

Realizing ongoing benefits through the deployment of Ultrasound technology

Ultrasound – Condition Monitoring for the Masses

Robert Dent, CMRP, CRL
National Sales & Service Manager
SDT Ultrasound
(289) 771-1313
robert.dent@sdtultrasound.com
www.sdtultrasound.com



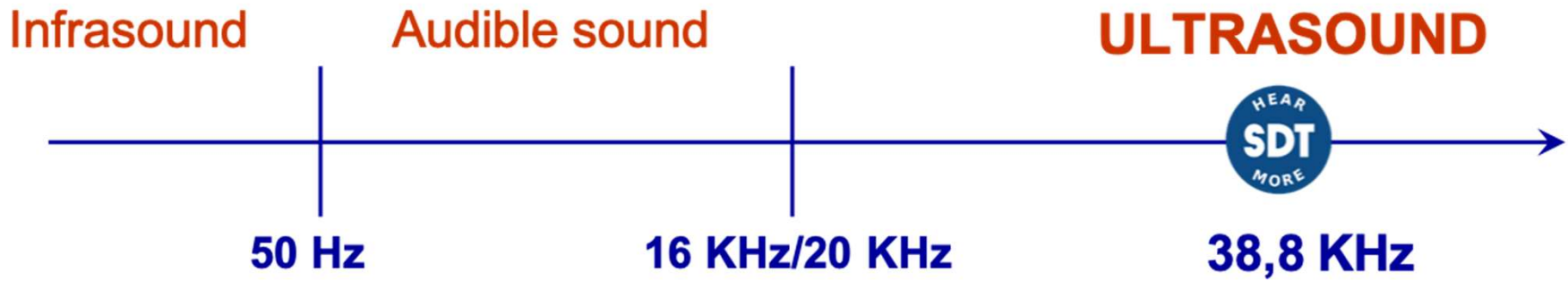
Mission

Provide Solutions That Give our Customers a Better Understanding About the Reliability of their Assets



PARTNERED ULTRASOUND

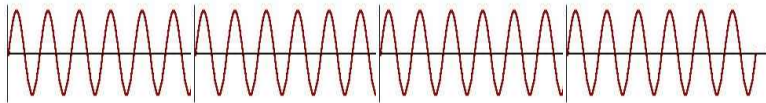
What is Ultrasound?



Characteristics

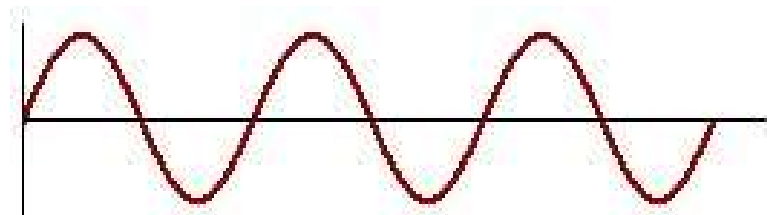
Ultrasound

- High frequency
- Short wavelength
- Lower amplitude
- Directional
- Quickly attenuated

