Ultrasound Solutions

Ultrasound Lube Technician Handbook

2017 Edition

www.sdtultrasound.com

Contents

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Introduction

Acoustic Lubrication is just one of the 8 application pillars adopted by world-class ultrasound programs. And what an important one it is. Poor lubrication practices account for as much as 40% of all premature bearing failures. Where ultrasound is used to assess lubrication needs and schedule re-greasing intervals, that number drops below 10%. What would 30% fewer failures mean for your company?

Keeping up with the changes in on-condition bearing lubrication techniques is challenging. Technology advancements from SDT's LUBExpert means rewriting complex processes into simple, 2-step procedures. The 2017 edition of SDT's Acoustic Lubrication Handbook features revisions and updates in step with the evolution of this exciting application.

Is your lubrication program world-class? Here are six signs to help you judge its effectiveness.

6 Signs your lubrication program is on track

1. A Change in the Quantity of Grease Consumed

Maintenance departments track their grease consumption to monitor and control costs. A change in consumption is a sure sign that your lubrication program is on the right track.

Most organizations are guilty of over-lubricating. Expect lower grease consumption as your program matures. Bad procedures lead to bearings routinely receiving more grease than they're designed to handle. The excess ends up being pushed into the motor casing or purged onto the floor.

Over lubrication happens when re-greasing intervals are scheduled based on time instead of condition. Control lubrication tasks with ultrasound to monitor condition and maintain optimal friction. The time between greasing intervals increases, resulting in less grease used per bearing.

2. Fewer Lube-Related Failures

Do you track failures and perform root cause analysis?

Organizations with optimized greasing programs experience fewer lube-related failures. Less fixing and fire-fighting translates to more creative time for maintenance. Use that time to bring more machines into the greasing program.

Additionally, with ultrasound you find many non-trendable defects. For example, broken or blocked grease pipes and incorrectly fitted grease paths prevent grease from reaching the bearing.

3. Optimized MRO Spares Management

Your new and improved lubrication program is delivering wins; better control of grease consumption, fewer failures, and more productivity for maintenance. Use this time to study trends and better manage your storeroom.

A decrease in bearing related failures improves spares optimization. Share your ultrasonic lubrication data with your MRO Stores manager to create a plan to reduce the number of emergency parts on hand.

Since you're taking stock, why not shift some burden to your suppliers? Ask them to confirm your emergency parts against their own stock. If it can be supplied on the same day then it doesn't need to be on the balance sheet.

4. Increased Number of Machines Monitored

One benefit of an effective lubrication program is time.

- Time allotted to monitoring machines instead of fixing them.
- Time allotted to correctly assessing the real needs for lubrication.
- Time to look at the big picture.

Take for instance, criticality assessment. Many lubrication programs begin with small steps. All the “A” critical machines receive priority, rightly so. But what about the rest? With more time to plan, organize, and schedule, the number of machines acoustically monitored for optimal lubrication increases.

5. Save Time. Combine Acoustic Lubrication and Condition Monitoring

You worked hard for these results. It’s time to use your data for more than just lubrication.

Acoustic lubrication is the proven method to ensure precise bearing lubrication. New technology from SDT, LUBExpert, combines the power of onboard lubrication guidance with Four Condition Indicators for bearing condition assessment.

The time savings from assessing bearing condition during the lubrication process is beyond valuable and another sign your acoustic lubrication program is on the right track.

6. Inspector Confidence at an All-Time High

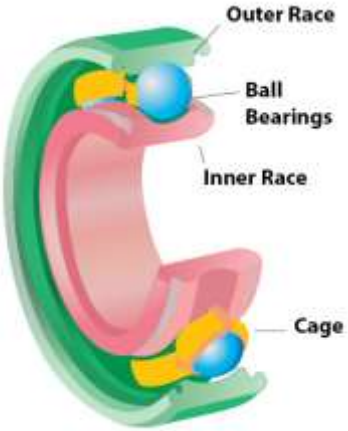
Reliable machines are the product of an effective lubrication program. You have:

- Managed grease consumption
- Fewer grease related bearing failures
- Optimized MRO spares
- More machines under watch
- Increased data collection intervals

The power of adding ultrasound to your greasing program delivers win after win for reliability. Reliability breeds confidence. More confident inspectors making the right calls and infecting a positive culture throughout the organization.

