

6 Ways to Improve Maintenance and Production: Good practices for better performance from production and maintenance

Abstract

6 Ways to Improve Maintenance and Production: Good practices for better performance from production and maintenance. The journey to world-class production performance is a partnership effort from the Engineering, Production and Maintenance groups in an organisation. It requires involving them in improving business quality systems and assuring individual's work quality. Improving Maintenance and Production calls-for setting-up opportunities to work together in teams and to help each person master their duties. Here are six useful improvements you can make in the Maintenance and Operations groups to help them become more successful.

Keywords: maintenance management, work quality control, work quality assurance, equipment reliability, physics of failure, failure prevention, defect elimination,

World-class industrial operations use their maintenance efforts to make their company more competitive. In businesses such as DuPont Chemicals, Toyota of Japan, Meridian Energy in New Zealand, the Maintenance Group is responsible to make the business more successful. When maintenance is tasked to be a business-building function it becomes necessary to adopt different views as to how maintenance and operations should be performed.

Keeping equipment running in a condition to make quality product for the lowest production cost is the job of maintenance. This requires Maintenance to use the best proven systems and methods of the past, yet simultaneously to seek-out and use those new concepts and technologies which bring added value and competitive benefit to the business. Maintenance carries the responsibility to bring innovative methods and new technologies into a company and to use them to make the company more competitive.

When the maintenance function is used to produce business-growth and success, it requires us to take-on new beliefs and paradigms about the way Operations and Maintenance need to work.

1. Define Exactly the Process and Equipment Reliability Practices and Principles to Use

If you are given a blank sheet of paper and asked to draw a picture, you will think about what to draw for some time. It will be a random decision and no one else will know what to expect. But if you are asked to draw a sandy beach scene on a sunny day you will start on it immediately and people know basically what you will produce. If you go further and are asked to draw a scene of a wide bay with big grey rocks at the points and big breaking waves peeling off each point running into a sandy beach at the bottom of the bay. You will immediately draw exactly what you are asked, and people will know exactly what they will get.

If all that that is needed to get you to draw exactly what is required is to describe it to you with clarity and detail, would not the same result happen if you described with clarity and detail how you want to get great reliability and performance from your plant and equipment?

Of course, it would.

If you want your people to deliver high equipment reliability, do they know what great reliability looks like; exactly? Do they know how to measure it so they can correct their actions and learn how to get the best reliability?

Teach your maintenance and operations people exactly what reliability looks like on their equipment and in their processes. Paint a clear and detailed picture of everything they need to do to get world-class equipment reliability. Let them measure their results. In time you will have exactly the level of reliability you clearly detail and specifically define. But with no detailed specification no reliability improvement is possible. Provide clear and detailed reliability specifications and measures, and with consistent effort, you will be certain to get the level of reliability you describe.

2. Life-Long Learning and Up-skilling

Only experts can be expected to deliver expert performance. Great companies have systems in-place to train and provide hands-on experiences that teach their people to be better and to do their work better. They turn their people into masters of their duties.

Unfortunately, maintenance and plant operation are mostly taught and learned ‘on-the-job’. Typically, only basic engineering knowledge and work skills are taught at technical trade schools, and usually none are taught to operators. Maintenance people and Operators mostly gather their knowledge and learning by observing and mimicking others. They learn bad old habits at the same time as learning the good practices. They do not know enough to recognise a bad practice from a good practice. After years of service, they are thought to be ‘experienced’, but in truth their skills and knowledge reflect the quality of past training they received. Poor quality, low-value training results in poor quality, low-value experience. They then use that experience to run and maintain the equipment in the business.

If people are to help build businesses into great and valuable organisations, those persons first need to have the capacity to contribute to the business’ growth. The ability to make new improvements comes from having new knowledge to use.

Whether people are in operations or maintenance they can only up-skill by learning new information and being taught better ways. To master their job and always produce high quality work, operators and maintainers require basic training in the engineering and quality control of the equipment they use and the production processes they run. To increase the contributions from your people they need systematic and regular training in the right knowledge and the best-practices.

You can help operators and maintainers learn the engineering of their plant and equipment with a planned training process over an 18-to-24-month period. Fortnightly provide new knowledge and detailed explanations, along with site-specific examples, of how to use the information to improve plant, processes, and equipment performance. Explain simply what really happens in the machines and with the process. Use diagrams and open group discussion to reveal how things work.

You will see the benefits brought to the business from a short 30-minute training session held fortnightly over 18 to 24 months in the decreasing number of breakdowns, improving product quality,

the lower cost of production, and the many personal thanks you will get from the people you train for improving their lives.

3. Set Standards to Quality Control Workmanship

To keep production equipment functioning ‘as-new’ and producing in-specification product, the maintenance of machinery and equipment must be done right and be done to design accuracy. Ensuring the required work quality needs a quality assurance process. Quality means setting standards and meeting them. Hence doing maintenance with quality requires setting standards for every maintenance action performed on an item of equipment to ensure the necessary standard is achieved every time.

Doing production with quality means setting standards for every operating action performed. This maximises the chance that operators will do the right actions that keep the process in-control and capable of meeting the product specifications.

Without standards to meet and measure against, you are using luck and happenstance to run your business. Good things do happen and from time-to-time you might be lucky and produce good results. But over the long run you cannot build a world-class operation on luck and accidental good fortune.

Removing the ‘luck factor’ requires documents that list the standards to be met for every activity done by maintainers and for every activity done by operators. Equipment maintenance standards must be set for lubrication, fastener tension, rotating equipment balancing, bearing vibration, shaft alignment, machine distortion, and parts’ tolerances, along with many other engineering requirements. For operators, standards must be set for starting equipment, for stopping equipment, for changing process parameters, for keeping processes running steadily, along with all other requirements that can affect the behaviour of the operation.