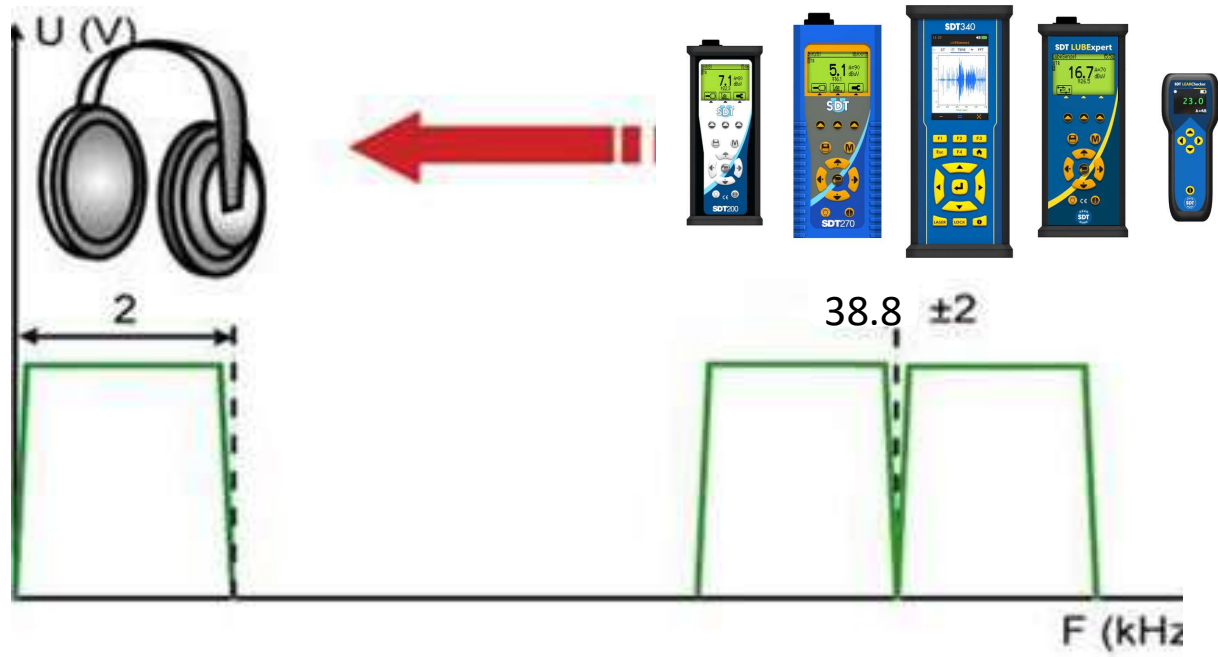


Sound

- Low frequency
- Long wavelength
- Powerful amplitude
- Multi Directional
- Transports Well