Ultrasound Guided Bearing Lubrication

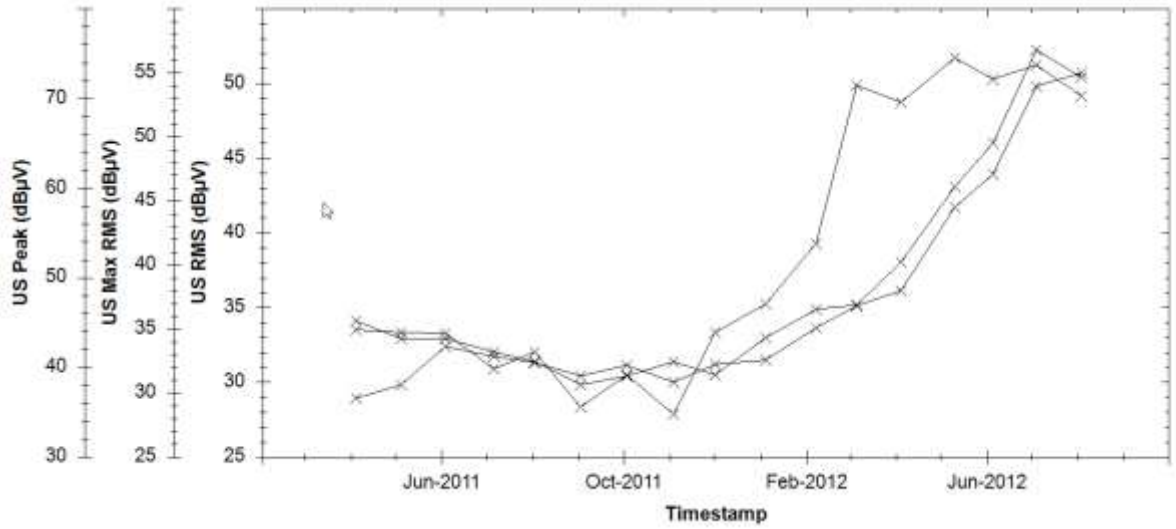
The insides of a bearing consist of four important components. The inner and outer raceways form a path for the rolling elements to glide on a thin film of lubricant. A metal cage separates the rolling elements, keeping them evenly spaced to distribute the load and stop them from crashing into one another. These four components move in concert producing frictional forces from rotational inertia, surface load, misalignment, imbalance, and defects. Zero friction is impossible, but optimal levels of friction are achievable with correct installation techniques and the proper amounts of lubricant.



Ball Bearing Components

Determining optimal friction is best done with an ultrasound condition monitoring program. Ultrasound detectors measure Friction and Impacting as acoustic energy from rolling friction and defect impulses. When lubricant levels are optimum, the energy created is at its lowest. As frictional forces increase so does the acoustic energy.

Use ultrasound to sort bearings with high levels of friction from those with normal levels. Establish trends from ultrasound measurements.



Evidence of changes in friction are revealed by the RMS decibel values. Defects causing impacting, rubbing, and skidding are witnessed by changes to the Peak decibel values and the Crest Factor. Make sure your ultrasound greasing instrument provides these key Condition Indicators, as well as temperature.

Simple Tools Needed

LUBExpert is an acoustic system designed to help lube-techs grease bearings right. LUBExpert tells you when to grease... and when to stop. It tracks the quantity of grease dispensed, and alerts you if the quantity of grease injected is about to exceed the designated maximum quantity.

LUBExpert combines SDT's strong measurement capabilities and clever user interface to create an onboard lubrication & greasing assistant. Intelligent algorithms guide lube-techs before, during, and after re-greasing resulting in optimal lubrication parameters on all assets.

With only a few machine parameters, LUBExpert monitors each stroke of grease and its effect on bearing friction. Before and after bearing conditions are reported alongside a "GOOD", "BAD", or "SUSPECT" status report.

Ultranalysis Suite (UAS) software powers the data management aspects of LUBExpert. Design specific lubrication routes and set intervals based on either calendar or condition. UAS knows the capacity of each bearing so over-lubrication is a thing of the past. Trend friction levels before and after lubrication and generate grease consumption reports for each asset for your entire plant. Receive guidance on points with no historical data available.

Advanced Tools Available

SDT270SU equipped with LUBExpert firmware and the Ultranalysis Suite software (UAS™) provides advanced ultrasound measurement and data collection. This solution combines the powerful features of the SDT270 with sophisticated database software. Manage all your greaseable assets from one flexible tree structured database. Build custom task lists for routine condition assessment. Set alarms to trigger lubrication needs right in the field. Then trend bearing condition before and after greasing to create meaningful reports. Equipped with the all new (2017) LUBEsense threaded contact sensor, Acoustic Lube Adaptor, and Multi-Surface Magnet, the SDT270SU LUBExpert answers the advanced needs of lube techs.

