

ANALYSIS OF WEAK POINTS IN BOTTLING OR PACKAGING LINES

The why and wherefore this kind of Analysis?

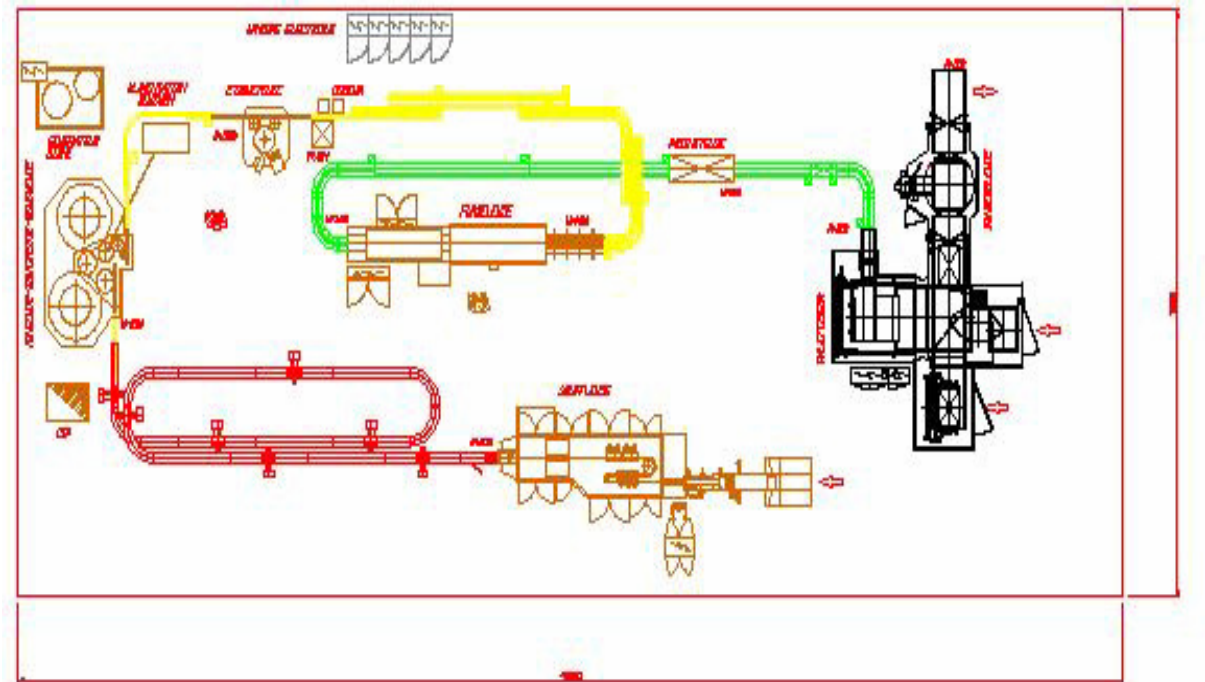
A one way PET line will be examined on its weak spots. Generally efficiency of these installations is guaranteed more than 90%, because impairment by defective or incorrect empty goods is not appearing.

The bottles are manufactured of controlled preforms and posses high reproducibility. Over the years most of the filling lines have to be adapted to new bottles or sorts of production.

Therefore parts of the installations will be changed, for example the control of the conveyors and after years nobody knows exactly, why the conveyor speeds have been reduced.

The reduction of line performance is mainly depending on the blow moulding machine because its availability is only 95%. All other machines are guaranteed with single machine efficiency up to 99% and therefore the line efficiency could reach at least more than 90%. If this is not the case the line efficiency should be investigated by an analysis of weak points.

A PET line for 10.000b/h with machine specifications, weak spots and proposition for solutions



Picture 1 PET line for 10.000b/h

The period of this test makes sense when it takes place some days without product or bottle change and some more days with case and bottle change.

It is very important that the examiner has checked the layout of the bottling line, but should only see it in reality during the analysis for avoiding any operating blindness.

That is why operators or the staff is not qualified to carry out this test and this is not any degradation because the lack of knowledge.

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All operators are equipped with registration forms in order to get a detailed supervision for listing of number and time of disturbances.

Before start of the test all photocells have to be cleaned, in order to do not influence the result. The test manager is also in possession of complete set registration forms and fills in the disturbances he can notice.

