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High volume materials distribution and control in the beverage and food industry in the Republic of South Africa

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2.8.1. Crates

Plastic and wooden crates are especially popular where returnable products are used. This is because the empty products can be easily packed in the now empty crates.

In the U.S.A. there has in the past been a swing away from the reusable plastic/wooden crate, but lately the reusable crate has become popular again.

The plastic crate has the added advantage that it provides protection for the bottles in transit.

A typical plastic crate would cost ± R4,00.

2.8.2. Cardboard and Shrinkwrap Packs.

Non-returnable containers are usually packed in cardboard or shrinkwrap packs. Lately there has been a considerable swing to shrinkwrapping of all containers. This is because the shrinkwrapped pack is ± ½ the price of a corrugated cardboard pack. (7 - 8c per pack compared to 14c per cardboard pack of 24 cans).

Interlocking plastic crates i.e. crates which lock together when stacked upon each other, have become the standard form of pack in the beer industry throughout the world. The soft drink industry has been somewhat slower to follow and in South Africa no completely interlockable crates are used.

../13

2.8.3. Handling Case

Most products are stacked in cases in patterns of 24 and 12 (6 x 4 or 4 x 3). There seems to be no apparent logical reason for this besides the old measurement of the standard dozen bottles.

Typical cases weigh from 8kg. to 25kg.

2.8.4. The Pallet Load

With the need to move such high volumes the beverage industry (and to a lesser extent the milk industry) soon became aware of the advantages of the unit load concept. The palletising of products became standard in South Africa in the 1960's. However, at that stage little attention was paid to the design of the shape of the pallet and the corresponding shape of the trucks. Pallets of any shape ranging from sizes of 0,9m x 1m to 2m x 2m are thus used in the industry.

2.8.5. The Perfect Sized Pallet

Appendix 3 shows the author's recommendation for the perfect pallet. (1,0m x 1,2m in size). This pallet conforms to the ISO standards (ref. 13), and it fits ideally with the transport standards allowed by the Roads Ordinance Act (ref. 18).

../14

The corresponding case size for the "perfect" pallet is also discussed in appendix 3. Generally 40 - 50 cases are stacked on a pallet. The average mass of a beverage pallet is thus 1000 to 1300kg.

Pallets are in most cases handled by forklift trucks inside the warehouse and production facilities and by A-Frame trucks (see fig: 2.8.5.) en route to the consumer.

../15

FIG: 2.8.5.



TYPICAL TEN PALLET "A" FRAME BEVERAGE TRUCK



CLOSE UP OF UNIT LOAD STACKED ON TRUCK

CHAPTER 3.

MATERIALS MOVEMENT AND CONTROL WITHIN THE PRODUCTION AND PROCESSING FUNCTION.

3.1. THE BASIC PRODUCTION UNITS.

Fig: 3.1. shows a very modern high speed production unit for beverage manufacture.

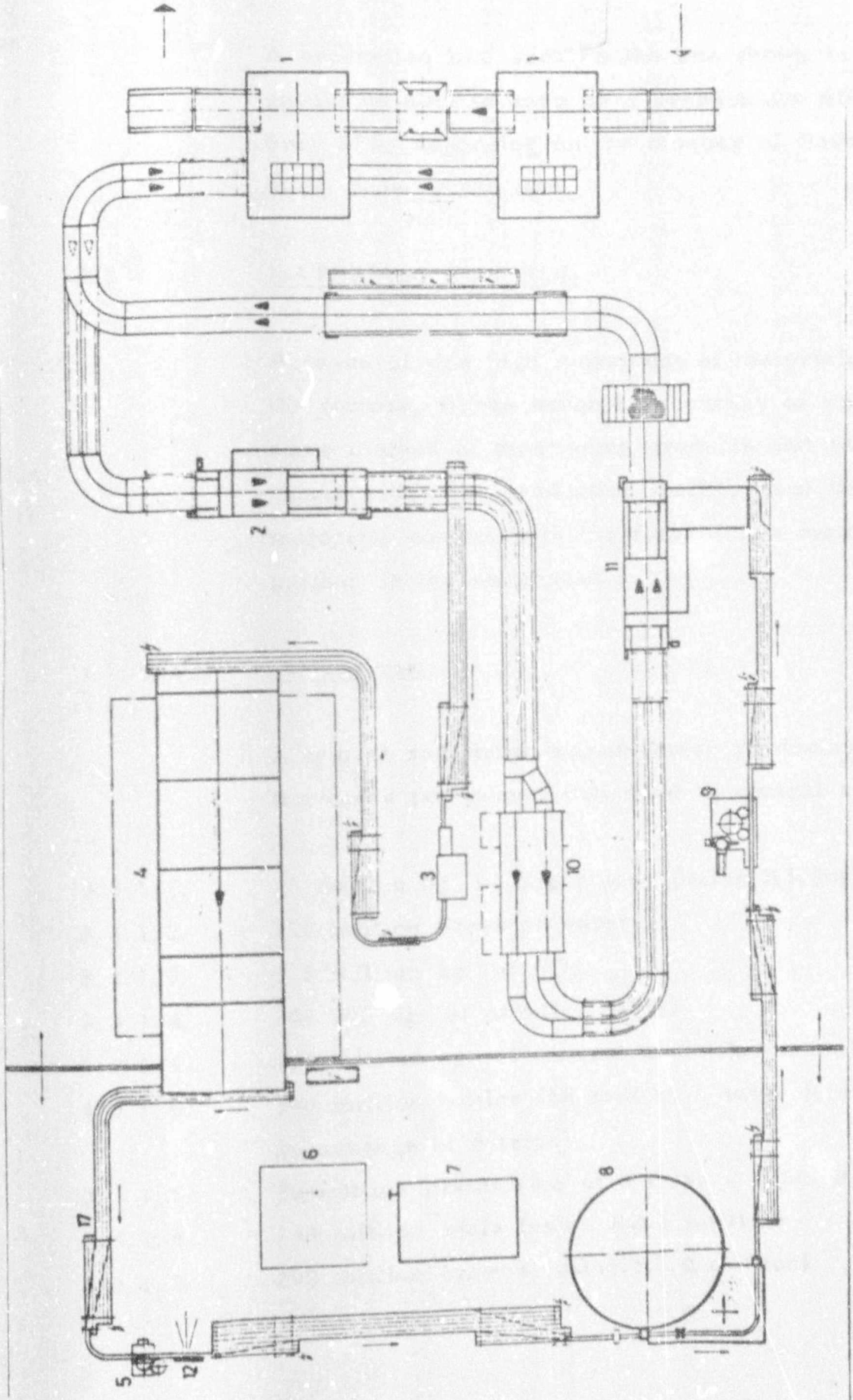
Dirty bottles are brought from the warehouse in pallet form and loaded on the depalletiser (1). The individual cases are then sent to the de-caser (2) where the bottles are removed from their cases. Each bottle is then sent to the washer (4), via a de-capper (3), washed in a caustic detergent and then sent to the filler (8) via an automatic inspector (5). From the filler the filled bottles are capped and labelled (9), put back in their cases (11) and replaced on a pallet.