Ultrasound

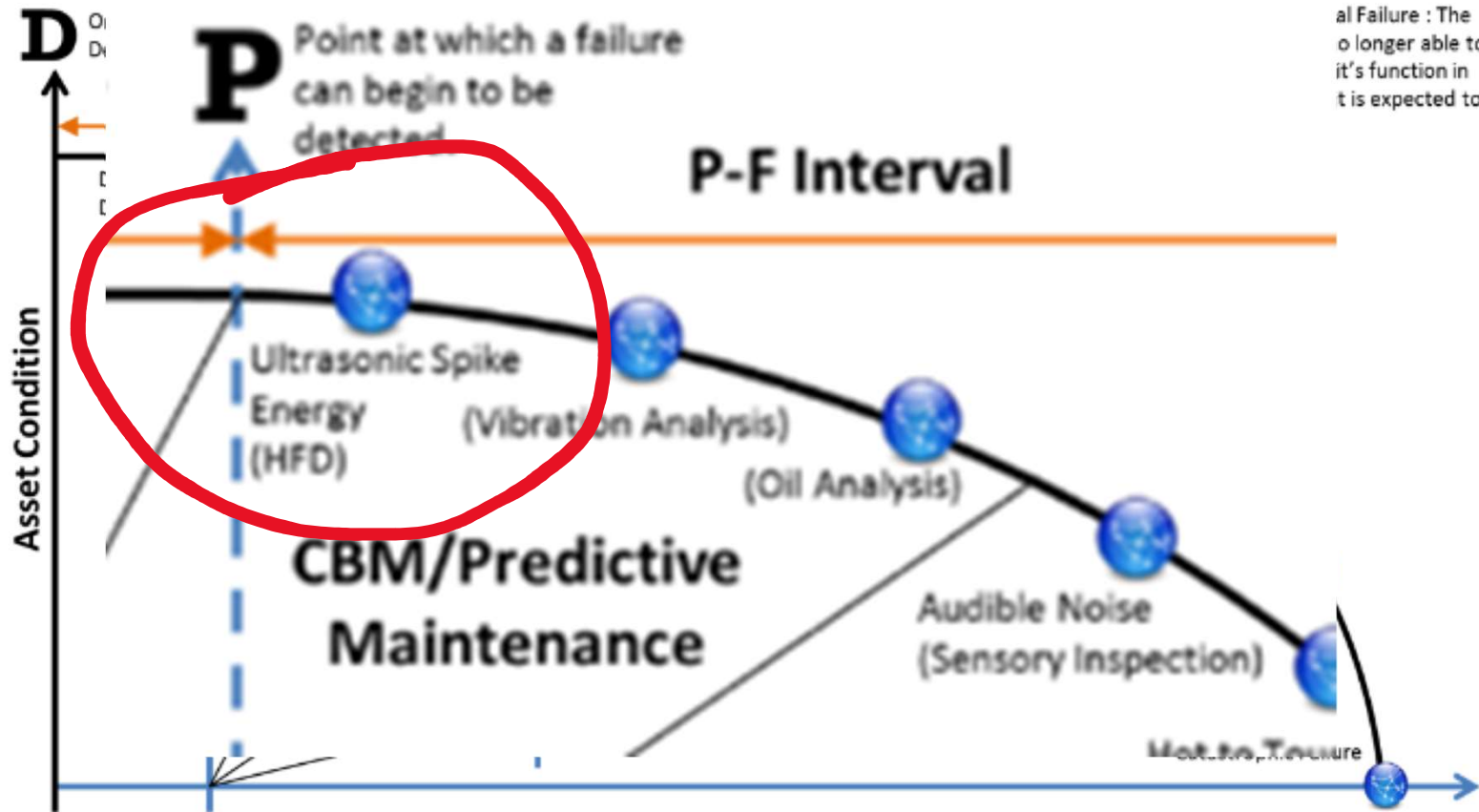


Why Ultrasound?

Condition Monitoring with Ultrasound

- Versatile Predictive Maintenance Technology
- Complimentary Technology
- Easy To Use
- Results Right From The Get Go
- Short Learning Curve

Ultrasound Owns the Apex of the P-F Curve











Final Failure : The point at which the asset is no longer able to perform its function in a safe and reliable manner.

Sound Strategy

Ultrasound is generated by many things

The Eight Application Pillars

APPLICATIONS

							
MECHANICAL Detect defects in any mechanical system.	LEAKS Find pressure and vacuum leaks in noisy conditions.	LUBRICATION Avoid over/under lubrication. Grease bearings right.	ELECTRICAL Inspect medium and high voltage systems for arcing, tracking and corona.	VALVES Asses valve tightness.	STEAM Find faulty steam traps and leaking components.	HYDRAULICS Troubleshoot any hydraulic system for passing and blockages.	TIGHTNESS Determine the tightness of any enclosed volume.

Zero Waste



Zero Downtime



Ultrasound as a Measure of FITness

F R I C T I O N
I M P A C T I N G
T U R B U L E N C E

Two Ways to Detect

Ultrasound moves through any medium

- Gas, Liquid, Solid

Two modes of detection

Airborne Detection



Structure Borne Detection



Today's Focus



Leaks



Lubrication

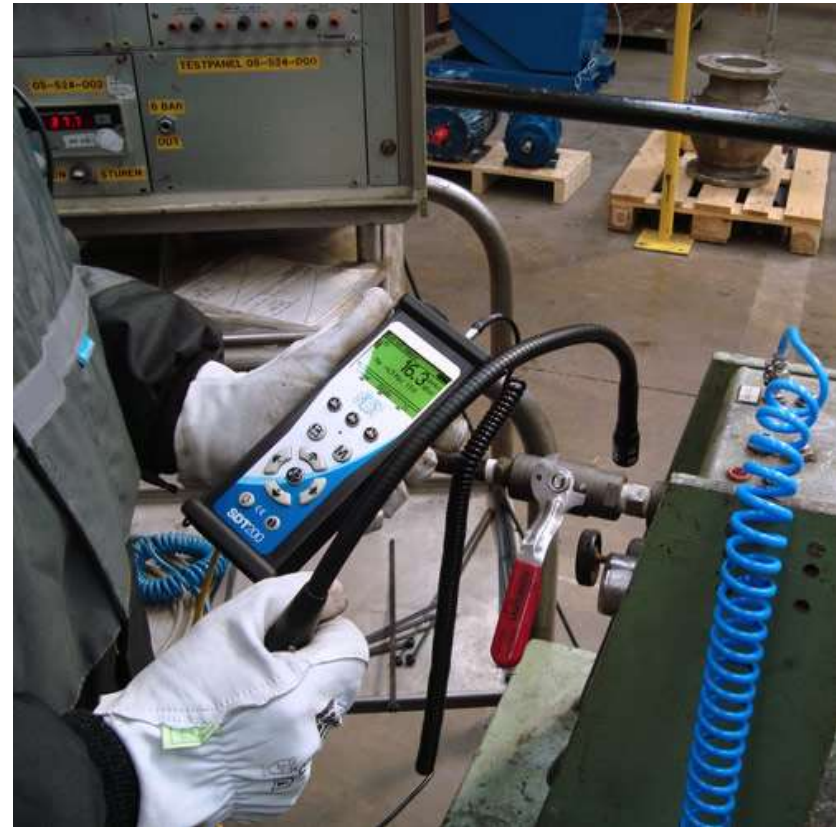


Steam

Leaks



- Friction?
- Impacting?
- Turbulence?



