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MAINTENANCE BASICS:

The First Steps to Achieving Zero Breakdowns

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When equipment reliability and zero breakdowns are the goals of a Maintenance program, the best place to start is with “basic training.”

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One of the latest buzzwords sweeping through plant engineering and maintenance circles is *equipment reliability*. When equipment reliability is the goal, the optimum situation is zero breakdowns. While the possibility of *zero breakdowns* seems unrealistic to some, that nevertheless is the target for many organizations, especially those with quality programs in which the goal is *zero defects*.

An informal survey of more than 2,000 seminar attendees conducted over a two-year period asked what situations contribute to break are related to basic maintenance, the basics are precisely where many maintenance training programs fail to focus. The basics highlighted in the survey fall within three main categories:

1) Equipment cleanliness

2) Fastening procedures

3) Proper lubrication procedures

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The survey examined the breakdowns and what percentages of breakdowns are attributable to each kind of situation.

Examining these three areas will help explain why the basics of maintenance training are so important and why so many equipment breakdowns are related to the neglect of basic maintenance training.

Equipment Cleanliness

Consider the reasons usually cited for keeping equipment clean: Easier inspections, better employee morale, easier servicing, less wear on moving parts, less contamination of products, and better customer impressions. While these reasons are valid, what about technical reasons for keeping the equipment clean? For example, consider components such as motors, gear cases, and hydraulic systems. Why should they be kept clean?

How many plant personnel actually understand the technical reasons for cleanliness?

One reason is heat dissipation. If a motor becomes dirty, the surface of the motor becomes insulated. Being less able to dissipate heat, the motor runs hotter. Most manufacturers' produce temperature/life curves that show an inverse correlation between operating temperature and motor life. As operating temperature increases, the life of the motor decreases. And while it is true that the motor will not fail immediately, what if you now get six months' service from a motor that should give 10 years of service? Neglecting cleanliness creates unnecessary motor failures and unnecessary maintenance expense.

The scenario is similar for gear cases. If they become dirty, heat dissipation decreases. If you use the manufacturer's suggested lubricant, it is now the incorrect lubricant, since the operating parameters are different. The viscosity will be too thin and the gear cases will wear faster. The gear case will not fail immediately, but if it fails once every six months instead of once every six years, unnecessary maintenance expenditures result.

Consider, too, hydraulic systems. The reservoirs are designed with enough surface area to dissipate the heat generated during operation. If dirt or contamination builds up on the tank, the hydraulic fluid retains heat. Above 0125 F or 0130 F, depending on the hydraulic fluid and its additives, the oil's life is shortened by 50% for every few degrees of temperature rise. As the oil's temperature continues to increase, the fluid varnishes. Varnish particles can travel through a hydraulic system and cause valves and other components to jam and fail. Again, the failures are not immediate, but occur over time.

These are just three of many possible examples that illustrate the importance of keeping equipment clean. How many plant personnel, though, actually understand the technical reasons for cleanliness? To ensure that the maintenance activities carried out in a facility are cost effective, basic maintenance training must include these critical topics.

Proper Fastening Procedures

Many maintenance technicians are familiar with the process of rebuilding automobile engines. One of the steps is to install the engine heads. Part of the process entails the fastening of the heads to the block with the head bolts. This is a critical process because it seals the engine's compression chambers and its fluids. When observing the installation of the head bolts, have you ever seen a skilled mechanic use channel locks, vise grips, adjustable wrenches, combination wrenches, or pipe wrenches? Of course not! A skilled mechanic uses a torque wrench to install head bolts. Basic high school physics taught us that screw threads are two inclined planes wedged against each other to provide the correct tensile stress to hold a fastener in place.

Even though this is a basic mechanical fact, it's unlikely that most bolts in your facility get tightened with a torque wrench. Instead one of the other tools mentioned earlier is used. The result is poorly installed fasteners that eventually work loose, vibrate, wear, and ultimately fail—all because the basics were ignored. Every maintenance-training program should teach basic fastening techniques.

Notice the patterns on the heads of the bolts or fasteners. The pattern tells us the hardness of the bolt. Even bolts that are the same size physically require different amounts of torque based on their hardness. How many mechanics carry a torque table as well as a torque wrench? For that matter, how many of them pay any attention to the proper hardness of fasteners for specific applications?

If someone opened the coupling guards in your plant, how many couplings would have bolts that are too soft? A too-soft bolt stretches and wears. It then elongates the coupling hole. The result is coupling failure. Again, paying attention to the basics will result in fewer breakdowns.

Basic Lubrication

In practice, how often is the right lubricant applied in the right amount and at right frequency with the correct application tool? Very seldom, yet a large percentage of mechanical failures (bearings, chains, gears, and sometimes belts) are lubrication related.

In the hands of a worker not trained in its use, a power grease gun is a lethal weapon—for equipment, that is. Typically, a worker places one of these high-powered lubricators on a small pillow block bearing and pulls the trigger. How does the worker know when the bearing has enough lubricant? When the lubricant runs out the seals is the most common answer. But that's the wrong answer. Most pillow block bearings are made to be filled only about one-third full, leaving the remaining air space for heat dispersion.

How many different lubricants from different vendors are in a typical facility? Usually many and that too can cause problems. Workers should have and use lubricant interchange charts. When lubricants are mixed, you can get alkaloids, acids, thinning viscosity, thickening viscosity, coagulation—in short, a mess. Lubricant contamination is another cause of equipment failure. The most common contaminant is water. A water content of just 0.002% in a lubricant can reduce the fatigue life of an antifriction bearing by as much as 80%.

With such a minute amount of water in a lubricant able to cause problems, shouldn't your workers pay attention to re-lubrication when equipment is washed down in a sanitizing cycle or a steam-cleaning period? Do they, or is the water left to work its way out by it destroying the bearing in the process? Preventing contamination includes the correct storage of lubricants. What's the proper way to store a drum of oil or grease? Horizontally or vertically? The answer is horizontally. Water can accumulate on the top of a drum and through the normal heating and cooling of a day be drawn down the screw threads of the bung and into the lubricant. Two-thousandth percent (0.002%) is not much water.

More Uptime, Small Investment

Just imagine the results if you could eliminate the breakdowns in your plant that have their root causes in lack of cleanliness, incorrect fastening, and improper lubrication procedures. Would your figures agree with the survey, which showed that almost 50% of equipment breakdowns have a root cause in one of the aforementioned areas? Would employing the basics cut the number of breakdowns in half? If so, how much would it cost you to get such results? Not much, just training costs and the cost of the time to allow workers to do the job right the first time.

Most organizations do not stress maintenance basics, though. And in some companies, especially those that want the operations group to take over some of the basic maintenance duties, the situation probably will not improve. If the maintenance group is not doing the basics correctly now, will involving operations personnel make any difference? No, it will not. Training in the basics for everyone involved in maintenance is critical to progress toward zero breakdowns.

For more information on maintenance basics, contact us today!