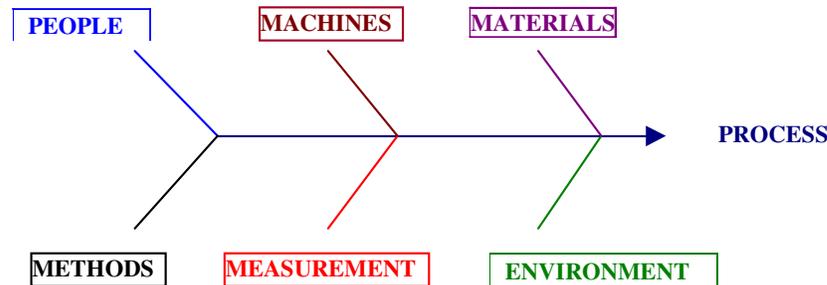


## Efficiency – Line Philosophy



In 1992 I presented a paper titled ‘Development of a Packaging Line’ to the Brewers Guild in Blackpool, and then at the MBAA Conference in the Caribbean. I made reference to the first packaging line that I managed in Ghana from 1971 to 1973. The speed was 120bpm, efficiencies were 85% and waste was negligible. It was a doddle! So what’s gone wrong? The answer is simple. The modern line is faster, technology more complex and there is a multiple range of products. If you want a successful line today, it *must* be right – the line philosophy should be perfect. Is this too much to ask for – well it usually is!

When starting from new, frustrations can evolve as a result of:

- Inadequate budget. It is either arbitrarily cut or poorly constructed.
- Time constraint. Once a decision is made there never seems to be enough time, everything must happen now!
- The contract. It is important to have a contract but I find they are now overly complex. This does three things 1) makes the supplier nervous (they will probably seek legal advice), 2) leaves a tendency for simple things to be left out, and 3) can delay the project. What generally happens is the project goes ahead while the contract is still being sorted out – not the perfect situation.
- Second-rate machinery is purchased or insufficient research is carried out.
- Not enough work is done on studying the compatibility of the materials with the machine.
- Operators are not properly trained.
- There is not enough involvement with those who will be running it!

Good planning is the essence of achieving the right end result, if this is not achieved, there is a nightmare to follow, and there is not much sympathy around! Good planning also means that when you are challenged you have the answer, and the consequences of any change are immediately known. So before developing a packaging line ensure that all parties have been consulted, and that there is total agreement on the objectives. So whom should you involve? The simple answer is, the customer, but sadly there is not one but many of them. My list would include – planning/sales, marketing, manufacturing (production and engineering managers and shop floor), and finance. Make sure that the top person is approached in each area, and ask that he/she nominate individuals who will

be asked to sign off what has been agreed. There will then be a steering committee involving all these people and a project 'owner' who would normally be someone from manufacturing who will work with the project and then finally take it over. This may seem a bit petty but a lot of money is being invested, so it is important that a great deal of up front work is carried out. If the reader works for a small company all this may not be necessary, as communications are easier and ownership is extremely clear. It is also likely that the same people will be around throughout the project! However, a clear plan still needs to be put together. All this may seem extremely obvious, but so many fall at this hurdle.

After the requirements have been established, the line layout and type of plant must be decided. Specifications therefore need to be prepared and discussions take place with suppliers. You should still remain reasonably flexible in your approach, as suppliers will often as not come up with good ideas.

On one occasion I remember talking to a supplier after the installation of his palletiser. We in manufacturing had specified the patterns for palletisation, and these were duly given to the supplier who actually suggested a better pattern for one particular format. This was turned down by project because the pattern had already been specified! Later on, when we discovered this, we changed the pattern on the supplier's advice, and it worked much better. So have an open mind – do lots of listening!

Line layouts and speeds are of the essence to good line performance. There are many layout alternatives. The end result may depend on existing layouts but the modern objectives would include (Mnemonic-FEEL DEMO!):

- F ast changeovers (Less than 10 mins)
- E rgonomics
- E ase of maintenance and cleaning
- L ow manning levels
  
- D esign line to 'pull' product
- E ase of waste removal
- M aterials ingress and compatibility
- O n line Quality Control

The line needs to be designed around the heart of the line i.e. the machine that does the primary packaging. If this machine stops, the output is immediately affected. For a beverage packaging line this would normally be the filler. A graph is then drawn with the filler at the bottom of the graph – this is known as a 'V' graph (see fig 1). In cases where a tunnel pasteuriser is installed, this may be at the bottom of the graph. However, if this is

done the filler needs to be electronic to allow it to modulate.