A modern high speed line (160 valve filler) can operate at 800 litres or 1500 x 300 ml bottles/min. Such a line should be able to fill ± 8 million cases per annum on a single shift basis and the machinery involved would cost ± R1,3 million (excluding services such as air, steam and electricity).

../16

FIG : 3.1

A MODERN HIGH SPEED BOTTLING LINE



KEY

1 Palletiser
1 Depalletiser
2 De-caser
3 De-capper
4 Washer
5 Automatic Inspection
6 Carbonator
7 Blender
8 Filler
9 Labeller
10 Case Washer
11 Caser
12 Manual Inspection

3.2. EFFICIENCY

A production line such as the one shown in Fig: 3.1. should be able to keep up a productivity efficiency of over 75%, depending on the number of flavours and sizes done on the line.

3.3. MATERIALS CONTROL

Because of this high movement of materials within the factory, it has become necessary to implement some method of monitoring products and raw materials within the production facility, and link this materials control with the flow of raw materials and product in the warehouse.

3.3.1. Dimensions.

A typical soft drink manufacturer producing 20 million cases per annum will need to control some:-

3.3.1.1. 23 million kg. of sugar p.a. (value R3,5m)

3.3.1.2. 170 million litres of water

3.3.1.3. 3,8 million kg. of CO_2

3.3.1.4. 200 000 kg. of caustic (NaOH)

3.3.1.5. 1,2 million kg. of concentrates (flavouring)

3.3.1.6. 340 million bottles (68 million - value R14m - doing an average of 5 trips)

3.3.1.7. 20 million crates (4m at 5 trips - value R13,5m)

3.3.1.8. 140 million seals (value R2,5 million)

3.3.1.9. 200 million crowns (value R1,0 million)

../17

3.3.1.10. 3 million broken bottles (at a value R620 000)

3.3.1.11. 500 KVa electricity (value R20 000 p.a.)

Besides these materials, the production efficiency needs to be carefully monitored as a 1% loss in efficiency will mean a loss of some 200 000 cases per annum.

Labour use and control is also very important. A production line such as this will need ± 15 persons to run it and another 10 - 15 persons to run the service equipment and manufacture and mix the necessary raw ingredients. Besides this, three to four forklift trucks (with drivers) will be needed for each production line to bring the empties and return the full products to the warehouse. Thus making a total of ± 30 persons per line.

3.4. THE DAILY OPERATIONAL RETURN

The Daily Operational Return (DOR) is a system of controlling and measuring all the materials flow within the production function. The principle behind the Daily Operational Return is to keep a continuous monitor on all the production in the factory.

This includes monitoring:-

All materials used
Efficiency of the use of materials

../18

Productivity of machines
Productivity of personnel
Materials loss
Movement of product to stores

The DOR operates by comparing the theoretical useage of material (or theoretical running speed of the machines) to the actual usage of material (or actual number of cases produced).