Leak detection



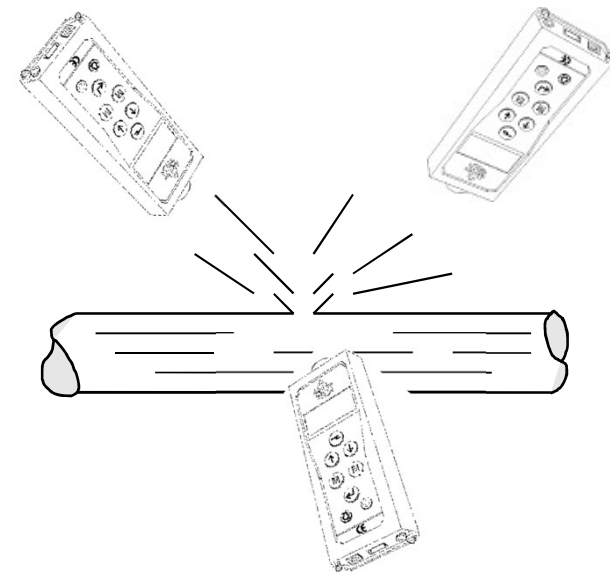
What is a leak?

When a fluid, gas or liquid, passes from a high pressure to a low pressure through a hole that is not supposed to exist, usually accompanied by an irreversible loss of material and / or energy

Leak Detection



- Turbulent flow at leak site**
- Produces ultrasound with peaks at 40kHz**
- Directional... easy to pinpoint**
- Oblivious to plant noise**
- Vacuum leaks**



Scan For Leaks



- **Sweep Assigned Area**
 - Back and Forth
 - Up and Down
 - Follow Cross Pattern
- **Listen for Leak Sound**

Document Follow Up



Numerically tag leaks

- Date found
- Date repaired
- Repaired by ??
- Type of leak
- Location of leak
- Criticality

Repair on the spot?

LEAK TAG
№ 18572

Date Reported: _____
Date Repaired: _____
Repaired by: _____

LEAK TAG
№ 18572

Date Reported: _____

TYPE OF LEAK

<input type="checkbox"/> STEAM	<input type="checkbox"/> AIR	<input type="checkbox"/> OIL	<input type="checkbox"/> OTHER/GAS/RE
<input type="checkbox"/> VAPOR	<input type="checkbox"/> CO ₂	<input type="checkbox"/> NH ₃	

Location: _____

Equipment & Name: _____
Reported by: _____
Dept: _____, Est: _____
401 - 726 - 1800

