Three THINGS

That Kill Your Reliability & What You Can Do About Them Now

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During the many root cause analysis (RCA) investigations we facilitate and coach, we notice some themes that continue to manifest themselves in the findings. Often, they are grouped under the heading of precision maintenance or lack thereof. Let's take a look at some of them and determine if they are also killing your reliability.

The six killers are grouped into three areas: Lubrication, Misalignment and Undiagnosed Wear.

Lubrication

Lubrication is a broad topic, but the mismanagement of lubrication is a killer. There are two issues seen regularly within most facilities: incorrect type of lubrication and the incorrect amount. Let's dive deeper into both of these.

First, the incorrect type stems from a lack of understanding of lubricants and their properties. Many practitioners operate under the premise that "grease is grease and oil is oil." This can lead to the wrong lubricant in the application or even to the mixing of lubricants which can cause additional loss of lubricity. Each lubricant has special additive packages that allow it to shed water or carry additional load, as well as other functions. These must match the application. In some cases, mixing may lead to lubricant breakdown.

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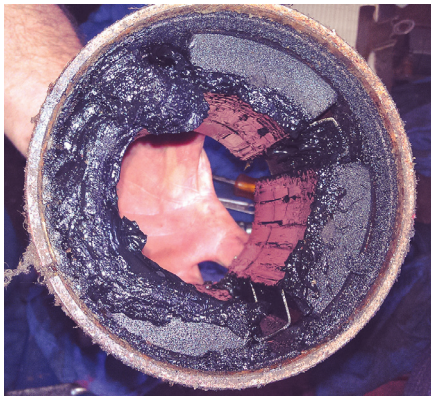
The second is lubrication amount. It covers everything from no lubrication at all and under-lubrication to the more common situation, over-lubrication. We typically see “no lubrication” type failures in new equipment that was installed and started without filling the oil reservoir. In many cases, these oversights were caught. Unfortunately, they were at a point where the damage was already done, and the trip down the Potential Failure (PF) Curve had already begun. In other words, it was too late. While the “no lubrication” problem tends to exist in the oil-lubrication world, the next two issues plague grease-lubricated assets.

Under-lubrication happens for a multitude of reasons ranging from lack of effective preventative maintenance (PM) plans or due to auto-lubrication system failures – from a root cause standpoint, it can vary widely.

Over-lubrication is the most common killer in this group and is born out of good intentions. “If a little grease is good, a lot is better.” In the past, to prevent both over- and under-lubrication, we had to calculate the volume of grease required for each bearing based on type, size and speed of rotation – a burden well beyond most maintenance assigned to this task. However, thanks to modern ultrasonic tools, we can now detect if the optimum level of lubrication has been effectively applied without these calculations. This is done by collecting the decibel level of the bearing both prior to and during the lubrication process. When the user hears the reading drop to their lowest levels, the lubricant has reached the correct level in the rolling elements of the bearing and satisfied the bearing’s needs. If the lubrication tech stops filling at that point, we can keep the killer at bay.



To summarize, to prevent these issues from taking away from your reliability, you need to clearly define lubrication types for your assets, have effective start-up procedures and lubrication job plans, create job plans that are well-defined and clear enough that they can be completed by different people with the same results, and you should include ultrasonic-assisted lubrication to ensure lubricating success.

Misalignment

Misalignment is another common cause of premature machine failure resulting in downtime, lost production, higher labor costs and parts consumption. Here's a list of the most common failures due to misalignment and some recommendations on how avoid them:

Conveyor Belt Misalignment Produces:

- Head pulley wear
- Bearing failure
- Roller failure
- Shaft failure
- Seal failure
- Product loss
- Belt edge destruction by wear, fraying or cutting
- Seam failure
- Excessive energy consumption
- Excessive heat generation

V-groove Belt Misalignment Produces:

- Pulley or sheave groove wear
- Belt failures from slippage, fraying, stretching, breaking, jumping off and jumping time (timing belts)
- Bearing failure
- Shaft failure
- Vibration

Many machine failures and defects can be eliminated and prevented by correctly installing belt-driven equipment. This includes, among other things, selecting the right length and material belt along with its pitch angle, and then correctly installing the belts and sheaves. For example, when aligning a multiple-belt drive, you should install (or replace) with belts from the same manufacturer, preferably using a factory-matched set to ensure consistent specifications and improved operating condition, and always check and measure sheave runout. Correcting all three types of misalignment – vertical angularity or twist, horizontal angularity and axial offset – as part of the precision alignment process is essential. This will help to reduce vibration and elevated temperature levels that lead to premature bearing failures. Good sheave alignment followed by proper belt tensioning is key to increasing belt life and drive efficiency.

Shaft Misalignment Produces:

- Seal failures
- Bearing failures
- Bushing failure
- Shaft failure
- Coupling failures
- Gearbox failures (gears)
- Excessive energy consumption
- Excessive heat
- Fastener and bolt failure
- Vibration

As with belt-driven equipment, many machine failures and defects can be eliminated up front by correctly installing rotating equipment. This includes, among other things, making sure the foundation can withstand the mass of the equipment, any operational load stresses and vibration that the machines will generate. It's also important to ensure the baseplate is properly bolted or grouted to the foundation – it should be both flat and level. Equipment should be centered horizontally on the baseplate with the correct amount of shims placed under each foot. Installing jack-bolts is also recommended to facilitate horizontal movement of the machines. All anchor bolts on the machines should be tightened to the proper torque. Precision laser shaft alignment of the machines to proper tolerances and the elimination of soft foot are also both critical to increase machine reliability.

Undiagnosed Wear

The last area that turns up in the causal chains of many a fault tree is undiagnosed wear. It is almost never the root cause, but a manifestation that we are required to notice and inspect for first and then try to understand the cause. It can be found as wear on shafts causing bearings races to spin in place or wear on a pulley leading to slipping belts, over-tightened belts or belts covered with goopy belt dressing.

These will be killers to your reliability. So what can you do? Your planner needs to include steps in the job plan to use a micrometer to check the shafts and provide what range is acceptable. You can search online for a bearing shaft fit guide to get the specifications for the job that you are planning. As part of the kit for the job, the planner needs to ensure that pulley or sheave groove gauge sets are provided with a belt tensioning tool.

By putting these quick inspections in place, you can further reduce the potential for reliability killers at your site.

We have looked at three different areas that commonly show up in our RCA investigations and have given you a few options to mitigate or eliminate the risk associated with those failures. Bringing these elements into your reliability program will keep the reliability killers out of your plant and will lead to increased profits.