SDT270DU equipped with LUBExpert firmware and the Ultranalysis Suite software (UAS™) provides expert ultrasound measurement and data collection. This solution combines dependable trending capabilities with advanced dynamic signal analysis. Dynamic ultrasound data provides powerful images of your bearing before, during, and after lubrication. Equipped with the all new (2017) LUBEsense threaded contact sensor, Acoustic Lube Adaptor, and Multi-Surface Magnet, the SDT270DU LUBExpert answers the advanced needs of predictive technicians. The SDT270DU alerts lube techs when action is needed while providing graphical evidence of successful bearing re-lubrication.

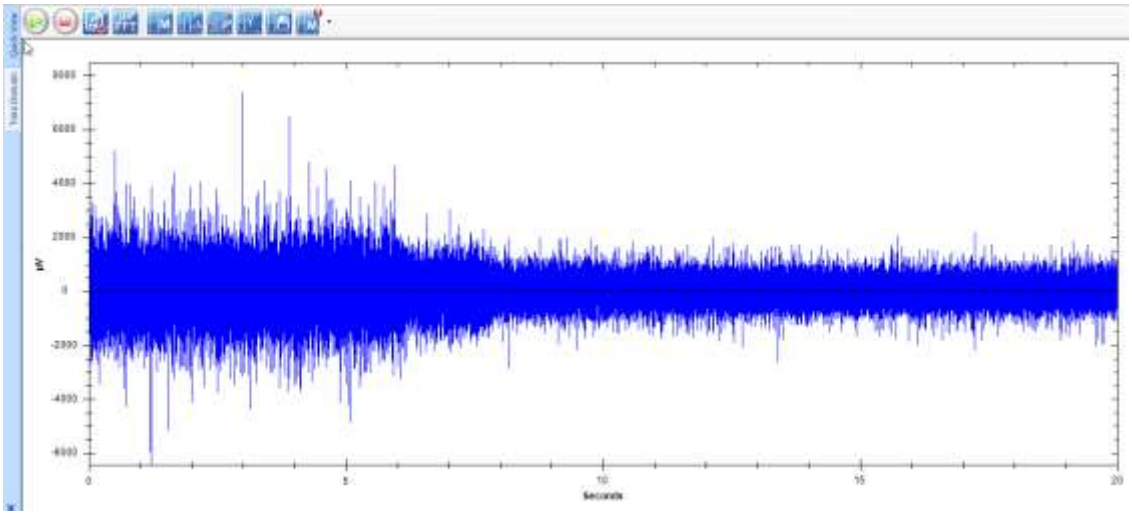


Figure 1 - Dynamic data collected from a bearing using a LUBEsense Threaded Sensor from SDT. This data sample is 20 seconds in length. Notable is the high amplitude of the signal and the random peaks caused by impulses. At 6 seconds the grease reached the rolling elements. At 8 seconds the amplitude decreased and by 10 seconds the impulsive peaks all but disappeared. This is a typical result of a time signal captured on a bearing that needed grease, and received the correct amount.

How to Get Started

Success is dependent on organization and commitment. Without these two structural elements, your ultrasound lubrication program will find difficulty getting traction. A well-organized strategy and carefully planned execution will get the project started properly. Getting the commitment from all levels becomes much easier when a program can demonstrate structure and cohesion. Results will prove the program faster which will trigger easier access to funding to grow and sustain the program.

Clearly defining the goals is the only way to create organization around a project.

Start by asking *"Why are we starting an ultrasound lubrication program and what rewards do we expect to reap?"* There is no one easy answer to the question. Saving money is an obvious benefit that gets the attention of management but it is not specific enough. How will an ultrasound lubrication program save money?

- By reducing grease consumption
- By raising awareness of the right types of grease to use
- By making more effective use of lube tech's time
- By reducing unwanted machine breakdwons caused by lubrication failures
- By extending bearing life expectancy

A new beginning is the best opportunity to review what you have been doing previously. Identify what worked and improve or remove what did not. Since this handbook is designed to help create an effective and enduring ultrasound lubrication program, it is not our intention to go deeply into all aspects related to good lubrication practices. However, there are some basic and relevant points that should be noted.

