Linear Bearing Maintenance.

5 Key Tips for Linear Bearing Maintenance That Save Money by Avoiding Unplanned Downtime

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How a $25 Investment Now Can Prevent Tens of Thousands of Dollars in Unplanned Downtime

5 Key Tips for Proper Linear Bearing Maintenance

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Ng has been with Thomson for over 23 years. He is responsible for product development, design, and engineering of linear bearings, has been published and cited in several technical articles, and holds a dozen US patents (over 60 patents worldwide). Prior to his career with Thomson, Al was with the GE Aircraft Engine Group for over 6 years working on the conceptual mechanical design of jet engines. Mr. Ng earned his Bachelors of Science in Mechanical Engineering at the Columbia University School of Engineering and Applied Science.

Thomson bearings last longer than any other in the industry, but like all wear parts, they are not designed to last forever. Upcoming failures can be difficult and in many cases impossible to detect in advance. When bearings fail the cost often goes far beyond paying the operators that are forced to wait until the problem is fixed.

Case in point, a food processing company uses linear guides to shuttle food product. The guides are located above open food product containers as they are filled. On one occasion, the company neglected to adequately lube the bearings. The result was that a bearing disintegrated during operation and most of the balls were lost from the housing. The failure was not discovered until sometime later after the shaft had been destroyed. More importantly, plant operations had to scrap thousand of dollars worth of packaged product that potentially had shrapnel in it. Thomson Field Engineers have witnessed many other examples of unplanned downtime from inadequate linear bearings maintenance than can easily cost over $10,000 per hour.

This article will explain how you can avoid this type of expensive problem by inexpensively maintaining and replacing bearings during planned downtime.

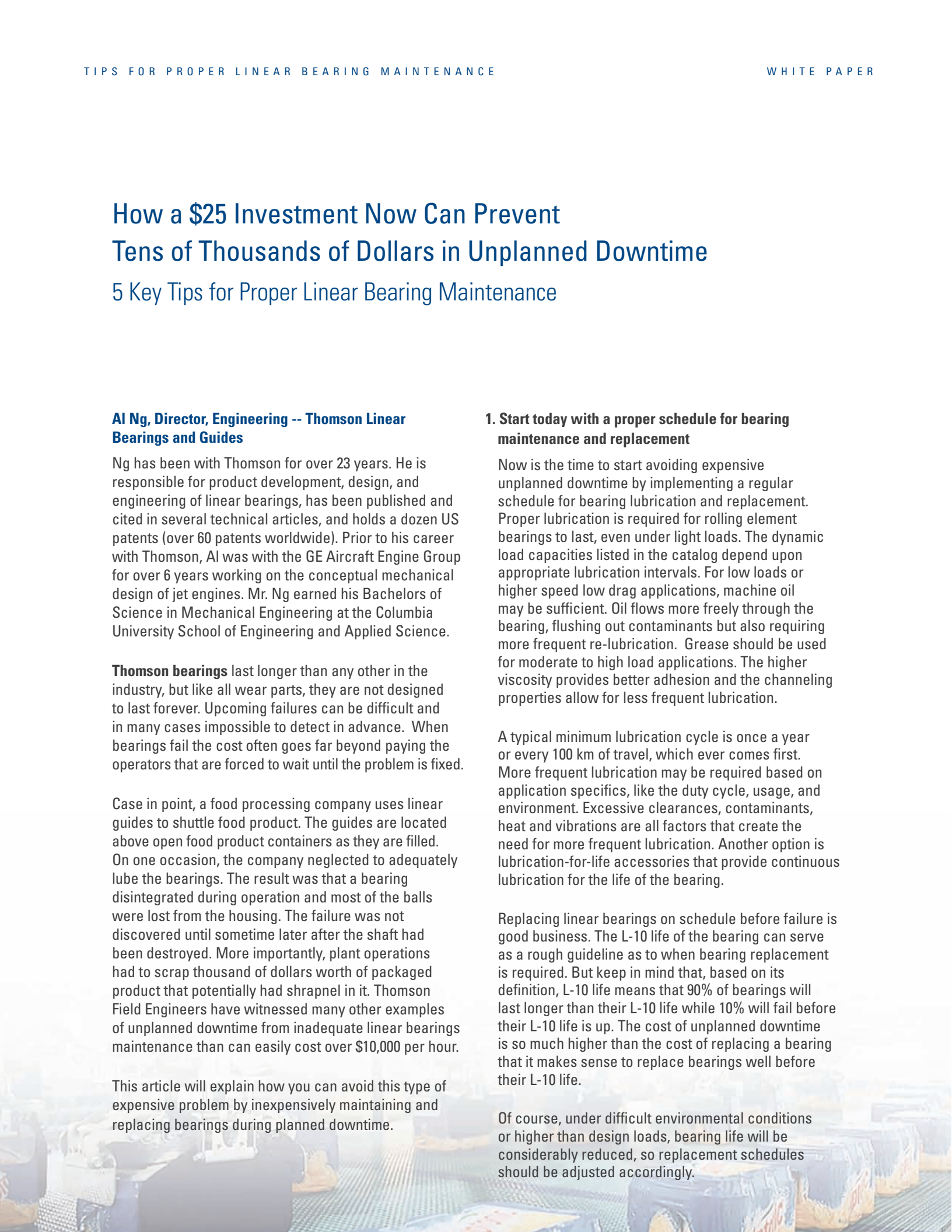
1. Start today with a proper schedule for bearing maintenance and replacement