3.4.1. Materials Used.

The actual physical amount of materials used is simply calculated by subtracting the opening stock from the closing stock. This can then be directly compared to the theoretical usage and the difference can then be expressed as a percentage loss.

A minimum target loss can then be set and the daily loss compared to this each day. Should the loss be too high immediate action can be taken.

Furthermore a record of the losses over the month can also easily be calculated by adding the individual losses each day.

3.4.2. Efficiencies Achieved.

The theoretical maximum efficiency that could be achieved can be calculated by multiplying the number

../19

of hours worked by the maximum speed of that machine and then comparing this figure with the actual amount of items produced.

This can be taken a step further by examining the make-up of the losses in efficiency i.e. the loss due to the machines not running at maximum efficiency and the losses due to the personnel not utilising all the time available to them (machine efficiency and machine utilisation).

3.4.3. Materials Loss.

The actual loss of materials due to exterior influences (normally the number of bottles broken in the trade) can also be monitored by separating the number of breakages/losses and comparing these to the total number of products passing through the production facility.

3.4.4. A day's detailed analysis using the D.O.R.

Fig: 3.4.1. shows a D.O.R. sheet which includes all materials flow and productivity analysis for a soft drink organisation. The entire analysis is shown on one large sheet to reduce the amount of paper involved.

A summary is also provided so that management need not read the entire day's analysis but can rather keep

../20

FIG: 3.4.1.

DAILY OPERATIONAL RETURN

Date 1-4-94 | No Days Worked this Month 0

Line Number	Flavour	Size	Time Start	Time Finish	Net Bottling Time	No bottles (Meter)	Cases	Physical Count to Stock	Ex Trade	BREAKAGES: Washer	Other	Filler	Other	Total	Tests	Rejects	% Breakages	Total Man Hours	Total cases per Man Hour	Rated Capicity of a/c mul. by net Bottling time	
1	C	L	8.00	5.50	4.00	35000	3146.6	3166	46	-	-	22	-	68	30	26	0.15	97.5	32.5	4.8000	
Total																					
Brought Forward																					
Month to Date																					

SYRUP

Flavour	Phys. Usage	Theor. Usage	Over/Under	%Over/Under
Coke	5830	5437.5	392.5	7.2%
Fanta				
Sprite				
Total				
Brought Forward				
N.T.D.				

CROWN INVENTORY

	O/Stock	Received	Total	Closing Stock	Physical Usage	Theoretical Usage	Over/Under	%
Coke	6750							
Fanta								
Sprite								
Total Today								
Brought Forward								
N.T.D.								

BREAKDOWN ANALYSIS

	LINE 1			LINE 2		
	Today	Brought Forward	N.T.D.	Today	Brought Forward	N.T.D.
WASHER	-					
PROPORTIONER	-					
FILLER	0.5					
CAPPER	0.67					
OTHER						
TOTAL	1.17					

SEAL INVENTORY

	O/Stock	Received	Total	N.T.D. Closing	Physical Usage	Theoretical Usage	Over/Under	% Over/Under
Coke	50	0	50	6250	75	37500	500	1.3
Fanta	50	0	50	50	-	-	-	-
Sprite	50	0	50	50	-	-	-	-
Total Today								
Brought Forward								
N.T.D.								

SUMMARY OF RESULTS

	Today	Brought Forward	MTD
Productivity efficiency	6.9%		
Total cases/man hour	32		
Total cases produced	3167		
Total % breakages	0.15		

CAUSTIC, B-OIL

	O/Stock	Received	Total	N.T.D. Closing	Physical Usage	Theoretical Usage	Over/Under	% Over/Under
CO2	4000	-	4000	3699	301	280.3	20.7	7.3
B-OIL/ Coal								
Caustic								

LOST TIME ANALYSIS

Line No.	1	2
Tot. Bottling Hrs	7.5	
STD. Allow	1.0	
Actual Bot. Time	6.5	
Change Overs	-	
Breakdowns	1.75	
Other Stops	0.75	
Net. Bot. Time	4.00	
Mach. Util.	62%	

SUGAR INVENTORY

O/Stock	KG. Used	Flavour	Theoretical Usage	Over Usage	%
Total					
Brought Forward					

Prepared by Rod. Bby Checked by Eric Bby

Checked by Eddie Bby

REMARKS

Low utilization today due to Equipment problems and Filler operator away by his self.

tabs on the most important items and then take action if something is wrong in the summary, examining the entire D.O.R. in more detail.

Appendix 2 shows how a day's detailed operational data is included in this D.O.R. sheet and how each piece of data is obtained.

3.4.5. Advantages of the D.O.R.

3.4.5.1. High degree of control by management.
3.4.5.2. Quick efficient feedback of information.
3.4.5.3. Easy production planning.
3.4.5.4. Detailed stock control.
3.4.5.5. Excellent security control.
3.4.5.6. Pinpoint problem areas.
3.4.5.7. Easy to implement.
3.4.5.8. Provides ease of establishing/identifying costs.
3.4.5.9. Provides basis for incentive schemes.
3.4.5.10. Provides quick and easy reference.
3.4.5.11. Easy for accessing the amount of work done.
3.4.5.12. Allows for co-ordination between production, stores, warehouse and administration.