Lubricant management program: Keeping your bearings healthy requires a lubricant with the right quality for the application. By quality we refer not only to the quality of the grease manufacturer, but

quality in a broader sense which involves all the processes from manufacturing to application. Some general recommendations are:

- Keeping high standards of housekeeping for storage, handling, and application to prevent contamination that degrades the quality of lubricants.
- Keep a detailed list of products to use for each lubrication point. Selecting the right lubricant requires technical knowledge in several aspects. Using the wrong product will jeopardize the useful life of the component. Don't change lubricants without solid reasons. Consider contracting a lubrication consultant to direct advice on this.
- Provide training in every aspect relevant to lubrication practices and product knowledge to those responsible for lubrication.
- Set objectives to reach so you have a clear path to follow.

Application devices: Delivering the lubricant to the right point require some type of device. One of the most common is the grease gun. These come in different models but something common to all is the high pressure with which they deliver the grease; usually thousands of PSI; enough to overcome the backpressure in the zerk fitting. Dirty grease and even using the wrong grease kills bearings. Therefore, it is necessary to extend the precautions for contamination and storage discussed above, to the application of lubricant through grease guns:

- Wherever possible insist on using a dedicated grease gun for each grease type to avoid the risk of applying the wrong product through cross contamination. Label the grease gun with the associated grease to be used.
- Consider standardizing your grease guns so that they are all delivering the same quantity of grease per stroke
- The same principle must be applied for your ultrasound device. When using SDT's acoustic lubrication adaptor to simultaneously apply grease and measure friction levels, assign a different lube adapter for each grease type used. Any amount of grease remaining in the adaptor can mix with new grease causing a chemical reaction which degrades the new grease.
- Always clean the zerk fitting and grease gun before and after every application.
- If the bearing has a drain plug remember to remove it during greasing to allow old grease to push out as new grease is applied. It is not enough to simply open the drain port. That drain hole may be clogged. Use a clean brush similar to a bottle washing brush to clear the port to allow free flow.
- Apply grease slowly and in small quantities (no more than 20% of the maximum designated quantity for example per injection)to avoid over greasing, this also avoids damaging the bearing. Too much pressure can push the bearing cage into the roller elements and always allow the grease some time to work its way into the bearing.

Type of bearing inside: Lubrication technicians can make a mistake if they assume that a zerk in the housing means a path to grease the bearing. Occasionally, the machine has been fitted with both grease fittings and sealed for life bearings. You must identify every grease point that will be managed within the ultrasound program. Then, identify for each lubrication point the bearing inside because you need to know the size for lubrication quantity and the particulars for defect diagnosis. and the type of grease that will be used. Here are some helpful tips regarding the use of acoustic lubrication.

- Friction produces ultrasound. Friction inside the bearing comes from the contact between race, rolling elements and seals or shields

- Less contacts means less friction. A ball bearing produces less friction than a same size roller bearing under the same lubrication conditions, speed and load.
- Plain bearings produce the lowest friction levels. Their ultrasound baseline often trends in the single digits or low teens. Typically, they remain consistent for their lifespan and only display sudden upward trend lines when the oil film becomes contaminated or the bearing is near failure.

Safety

Each company has its own set of safety regulations that must be followed. Safety is not a subject to be taken lightly or ignored. Everyone has the right to work in a safe environment. At the end of the day everyone wants to return home to family and friends. Be sure to complete any company sponsored safety orientation courses and stay current with requirements.

Have the correct PPE – especially the right gloves to protect your skin from dermatitis-related injuries. Wearing adequate hearing protection around noisy motors and pumps. The SDT270 and LUBExpert come equipped with noise attenuating 130dB headphones. These headphones provide suitable hearing protection during data collection and monitoring.

Tie back hair and keep loose clothing in check to avoid coming in contact with rotating equipment. Similarly, be mindful that cabling from your ultrasound equipment could also come in contact with exposed rotating shafts, belts, and chain drives. Do not wear neck ties and chains or name badges with lanyards. Long shoe laces should also be safely tucked inside your safety shoes.

Frequency

How often should machines be greased? This is not an easy question to answer, as there are many possibilities. Presuming that full faith in ultrasound condition based re-lubrication is engaged then we can approach this with simple logic:

Q: Why do bearings need grease?

A: To reduce the frictional forces between the surfaces of the bearing's rolling elements.

Q: Ok, so when does new grease need to be added to a bearing?

A: When the bearing's frictional forces increase beyond a set quantifiable level.

Q: What is a reliable and easy to use technology that determines changes in frictional forces?