Standards must also be set for task workmanship quality. Maintainers need to be given clear specifications on the condition of parts to use in a machine. They need to be clear whether a part is in a ‘good enough’ condition to use, as well as how to install it correctly for maximum reliability and trouble-free life. This knowledge is not taught to maintainers. They mostly learn it on-the-job. Often from people that did not know it very well in the first place. There is documented evidence that most equipment failures are caused by poor and negligent maintenance practices¹. To solve most of your equipment maintenance problems it is necessary to document the right way to do a job and the standards it must be done to.

The ideal format for procedures to control work quality and provide work quality assurance is the Accuracy Controlled Enterprise 3T format with tolerance banding. The 3Ts are **T**arget, **T**olerance, **T**est, and must be part of every maintenance activity and every operating activity, if you want high equipment reliability and production plant productivity.

You can learn more about the Accuracy Controlled Enterprise 3T way of high-quality work by buying and reading our book ‘Employee Training and Development with ACE 3T Standard Operating Procedures (SOP) Manual’. It will show you how to write standard operating procedures (SOPs) that prevent human error at work.

4. Provide Instant Access to Engineering Knowledge and Work Quality Specifications

¹ Smith, Ricky, ‘Best Maintenance Repair Practices’, Technical Training Division, Life Cycle Engineering, Inc, 2002

If you are intentionally creating a world-class business with world-class performance, your maintenance people will need correct information on equipment parts, their engineering design limitations and on their in-specification installation and use. For operators, they must have ready access to how their machines and production processes work and how their jobs are properly and expertly done.

Most equipment is not regularly worked-on by maintainers. As reliability improves it is worked on even less. When a maintenance job reappears, it may have been months, sometimes years since it was last done. To expect maintainers to know the intricate details of every aspect of a task not done in a long time is unrealistic. This necessitates maintainers have instant access to the right information for doing their work precisely, to top-quality, and right-first-time. To help them make the right choices that improve reliability they need access to this information when they are on-the-job.

Getting the right information to maintainers when they need it is the responsibility of the Maintenance Department Management. The best way is to have all the maintenance information in the work procedures and work pack documents for the job. Getting the right information to operators when they need it is the responsibility of the Operations Group Management. This too needs to be right at the Operator's finger tips.

A lesser alternative is to have an electronic library that can be interrogated in real-time while doing a job. This means using computers in-the-field with satellite or wireless communications connected to engineering databases. It is a lesser alternative because it will slow the job down and cause people to waste time. But at least they will get the right information when they need it.

5. Teamwork Maintenance with Engineering and Production to Fix Problems

No one in a company knows everything about the way their machines and production processes are built and work. There are too many variables and intricacies that can impact on their operation and performance. But put a group of people together in which each member know various things about those machines and processes and you have created a gestalt – an integrated whole that is greater than the sum of its parts.

Once you connect people with various expertise and knowledge of your machines and their operation together, it is very likely that someone in the group knows the answers to all the problems.

The power of teamwork is its ability to bring widely distributed knowledge and experience together to solve previously unsolvable problems.

A gestalt of engineering, production and maintenance is a wonderful opportunity to put the best of everyone's knowledge and experience to use to improve the business. Quite literally, you make-up teams of people from engineering, maintenance and operations and make them responsible to fix specific problems. Train each team in proper meeting procedures and in project management methods and then give them a deadline to deliver the answers to the problems.

A team comprising engineering, maintenance and production has within itself the capacity to solve any equipment and production process problems the business is suffering. By creating a gestalt, you are multiplying the effectiveness and problem-solving power of each person on the team.

In our free 'Change to Win' Business Improvement Team workbook use a well proven way to get people to work in teams that solve problems. (Email us if you have trouble finding the team workbook.)

6. Develop Precision Practices in Operations and Maintenance

The Physics of Failure approach to creating outstanding equipment reliability is based on preventing and removing stress in the materials used to make equipment parts. Physics of Failure research has found that when stress in materials is kept low, parts have a far, far longer operating life. The life extension possible from low stressed parts is ten to one hundred times their previous lives. Gearboxes have gone from an average 1,000 hours between failures to 11,000 hours. Pumps with bearing housing roller bearings that failed every two years on average, now never fail. Mechanical seals that leaked about every three months have been made to last 6 years. It is very important, in fact absolutely critical, to the success of your reliability growth efforts to keep the stresses and strains in the materials of your parts to the lowest levels possible.

High reliability automatically results when parts' stress is low. Achieving high reliability by reducing installed stresses in operating parts is the responsibility of Maintenance. The responsibility to run machines to keep parts' stresses low when in service belongs to the Operations group. Operations need to apply precision practices in running processes and equipment because if they create high stresses and strains in their equipment, they will cause early failures. Low stresses and high equipment reliability can only truly be achieved when maintenance people do Precision Maintenance and operations people do Precision Operation.

Precision means to be exact in what is done. Precision Maintenance means identifying how maintainers need to build equipment, so it is under the least stresses when in operation. Precision Operation means clearly specifying how operations will run their plant and process to minimise stress and degradation. If you know exactly how to achieve low stress in your equipment parts, and you do those practices, the payoff is life extensions of 10 to 100 times what you get without them.

Precision is a mindset. It requires the discipline to follow well-researched and clearly written instructions carefully. It necessitates the use of proof testing and evaluation of evidence to confirm that things are progressing as required. It means up-skilling people to become masters of their work and their equipment. It requires putting in-place the information and quality systems that support such high levels of expertise and professionalism. It needs leadership, commitment, and courage from management to do whatever needs to be done to become that good.

My best regards to you,

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