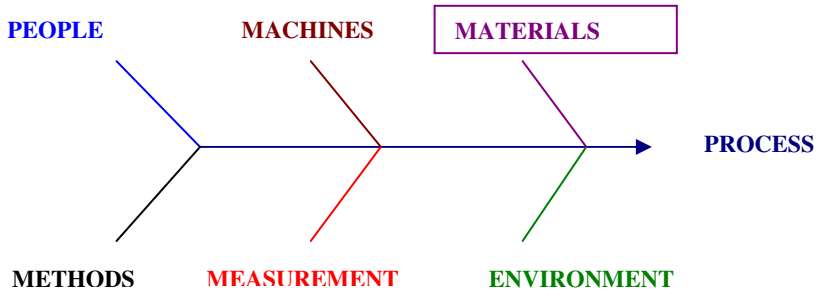
Efficiency – the Materials

In last month's article I talked about the Ishikawa approach in defining a process, as follows:



Most people tend to focus on the Machinery and People. Production blame the Engineers, Engineers blame the operators. Although this is a culture we would like to think has passed us by, unfortunately, when there is pressure on output, this rather unhealthy discourse tends to raise its head once more. When I visit operations that have not done a full study on their plant performance, I often find that the materials that they are using are the greatest cause of downtime. The frustration on the shop floor is enormous and the answers are often found there. A simple example that I came across was with a labeller that was applying pre-cut paper labels and the operator was struggling with the varying sizes of label. It turned out that the company was buying from two different suppliers and each company was cutting the label to a slightly different dimension. Materials are probably the most comfortable item to look at because it mostly involves people outside the manufacturing arena and also the results can be extremely rewarding!
So what is the best approach? I have listened to lecture in which a person from Quality Assurance was saying that you need good specifications and that you ensure that the suppliers keep to them, so far so good but who lays down the specification and is the supplier really comfortable with it. In this instance the user wrote the specification and then told the supplier that this is what he wanted. This can lead to an uncomfortable relationship with the supplier and tends to set up a feeling of animosity. This goes back to the days of material inspection and AQLs (Acceptable Quality Limits). In my mind a component is either right or wrong – why should there be any failures?
Interestingly the best approach is the one that favours the buyer and the manufacturer; that is to have a single supplier and partnership where the supplier works closely with the manufacturer to achieve the best result. Most suppliers are into this approach and like it as they can then ensure that they are supplying the best materials for your plant and understand why certain dimensions are critical – or not – as the case might be.

Specifications

These are important and can be divided into three parts. The first is an overall policy statement – it could relate to a restriction in chemical treatment or the use of compounds used which you, as the user, do not want to come into contact with your product. It would include the requirement for tests should the supplier wish to use a different form of treatment; for example, use a different lacquer inside a beverage can. This may also

include an environmentally based statement that requires a percentage of the supplied material to be recycled. This of course needs to be done with great sensitivity, as some materials will have a significantly reduced performance if there is a recycled content! The second part, which I call the 'Leader Specification', will cover all components that come under a common heading, such as bottles, cans, trays, cartons, film etc. This will cover the general description, technical requirements, quality and environment specific to this component. Finally the third part, the 'Individual Specification' which will specific to the actual component giving dimensions, type of material, barcodes, artwork and so on. This is agreed with the supplier with other players, such as marketing, sales and manufacturing being involved. There are other ways of putting specifications together but I have always liked this hierarchical approach. As components are added or changed there is less documentation involved – whether it is computer based or in a file. Each component is given a code – preferably alphanumeric but if you are unlucky and have SAP it has to be numeric!

Getting the Specifications Right

This is all about capability. Packaging is in effect a means of carrying your product undamaged to the consumer. But there is more – I use an aide-memoire, 'Is Capable' to help!

I – Innovative
S – Sells the product

C – Collation of packs
A – Appeal through good design
P – Protects and preserves the measured contents
A – An easy product to handle
B – Best practice for pack integrity
L – Labelling for identity and information
E – Environmentally acceptable

When specifying the packaging it is necessary to have some or all of the above points considered. Especially important is to consider its end destination and how it will be handled en route. Having said this it must ALSO be capable of running on the machine! Earlier in this article we mentioned the importance of dimensions. There will be others such as slip for board, cans and bottles; glue viscosity and temperature and so on. This capability is well demonstrated by a frequency distribution curve. The Lower Specified Limit (LSL) and the Upper Specified Limit (USL) are the tolerance limits for the machine – this is known as the Engineering Tolerance or ET. The range is calculated by multiplying the standard deviation by 6. This is known as the Normal Tolerance or NT. Capability is calculated using standard deviation – a function available on any scientific calculator. At least twenty readings are necessary to give good data. It is calculated using the following formula

How to Calculate Process Capability Cp:

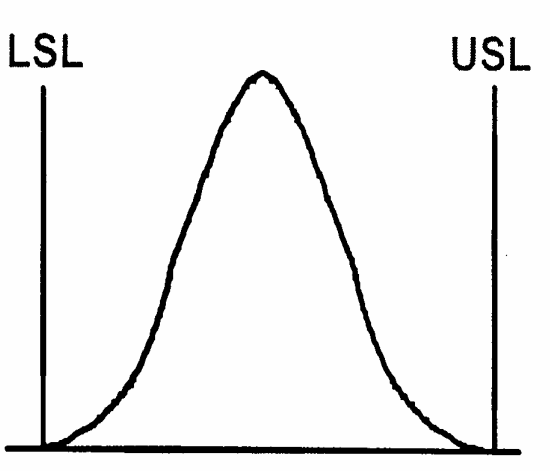
$$Cp = \frac{USL - LSL}{6 \times SD}$$

How to Calculate Process Capability Cpk:

Cpk is the lower of these 2 calculations:

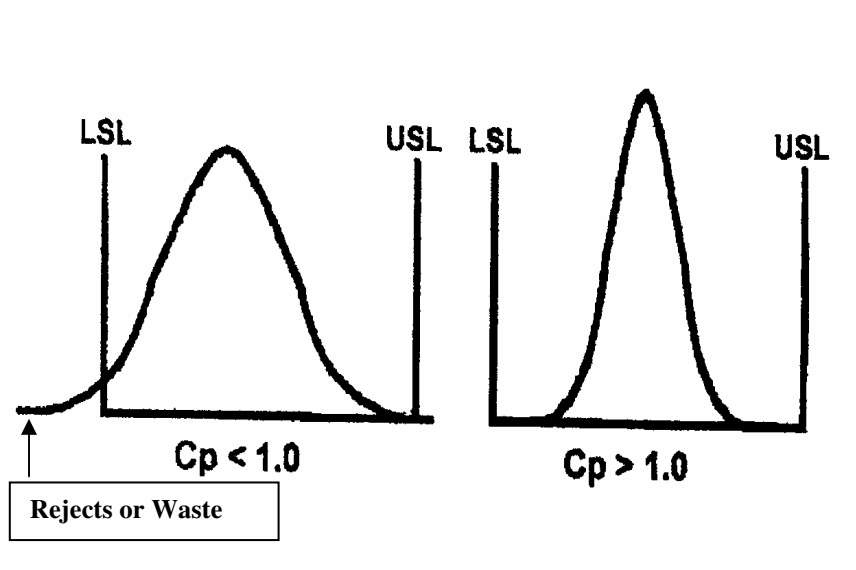
$$Cpk = \frac{USL - Avg}{3 \times SD} \qquad \frac{Avg - LSL}{3 \times SD}$$

Where USL=Upper Spec Limit
LSL=Lower Spec Limit
SD= sample standard deviation (σn^{-1})
Avg= sample average

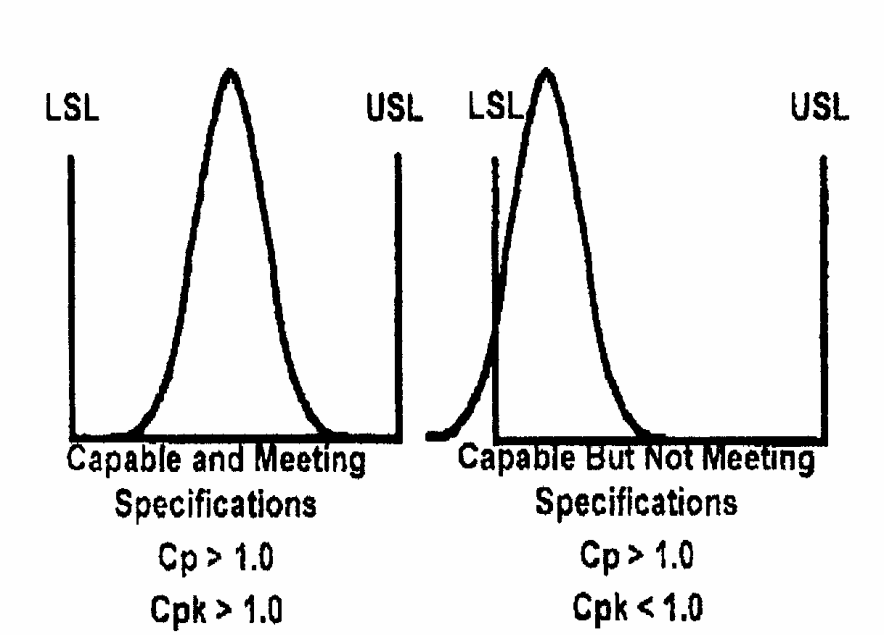


Frequency Distribution showing a Process Capability ($C_{p.}$) of 1

Unfortunately another calculation is required known as Cpk which takes the mean or average result into account. The following graphs aptly demonstrate this:



Graphs showing Capability Variation



Process Capability Graphs showing Capability within Specification

I have had experience of a supplier adding up all his measurements, taking the average and then boldly stating that he has met the specification! This brings us to the final comment.

Final Comment

To achieve the best out of the plant the materials or components must be consistently correct. The specifications should be agreed with the supplier and signed off – perhaps using a Certificate of Conformance – this should be done at least annually. It is the suppliers' responsibility to meet this specification as it is with the manufacturer to meet specifications for the final product!

The best way of achieving this is to introduce 'Exception Reporting' with a points system relating to the severity of fault. The exception report will be instigated by the operator and followed through with the supplier by Quality AND the Buyer who if not directly involved should be aware. Audits are then carried out with suppliers as to their performance and at the end of the year a certificate can be awarded to the 'Supplier of the Year'. Suppliers take great pride in being awarded with these.

At the end of the day never forget the significance of materials in achieving better efficiencies. Also having received them on site, ensure that they are stored in the right conditions in a clean place and do not hold them for too long!

Next month the article will be on People.