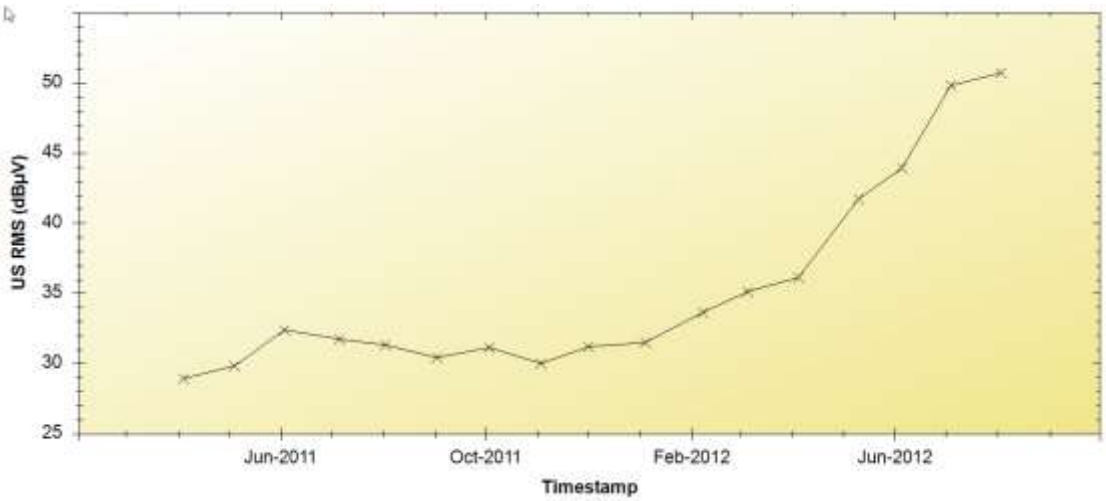
A: Ultrasound

Back to the original question then, "how often should machines be greased?" A 6 dBµV increase represents a doubling in amplitude. One approach is to say "every time that the ultrasound measurement indicates an increase of 8-10 dBµV above the previous reading or other reference value. 8-10 decibels is logarithmically and logically an intelligent point to create a re-lubrication interval alarm for condition base monitoring of assets.

With recent improvements in technology and software, ultrasound equipment can now detect more subtle changes and give guidance to lubrication technicians. This allows for fine tuning of critical assets as well as confirming judgments made by lubrication technicians.

When in the field, a lubrication technician may not have historical information for each specific bearing but he still has a job to do. An increase of as little as 2 dB after the initial addition of a small amount lubricant can indicate that a bearing is already over lubricated. Similarly, a decrease of a few decibels can indicate that the bearing is under lubricated and needs additional greasing.

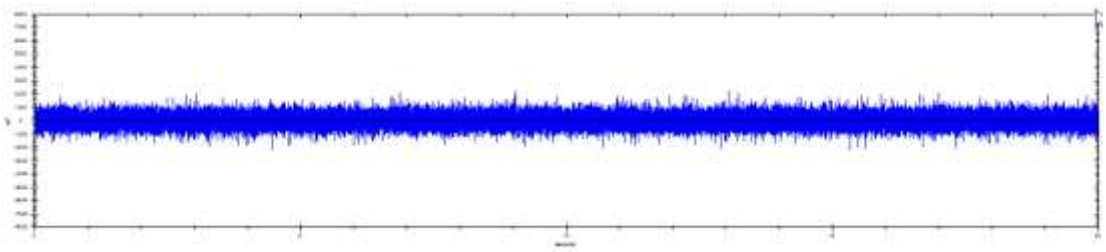
Another thing that the improvements can give is guidance on defects in the bearing itself. For example, it is common knowledge that after introducing lubricant to a bearing, before taking a second comparative reading to see what affect is, you must allow time for the lubrication to work its way throughout the bearing as well as warm-up to operating temperature. This is known as a stabilization period. The length of the stabilization period varies with the size of the bearing as well as the working temperature of the bearing. If there is an increase in decibels between the time you initially added grease and your stabilization period completion, this can indicate a defect in the bearing. It could also indicate the bearing is over-greased.



