What can the TPM Best Practice bring to the Operational Excellence Table?

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In January we published a schedule of forthcoming articles (view issue 1) around the topic of TPM with the purpose of equipping the reader to...

- Gain a better appreciation that TPM is often a fundamental foundation of Operational Excellence and as such, is a key enabler to deliver the principles underpinning your own Company’s vision and aspirations or for example-the Shingo model.

- Be better able to assimilate the likely resource commitments of People, Money and Time of running an in-house TPM Program & how to prepare a compelling Cost / Benefit business case

**January - Overview & Scene setting.** The Changing Perceptions of Maintenance including a [10 pt Assessment as an ‘honesty’ check exercise](#) of ‘Where are you now with your Maintenance delivery?’

**February - What can TPM Best Practice bring to the Operational Excellence table? Plus dispelling some of the Myths and Realities around TPM**

- Is TPM a hidden Agenda.....?
- Is an OEE of 85% ‘World Class’?
- Explaining the OEE from the Operator’s perspective

1.0 What can the TPM Best Practice bring to the Operational Excellence Table?

Let us first take a look of what Maintenance can bring to the Operational Excellence Goals

Firstly, Operational Excellence impact on the Maintenance Function and Its Delivery:

- Traditional manufacturing (in theory) made it easier to release equipment for maintenance
- However, Lean Manufacturing requires equipment to be available on demand -so the successful adoption of Lean will lead to the revision of the traditional maintenance process
- The Maintenance function needs to implement plans to integrate and evolve its methods to meet the new demands placed on it by the Operational Excellence goals
- Operational Excellence can help the Maintenance Department to deliver improved performance, lasting change and raise the profile of Maintenance as a value adding function rather than an overhead/cost.

As such, Maintenance practices must change & respond to meet the challenge of Operational Excellence as illustrated in figure 1 below
The Operational Excellence Model and practice recognizes there are three main categories of work as follows:

- **Value adding activities** (Activities which, in the eyes of the customer make a product or service of value). The Maintenance Response needs to be directed at stabilising and extending component life by controlling contamination and causes of human error.

- **Non value adding activities** (Activities which do not provide product or service features which the customer uses. This includes the 7 classic wastes.) The Maintenance Response needs to promote Focussed Improvement to analyse and remove unnecessary PM’s, waiting time, and other equipment based wastes.

- **Necessary non value adding activities** (Non value adding activities which are difficult to remove but are essential to the running of the operation). The Maintenance Response needs to engage Operators in routine, front line Asset Care and early problem detection. Also to improve ease of inspection and reduce time to repair.

Let us now consider the Impact of Maintenance on Operational Excellence in terms of those same three categories of work as illustrated here in Figure 2.
• **Value adding activities** — Activities which, in the eyes of the customer, add value to the product or service.

• **Non value adding activities** — Activities which do not provide product or service features which the customer uses. This includes the 7 classic wastes.

• **Necessary non value adding activities** — Activities which are difficult to remove but are essential to the running of the operation.

**Figure 2- Maintenance Impact on OE**

- **Value adding activities**—The Maintenance Response needs to define how it can contribute to Improve Quality, Cost and Delivery Capability

- **Non value adding activities**—The Maintenance Response needs to focus on Stabilising Process Performance

- **Necessary non value adding activities**—The Maintenance Response here concentrates on how to Optimise Process Performance

The **Key Message** to recognise in all this is that Operational Excellence and Maintenance are both Essential and Tied Partners

**Maintenance must improve** its ability to improve the value adding capability by delivering:

- Stabilised process/equipment performance to reduce unplanned events and waste
- Optimised performance to reduce quality defects, cost and delivery lead times
Operational Excellence can help Maintenance by the application of its proven tools and techniques to target the reduction of waste and non-value added maintenance activities by:-

- Stabilising and extending component life through controlling contamination and minimising human error
- Analysing and removing unnecessary maintenance procedures,
- Developing standard countermeasures to common problems
- Reducing the time to respond and repair
- Engaging operators in front line Asset Care
- Improving ease of inspection and early problem detection.

So in summary, the Maintenance Leadership Team needs to redefine their traditional thinking to one of aligning effective Maintenance to the Operational Excellence Agenda, and then present it to its customer (Production / Operations) as an essential ‘Partnership for Change’

There is no question in our minds that if you think through the above two requirements thoroughly, then there is a good chance that the ‘I operate you fix ‘mentality and the implied ‘I add value, you cost money’ perception will be consigned to history books once and for all!

2.0 Dispelling two of the common myths surrounding TPM

- Is TPM just a hidden agenda to get Operators to do the Maintainer’s Job?
- Is an OEE of 85% ‘world Class’?

2.1 Is TPM really just a hidden agenda .....?

The whole philosophy around TPM is centered on Teamwork between the Operator and the Maintenance Technician by taking shared responsibility for the health and reliability of their Equipment Assets

So we need to view and consider both roles together in order to define who does what-and hence the why, when and how?