The responsible of the line receives the forms of that part of the installation with which no operator is occupied (conveyors).

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Equipment	Filling group			
Registrator				
Registration period	Product counter			
Start	h	Start	p/h	
Stop	h	Stop	p/h	
Total	h	Total	p/h	
Reason Machine stop	Duration Machine stop s			
No bottles at entrance				
Accumulation at exit				
Problem with the Rinser				
Lying bottles at entrance				
Bottle gaps at entrance				
Bottle squeeze in the filler				
Bottle squeeze at exit				
Failure at closer				
Failure at exit inspection, level, closure				
Product pressure low				
no product				
Less air				
Less CO ²				
Problems with water injection				
Number of lying bottles on the entrance conveyor				
Number of squeezed and not correctly closed bottles				

Picture 2 registration form example filling group

Blow moulding machine, alternatively Bulk depalletiser, Pallet conveyors and Airveyors

At this capacity the blow moulding machine can be in linear or rotary execution. In opposition to returnable installations it is replacing the filler as main machine in the graph of Prof. Berg. In picture 1 there is designed a linear blow moulding machine.

Based on the experience in the project management of many different filling installations, already by regarding the rhythm of movements can be recognized anomalies.

Failures are registered by the operators and will be evaluated by the test manager.

The airveyors are buffer between the blow moulder and filling group and like all buffer conveyors should have a time reserve of about 2 min.

The installation is very important and should fulfil some criteria for not causing any hygienic or functional problems.

Rinser, Filler, Closer, Closure infeed incl. Inspection systems, Bottle conveyors

In this installation there is a rinsing machine connected to the filler. Sometimes at filling of drinks with CO² there is no use of it. At this case the airveyors have to be equipped in the highest hygienic class.

In the filler the bottle is guided at the neckring only. Transfer stations are always weak spots. The infeed of closures is always susceptible for disturbances. The proper execution of the caps and the closure infeed is a must.

After closing the bottles will be transported further on normal bottle conveyors. At today's PET lines they are not equipped with any soap lubrication system.

The connection conveyors between the machines always should have a buffer period of about 2 minutes. The number of blocked machines (electronically or mechanically) in a filling line is limited. Whereas the filling group has to be regarded as one unit, as there are hygienic reasons to connect the machines mechanically.

Labeller, alternatively Sleever, Inspection system, Shrink wrapper, Bottle infeed Packer

A very important machine for appearance of the product and for every marketing department is the labelling or sleeving machine. Good looking product the price and taste are the decisive arguments for buying.

The time distances for new appearances are getting shorter and therefore the diversification of the products takes more importance every day.

If the product, resp. bottle and case, has to be changed very often, there should be used the method SMED (Single minute exchange of dies). With this system the start up and calibration time are reduced. These times are reducing the line efficiency.

The shrink wrapper of today's generation are running constantly, change over is easier to execute, than before.

Control balance with Coding, Handle applicator, Case conveyors, Palletiser, Pallet conveyors, Pallet stretcher

Complete cases are checked generally by control balances. The case conveyor should be without maintenance and designed stable.

Handle applicator should not cause any problem at this capacity. There is high importance on correct infeed into the palletiser.

The loaded pallets are stabilised by means of flat layer pads and made safe for the transport by the following pallet stretcher. Failure can appear at any movement and can derive from any different reason.

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Unplanned down external			
Machines in the line	breakdown time(min)	breakdowns quantity	breakdowns reason
perform infeed			
blow moulding machine			
Airways to the rinser			
Rinser/Filler/Capper			
cap infeed			
inspection systems			
Bottle conveyor Rinser to Labeller			
Labeller			
Label inspection			
Bottle conveyor to Packer			
Packer			
Case conveyor to palletiser			
Palletiser			
pallet conveying system incl. Magazin			
pallet strapper			
Unplanned down internal			
Machines in the line	breakdown time(min)	breakdowns quantity	breakdowns reason
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Palletiser			
pallet conveying system incl. Magazin			
pallet strapper			

Picture 3 Analysis of Disturbances

The breakdown times, quantity and reasons are analysed, all adjustments interpreted and completed by photos of the weak spots concerned. Some propositions of possible solutions are submitted.

Often necessary improvements are appearing during the weak spot analysis and therefore the last day of data registration the line efficiency is increasing already significantly.