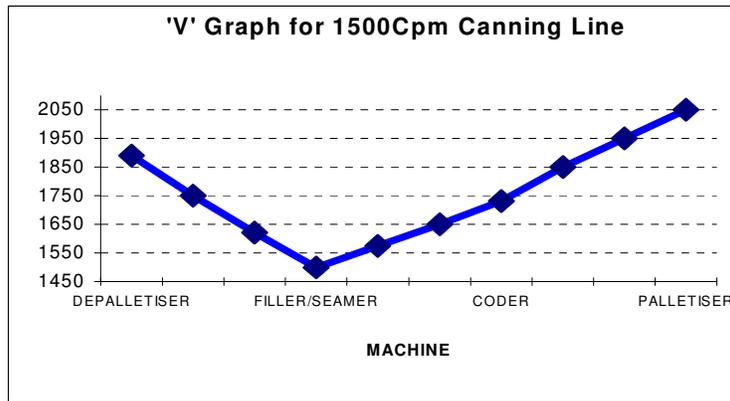


Fig 1

Machines before and after the filler are planned to run faster by increments of 5 to 8%. In this way the line stands the best chance of giving a good efficiency. The machine at the bottom of the graph gives you the rated output for the line. The faster the line, the less robust it is, and stoppages will also give a greater loss of output.

This leads us to the next point, accumulation. For slower lines, <500cpm, accumulation is not as important, and also the 'V' graph can be flatter. For higher speeds, however, accumulation is required to give an effective line balance. There are two types, static and dynamic.

The simplest form of static accumulation is the bi-directional table, which is fitted at right angles to the conveyor. The product accumulates, and is then released into the conveyor when the line restarts. The disadvantage of this type is that products maybe held on the table for some considerable time, as the product will only be slowly released onto the line. In fact on some tables, the product can sit on the dead plate at the end of the table until it is physically pushed onto the conveyer. At a recent exhibition, 'drinktec interbrau' in Munich, Gebo Industries exhibited an in-line accumulation conveyer table. This has the advantage of ensuring that no product is left behind and is a neat combination of the dynamic and static types. It also takes up less space than dynamic accumulation on the conveyor.

Dynamic accumulation can take place on any conveyors more than one slat wide. Conveyors on a packaging line are divided into two distinct areas – upstream and downstream (see fig 2)

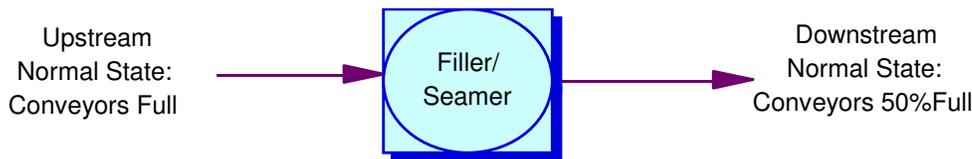


Fig 2

Upstream conveyors feed the core machine, in this case the filler, and downstream conveyors take product away from that machine. The upstream conveyors will normally run full, so if for any reason a machine feeding the filler should stop, there is a buffer of cans on the conveyor to keep the filler running. Conversely, the conveyors downstream

will run around half full which allows them to fill up when there is a stoppage downstream. So how much accumulation does one have? When it comes down to it, it is a matter of money and space. The best advice one can give is to analyse the most common stops on a line and relate the accumulation capacity to these. There are now some brilliant packages available that allow line performance to be simulated – there are companies around that can do this for you, conveyor manufacturers should also be able to do this for you.

For an existing line it is worthwhile spending some time on ensuring that your line is in balance and that the accumulation space is being properly used. On many occasions I have seen people increase the speed of the filler and expect higher output, the reverse actually takes place. A line always runs better when it is allowed to run continuously at the correct rated speed. It may be that the line has to be re-rated, or that machines upstream and downstream need to be speeded up. I have seen new plant being installed on a line and as it runs at a different speed to the de-installed plant, it throws the line out of balance.

Another consideration is the line layout. There are two distinct ways to go – a straight line or a ‘U’ shaped line (See figs 3&4). The latter gives the best solution from the ergonomic point of view, as machines are much more accessible and also more visible. However, this will not be the easy solution if straight lines are already in place, or when a range of different pack formats are required. Should the latter be the case, a comb layout will be necessary giving a choice of routes. Whatever is chosen the above objectives – FEEL DEMO - should be met in order to give a satisfactory performance.

In conclusion, the competence of the operating crew is absolutely key to achieving good output, but I also believe that a well-designed and balanced line makes a big difference to both morale and therefore output. Good planning is the essence; then ensure it is in balance and, finally, look after it!

The next article is about measurement of line performance with a little financial input.