
	δg	4.77E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.8356E+03				
Gas viscosity					Tw	1175.2			φ	2				
	δg	4.76989E-05							D	0.000201194				
					Thermal Conductivity of N2				x	2.67E-05				
Gas Density					λ	0.073782			Tg	1149.2				
	ρg	0.297076227			Tg	1149.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.3981908E-02			Hc	4.78E+05			D(T,P)	0.000201194				
	x	2.67E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1149.2				
	ρg	0.297076227			Hg	5.00E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001402848	0.0014028						q	5.11E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.07795528				
	Po	1							B	0.92204472				
	P1	1.000							So	1.02E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.364565609							So	1.02E+01				
	Rv	0.003848							X	2.67E-05				
Cumulative Residence Time									ρc	1720				
	t	3.3036040E+00												
	L1	0.4							Combustion efficency					
									ε	87.78319306				
									ε	92.20447204	Corrected x1.03+1.7			
									Combut.Ash	85.6				

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		42.07				
	Unburned Carbon %		22.5		Density	1720		Avg. Part diameter		2.67E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-4.37E-10			Ks	1.84E+00				
	Re	1.34E+02			Tp	1,532	K							
						1,259	℃		Overall Reaction Rate Coefficient					
	vg	0.461956526			Heat lost by radiation				Ko	1.838914182				
									q	0.055167425				
									Pgo	0.03				
	ρg	0.234445818			Hr	38498.22								
	δg	5.667E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.5810E+03				
Gas viscosity					Tw	1476.2			φ	2				
	δg	5.66739E-05							D	0.000304481				
					Thermal Conductivity of N2				x	2.67E-05				
Gas Density					λ	0.088785			Tg	1456.2				
	ρg	0.234445818			Tg	1456.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.1768133E-02			Hc	5.02E+05			D(T,P)	0.000304481				
	x	2.67E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1456.2				
	ρg	0.234445818			Hg	5.40E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001777609	0.0017776						q	5.52E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.169374434				
	Po	1							B	0.830625566				
	P1	1.000							So	2.21E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.461956526							So	2.21E+01				
	Rv	0.003848							X	2.67E-05				
Cumulative Residence Time									ρc	1720				
	t	1.097684046												
	L1	0.52							Combustion efficency					
									ε	78.91615576				
									ε	83.06255659	Corrected x1.03+1.7			
									Combut.Ash	77.5				

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		42.07				
	Unburned Carbon %		8		Density	1720		Avg. Part diameter		2.67E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-7.14E-07			Ks	1.72E+01				
	Re	1.336E+02			Tp	2,101	K							
						1,828	℃		Overall Reaction Rate Coefficient					
	vg	0.462908229			Heat lost by radiation				Ko	17.11567816				
									q	0.513470345				
									Pgo	0.03				
	ρg	0.233963816			Hr	753060.6								
	δg	5.68E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.59E+03				
Gas viscosity					Tw	1474.2			φ	2				
	δg	5.67589E-05							D	0.00030558				
					Thermal Conductivity of N2				x	2.67E-05				
Gas Density					λ	0.088928			Tg	1459.2				
	ρg	0.233963816			Tg	1459.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.1750513E-02			Hc	4.27E+06			D(T,P)	0.000305580				
	x	2.67E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1459.2				
	ρg	0.233963816			Hg	5.03E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001781271	0.0017813						q	5.13E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.017107318				
	Po	1							B	0.982892682				
	P1	1.000							So	2.24E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.462908229							So	2.24E+00				
	Rv	0.003848							X	2.67E-05				
Cumulative Residence Time									ρc	1720				
	t	1.9403947E+00												
	L1	0.4							Combustion efficency					
									ε	93.68503216				
									ε	98.28926816	Corrected x1.03+1.7			
									Combut.Ash	92				