../21

CHAPTER 4

SALES AND WAREHOUSING

4.1. INVENTORY

Fig: 4.1.1. shows a typical sales curve for the beverage industry. In order to cater for the seasonal peaks sufficient inventory must be kept to smooth the production facility and supply the market requirements. This becomes especially difficult in the soft drink industry where up to 70 packages are produced.

Allowance must also be made for machine breakdowns, day-to-day fluctuations in demand etc. However, with the high price of glass it is also necessary to keep the inventory as low as possible.

In all food industries the first in/first out principle (Fifo) must be strictly adhered to, as products have limited shelf lives. (e.g. 3 - 6 months in beverage industry, 1 - 2 days in milk industry). This is complicated by low demands for certain products. (e.g. tonics in soft drink industry).

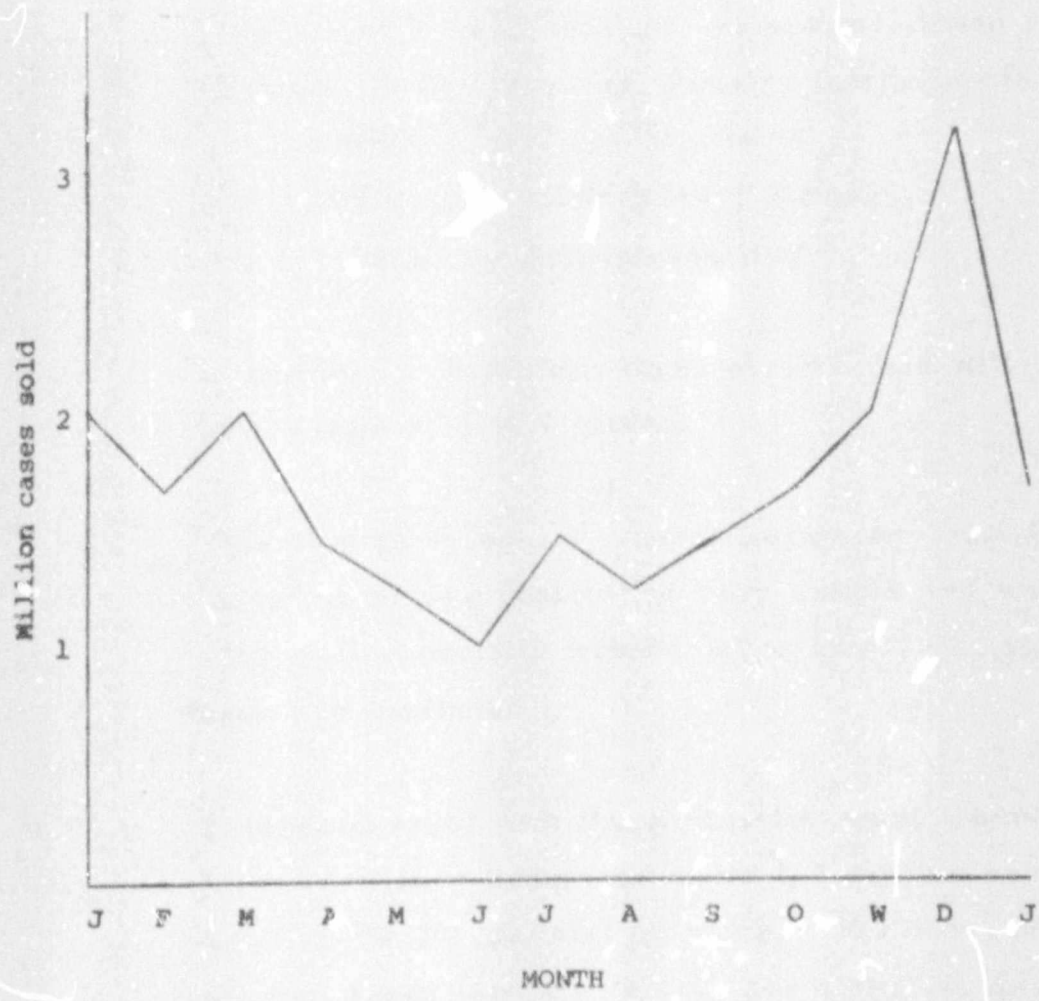
With high speed production facilities it has become impractical to produce small amounts (time to set up production line etc) and it might therefore mean a stock of 2 - 3 months must be held. Because of the

../22

FIG : 4.1.1

SALES PATTERN OF A TYPICAL PLANT SELLING

20 MILLION CASES PER ANNUM



competitiveness of the market considerable safety stocks are usually carried (often up to 2 weeks).

Most modern plants predict sales on previous history and expected growth. The number of days stock in inventory is then calculated by comparing the number of cases on the floor against the predicted sales.

The number of days stock is usually set by Management and will vary with the factors mentioned above. Normally in the beverage industry this amounts to:

4 - 5 weeks on slow moving items

2 - 3 weeks on medium moving items

1 - 1,5 weeks on fast moving items

In October - November these stock levels will reach an average of 5 to 6 weeks.