Now is the time to start avoiding expensive unplanned downtime by implementing a regular schedule for bearing lubrication and replacement. Proper lubrication is required for rolling element bearings to last, even under light loads. The dynamic load capacities listed in the catalog depend upon appropriate lubrication intervals. For low loads or higher speed low drag applications, machine oil may be sufficient. Oil flows more freely through the bearing, flushing out contaminants but also requiring more frequent re-lubrication. Grease should be used for moderate to high load applications. The higher viscosity provides better adhesion and the channeling properties allow for less frequent lubrication.

A typical minimum lubrication cycle is once a year or every 100 km of travel, which ever comes first. More frequent lubrication may be required based on application specifics, like the duty cycle, usage, and environment. Excessive clearances, contaminants, heat and vibrations are all factors that create the need for more frequent lubrication. Another option is lubrication-for-life accessories that provide continuous lubrication for the life of the bearing.

Replacing linear bearings on schedule before failure is good business. The L-10 life of the bearing can serve as a rough guideline as to when bearing replacement is required. But keep in mind that, based on its definition, L-10 life means that 90% of bearings will last longer than their L-10 life while 10% will fail before their L-10 life is up. The cost of unplanned downtime is so much higher than the cost of replacing a bearing that it makes sense to replace bearings well before their L-10 life.

Of course, under difficult environmental conditions or higher than design loads, bearing life will be considerably reduced, so replacement schedules should be adjusted accordingly.



2. Spend $25 now on a bearing replacement to save tens of thousands of dollars in unplanned downtime

If you find that you are behind in linear bearing maintenance, check your calendar for planned downtime and put it on the schedule right now. The cost of unplanned downtime can be thousands of dollars per hour. The cost of a new bearing usually runs well under $100. There is a great ROI in preventive maintenance and it just makes sense to replace bearings when the machine is down for scheduled maintenance.

Here's another real world example of a problem that could easily have been avoided with regular preventive maintenance: a US manufacturer operating a plasma cutting machine noticed that their bearings were starting to ride a bit rough but did not take their machine off line for a more thorough inspection. In time, the machine went down. They did not have spares on hand. Their production line was down with lost revenue estimated at $200,000 per day.

3. Train your maintenance team and operators to proactively identify potential bearing failure

When bearings fail, it is usually at the least opportune moment, such as when there are no spare parts in stock or no one qualified to do the replacement is in the plant. The result can often be thousands of dollars of expenses in lost production and direct and indirect labor costs. That's why it's so important to train your maintenance team and operators to spot the tell-tale signs listed in the next section. The right training makes it possible to predict oncoming bearing failure so it can be replaced at a much lower cost at a time of your choosing. And make sure that you have plenty of bearings in stock in your parts crib so they are available when you need to quickly deal with an urgent problem or preventative maintenance task.

4. Inspect bearings carefully and avoid the shock of unplanned downtime

An unexpected bearing failure can easily cause tens of thousand of dollars in lost production or downtime so it's crucial to do everything you can to spot the problem ahead of time to correct it at a much lower cost.

Bearings should be inspected on a regular basis. A simple check of the shaft and rail can be done by running your finger along them. You should feel a thin film of lubricant. Re-lubricate the bearing if it is dry. Check the bearing for corrosion or contaminants and also check the environment to see if the environment has become more challenging. Check the bearings, bearing outer race and shaft or rail for metal fragments which are a particular concern.

An increase in clearance is sometimes a sign that a bearing is about to fail. On a plain contact bearing you can often feel or see slop on the interior of the bearing. If the application does not require close tolerances then clearance may not have to be addressed immediately, however, if the application has accuracy requirements then immediate attention is needed. Unusual noise or vibration is often an indicator of a bearing problem. A worn bearing race can in certain cases be detected by an increase in noise and particulate matter although there are often cases where bearings will sound perfectly normal until they fail.

Thomson Linear Bearings.