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		42.07				
	Unburned Carbon %		6.6		Density	1720		Avg. Part diameter		2.67E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	2.45E-06			Ks	4.61E+01				
	Re	1.40E+02			Tp	2,925	K							
						2,652	℃		Overall Reaction Rate Coefficient					
	vg	0.434039911			Heat lost by radiation				Ko	45.62976416				
									q	1.368892925				
									Pgo	0.03				
	ρg	0.249524923			Hr	3544254								
	δg	5.42E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.37E+03				
Gas viscosity					Tw	1387.3			φ	2				
	δg	5.4159E-05							D	0.000273014				
					Thermal Conductivity of N2				x	2.67E-05				
Gas Density					λ	0.084562			Tg	1368.2				
	ρg	0.249524923			Tg	1368.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.2314490E-02			Hc	9.86E+06			D(T,P)	0.000273014				
	x	2.67E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1368.2				
	ρg	0.249524923			Hg	1.34E+07			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001670186	0.0016702						q	1.37E+00	CORRECTED			
	Fo	0.0003335	0.02001						U	0.00490841				
	Po	1							B	0.99509159				
	P1	1.000							So	6.41E-01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.434039911							So	6.41E-01				
	Rv	0.003848							X	2.67E-05				
Cumulative Residence Time									ρc	1720				
	t	2.8365436E+00												
	L1	0.4							Combustion efficency					
									ε	94.86824348				
									ε	99.50915903	Corrected x1.03+1.7			
									Combut.Ash	93.4				

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		42.07			
	Unburned Carbon %		20.8		Density	1720		Avg. Part diameter		2.67E-05			
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks				
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient				
					Iter.	-6.65E-09			Ks	2.52E+00			
	Re	1.21E+02			Tp	1,759	K						
						1,486	℃		Overall Reaction Rate Coefficient				
	vg	0.529844657			Heat lost by radiation				Ko	2.516973567			
									q	0.075509207			
									Pgo	0.03			
	ρg	0.204406658			Hr	80156.22							
	δg	6.26E-05			ε	0.9			Diffusional Reaction Rate Coefficient				
					σ	5.67E-08			Kdiff	5.08E+03			
Gas viscosity					Tw	1682.2			φ	2			
	δg	6.26245E-05							D	0.000387051			
					Thermal Conductivity of N2				x	2.67E-05			
Gas Density					λ	0.098831			Tg	1670.2			
	ρg	0.204406658			Tg	1670.2			R	8.21E-05			
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient				
	vp	1.0650115E-02			Hc	6.59E+05			D(T,P)	0.000387051			
	x	2.67E-05							D(T0,P0)	0.000217			
	ρp	1720			Heat gain by combusting particle				T	1670.2			
	ρg	0.204406658			Hg	7.39E+05			P	1.000			
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area				
	F	0.002038842	0.0020388						q	7.55E-02	CORRECTED		
	Fo	0.0003335	0.02001						U	0.148637255			
	Po	1							B	0.851362745			
	P1	1.000							So	1.94E+01			
Linear Velocity of Gas									Initial Surface Area				
	vg	0.529844657							So	1.94E+01			
	Rv	0.003848							X	2.67E-05			
Cumulative Residence Time									ρc	1720			
	t	0.962081461											
	L1	0.52							Combustion efficency				
									ε	80.92752137			
									ε	85.13627454	Corrected x1.03+1.7		
									Combut.Ash	79.2			

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash		42.07				
	Unburned Carbon %		9.9		Density	1720		Avg. Part diameter		2.67E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.97E-07			Ks	8.88E+00				
	Re	1.21E+02			Tp	1,974	K							
						1,701	℃		Overall Reaction Rate Coefficient					
	vg	0.530479126			Heat lost by radiation				Ko	8.863478245				
									q	0.265904347				
									Pgo	0.03				
	ρg	0.204162182			Hr	364762.9								
	δg	6.27E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	5.08E+03				
Gas viscosity					Tw	1684.2			φ	2				
	δg	6.26791E-05							D	0.000387863				
					Thermal Conductivity of N2				x	2.67E-05				
Gas Density					λ	0.098924			Tg	1672.2				
	ρg	0.204162182			Tg	1672.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.0640840E-02			Hc	2.24E+06			D(T,P)	0.000387863				
	x	2.67E-05							D(T0,P0)	0.000217				
	ρp	1720			Heat gain by combusting particle				T	1672.2				
	ρg	0.204162182			Hg	2.60E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002041284	0.0020413						q	2.66E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.034269347				
	Po	1							B	0.965730653				
	P1	1.000							So	4.48E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.530479126							So	4.48E+00				
	Rv	0.003848							X	2.67E-05				
Cumulative Residence Time									ρc	1720				
	t	1.7012891E+00												
	L1	0.4							Combustion efficency					
									ε	92.02043187				
									ε	96.57306526	Corrected x1.03+1.7			
									Combut.Ash	90.1				

