Reliability…What is it and why you want it?

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How is reliability defined? Most people expect that; equipment will start and continue to operate as long as needed. But how is Reliability defined? Reliability for equipment is defined as; "the ability to perform a required function under stated conditions for a specific period of time." An important note: Reliability is not just a maintenance issue, it is a culture. Reliability involves management, maintenance, operations, engineering and all parts of the company.

There are a number of methods used to measure reliability. One method is *Mean Time Between Failures (MTBF)*. This method measures the amount of time between placing a machine in service and when performance failure occurs. MTBF method is adequate when comparing equipment with similar operational use such as the length of service hours. To compare one machine that runs 24 hours a day with another running once a week will not be an equivalent assessment. Another method is *Mean Time to Repair or Replace (MTTR)* which measures the time between maintenance operations. Both of these methods result in the same assessment error. A superior method may be the *Operational Availability* which measures the percentage of time between actual operations and scheduled to operate. Operational Availability attempts to even the playing field regardless of actual operating hours.

There are many tools available to a Reliability culture. The first tool to consider is documentation. Without good records, it is very difficult to track, trend or understand the costs or constraints of equipment. Trusting memory is laden with errors and paper files are difficult to manage or search. Precision Alignment is the next tool to consider. Equipment requires a good foundation that will dictate the life of the equipment. Good installation maximizes the potential for reliable equipment life. Infrared surveys are crucial for electrical systems. There is no better method for locating electrical resistance problems. Correcting these issues will reduce electrical usage, nuisance trips and major heat damage to electrical systems. Ultrasonic lubrication enhances bearing life. It is a great method for ensuring proper grease levels and defect detection. Ultrasonic leak detection on compressed air systems can save thousands of dollars a year. Finally, Vibration Analysis is an "EKG" on equipment providing a health report on each machine. Vibration Analysis provides earlier warning detecting and identifying issues leading to reduced equipment life and availability.

Documentation is a critical step to Reliability. Keeping equipment specifications records (Motor HP, motor frame, reducer, coupling, belts, bearings sheaves and other parts) makes any replacement or repair easier. Documentation will aid in determining reliability needs. Do you have records to justify a replacement, reconstruction or other major work that may be necessary? How much is your equipment costing you to run or maintain? Record keeping helps to understand how much reactive work is being performed. What are the percentages for reactive, rework or proactive work? Records provide the documentation to know how your system is performing.

The greatest projects are built on a solid foundation at the beginning of equipment installation. Precision alignment builds on the foundation providing equipment the best possible start on life. Often overlooked, this is one of the most important maintenance tasks of Reliability. Precision alignment ensures the most efficient transfer of power from drive to driven. Horsepower is lost overcoming misalignment and the restriction it causes. Any misalignment can increase energy consumption by as much as 10% or higher. Misalignment also increases stress on seals, bearings and belts. These stresses cause premature wear and failures. Misalignment in belt drives often leads to over tension solely to maintain belt traction. With these increases in load, the life of the bearing decreases. Increased load has a cubed effect on decreasing the life of a bearing.

Infrared surveys are the only technique for locating resistance in electrical systems. Resistance loss is measurable but locating the actual source requires infrared thermography. Infrared is a non-contact inspection and will not interrupt production. Eliminating electrical resistance ensures the best power quality to your equipment. Not only will this provide better quality power to your equipment but will also reduce the energy loss to heat. Electrical heating is very costly and inefficient. Finding and eliminating these connections reduce the number and severity of heat sources that can be a part of the fire triangle. This creates a smaller opportunity for catastrophic failure. Any kind of resistance costs money.

One use for ultrasonic is motor lubrication. A large problem with motor lubrication is hidden bearings. Motor bearings are often sealed to the exterior so over lubrication cannot be noticed. It is difficult to judge if the proper level has been achieved. Ultrasonic lubrication allows the operator to “hear” the lubricant going into the bearing. Bearings can then be lubricated to just the right amount of grease. Ultrasonic lubrication is not merely limited to motors. This technology can be used on all bearings. Getting the right amount of lubrication in bearings will reduce failures and extend bearing life. Excessive lubrication is just as destructive as too little. Ultrasonic inspections can also save a lot of money detecting compressed air leaks. Leaks in compressed air systems necessitate air compressors work harder and longer to keep up with demand. Reducing these leaks will allow the compressor to run in idle mode longer and reduce energy usage. Running in idle will help to increase the life and reliability of the air compressor as well. A leak of ¼” diameter on a 100 psig system can cost almost $6000/year.

Finally, vibration analysis enables an in-depth look into the health of your equipment. Vibration analysis is similar to an EKG, CAT scan and blood work all rolled into one. It offers a health report on each piece of equipment tested. Vibration analysis has the capability to see many different conditions occurring within. Vibration analysis can detect imbalance, misalignment, and looseness. It can also detect bearing issues, gear problems and flow issues. Often vibration analysis can detect failures years in advance. Early detection allows plenty of time to plan repairs. With proper application, vibration analysis can provide information about the health of critical equipment.

Choose one technology to get a program started. Start small and build. The ability to respond to findings is critical to the success of a Reliability program. As the program unfolds, assets or technologies can be added or removed to fit needs. Reassess program needs on a regular basis. Assess the value being

received and the ability to react to the findings provided and adjust the program as needed. Reliability as a culture can provide savings and peace of mind.

Reference Material

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