Operator Maintenance or Autonomous Maintenance

Malcolm Jones

When Productivity, Inc. came across the work of the Japan Institute of Plant Maintenance (JIPM), developers of total productive maintenance (TPM), as part of our research into Japanese manufacturing practices in the 1980's, we encountered the same problem as with other systems: how do we teach this to people in the West?

When we first published the work of Shigeo Shingo on single-minute exchange of die (SMED), we came across the same issue: manufacturers saying, "That's fine in theory, but how do we do it in practice?" This led to our development of practical SMED workshops: a little theory and then extensive application on a pilot project. We then applied the same approach to lean flow – developing the Kaizen Blitz with Mr. Iwata and his group of ex-Toyota supplier development engineers.

TPM has two fundamental additions to our current approaches to maintenance management: OEE analysis and autonomous maintenance (AM). Our approach was therefore to take OEE and AM and develop a Kaizen event, which we rather grandiosely called "A Maintenance Miracle." More than twenty years on, we are still running these events as a way of learning about TPM.

Over those twenty years we have seen autonomous maintenance anglicised as "operator maintenance," but there is an important difference. Operator maintenance is largely the transfer of basic maintenance tasks to operators; autonomous maintenance is the improvement process we take people through on the "Maintenance Miracle," a process of restoring, improving, and maintaining equipment. If all we do is the third step, maintaining, then we have lost a major part of the process.

Operator maintenance is largely the transfer of basic maintenance tasks to operators; autonomous maintenance is the improvement process we take people through on the "Maintenance Miracle," a process of restoring, improving, and maintaining equipment.

The AM process is also important for learning. Once a team have inspected a piece of equipment in exhaustive detail, restored all its functions, and improved some further, they develop an understanding of the machine's functions, which enables them to operate and maintain it at its optimum condition. Personally, I am a great admirer of Professor Fujimoto's analysis of the Toyota Production System, which focuses on TPS as a "learning system." TPM, and AM in particular, can also be seen as learning systems, and learning generates improvement.

So what is the AM process? In the original translation from the Japanese, the first three steps are given as:

1. **Initial cleaning and inspection**
2. **Elimination of contamination and inaccessible areas**
3. **Establishment of provisional maintenance standards**

I prefer to call these restore, improve, and maintain. There are of course seven steps of AM in all the textbooks, but the first three are the fundamental processes, to which we might want to add visual management of maintenance standards, both on the equipment and on activity boards.

Step One – Restore. This step involves a team from production, maintenance, and engineering, most definitely including the equipment operators, in a comprehensive "deep clean," inspection, and restoration of a piece of equipment. The key to this activity is the recording and correction of every single abnormality with the equipment: every loose fastener, bent guard, damaged piece of insulation, leaking connector, and instance of dirt or grease. Often this is done by "tagging" the machine, giving the well-known "Christmas Tree" effect of a machine covered in tags. Personally, I am not an ardent advocator of tags, except during training exercises, as they themselves deteriorate quickly and are only an outward sign of the process. The important point is that abnormalities enter the work list and are corrected in a timely manner. For minor defects this means during the exercise and for more major work, or work that requires new parts or special skills, I tend to use an eight-week plan as a goal for completion.

Step Two – Improve. In this step we look for areas that are the source of the contamination that we spent step one removing from the equipment, and we try to prevent them from causing more contamination. We do this by developing guards and devices to contain and remove the contamination from the machine. We also look for areas where we had problems gaining access to clean, or areas where operating the equipment involves awkward movement by the operators. We then try to make modifications to eliminate these problems.

Step Three – Maintain. In this step we develop a provisional standard based partly on the current maintenance plan, but mainly on our experience in restoring the equipment. The question to ask is, "What maintenance activities would have prevented all this deterioration from happening in the first place?" It is a provisional standard because, as with all

The first three steps of the AM process:
Step 1 - Initial cleaning and inspection (top)
Step 2 - Elimination of contamination and inaccessible areas. "Cardboard engineering" (far left)
Step 3 - Establishment of provisional maintenance standards. Visual lubrication (left)

Kaizen activities, we go through a plan, do, check, act cycle where we not only make improvements, but also check how well they are working and modify as required.

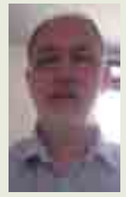
We will then use visual management to secure this maintenance standard. My favorite method is having a numbered inspection route around the equipment, with each inspection point being visualised in terms of max/min levels on sight glasses, gauge markings, valve markings, and even match marks on critical fasteners and thermal labels on bearings.

There is an important link between OEE and AM. OEE measures and analyses the availability, performance, and quality of equipment. Availability losses are due to changeovers or breakdowns. Performance losses are due to reduced speed or minor stoppages. Although TPM analyses show 6, 7, 8 or even 16 losses, depending on which model is used, another categorization of breakdowns and performance losses is more useful for AM.

The majority of breakdowns (around 70%) can be seen as caused by deterioration in equipment functions. The AM concept of accelerated deterioration regards this deterioration as not inevitable–in fact, accelerated deterioration points out that deterioration is normally happening faster than it should because of inadequate maintenance practices. AM aims to eliminate this accelerated deterioration through the restore, improve, and maintain process. Similarly, the majority of performance losses can be traced back to contamination issues, and AM aims to eliminate this contamination, particularly during step two improvements.

My problem with some of the operator maintenance programs I see in my work around the world (North America, Europe, Asia, and Africa) is that they are maintaining equipment in a deteriorated condition, because they have not gone through the hard work of restoring and improving the equipment before establishing the maintenance standard. When this is combined with a lack of proper OEE measurement, we really are working in the dark, utilizing equipment with no true idea of its real capacity and performance.

AM will not solve all your equipment problems, but it can be used to eliminate the deterioration and contamination that is the source of many of them. We can then use all our maintenance technologies to tackle the remaining more complex issues of equipment condition and performance. In this respect, AM is like 5S – it is providing a foundation for more complex improvement activities, and there is no point in performing complex analysis on equipment that is subject to extensive deterioration and contamination. First, we must remove the deterioration and contamination and then assess our baseline performance.



Malcolm Jones founded Productivity Europe Ltd. in partnership with Productivity Inc., USA in 1989. He provides facilitation in lean and TPM for global clients and was involved in the development of TPM programs in a number of large organizations, including Unilever and Diageo. He is currently working on a five-year lean transformation with a global manufacturer with plants in Eastern Europe and the Far East, alongside other smaller projects in the UK and Europe.

The Maintenance Miracle - An Autonomous Maintenance Kaizen Event, November 8-11, 2011. www.productivityinc.com