This type of inventory control (known as "Run Out Time" inventory control) is very simple and works very well especially when a large number of packages are marketed.

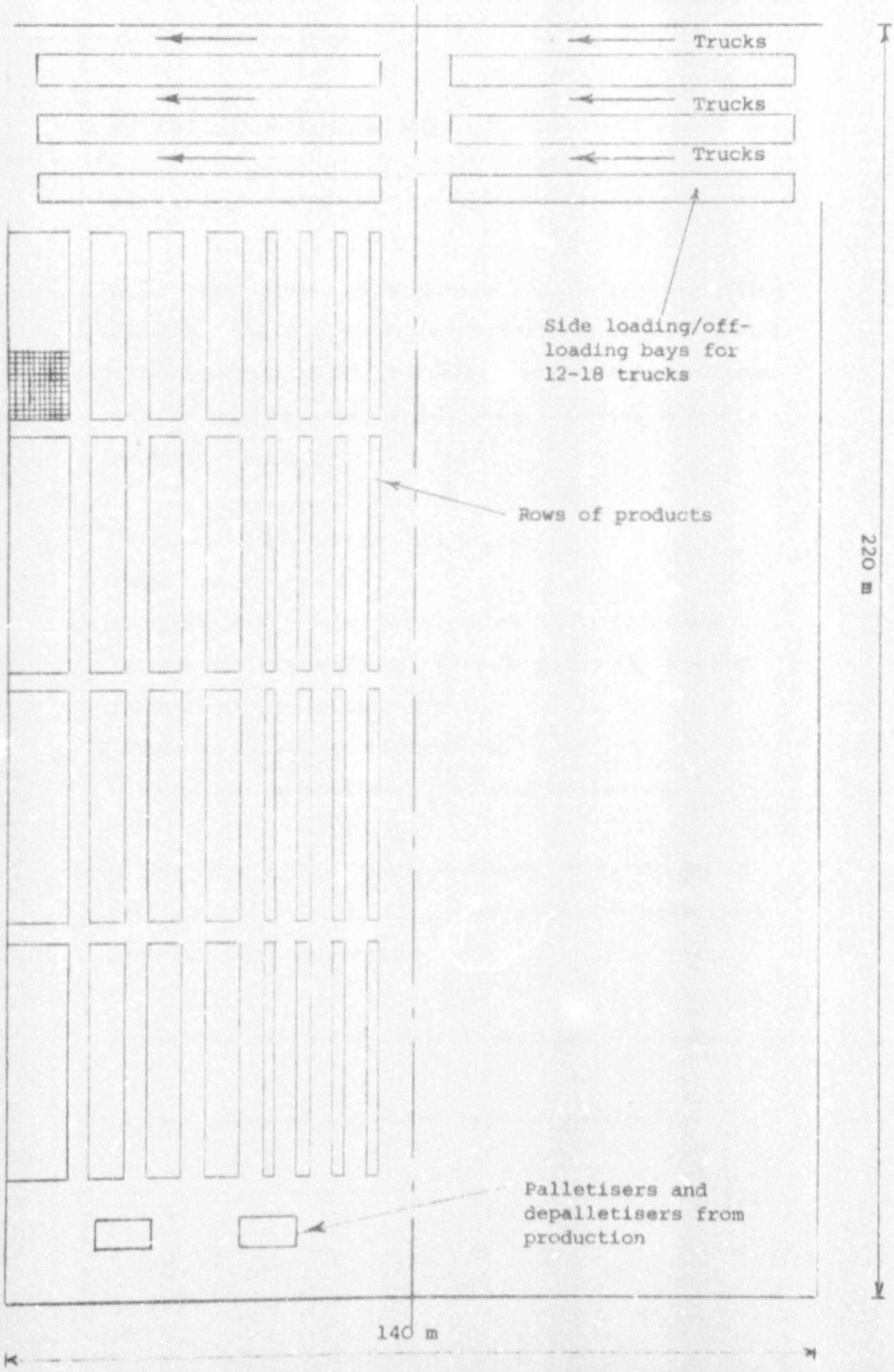
A large beer or soft drink industry must therefore have warehouse space for some 2,5 million cases of product (50 000 pallets) or some $\pm$ 30 000m^2 of storage space (see fig: 4.1.2. for a typical warehouse layout).

../23

FIG : 4.1.2

TYPICAL WAREHOUSE LAYOUT FOR

50 000 PALLETS SERVICED BY FORKLIFT TRUCKS



Many other types of production planning and inventory control systems may be used (short, medium and long term). However these will not be discussed in this dissertation.

4.2. ORDERING AND SELLING

4.2.1. Preselling

Most high volume distributors sell on the preselling system. Here a preseller, usually a fairly dynamic salesman, tours all customers and potential customers in a given area on set days. During a typical customer visit he will:

Help the outlet review his stock.
Take new orders.
Estimate the number of empties to be returned.
Inform the customer of any new products, special promotions or special offers.
Listen to customer complaints.
Display any promotional material necessary.