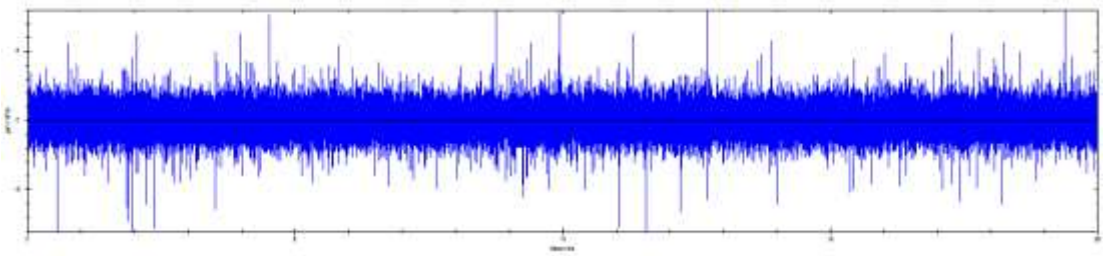
A simple trend graph like the sample demo data above shows a bearing's degradation over a 12+ month period. The reading ranged between 29 dBµV and 32 dBµV for the better part of 10 months. Around May 2012 the amplitude increased and breached the 40 dBµV mark for the first time. 40 dBµV represents 8-10 dBµV above the historical norm for this bearing. This should have triggered an alarm for intervention. Lubrication of the bearing at this point to return it to baseline may have prevented the breach above 50 dBµV and resulting failure.

The SDT270DU and UAS can go much deeper than just this static dBµV trend. Using time signal analysis and checking the Crest Factor reveals a lot about the state of your bearing. Time signal analysis allows us to capture a time block of data (20 seconds for example was chosen in the examples below) and view the ultrasound signal's behavior over that period of time. The Crest Factor is a linear ratio between the RMS µV level and the Peak µV value. The Crest Factor can reveal how "peaky" the bearing data is versus a bearing that has high levels of friction but no significant impulses (damage).

Look at the Dynamic data from two bearings below. The Y-Axis of these time signals has been scaled identically to make them comparable.



In Bearing 1 we see a bearing in good condition with a modest level of overall noise and very low amplitude peaks. The RMS is 51.2 dBµV. The Peak is 67 dBµV and the Crest Factor is 6.17

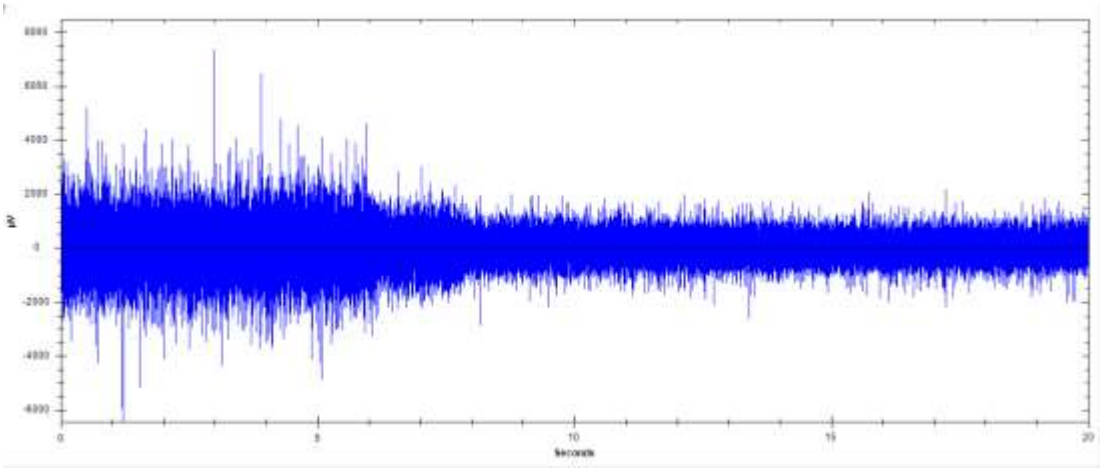


In Bearing 2 we see a bearing in need of lubrication. The overall noise level is much higher in comparison to bearing 1 and there are a lot of impulses related to surface to surface contact indicating the thin film of lubrication is not managing its task. The RMS is 57.8 dBµV (a factor of 2x higher than frictional forces in Bearing 1). The Peak is 79 dBµV and the Crest Factor is 11.48. The higher CF value on Bearing 2 indicates that not only high frictional forces exist, but also higher peaks caused by impulses in the bearing.

Summary Comparison Table for Bearing 1 & 2

	RMS (US) dBµV	Peak (US) dBµV	Crest Factor
Bearing 1	51.2	67	6.17
Bearing 2	57.8	79	11.48

Since Bearing 2 data suggests a need for lubrication our Lube Tech did just that. The result is visually obvious:



The grease first reached the rolling elements at the 6-7 second mark. By the 10 second mark the bearing was noticeably quieter and the sharp peaks from bearing impulses are now considerably shorter.