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		42.07			
	Unburned Carbon %		7.8		Density	1720		Avg. Part diameter		2.67E-05			
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks				
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient				
					Iter.	-6.62E-07			Ks	1.51E+01			
	Re	1.26E+02			Tp	2,107	K						
						1,834	℃		Overall Reaction Rate Coefficient				
	vg	0.500024637			Heat lost by radiation				Ko	15.09386577			
									q	0.452815973			
									Pgo	0.03			
	ρg	0.216596879			Hr	681045.4							
	δg	6.00E-05			ε	0.9			Diffusional Reaction Rate Coefficient				
					σ	5.67E-08			Kdiff	4.86E+03			
Gas viscosity					Tw	1587.2			φ	2			
	δg	6.00379E-05							D	0.000349738			
					Thermal Conductivity of N2				x	2.67E-05			
Gas Density					λ	0.094455			Tg	1576.2			
	ρg	0.216596879			Tg	1576.2			R	8.21E-05			
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient				
	vp	1.1108872E-02			Hc	3.75E+06			D(T,P)	0.000349738			
	x	2.67E-05							D(T0,P0)	0.000217			
	ρp	1720			Heat gain by combusting particle				T	1576.2			
	ρg	0.216596879			Hg	4.43E+06			P	1.000			
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area				
	F	0.001924095	0.0019241						q	4.53E-01	CORRECTED		
	Fo	0.0003335	0.02001						U	0.015341936			
	Po	1							B	0.984658064			
	P1	1.000							So	2.00E+00			
Linear Velocity of Gas									Initial Surface Area				
	vg	0.500024637							So	2.00E+00			
	Rv	0.003848							X	2.67E-05			
Cumulative Residence Time									ρc	1720			
	t	2.4838635E+00											
	L1	0.4							Combustion efficency				
									ε	93.85626231			
									ε	98.46580644	Corrected x1.03+1.7		
									Combut.Ash	92.2			

KINETIC CALCULATIONS BASED ON CORRECTED PROGRAM: 20% GRASS

INPUT DATA		GAS TEMP.	976		POSITION P3	0.92		Dry Char ash		42.58		1	
	Unburned Carbon %		23.8		Density	1760		Avg. Part diameter		3.10E-05		Flow	0.02001
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks				
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient				
					Iter.	2.47E-10			Ks	9.102E-01			
	Re	1.50E+02			Tp	1,300	K						
						1,027	℃		Overall Reaction Rate Coefficient				
	vg	0.396289035			Heat lost by radiation				Ko	0.909966982			
									q	0.027299009			
									Pgo	0.03			
	ρg	0.273294909			Hr	9483.417							
	δg	5.07E-05			ε	0.9			Diffusional Reaction Rate Coefficient				
					σ	5.67E-08			Kdiff	3.52035E+03			
Gas viscosity					Tw	1278.2			φ	2			
	δg	5.06868E-05							D	0.000232825			
					Thermal Conductivity of N2				x	3.10E-05			
Gas Density					λ	0.078755			Tg	1249.2			
	ρg	0.273294909			Tg	1249.2			R	8.21E-05			
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient				
	vp	1.811E-02			Hc	2.58E+05			D(T,P)	0.000232825			
	x	3.10E-05							D(T0,P0)	0.000217			
	ρp	1760			Heat gain by combusting particle				T	1249.2			
	ρg	0.273294909			Hg	2.67E+05			P	1.000			
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area				
	F	0.00152492	0.0015249						q	2.73E-02	CORRECTED		
	Fo	0.0003335	0.02001						U	0.19079384			
	Po	1							B	0.80920616			
	P1	1.000					0.01667		So	2.10E+01			
Linear Velocity of Gas									Initial Surface Area				
	vg	0.396289035							So	2.10E+01			
	Rv	0.003848							X	3.10E-05			
Cumulative Residence Time									ρc	1760			
	t	2.220057073											
	L1	0.92							Combustion efficency				
									ε	76.83861879			
									ε	80.92061597	Corrected x1.03+1.7		
									Combut.Ash	76.2			