In the case of the liquor industry, it is illegal to sell product directly from the truck and presellers are thus very necessary.

Preselling has many other advantages - including:

Higher educated and more capable sellers.

Closer customer relationships.
Less delays of trucks and loading crews.
Trucks with only enough product for the customers - therefore no wastage

4. 2. 2. Better Implementation of Marketing Ideals

It is however often impossible to completely satisfy all customers by preselling only. Customers often run out of product between deliveries and need to phone urgently for products. Also customers are often difficult to service and might be very far away from any distribution point. It might therefore not be practical to send a preseller this far. In this case product can be sold directly from the truck.

Extensive use can also be made of communication by telephone. This however does not have the advantage of direct relations with the customer.

4. 2. 3. Order Delay Period

Perhaps one of the most sensitive subjects of customer deliveries is the order delay periods. Most major beverage producers in South Africa guarantee a 24 hour delivery period, i.e. product is delivered within 24 hours of taking the order. The main advantage of this system is the prompt service to the customers. This however, from a purely distributional approach, is not ideal as it gives the dis-

tribution manager very little time to load and route his vehicles.

Some factories have tried to alleviate these problems by sending in the orders by radio as soon as they receive them. A few factories have moved to a 48 hour delivery period. The advantages of a 48 hour delivery period are:

4.2.3.1. There is far more time to plan distribution carefully.

4.2.3.2. As the time period between successive visits to the customers will not change i.e. will still be weekly or bi-weekly etc. the service to the customer will still be as efficient.

4.2.3.3. More customers can be collected before the distribution is planned, thus making the distribution more flexible.

4.2.3.4. Accounts will have more time to finalise the individual accounts thus eliminating more errors. Customers requiring urgent attention can still be serviced on a 24 or even a 12 hour basis - channels being made available according to the urgency of the situation.

It is thus hard to see why major distributors in South Africa (Coca-Cola and S.A.B.) still operate on a 24 hour delivery period.

../26

4.2.4. Customer Service

Because of the large amount of competitiveness in this field of industry, it is necessary that all the customers' needs be satisfied. This means that orders of very small quantities (e.g. 5 cases) must be delivered, even if this is not financially feasible.

As the low volume customer (see Fig: 2.4.1. and 2.4.2.), especially in the soft drink industry, makes up a large percentage of the total market, one cannot dictate types of delivery, delivery quantities etc. This means that deliveries of 5 cases to 500 cases need to be considered by the distributors.

4.3. BOTTLE SORTING AND TYPES

Basically two types of bottles are used in the beverage industry.

4.3.1. ACL Bottles

These bottles have a permanent etched label and can only be used for a specific package.

4.3.2. The Generic labelled bottle.

This bottle is of a standard shape and is labelled only after it is filled. The generic bottle is used exclusively in the beer industry while ± 80 % of all bottles used in the soft drink industry are of the ACL type.

../27

4. 3. 2. 1. The generic bottle has the following advantages:

Easy to sort - as all bottles are the same - the only difference being in their sizes.

Lower inventory levels - as a safety stock does not need to be held for several specific types of bottles.

4. 3. 2. 2. Disadvantages:

The bottle is less exclusive and identifiable and this means a great deal in the marketing of the product.

Bottle "Borrowing"

As the bottle is the same as the competitors', there tends to be a permanent battle to get as many bottles as possible back from the trade by each bottler. This is because a new bottle costs ± 12c (350 ml) while the deposit on such a bottle will be ± 6c.

In European countries where the vast majority of bottled products are issued in standardised generic bottles a constant war is waged between the various bottlers, each trying to get more than their fair share of bottles back from the trade.

The removal and application of labels was in the past also a great problem, and had a large effect on productivity. But with the development of the modern single ended washer, washing methods and labelling methods these problems have almost completely disappeared.

../28

Normally an ACL bottle would need to do ± 8 to 10 trips before the actual incremental cost of the bottle as compared to a generic bottle can be justified.

4.3.3. Physical Sorting

In South Africa some 50% of all bottles produced in the beverage industry have an ACL label. This means considerable sorting of bottles needs to be done before these bottles can be sent to the production area.

Automatic sorting machines are used in USA for this purpose. These operate on a colour, size principle. In South Africa sorting is still done manually.

Most factories do their sorting in the trade (see Fig: 5.4.4. for amount of time spent sorting in the trade). This has the following advantages:

4.3.3.1. It is easier to pack sorted bottles in the trucks.

4.3.3.2. It is easier to check (count) sorted bottles.

4.3.3.3. There is more space available for sorting in the trade than in warehouses.

Although most of the major sorting is done in the trade, it is impossible to complete this due to odd numbers of bottles and cases. This means that considerable sorting needs to be done back at the warehouse.

Fig: 4.3.3.1. and 4.3.3.2. show typical sorting bays.

