Case Study: Total Productive Maintenance

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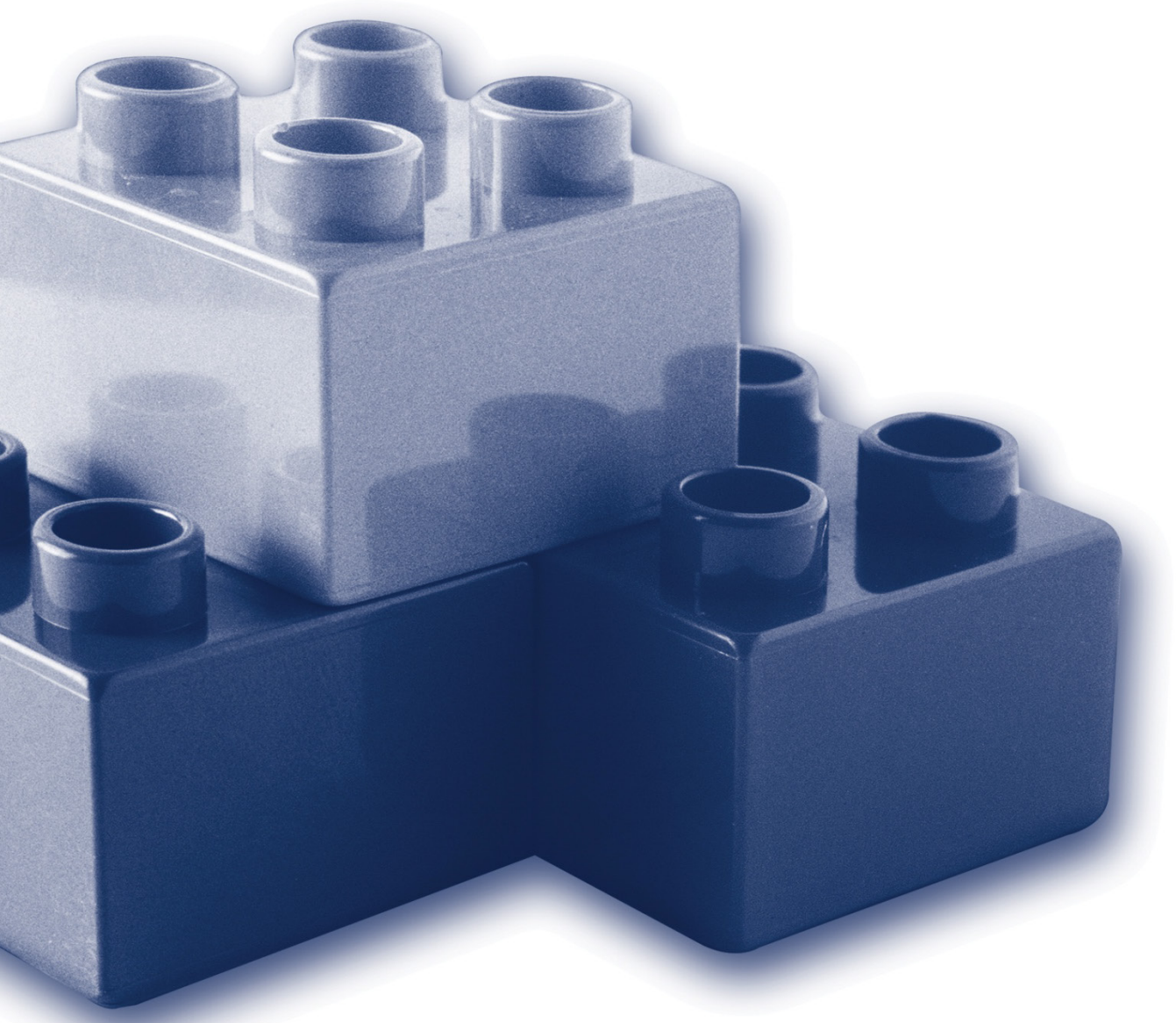
Process Consulting and Management



Leading through Continuous Improvement©

Case Study: Total Productive Maintenance (TPM)

Background

A high volume furniture manufacturer was experiencing a growth in volume and was looking to maximise on the increase in sales. Initial investigations by the manufacturer showed the extra volume would require additional shifts coupled with a consequential management cost increase. The key requirement of any improvement program was to increase volume whilst reducing the cost base.

Through discussions with Zentec, TPM was identified as a process that could deliver a significant productivity rise, skill uplift and an increase in communication between Maintenance and Operators. TPM is not a Maintenance Department based task rather it is about the maintenance and improvement of a process.

Through the training and coaching the skill uplift for all the people involved was to enable a continued roll-out of the TPM process across the site.

The five aspects to TPM are as follows:

Training

Each participant in a TPM process must understand all the elements of the process and how it will be applied.

