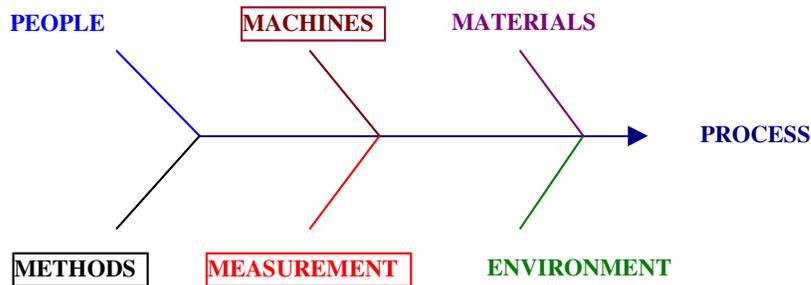
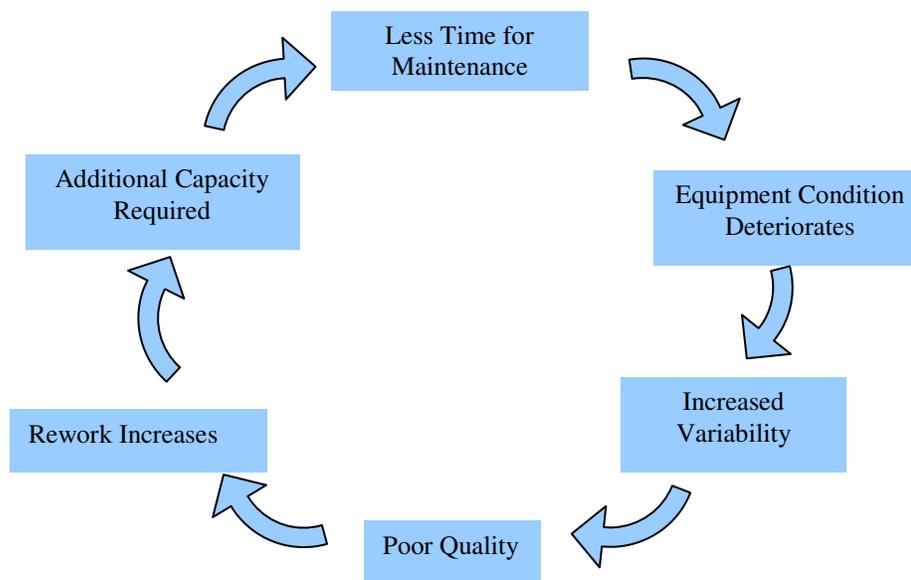


## Efficiency – Maintenance

This month maintenance is the theme:



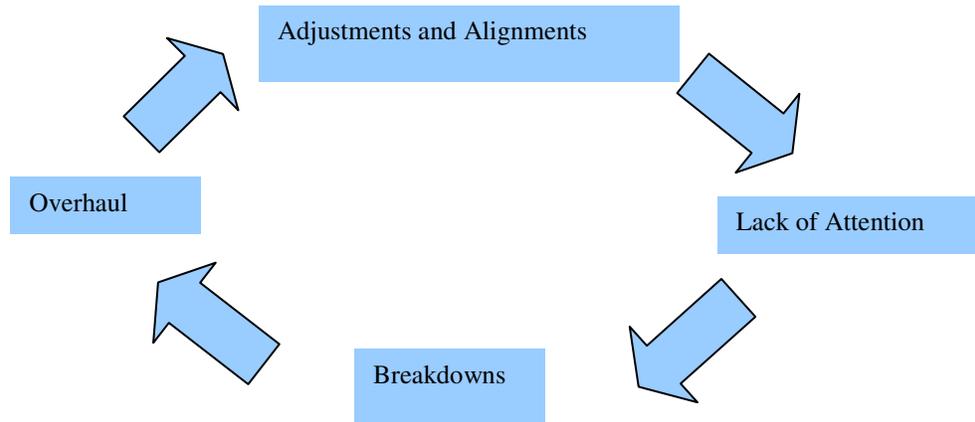
Maintenance is not the ‘sexy’ part of packaging, which is why perhaps it never receives enough attention. If a packaging line is under pressure, that maintenance slot is lost, and if this becomes a habit, the line performance becomes worse, confidence in the plant reduces, and morale is low. It becomes a vicious circle.