5. Reduce the risk of failure by ensuring that your bearings are designed properly into the application

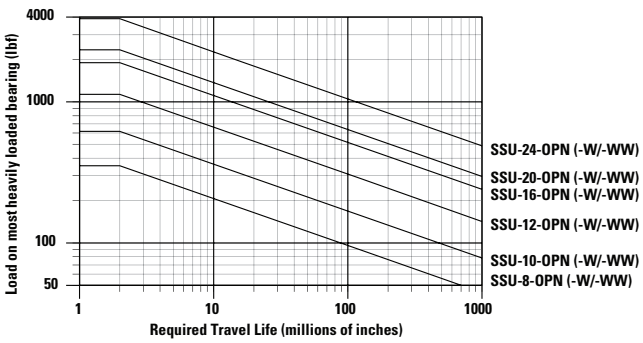
Bearings will require less maintenance and operate with a long and predictable life and much lower risk of premature failure and downtime if they are selected and sized properly for the application. Talk to an application engineer with years of experience to make sure you have the right bearings for your application. The chart below provides an overview of the advantages and disadvantages of plain contact sliding and re-circulating rolling element linear bearings. For example the chart shows that bronze bushings have high load capacity and low accuracy while profile rail linear guides have high load capacity and medium accuracy.

Feature	Bronze bushing	Air bearing	Cam follower	Round rail Ball Bushing® bearings	Profile rail linear guide
Load capacity	High	Low	Low	Medium	High
Accuracy	Low	Medium	Medium	Medium	Medium High
Smoothness	High	High	High	Medium	Medium
Ease of installation	Medium	Low	High	High	Medium
Self-aligning	No	Yes	No	Yes	No
Speed	Low	High	High	Medium	Medium
Available preloaded	Yes	No	Yes	No	Yes
Available end support mounting	Yes	Yes	No	Yes	No
Drag	High	Low	Medium	Medium	Medium

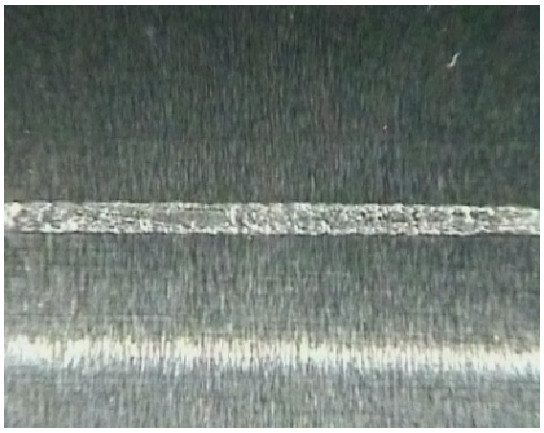
Load/Life Graph

The loads acting on linear bearings and guides have a major impact on the life of the bearing as shown in the chart below. To determine the proper ball bushing bearing size, select the maximum load on the vertical axis and the required travel life on the horizontal axis of the chart below and mark where these points intersect. All bearing sizes that pass through or above and to the right of this point may be suitable for the application. Note that an increase in load can have a huge impact on bearing life. For example, increasing load from 50 to 100 pounds of force reduces the expected life of a Thomson SSU-8-OPN bearing from 800 to 100 million inches of travel.

(Lines indicate limiting load for given Ball Bushing bearing)



The shaft can serve as a probe into the health of the bearing. Check the shaft for signs of wear such as spalling and grooving. Grooving is not necessarily a sign of failure but may indicate that either clearances have increased or vibration is occurring. Shaft grooving may sometimes be acceptable during the initial run-in if it is what is known as shakedown phenomena and scratches are typically only cosmetic. But replacement of both the bearing and shafting may be required if metal fragments appear. Shaft failure is common in short stroke applications where the stroke is less than 1.5 times the bearing length. Also, soft metal bearing housings, such as aluminum, can easily become indented at the bearing plate contacts. Indenting can interfere with bearing plate loading and self-aligning features so it may require the replacement of the housing. Quality parts make a difference. It's a fact that Thomson Linear Ball Bushing® bearings last longer that the competition, longer still when paired with Thomson 60 Case LinearRace® Shafting.



Shaft spalling

Conclusion

While the cost of linear bearings is low, their performance is essential to the accuracy, repeatability and throughput of a wide range of critical production machines. That's why it's so important to take these positive steps to ensure that your linear bearings deliver the performance to which you are entitled:

1. Start by implementing a reasonable maintenance schedule for bearing lubrication and replacement.
2. Take advantage of planned downtime and replace bearings at minimal cost.
3. Train your maintenance team and operators to identify the early signs of imminent bearing failure.
4. Inspect bearings on a regular basis to identify signs of premature failure and avoid unplanned downtime.
5. Finally, ensure that the bearings used in your machinery have been properly selected and sized to match the application.

This straight forward approach will help increase productivity and quality and reduce costs by ensuring high levels of bearing performance.

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