Reporting

The objective of good reporting is to provide information and build awareness to those who need to be informed. They need to know what work they must do to bring an asset back to best condition. They need to know when that work should be done and the consequences of not acting on the work in a timely fashion. The job of the report generator can be compared to that of a translator. This job normally falls on the person responsible for collecting condition-monitoring data. CM data is the machine, the valve, the pump, the motor, the "whatever it may be" talking to you in an ultrasonic language. You are trained to understand that language. It is your job to translate what the asset is telling you into meaningful information that the planner, the repair crew, production and management can understand. That is what a good report should be; a product of considered engineering opinion based upon the facts you have gathered.

A report should NOT be data spewing. Time signals and spectra are merely hieroglyphics to most and while they may look pretty to techies, they will not impress upper management. Should they be included? Absolutely; But only include illustrations that support a clear explanation of the problem. Indeed, using the graphics in the example above, including explanations and best recommendations form the essence of any good report.

What message should you be conveying then? Your report should start by stating the problem: "There is an issue with this machine, or this valve, or this bushing, or this transformer. Additional follow-up with vibration analysis and an oil lab report is recommended to confirm the problem." Identify the asset and identify the issue. Then clearly state what needs to be done to bring it back to best acceptable condition. A good report should also include a message about the consequence of doing nothing: "You can fix it now and the cost for the repair, including spares, labor and scheduled downtime, will be $500. Or, you can leave it alone, however, besides continuing to impact production and product quality, the cost to fix it on an emergency basis will be $50,000."

What is wrong with writing a strong messaged opinion such as this in your report? Is it politically incorrect to make that assertion and state the blindingly obvious? Or is there lingering fear of making a bad call. The latter is a confidence issue that relates either to distrust in the technology used for CM or the person charged with collecting the data. Both can be addressed through expert training.

Training

Many people ask, "Is ultrasound complicated?" and without hesitation, the answer is "no". Yet the degree of sophistication can vary from one program to another. Should you embark on an ultrasound assisted lubrication program on your own? That is probably not a good idea if fast results and longevity are adjectives that describe your goals.

Training is the foundation of an effective and enduring ultrasound program. Whether you choose a 1-day ultrasound lube-tech course or a full week implementation and certification, your program will survive and thrive through the experience of trainers who have helped create thousands of programs just like yours.

SDT Training Courses include:

- 2-day Lubrication Seminar
- 2 ½-day Level 1 certification (in accordance with the material content of ISO 183436-8 and ASNT Recommended Practice SNT-TC-1A)
- 4-day ISO Cat 1 certification in compliance with ISO 18436-8

- 2 ½ day Level 2 certification (in accordance with the material content of ISO 183436-8 and ASNT Recommended Practice SNT-TC-1A)
- On-site Implementation (2, 3, 4, 5 day)
- Signal Analysis Training
- Custom courses to fit YOUR needs.

For more information visit: www.sdtultrasound.com/training

Benefits

Ultrasound assisted lubrication of plant assets offers significant benefits that calendar based lubrication cannot. Lubrication serves a primary purpose, which is to create a thin layer of lubricant between rolling and sliding elements that reduces friction. So, it makes sense that the best way to determine the lubrication requirement of a machine is to monitor friction levels, not time in service.

Optimizing lubrication of plant machinery with ultrasound will result in a significant reduction in grease consumption. Having an ultrasound program in place will create a better culture leading to cleaner storage practices, sampling, and avoiding mixing greases.

Machines that are properly lubricated require less energy to run. Imagine that reducing the amount of money spent on grease will lead to lower energy bills. Machines that consume less electricity run cooler and machines that run cooler have longer life cycles.

The real reason to optimize bearing lubrication is to extend the life of bearings by making sure they have the right amount of grease, but not too much. When everything is running according to plan lubetechs will spend less time greasing bearings that do not need it. So, when counting up the benefits of your ultrasound program do not forget to add “decreased labor” to the long list.

Finally, by monitoring the condition of your machinery’s lubrication, you are at the same time collecting valuable condition data about the machine itself. Dynamic and static ultrasound data coupled with the 4 condition indicators (RMS, Max RMS, Peak, and Crest Factor) are all indicators of bearing health. Who knew so much good could come from such a simple shift from calendar to condition based maintenance? Now you know.

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Appendix A

3-Step Generic Lubrication Procedure for Ultrasound On-Condition Lubrication

Every plant is different, but basic similarities make this generic procedure for ultrasonic lubrication relevant. This guideline is a foundation from which to build out a more tailored, individual solution. With decades of experience implementing effective ultrasound lubrication procedures, we invite you to contact SDT for trusted guidance.