INPUT DATA		GAS TEMP.	876		POSITION P1	1.32		Dry Char ash		42.58				
	Unburned Carbon %		14.2		Density	1760		Avg. Part diameter		0.00003097				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-3.27E-10			Ks	2.03E+00				
	Re	1.59E+02			Tp	1,267	K							
						994	℃		Overall Reaction Rate Coefficient					
	vg	0.364565609			Heat lost by radiation				Ko	2.027347243				
									q	0.060820417				
									Pgo	0.03				
	ρg	0.297076227			Hr	34169.29								
	δg	4.77E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.307E+03				
Gas viscosity					Tw	1175.2			φ	2				
	δg	4.76989E-05							D	0.000201194				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.073782			Tg	1149.2				
	ρg	0.297076227			Tg	1149.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.9249180E-02			Hc	5.61E+05			D(T,P)	0.000201194				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1149.2				
	ρg	0.297076227			Hg	5.95E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001402848	0.0014028						q	6.08E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.07853253				
	Po	1							B	0.92146747				
	P1	1.000							So	8.64E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.364565609							So	8.64E+00				
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	3.2622264E+00												
	L1	0.4							Combustion efficency					
									ε	87.72720371				
									ε	92.14674703	Corrected x1.03+1.7			
									Combut.Ash	85.8				

INPUT DATA		GAS TEMP.	1183		POSITION P5	0.52		Dry Char ash		42.58				
	Unburned Carbon %		19.8		Density	1760		Avg. Part diameter		3.10E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-7.93E-09			Ks	2.85E+00				
	Re	1.34E+02			Tp	1,588	K							
						1,315	℃		Overall Reaction Rate Coefficient					
	vg	0.461956526			Heat lost by radiation				Ko	2.847509857				
									q	0.085425296				
									Pgo	0.03				
	ρg	0.234445818			Hr	81996.55								
	δg	5.667E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.95E+03				
Gas viscosity					Tw	1476.2			φ	2				
	δg	5.66739E-05							D	0.000304481				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.088785			Tg	1456.2				
	ρg	0.234445818			Tg	1456.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.6201417E-02			Hc	7.54E+05			D(T,P)	0.000304481				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1456.2				
	ρg	0.234445818			Hg	8.36E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001777609	0.0017776						q	8.54E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.140752171				
	Po	1							B	0.859247829				
	P1	1.000							So	1.55E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.461956526							So	1.55E+01				
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	1.087506769												
	L1	0.52							Combustion efficency					
									ε	81.69232092				
									ε	85.92478287	Corrected x1.03+1.7			
									Combut.Ash	80.2				

INPUT DATA		GAS TEMP.	1186		POSITION P3	0.92		Dry Char ash		42.58				
	Unburned Carbon %		8.1		Density	1760		Avg. Part diameter		3.10E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.15E-06			Ks	1.79E+01				
	Re	1.336E+02			Tp	2,203	K							
						1,930	℃		Overall Reaction Rate Coefficient					
	vg	0.462908229			Heat lost by radiation				Ko	17.82678572				
									q	0.534803571				
									Pgo	0.03				
	ρg	0.233963816			Hr	961972.9								
	δg	5.68E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.96E+03				
Gas viscosity					Tw	1474.2			φ	2				
	δg	5.67589E-05							D	0.00030558				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.088928			Tg	1459.2				
	ρg	0.233963816			Tg	1459.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.6177160E-02			Hc	4.27E+06			D(T,P)	0.000305580				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1459.2				
	ρg	0.233963816			Hg	5.24E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001781271	0.0017813						q	5.35E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.01938615				
	Po	1							B	0.98061385				
	P1	1.000							So	2.13E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.462908229							So	2.13E+00				
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	1.9224310E+00												
	L1	0.4							Combustion efficency					
									ε	93.46400101				
									ε	98.06138504	Corrected x1.03+1.7			
									Combut.Ash	91.9				