../29

FIG : 4.3.3.1

SEMI-MECHANISED PRODUCT SORTING BAY

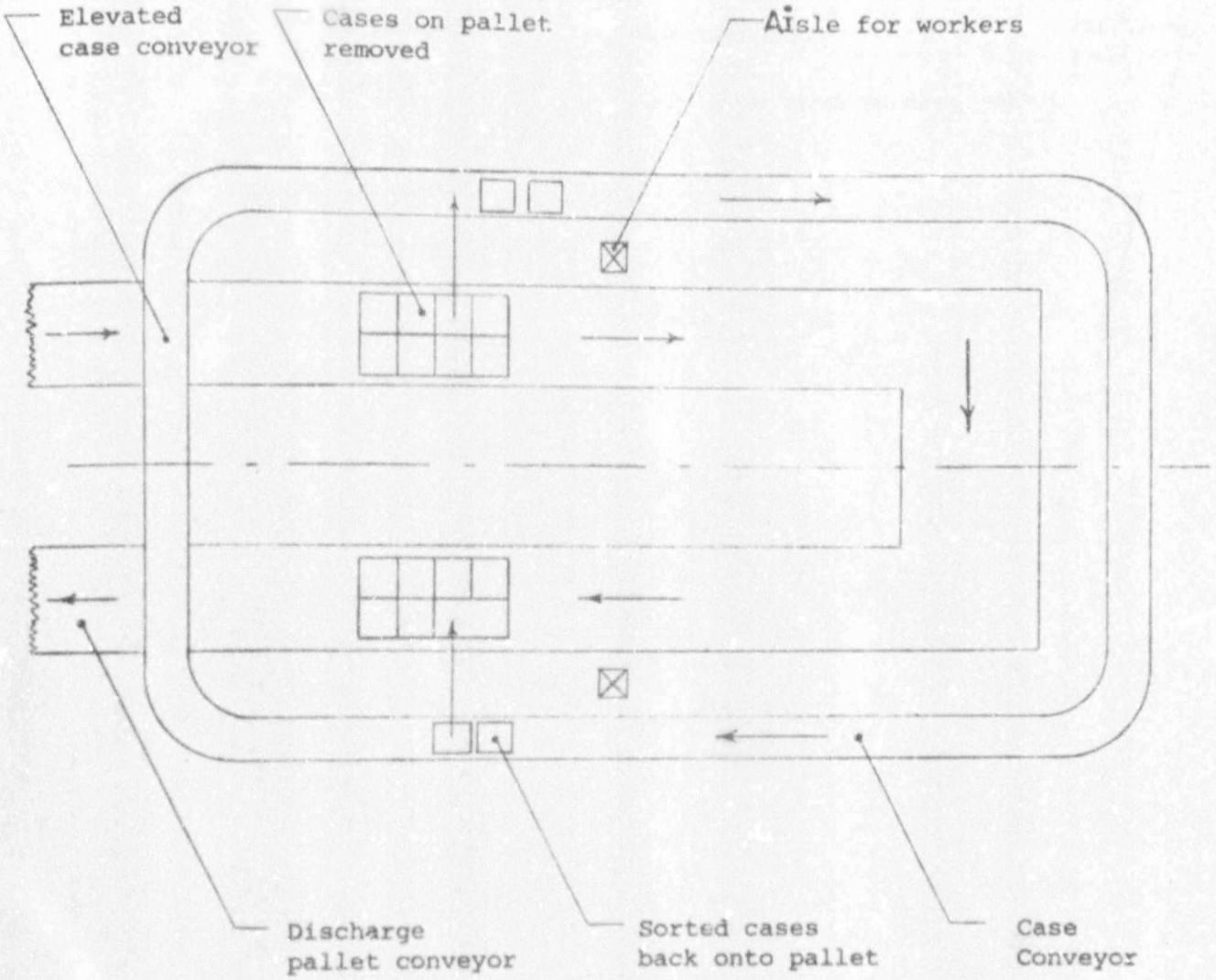
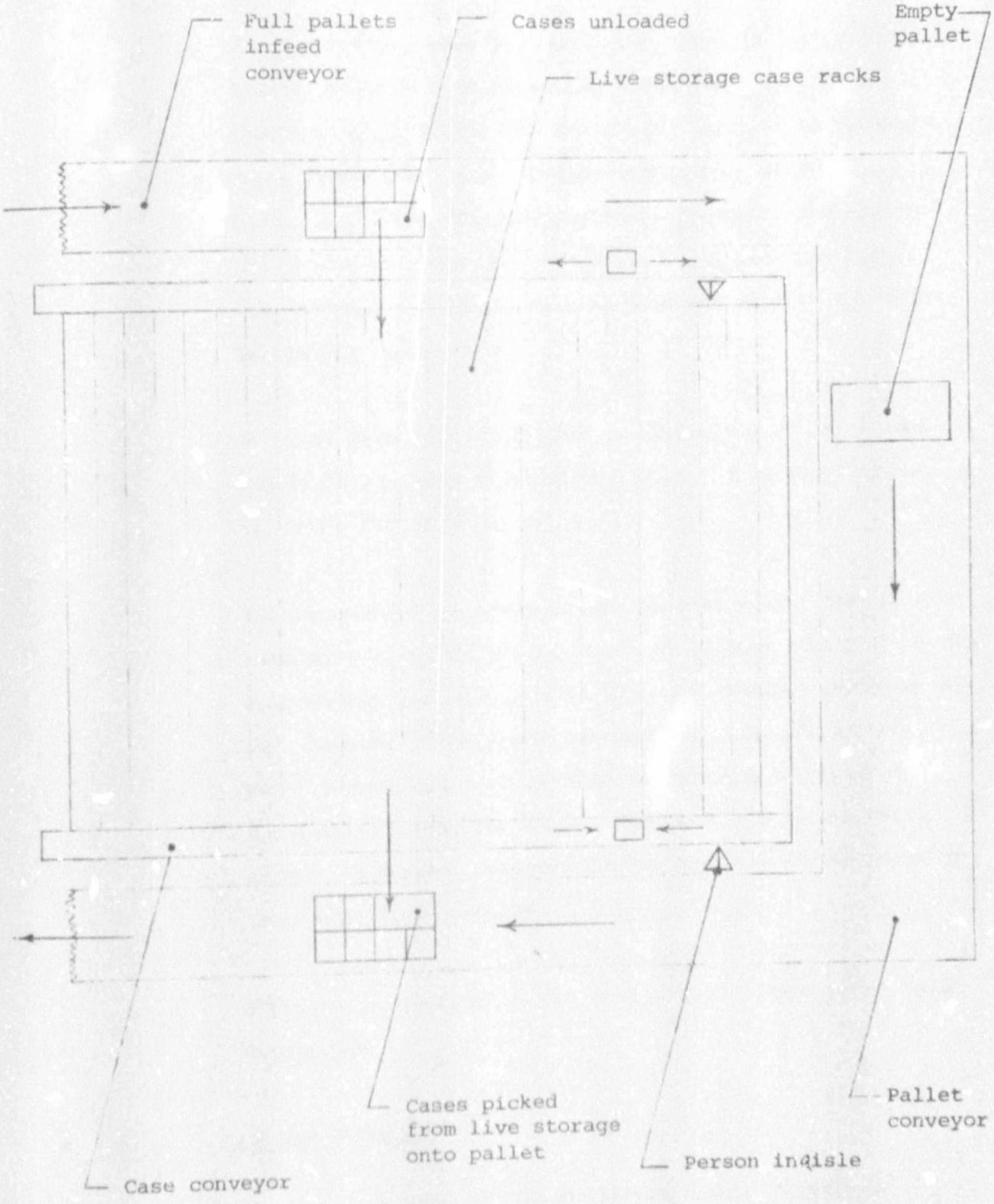