I encourage the analogy that healthy equipment is just like a healthy body. In this scenario the Operator is the Nurse of the Asset (the patient) and the Technician is the Doctor (and occasionally the Surgeon in an emergency)
One way of describing the TPM Journey and the way in which a Maintenance Technician’s use of time and skill sets are progressively developed more productively, is to use figure 3 below:

**Figure 3—Maintenance Activity Profile**

Experience shows that before adopting the TPM philosophy, a Maintainer’s time and effort is typically spent as 50% Breakdown / Reactive, plus 30% Planned Maintenance /fixed interval, plus 10% Condition based /Predictive, and only the final 10% as Proactive / Design out.

By adopting the TPM ‘ways of working’ this use of time profile progressively develops to a more ‘value adding’ / productive role—typically over 3 years—to one of only 10% Breakdown / Reactive, plus 15% Planned Maintenance /fixed interval, plus 50% Condition based /Predictive, and the final 25% as Proactive / Design out.

The figures are relative rather than absolute—but in both cases add up to a 100%.

The biggest changes are:

- Breakdowns become a rarity, because of the ‘100 year fix’ mentality - to not only solve - but also to prevent re-occurrence of the issue by using 5 why’s, FMEA and A3 Problem solving tools.
- PM’s have halved—Why? Because improved reliability means we can both extend the interval between PM’s and take out unnecessary PM routines.
- Why?—because they have shifted to a condition-based / inspection routine regime (including selective use of Thermography, Vibration monitoring and Oil debris analysis tools) –but also recognising that the Operator is the best condition monitor ever invented using their God-given senses of look, listen, feel, hear and touch via the Front Line Operator Asset Care checks (Autonomous Maintenance) that they have developed. —where the Maintenance Technician now becomes the ‘teacher’ of the way to do the checks - and the Operator the ‘pupil’. As such Maintenance Technicians train and encourage the
Operators to become ‘Equipment Conscious’ to improve their understanding of the typical Front Line Operator Asset Checks (FLOAC)

- This means that 25% of the Maintenance Technician’s time can now be devoted to designing out the equipment weaknesses as the ‘Engineer’ he was indentured for - rather than the ‘quick-fix’ person he had become, by having a ‘knee-jerk’ reaction to respond to the next ‘nasty surprise’ breakdown!

When I explain this I ask the rhetorical question – ‘where would you prefer to use your skills?’ - not in an arrogant way, but by showing some empathy for their current daily hassle and miss-use of their capabilities

There’s a lot more detail of course – but this is the essence, and it’s worth reminding ourselves also to stress 3 factors about those Front Line Operator Checks…..

a) they probably don’t get done by anyone at the moment (so it’s not a hidden agenda to get the Operator to do the Maintainer’s job) and ....

b) they do not involve using any spanners, screwdrivers - far less voltmeters!

c) they are developed with both the Operator and the Maintenance Technician – Who also helps train the Operators to do carry them out via Single Point Lessons and Standard Work

So it can stated with some conviction that adopting the TPM philosophy enhances - rather than dilutes- the skill sets of both the Operator and Maintainer

2.2- Six Myths about Overall Equipment Effectiveness (OEE)

We find there are a number of misconceptions, miss-understanding, interpretation and hence how to apply and use OEE as a key performance indicator of the true productivity of our physical manufacturing assets and production processes

Before exploring these myths it is perhaps worthwhile getting the perspective of an Operator of what the OEE is all about.

Video: A Day in the life of an Operator Video, to support the OEE points
Myth No 1 - An Overall Equipment Effectiveness level of 85% is ‘World Class’

It certainly is not if you are running, say, a flour mill or an off-shore oil platform! In this case if you’re not hitting 90% + OEE then you’ll soon be out of business. We didn’t let the Japanese finish off the sentence of what they told us 25+ years ago –and that is that “85% is World Class.......(we then rushed out of the room, before they added).... for a typical Machining Centre that has a significant number of Changeovers”

So, 85% Is No Golden Goal!

It is necessary to look inside the OEE and determine so say World Class levels of Availability (uptime), Performance Rate when Running and Quality Rate Produced, Then multiply the 3x metrics to determine your World Class target OEE.

Depending on your industry, the result might be:

- Packing Line  
  80% x 96% x 97% = 75%
- Flour Mill  
  98% x 99% x 99% = 96%
- Bottling Plant  
  85% x 98% x 96% = 80%
- Machining Centre  
  90% x 96% x 99% = 85%

What can a Lean Maintenance / TPM driven approach deliver in improved Overall Equipment Effectiveness?

Some Examples are:-

<table>
<thead>
<tr>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Plant</td>
<td>74%</td>
</tr>
<tr>
<td>• White Goods</td>
<td>79%</td>
</tr>
<tr>
<td>• Automotive</td>
<td>48%</td>
</tr>
<tr>
<td>• Flour Mill</td>
<td>86%</td>
</tr>
<tr>
<td>• Chemical Plant</td>
<td>82%</td>
</tr>
<tr>
<td>• Filling Line(1)</td>
<td>55%</td>
</tr>
<tr>
<td>• Filling Line(2)</td>
<td>68%</td>
</tr>
<tr>
<td>• Packaging Line(1)</td>
<td>66%</td>
</tr>
<tr>
<td>• Packaging Line(2)</td>
<td>50%</td>
</tr>
</tbody>
</table>

Myth No 2 - OEE is a Management tool to use as a benchmark and comparator-

This misses the point of the OEE being a Manufacturing Floor problem solving tool. If however, ‘Corporate’ insists on benchmarking, then beware of not comparing like with like, and not just ‘apples with apples’ But ‘Bramleys with Bramleys’!