The above demonstrates this dilemma well, and although it is not a position we like to find ourselves in, I suggest that there is not one reader who cannot identify with that situation. How can this be overcome?

Let us assume that you are in this situation. Before you can do anything, it is important that you **know** your equipment. Machines are inclined to move in a cycle. When they are new or overhauled there is the teething phase – adjustments, alignments have to be made. The machine at this stage is receiving a lot of attention and will settle down. At this stage interests wane because another machine has become a problem, and many of the ‘learnings’ that have been made about the machine are forgotten. Planned maintenance schedules have probably been prepared but only 25 to 50% of these have been carried

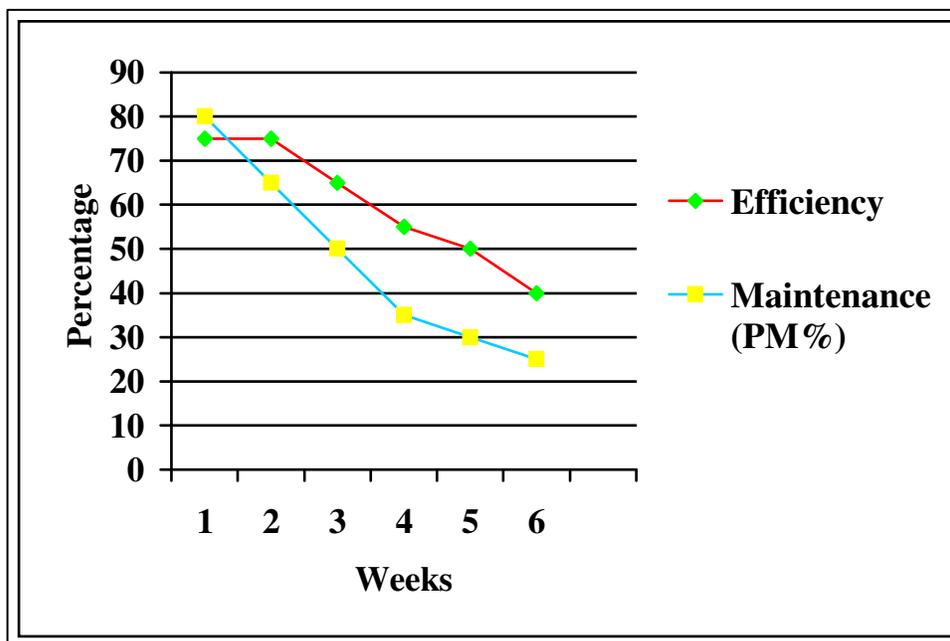
out. The machine then starts to become unreliable again and major work is required once more.



This raises the question about planned maintenance. If the schedules are not adhered to the maintenance system is discredited and, indeed, the critical work may have been missed. The key to this is to know your machine and to look after it; if it is ignored the following will happen:

- Unplanned Downtime
- Catastrophic failures
- Collateral equipment damage
- Product quality suffers
- Every day is a surprise!!

Efficiencies also tend to follow the planned maintenance trend as the following graph illustrates:



So how do you start to bring yourself on track? Initially there must be a clear maintenance policy and it needs to be adhered to and measured. For example, as illustrated above, planned maintenance compliance is as important as line efficiency, as one will directly effect the other. Therefore, both should be reported together. The policy should include:

- Maintenance Approach
- Capability/Skills required to carry out work
- Resources – use of contract, own skill limitation etc
- Support – tools, spares, planning etc
- Training and Development

A lot of this work will hinge on knowing your equipment as already stated. So what does this entail?

*Firstly*, a gathering of equipment history. Hopefully this is available – if not – this must also be addressed and data built up from existing knowledge, and this then updated as the facts emerge – use every available source of information including the manufacturers! The historical data needs to be sub-divided into two categories:

- Repetitive failures
- Major stoppages

Each will require a different approach and indeed may lead to machine modification in some cases. Modifications should not be entered into lightly. They are often felt to be the fun bit of maintenance and can go badly wrong. Any changes should receive as much attention as any project and be properly planned. Plan – Do – Check – Act. The data gathered will help to build up a sensible preventative maintenance plan and indeed change what is already in existence. The use of a **CMMS** (Computerised Management System) is recommended.