INPUT DATA		GAS TEMP.	1095		POSITION P1	1.32		Dry Char ash		42.58				
	Unburned Carbon %		8.7		Density	1760		Avg. Part diameter		3.10E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.97E-07			Ks	9.24E+00				
	Re	1.40E+02			Tp	1,800	K							
						1,527	℃		Overall Reaction Rate Coefficient					
	vg	0.434039911			Heat lost by radiation				Ko	9.213526764				
									q	0.276405803				
									Pgo	0.03				
	ρg	0.249524923			Hr	347004.3								
	δg	5.42E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	3.77E+03				
Gas viscosity					Tw	1387.2			φ	2				
	δg	5.4159E-05							D	0.000273014				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.084562			Tg	1368.2				
	ρg	0.249524923			Tg	1368.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.6953602E-02			Hc	2.36E+06			D(T,P)	0.000273014				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1368.2				
	ρg	0.249524923			Hg	2.71E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001670186	0.0016702						q	2.76E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.024853364				
	Po	1							B	0.975146636				
	P1	1.000							So	2.74E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.434039911							So	2.74E+00				
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	2.8093617E+00												
	L1	0.4							Combustion efficency					
									ε	92.93371834				
									ε	97.51466361	Corrected x1.03+1.7			
									Combut.Ash	91.3				

INPUT DATA		GAS TEMP.	1397		POSITION P5	0.52		Dry Char ash		42.58				
	Unburned Carbon %		22.2		Density	1760		Avg. Part diameter		3.10E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.62E-08			Ks	2.49E+00				
	Re	1.21E+02			Tp	1,770	K							
						1,497	℃		Overall Reaction Rate Coefficient					
	vg	0.529844657			Heat lost by radiation				Ko	2.492374784				
									q	0.074771244				
									Pgo	0.03				
	ρg	0.204406658			Hr	92663.63								
	δg	6.26E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.38E+03				
Gas viscosity					Tw	1682.2			φ	2				
	δg	6.26245E-05							D	0.000387051				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.098831			Tg	1670.2				
	ρg	0.204406658			Tg	1670.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.4662215E-02			Hc	6.39E+05			D(T,P)	0.000387051				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1670.2				
	ρg	0.204406658			Hg	7.32E+05			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002038842	0.0020388						q	7.48E-02	CORRECTED			
	Fo	0.0003335	0.02001						U	0.170159692				
	Po	1							B	0.829840308				
	P1	1.000							So	1.87E+01				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.529844657							So	1.87E+01				
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	9.5499254E-01												
	L1	0.52							Combustion efficency					
									ε	78.83999108				
									ε	82.98403081	Corrected x1.03+1.7			
									Combut.Ash	77.8				

INPUT DATA		GAS TEMP.	1399		POSITION P3	0.92		Dry Char ash		42.58				
	Unburned Carbon %		8.8		Density	1760		Avg. Part diameter		3.10E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-1.40E-06			Ks	1.48E+01				
	Re	1.21E+02			Tp	2,219	K							
						1,946	℃		Overall Reaction Rate Coefficient					
	vg	0.530479126			Heat lost by radiation				Ko	14.70706353				
									q	0.441211906				
									Pgo	0.03				
	ρg	0.204162182			Hr	826684.7								
	δg	6.27E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.38E+03				
Gas viscosity					Tw	1684.2			φ	2				
	δg	6.26791E-05							D	0.000387863				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.098924			Tg	1672.2				
	ρg	0.204162182			Tg	1672.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.4649445E-02			Hc	3.49E+06			D(T,P)	0.000387863				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1672.2				
	ρg	0.204162182			Hg	4.32E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.002041284	0.0020413						q	4.41E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0.02577156				
	Po	1							B	0.97422844				
	P1	1.000							So	2.84E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.530479126							So	2.84E+00				
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	1.6887644E+00												
	L1	0.4							Combustion efficency					
									ε	92.84465954				
									ε	97.42284399	Corrected x1.03+1.7			
									Combut.Ash	91.2				