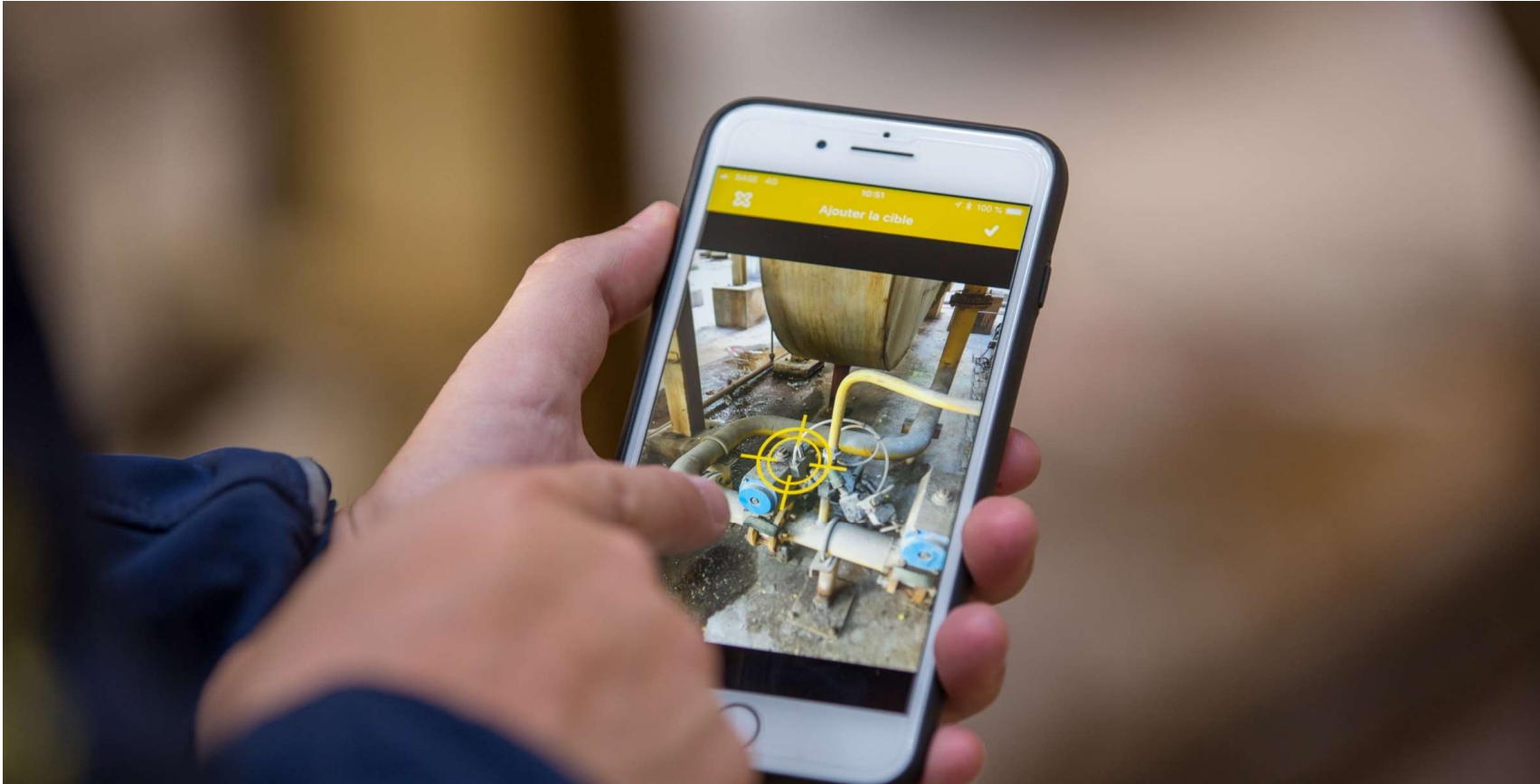


Find Leaks



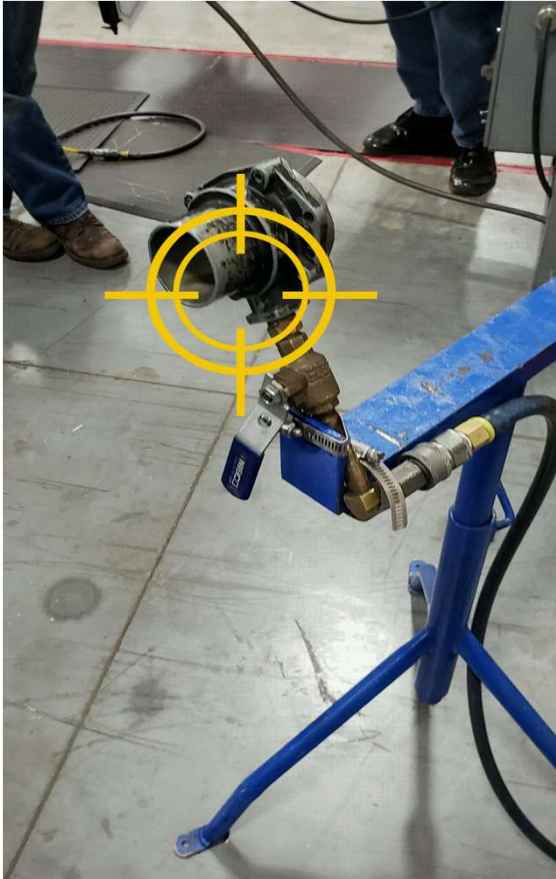
Track Leaks

Document Findings





Capture The Savings



Leak 1

Location	Finisher 2
Tag number	1
Sensor	Flexible Sensor
Distance from leak	12.20 in
Gas type	Compressed air
Measurement (dBμV)	79.0
Liters/Hour	13575.0
Loss (ft ³ /H)	479.4
Loss (\$/year)	1890.0
kWh/ft ³	0.005
Hours/year	8760.0
Status	High

Surveys Ranking Settings

Benefits



Total Cost Of Ownership Of A Compressed Air System From Cradle To Crave Can Be Broken Down As Follows:

- 15% Capital Cost – Acquisition & Installation
- 15% Maintenance And Repair
- 70% Electricity

In A Facility With No Compressed Air Leak Program 40% of the Electricity Costs Is Wasted On Leaks And Wrong Applications:

- Using Compressed Air When A Lower Cost Energy Source Is Available
- Blow Offs Without Energy Efficient Nozzles
- Un-Cleaned Filters Etc..