FIG : 4.3.3.2

LIVE STORAGE LOADING/SORTING BAY



4. 3. 4. Removing Empties.

Empty bottles play an important part in any distribution system. It is vitally important to the production facility that all the empty bottles be brought back from the trade so that sufficient bottles be made available for production purposes. Furthermore the quicker the turnover of bottles the lower the inventory necessary and thus the lower the capital outlay necessary.

It must also not be forgotten that the cost of a new bottle is considerably higher than the deposit value (± twice the deposit value).

To an outlet an empty bottle is idle cash, and in our capatalistic world where cash is always short it is not surprising that the outlets demand prompt removal of their empty bottles and containers. Unfortunately most presellers are paid on a commission basis. This means that the more they sell the more they earn. However, empty bottles are not considered in this incentive scheme.

Returning empties to the factories is thus often badly neglected.

4. 3. 5. Sales Volumes

A large factory in South Africa would distribute

± 15 - 20 million cases of product per annum in a large city such as Johannesburg (and area). Typically this means the movement of ± 3 million cases over the December peak season period ± 136 000 cases or 2 750 pallets per day.

Normally ± 200 trucks would be used for this distribution or an average of 680 cases per truck per day in peak season.

A typical producer as mentioned above would service ± 10 000 outlets in the soft drink industry and ± 2 000 outlets in the beer industry.

4.4. DISTRIBUTION CENTRE LOCATION.

Before one can discuss the materials handled within a warehouse it is essential to decide on the optimum positioning of the warehouse.

Background Information:

Before positioning this distribution centre the following information needs to be collected:

4.4.1. Population History.

A history of the growth of the population in each area to be serviced (see ref. 20).

4.4.2. Economic Trends

A history of the per capita income in each area to be serviced (see ref. 3).

4.4.3. Sales History

A sales history of each area to be serviced by the package.

From the data a prediction can be made (long and short term) as to the future sales in each area.

Once the volume of sales has been determined, methods can be set up to find the best theoretical place to locate the distribution point.

Appendix 4 details various methods of optimum positioning of the warehouse facility and documents all the factors involved.

It should also be noted that in this sort of industry the cost of importing materials is usually much cheaper than the distribution of the final product.

4.5. MULTIPLE DISTRIBUTION POINTS

4.5.1. Centralised vs. Multiple Distribution Points.

Everytime a product is handled a cost is incurred

../32

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