As the TPM process unfolds, training takes place to lift technical skills for the team with operators becoming a little more technical with maintenance technicians honing their specialist skills.

Equipment Improvement

A performance baseline needs to be established to understand the process start point.

A deep clean and tag process begins to restore the equipment to its design specification. Any defects in the equipment need to be addressed with urgency.

As the repairs are made, attention moves to the Six Big Losses that can be addressed under the banner of OEE where the focus is on Availability, Productivity and Quality.

Key metrics for the maintenance team are established to cover 'mean time between failure' MTBF and 'mean time to repair' MTTR. These metrics are a key measure for the maintenance team performance related to the onsite process.

Autonomous Maintenance

Operator ownership of equipment is an essential part of TPM and it is from the Preventative Maintenance(PM) work that the schedule of autonomous maintenance tasks are built up.

Aspects of 5S, Work Standards and visual control are an important part of the operators actions too. The hand-over of tasks to the autonomous maintenance schedule from the PM task list must be done with a clear risk assessment and proper documented training.

Preventative Maintenance

Preventative Maintenance seeks to cover both Planned and Predictive Maintenance.

Planned maintenance is based on a schedule whereas Predictive maintenance is condition based through analysis with normal Non Destructive Testing (NDT). Acoustic testing, Vibration testing, oil analysis and thermal imaging are all examples of NDT techniques that can be utilised

Adherence to the manufacturers service schedules through Planned Maintenance will bring immediate benefits as many failures can be attributed to its absence.

Maintenance Prevention

Utilising modern materials and redesigning processes can deliver an improvement where maintenance is no longer required.

As appropriate tasks are transferred from the maintenance department to the operations team, under autonomous maintenance, which will free up time in the long term. This time needs to be allocated to necessary skill increases, new process introduction and enhancement of the current processes to increase the reliability of those processes. This allows the maintenance team to engineer solutions to identified problems

Engagement Objective

Zentec were selected and engaged by the manufacturer to train and embed TPM into the culture of the business to allow the sales volume increase to be met at a lower cost per unit.

Training

The first step in project was to deliver a suite of training modules to all the participants and sponsors of the TPM project.

The initial training was classroom based to allow a range of personnel, from the production director to operator, to fully understand the TPM process as an overview and in its constituent parts.

Without training a suite of Lean tools, with TPM as the final module, then the remaining period of engagement would have been impossible.

Clear communication of what the TPM process entails, the expectations of the program and clarification of roles is paramount to it's success.

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Diagnosis

Good data is key to a successful project of any kind and this TPM process is no exception. The data acquisition process was developed with the team and became quickly established as an essential operational feedback tool. Once the gathered data was fed in to the Overall Equipment Effectiveness (OEE) model, the key indicators were examined for improvement opportunities.

From the OEE model we established baselines for each of the Six Big Losses; breakdowns, changeovers, minor stops, speed losses, defects and start-up losses. From the baseline data it was possible to determine which of the losses required urgent attention.

Throughout the established TPM review meetings the focus was on the worst performing aspect of the Six Big Losses. At times this meant programmes for Quick Changeover (SMED) were the focus and at other times it was Breakdown Diagnosis with root cause analysis..

OEE was calculated at 45% at the beginning of this process as the baseline from which we were working.

Deep Clean

In parallel to the OEE data gathering, the team performed a deep clean of the process line with the purpose of restoring the line to its original condition. All defects were recorded and tagged before a plan was developed to clear all outstanding issues in a given timescale.

Leaking pipes, broken fastening and loose fittings were all quickly dealt with.

Team Meetings

Regular meetings regarding the metrics were established that reviewed the performance on a daily and weekly basis. These meetings gave a forum for open discussion regarding process performance. All possible options for improvements were explored and a plan made to implement those solutions in a timely manner.

Task Transfer

The maintenance team were tasked with identifying all Planned Maintenance tasks associated with the line based on the manufacturers recommendations for the equipment. Each of which were assessed to determine if it could be transferred to an operator. If this were the case then an appropriate Standard Operating Procedure was written. In preparation for subsequent training.

A competency matrix was prepared for the training phase that would ensure all operators carried out tasks safely as tasks were transferred from maintenance to operations.

Results

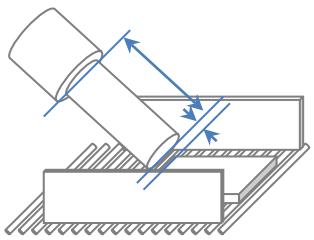
Equipment Improvement - OEE

All of the Six Big Losses were plotted and the trends for each were analysed. With complete detail of the process performance it was easier for the team to understand where the focus of effort needed to be.