INPUT DATA		GAS TEMP.	1303		POSITION P1	1.32		Dry Char ash		42.58				
	Unburned Carbon %		3.5		Density	1760		Avg. Part diameter		3.10E-05				
	CALCULATION OF RESIDENCE TIME				CALCULATION OF Tp				CALCULATION OF Ks					
Reynolds Number Calculation					Particle Temperature at equilibrium				Surface Reaction Rate Coefficient					
					Iter.	-9.71E-07			Ks	1.37E+01				
	Re	1.26E+02			Tp	2,120	K							
						1,847	℃		Overall Reaction Rate Coefficient					
	vg	0.500024637			Heat lost by radiation				Ko	13.70267673				
									q	0.411080302				
									Pgo	0.03				
	ρg	0.216596879			Hr	707146.8								
	δg	6.00E-05			ε	0.9			Diffusional Reaction Rate Coefficient					
					σ	5.67E-08			Kdiff	4.19E+03				
Gas viscosity					Tw	1587.2			φ	2				
	δg	6.00379E-05							D	0.000349738				
					Thermal Conductivity of N2				x	3.10E-05				
Gas Density					λ	0.094455			Tg	1576.2				
	ρg	0.216596879			Tg	1576.2			R	8.21E-05				
Free Fall Velocity					Heat lost by conduction				Diffusion Coefficient					
	vp	1.5293797E-02			Hc	3.32E+06			D(T,P)	0.000349738				
	x	3.10E-05							D(T0,P0)	0.000217				
	ρp	1760			Heat gain by combusting particle				T	1576.2				
	ρg	0.216596879			Hg	4.02E+06			P	1.000				
Volumetric Flow									Rate of Carbon Removal per Unit Surface Area					
	F	0.001924095	0.0019241						q	4.11E-01	CORRECTED			
	Fo	0.0003335	0.02001						U	0				
	Po	1							B	1				
	P1	1.000							So	2.96E+00				
Linear Velocity of Gas									Initial Surface Area					
	vg	0.500024637							So	2.96E+00	*			
	Rv	0.003848							X	3.10E-05				
Cumulative Residence Time									ρc	1760				
	t	2.4649835E+00												
	L1	0.4							Combustion efficency					
									ε	97.31042784				
									ε	100	Corrected x1.03+1.7			
									Combut.Ash	96.5				

SUMMARY OF THE KINETIC REACTIONS DATA

BASELINE

Tp	Ks	ln(Ks)	1/Tp
1278	4.4289E-01	-0.81443733	7.83E-04
1260	1.7304E+00	0.54837795	7.94E-04
1515	1.1226E+00	0.11566598	6.60E-04
1918	9.6610E+00	2.26809368	5.21E-04
2231	1.8247E+01	2.90402657	4.48E-04
2057	9.3241E+00	2.23259867	4.86E-04
2012	8.1307E+00	2.09564255	4.97E-04
2009	9.8685E+00	2.28934807	4.98E-04

Y-Intercept	6.5956636
Slope	-8774.0324
Corr. Coeff.	0.8563476
Activation Energy [J/mol]	72,950.90
Pre-exponential Factor [kg/m^2/s/atm]	731.91

10% SAWDUST

Tp	Ks	ln(Ks)	1/Tp
1290	6.4500E-01	-0.43850126	7.75E-04
1285	2.0963E+00	0.74016813	7.78E-04
1524	1.2776E+00	0.24501990	6.56E-04
1519	1.1465E+00	0.13670145	6.58E-04
3153	4.6242E+01	3.83388525	3.17E-04
1748	1.7194E+00	0.54197056	5.72E-04
1855	4.1650E+00	1.42670438	5.39E-04
1885	6.7748E+00	1.91321599	5.30E-04