*Secondly*, the involvement of the operator through activities like **TPM** (Total Productive Maintenance). It is important that there is **ownership**. Sadly this has been lost through operators now being flexible. I am suggesting that they should still be flexible but, at the same time, maintain an interest in one piece of equipment. TPM is an important factor in this as it provides a good systematic approach to understanding the machine and it involves people. There is clearly not enough space to describe the process here, but suffice to say that the process is designed to maximise the overall equipment effectiveness. This is done by establishing and sustaining the optimal relationship between people and their equipment. The objective is to eliminate the **six losses** as follows:

1. Breakdowns
2. Excessive set-ups and adjustments
3. Idling and minor stops
4. Reduced Speed

5. Reduced Yield through defects
6. Start Up losses

The next stage is to go through the three cycles; the Measurement Cycle (historical and present performance), the Condition Cycle (assess and plan) and the Problem Prevention Cycle (develop and install). **Overall Equipment Effectiveness (OEE)** is defined as the multiple of three factors; Availability (losses 1&2), Performance (losses 3&4) and Quality (losses 5&6).

So  $OEE = \text{Availability}\% \times \text{Performance}\% \times \text{Quality}\%$

*Thirdly*, it is important that materials fed to the machine are consistent and that the operator follows work instructions. This really does not need explanation and is well covered in my previous articles on materials and people.

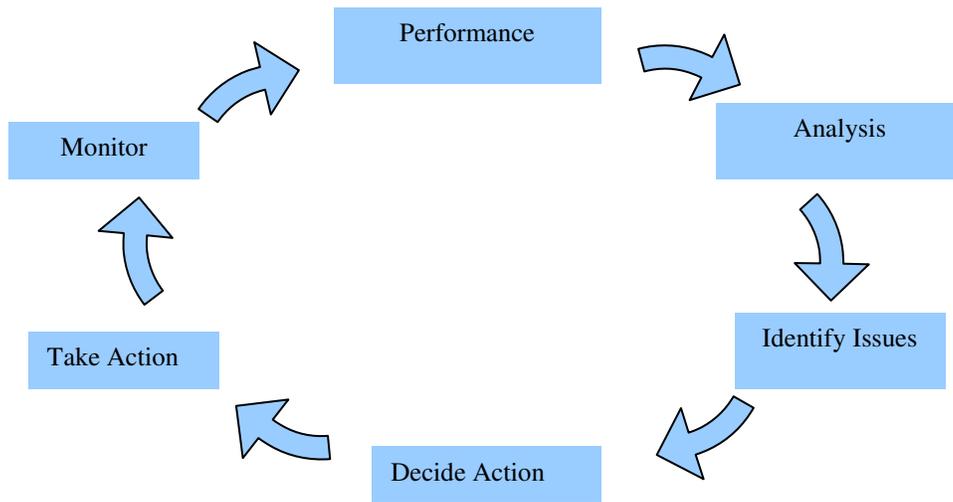
Another vital factor is the cleanliness of the machine in an uncluttered workplace, and the Japanese approach to this is perhaps the best. It is known as the 5 'S's and this will be explained in the next article, which is about changeovers.

This article would be unfinished if RCM (Reliability Centred Maintenance) was not mentioned. It provides another approach to putting together a maintenance plan and is very focussed on the equipment operation and the possible consequent failures. The approach is not unlike the FMEA (Failure Mode and Effect Analysis) which follows through every detail. It is a top down approach should come up with a sensible maintenance strategy, which is technically feasible and economically justified. However it takes a lot of resource and is time consuming. Within this strategy condition monitoring may be considered. This would include vibration analysis (pumps and shafts), oil analysis (particles, lubricant breakdown,, water) and infrared(IR) thermography (contacts in panels). This is expensive so needs to be very precise if used.

Finally, if you get it right it is very rewarding. The following are the positive indicators:

- Operator and technician ownership and productivity
- Work is known and measurable
- Reduced overtime requirements
- Effective budgeting
- Better and more focussed overhauls
- Increased uptime/higher efficiencies
- Increased capacity
- Higher morale!

The ownership or improvement cycle should look something like this:



A much healthier state to be in!