Also 5 x questions to answer...

- What is the impact of the number and variety of product changeovers?
- Who sets the standards for performance rates when running? (Production Planning; Equipment Supplier or Engineering?)
• How big an impact does manning levels and skill levels have on cycle time?
• Are all minor stoppages recorded?
• Are we measuring all aspects of quality including packaging materials?

Myth No 3 – OEE should be calculated automatically by computer
The computation approach is far less important than the interpretation. Whilst initially calculating manually or inputting manually you can be asking ‘why? x 5 times’. Once you’ve proven the manual measurement process-then mechanise it.

Myth No 4-OEE on non-bottleneck equipment is unimportant
OEE provides a route to guide problem solving. The main requirement is for an objective measure of hidden losses even on equipment elsewhere in the chain especially if it is generating controllable waste or non-value adding.

Myth No 5-We don’t need any more output, so why raise the OEE?
Management’s job is to maximise the value generated from the Company’s assets. This includes business development. Accepting a low OEE defies commercial common-sense. If you are able to increase the OEE from say 60% to 80% by tackling the relevant 6x Losses, you will have increased the productive capacity of that asset by 33%-which means you can produce the same output in 2/3rds of the current time-or make 33% more in the same time. Either way it gives you a choice of flexibility at 80% OEE that you do not enjoy at 60%

Myth No 6-OEE is not useful because it doesn’t consider planned utilisation losses and, for example labour co-ordination / diversion losses and material supply starvation losses
The OEE is one measure, but not the only one used. Others will include productivity, cost, quality, delivery, safety, morale and environment. Often these ‘Door to Door’ or ‘Management ‘losses (as opposed to equipment based Manufacturing team ‘Floor to Floor’ losses) are vitally important.

There is no ‘one size fits all’ approach to OEE. The trick is to adapt OEE to your business (as opposed to blindly adopting it in the classic sense) What you must not do however is corrupt it, so it becomes unrecognisable and doesn’t point you at the problems & hence opportunities

2.3 Recognising the Different Production Characteristics

It’s important to recognise the different industry characteristics between for example, Process, Manufacturing, Packaging, Utilities, Warehousing, especially (but not exclusively) in terms of:

• OEE Measurement
• Operator Impact on Performance
• Maintainer Impact on Performance
• 5S Work place Organisation
• Changeovers
The figure below highlights these differences and it is really important to recognise them at the outset, otherwise confusion and a ‘one size fits all’ mind-set will result in unrealistic expectations and unrealised potential.

The reference to ECRS in the figure is the challenge when –having process mapped the current state –the Team scrutinize each activity and say which of these process steps can we

- Eliminate
- Combine
- Replace or
- Simplify

…..and then Standardize as part of our future state

<table>
<thead>
<tr>
<th>Type of Facility</th>
<th>OEE Measure</th>
<th>Operator Impact</th>
<th>Maintainer Impact</th>
<th>SS-WPO</th>
<th>Change overs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Process/Bulk Manufacturing</td>
<td>Campaign or Batch OEE or a Fixed Repeating Schedule</td>
<td>Significant</td>
<td>Major</td>
<td>Significant (contamination control)</td>
<td>Significant + Cleaning In Process using ECRS</td>
</tr>
<tr>
<td>Classic Manufacturing</td>
<td>Running Clock OEE</td>
<td>Major</td>
<td>Major</td>
<td>Major (to create Flow)</td>
<td>Major</td>
</tr>
<tr>
<td>Packaging</td>
<td>Running Clock OEE</td>
<td>Major</td>
<td>Major</td>
<td>Major (to create Flow)</td>
<td>Major</td>
</tr>
<tr>
<td>Utilities</td>
<td>Relevance of OEE??</td>
<td>Very Little</td>
<td>Major</td>
<td>‘Housekeeping’ Eng ‘Pride’</td>
<td>N/A?</td>
</tr>
<tr>
<td>Warehousing</td>
<td>Running Clock OEE</td>
<td>Major</td>
<td>Major</td>
<td>Major (to create Flow)</td>
<td>Pre-Kitting ECRS</td>
</tr>
</tbody>
</table>

Figure 4 Recognising the Differences

In our March article we will be exploring how to Deliver a Sustainable TPM program starting with the Purpose of why we are considering the TPM tool as part of our Operational Excellence journey. This will include the front-end Scoping Study and how to go about securing Management Commitment. Plus how to prepare a compelling Business case. The article will also include a 28 perceptions exercise you can use to gauge the ‘readiness’ cultural temperature