Speed Loss is usually the least recognised of all the Losses and is not necessarily the easiest to calculate. Time spent understanding what the true process capability, when all of its component parts are running at an optimum, is time well spent in setting a target performance level. In this case study, the machinery was running at a lower rate then its design speed. On further investigation we identified a small component of the system that was travelling further than it needed to during each cycle of production. Reengineering the operation of this components to suit the product allowed a break through of a constraint that, in an instant, lifted the output by 5%.

In another part of the process the whole production line would stop for the purposes of a 2 minute quality check. Due to the work carried out in the TPM process there was little variation and rare instances of error. Stopping the line made no sense and a decision was made to continue to run the product whist the quality check took place. The risks of defects were very low and the lost minutes were fed back into the process resulting in a further 4% of increased productivity.

Reengineering the operation of the components gave an immediate uplift in productivity



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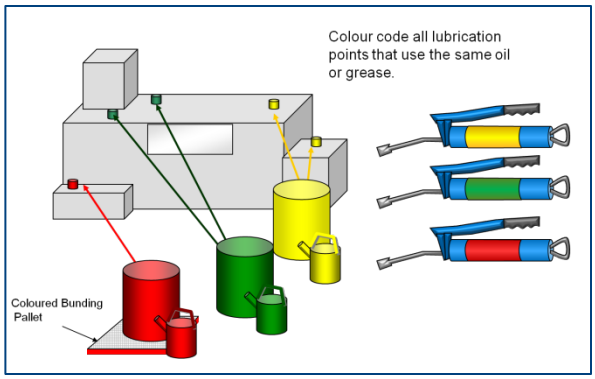
Autonomous Maintenance

Many tasks were identified, documented and transferred to the operator team. This fostered a greater understanding of the machine operation by the operators and instilled a sense of ownership.

Lubrication checks were quickly established based on manufacturer recommendations and adjusted based on usage and history. These lubrication and greasing activities were included as part of the 5S process.



Preventative Maintenance

Based on the manufacturers service schedules all necessary overhauls were planned into the PM schedule and monitored for compliance. Some were passed to operators under the Autonomous Maintenance heading and others were kept within the maintenance team.

By handing over some of the easier tasks to operators, it allowed technicians the time to use more advance techniques to reduce the frequency to lubricate and adjust.

Thermal imaging was used to extensively on motors and circuits with other Non Destructive Testing (NDT) such as crack detection used on various items of equipment.

Some aspects of Statistic Process Control were also introduced to improve the adherence to size. The link to TPM here is to check when tooling needs to be replaced based on given parameters that the team established.

Maintenance Prevention

One aspect of TPM that often gets overlooked is that of Maintenance Prevention. If it does not leak, spill or otherwise create a defect then there is no requirement to repair the defect. As is often said, 'Prevention is better then cure'

Caution must be exercised when dealing with any Automatic Greasing/Lubrication systems. This type of labour saving equipment can fail and if there is no regular visual check then an acute issue with the equipment may result.

Conclusion

The value of a well executed TPM program is significant and has many benefits.

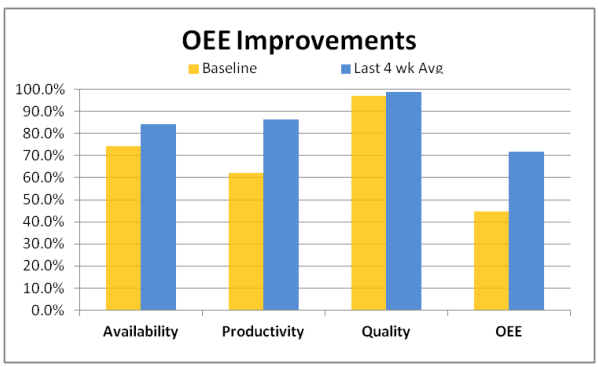
Communication has a major part to play in the success of the program but this also becomes a lasting benefit. The maintenance teams and the operators are able to respect the role of each other and the program brings them into closer contact. This ongoing cooperation is a lasting benefit of TPM

A clear understanding of problem solving at a root cause level is developed throughout the program. Any symptomatic solutions were soon identified and discarded to allow a countermeasure of the real, root cause, issue. This type of behaviour was fostered through the program and survives beyond it.

The ability of the teams in operations and maintenance to analyse data through Pareto and run charts was a major step forwards. 'Speaking with data' became a key philosophy for all.

The major numerical gain was through the equipment improvement activities which delivered an uplift from 45% to over 70% OEE. This increase allowed a night shift to be removed and additional capacity to be provided for other products.

Each of the component parts of OEE saw and uplift in performance. Availability , Productivity and Quality all made significant improvements from the baseline checks to deliver the OEE gain.



Next Steps

The TPM process for this client became one which they utilised across all of their operations delivering savings through each one.

Different people from the original team were invited to lead other TPM programs which helped to reinforce their understanding.

Total Productive Maintenance and Lean Training

Contact Zentec Limited to find out
what you can do with TPM in your facility.

Find us on the web or call us.
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