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Approach to the hygienic fabrication of process plants subject to health legislation

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ABSTRACT

Many products are commercially produced in process plants. Process plants include factory made entities linked by site-welded pipes. However, onsite welding is more difficult to control. Biofilms inside pipe surfaces, particularly on rough surfaces including welds, encourages bacteria growth and microbial influenced corrosion (MIC). Industries producing products intended for human ingestion are subject to increasingly onerous health legislation related to permissible microbial load. Presently, clean-in-place (CIP) methods are used to ensure hygienic products. CIP is limited in actual performance and, also, consumes much water, a scarce commodity. Over time a rise in product contamination due to increased surface roughness results in bacteria build-up and material failures is induced by MIC increases.

This study is aimed at improving onsite welding of pipes, leading to more hygienic welds, thereby reducing or eliminating local biofilm formation. This research describes various forms of pipe end modification accommodating the effect of manufacturing tolerances before clamped Orbital TIG welding. It considers the effects of no pipe-end modification, swaging only and transverse impact of the pipe end then swaging. The weld zones were subsequently examined. The study showed that the weld zone of the impacted then swaged pipes had the best surface topography and morphology results. This should lead to a reduction in bacterial load, the CIP required, and enhance productivity. The pipe-end modification process is easy to implement onsite. The welder should be expected to manage pipe orientation and alignment. Pre welding pipe-end swaging is a practical method to improve weld joint fit-up and, hence, hygiene.