1. Equipment setup.

a. Determine the ultrasound equipment for monitoring
    i. SDT LUBExpert – see LUBExpert Procedure Appendix B
    ii. SDT170; SDT200SD; SDT270SB; SDT270SU; SDT270DU
    iii. Other non-SDT equipment
b. Determine the ultrasound sensor
    i. LUBEsense1 Acoustic Lubrication Sensor (LUBExpert only)
    ii. RS1T – Resonant Sensor, Threaded with magnetic base or acoustic lube adaptor
    iii. RS1N – Resonant Sensor Needle (3”, 11”, 21”)
c. Connect the sensor to ultrasound collector with supplied cable
d. Functionally test equipment – including headphones --- and ensure the battery is charged

2. Collect an ultrasound reading.

a. Take initial dBµV reading using steps prescribed by SDT operations manual, Level 1 course training material, “Methods of Mechanical Inspections”
b. Determine, based on the dBµV reading, if the bearing requires grease. SDT uses the 8/16/24 dBµV method to determine failure stages. Here’s how it works:
    i. An increase of 8 dBµV over baseline indicates a need for grease.
    ii. 16 dBµV over baseline is a serious warning; the bearing has entered a failed state
    iii. 24 dBµV over baseline is a severe warning; catastrophic failure is a real possibility

3. Grease the bearing.

a. Does the bearing have a drain plug? If so, remove it and clear the orifice with a CLEAN brush.
b. Place the ultrasound sensor on the zerk fitting (with lube adaptor) or on the bearing directly (magnetic base or threaded mounting block).
c. Slowly dispense a small amount of grease, no more than 10-20% of the max quantity
d. Wait for some time, (10-60 seconds) – depending on the bearing configuration – for the grease to churn into the bearing.
e. Retake the static ultrasound dBµV reading.
f. Repeat steps c) thru e) as long as the dBµV continues to decrease.
g. If an additional shot of grease causes dBµV to increase, STOP greasing

The goal is to return the bearing to its minimal dBµV value. An increase in dBµV from this point could be an indication of over-lubrication.

Appendix B

2-Step LUBExpert Lubrication Procedure – Grease Bearings Right!

LUBExpert is an ultrasound solution designed to help you grease bearings right. It combines accurate measurement capabilities and a clever user interface to create an onboard lubrication assistant. LUBExpert guides lube-techs before, during, and after resulting in optimal lubrication for all assets.

For specific guidance on creating a world-class acoustic lubrication program contact your authorized SDT training and implementation specialist.

For more detailed explanation of this procedure refer to the LUBExpert User Manual

1. Set up UAS and LUBExpert

a. Tell UAS how much lubricant is dispensed with one full stroke of your grease gun
b. Enter your list of used greases
c. Put UAS in LUBExpert Mode so only LUBEsense1 and Temperature sensors are active
d. Build your lubrication routes in UAS
    i. Asset identification (6 nodes to describe machine location in your plant)
    ii. Sensor assignment (Ex. LUBEsense1, Temperature)
    iii. Measurement type (Ex. Static, Dynamic)
    iv. Data collection interval (Ex. weekly, monthly)
    v. Data acquisition time (Ex. 3 seconds)
    vi. Grease name (Ex. Mobil synthetic)
    vii. Maximum grease quantity (Ex. 20 grams)
e. Upload greasing routes from UAS to LUBExpert
f. Connect the LUBEsense1 sensor to ultrasound collector with supplied cable
g. Functionally test equipment – including headphones --- and ensure the battery is charged

2. Grease the Bearing

a. Enter **Planned Survey** mode and select your first asset location
b. LUBExpert displays the Lubricant to use and the maximum quantity to dispense
    i. verify the information is correct
c. Attach LUBEsense to bearing, set amplitude gain, and take your initial measurement
d. Press ENTER to display measurement and F3 to save it.
    i. LUBExpert provides dBµV level and SDT's 4 Condition Indicators
e. Follow on-screen instructions from LUBExpert onboard assistant
    i. Add 1 shot of grease and press ENTER
    ii. Wait for the churn time (you may adjust churn time by pressing F2)
f. Add another shot of grease if advised or press F3 to end lube task and retrieve status report
    i. Good – continue greasing under LUBExpert advice
    ii. Suspect – Investigate bearing condition; ensure lubrication is reaching bearing
    iii. Bad – Investigate bearing health
g. Complete lubrication of the remaining assets in the survey
h. Upload greasing task survey data to UAS and generate reports

The goal is to return the bearing to its baseline dBµV value, avoid over/under greasing, and provide a status report on the condition of the bearing.

Notes