Y-Intercept	5.895629
Slope	-8031.486
Corr. Coeff.	0.804297
Activation Energy [J/mol]	66,777.07
Pre-exponential Factor [kg/m^2/s/atm]	363.45

15% SAWDUST

Tp	Ks	ln(Ks)	1/Tp
1295	6.9820E-01	-0.35925535	7.72E-04
1207	8.3499E-01	-0.18034106	8.29E-04
1542	1.5885E+00	0.46278054	6.48E-04
1545	1.6029E+00	0.47184511	6.47E-04
2324	1.9614E+01	2.97625698	4.30E-04
1819	3.2555E+00	1.18035519	5.50E-04
1793	2.6384E+00	0.97017636	5.58E-04
1942	7.8492E+00	2.06041625	5.15E-04

Y-Intercept	5.83604
Slope	-7900.75
Corr. Coeff.	0.875578
Activation Energy [J/mol]	65,690.08
Pre-exponential Factor [kg/m^2/s/atm]	342.42

20% SAWDUST

Tp	Ks	ln(Ks)	1/Tp
1268	4.6221E-01	-0.77173246	7.89E-04
1216	1.6695E+00	0.51251907	8.22E-04
1505	1.4951E+00	0.40222363	6.64E-04
1531	2.2160E+00	0.79568462	6.53E-04
2624	4.2452E+01	3.74837802	3.81E-04
1705	1.2130E+00	0.19310888	5.86E-04
1680	2.2788E-01	-1.47891489	5.95E-04
2494	3.3990E+01	3.52607970	4.01E-04

Y-Intercept	6.21171
Slope	-8741.49
Corr. Coeff.	0.560335
Activation Energy [J/mol]	72,680.33
Pre-exponential Factor [kg/m^2/s/atm]	498.55

10% GRASS

Tp	Ks	ln(Ks)	1/Tp
1289	6.2404E-01	-0.47154393	7.76E-04
1201	7.7504E-01	-0.25483457	8.32E-04
1516	1.1281E+00	0.12054489	6.60E-04
1753	5.8855E+00	1.77249516	5.71E-04
1611	4.5044E+00	1.50504433	6.21E-04
1969	6.9638E+00	1.94072153	5.08E-04
1985	7.3108E+00	1.98935023	5.04E-04
2074	1.1275E+01	2.42254418	4.82E-04

Y-Intercept	6.2687769
Slope	-8303.2968
Corr. Coeff.	0.8958329
Activation Energy [J/mol]	69,037.01
Pre-exponential Factor [kg/m^2/s/atm]	527.83

15% GRASS

Tp	Ks	ln(Ks)	1/Tp
1281	6.4721E-01	-0.43509153	7.81E-04
1236	1.7031E+00	0.53243866	8.09E-04
1532	1.8397E+00	0.60957678	6.53E-04
2101	1.7180E+01	2.84373236	4.76E-04
2925	4.6111E+01	3.83105251	3.42E-04
1759	2.5182E+00	0.92355308	5.68E-04
1974	8.8790E+00	2.18368499	5.07E-04
2107	1.5141E+01	2.71739817	4.75E-04

Y-Intercept	6.514604
Slope	-8440.089
Corr. Coeff.	0.875581
Activation Energy [J/mol]	70,174.36
Pre-exponential Factor [kg/m^2/s/atm]	674.93

20% GRASS

Tp	Ks	ln(Ks)	1/Tp
1300	9.1020E-01	-0.09408844	7.69E-04
1267	2.0286E+00	0.70734143	7.89E-04
1588	2.8496E+00	1.04716614	6.30E-04
2203	1.7907E+01	2.88521919	4.54E-04
1800	9.2361E+00	2.22312026	5.55E-04
1770	2.4938E+00	0.91380556	5.65E-04
2219	1.4757E+01	2.69169051	4.51E-04
2120	1.3748E+01	2.62086608	4.72E-04

Y-Intercept	6.025349
Slope	-7515.212
Corr. Coeff.	0.823717
Activation Energy [J/mol]	62,484.56
Pre-exponential Factor [kg/m^2/s/atm]	413.79