Lubrication



- Friction?
- Impacting?
- Turbulence?





What is the function of lubrication

- **Some lubricants are used to pull away heat**
- **Control contamination/flushing**
- **Reduce friction and wear between moving surface.**

If A Little Is Good Then A Lot Must Be Better - Right?



Time To Grease Some Stuff...



- Time Based?
- Condition Based?
- When to Grease?
- How Much Grease?
- Was I Effective?

Lubrication



veni, vidi, uncto

I Came, I Saw, I Greased

Lubrication Outcomes



3 Outcomes Are Possible When Greasing A Bearing:

- Friction Goes Down – Good
- Friction Goes Up – Bad
- Nothing Happens - ????



I Arrive At The Asset – What Next?

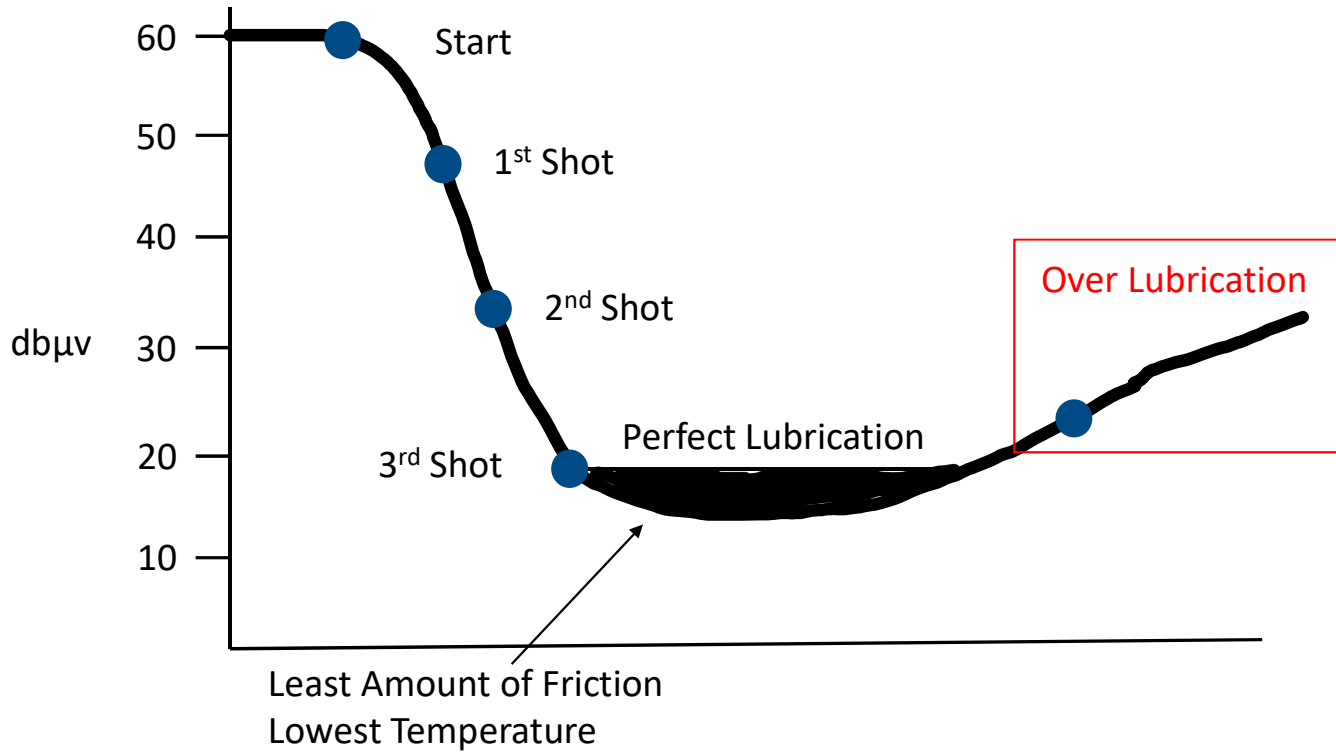
Scheduled PM

- Technician Receives Work Order
- Delivers Grease To Bearing Based on OEM Recommendation

On-Condition Lubrication

- Technician Receives Work Order
- Delivers Grease To Bearing While Measuring Ultrasonically
- Delivers Correct Amount Of Grease To Bearing

Reduce Friction



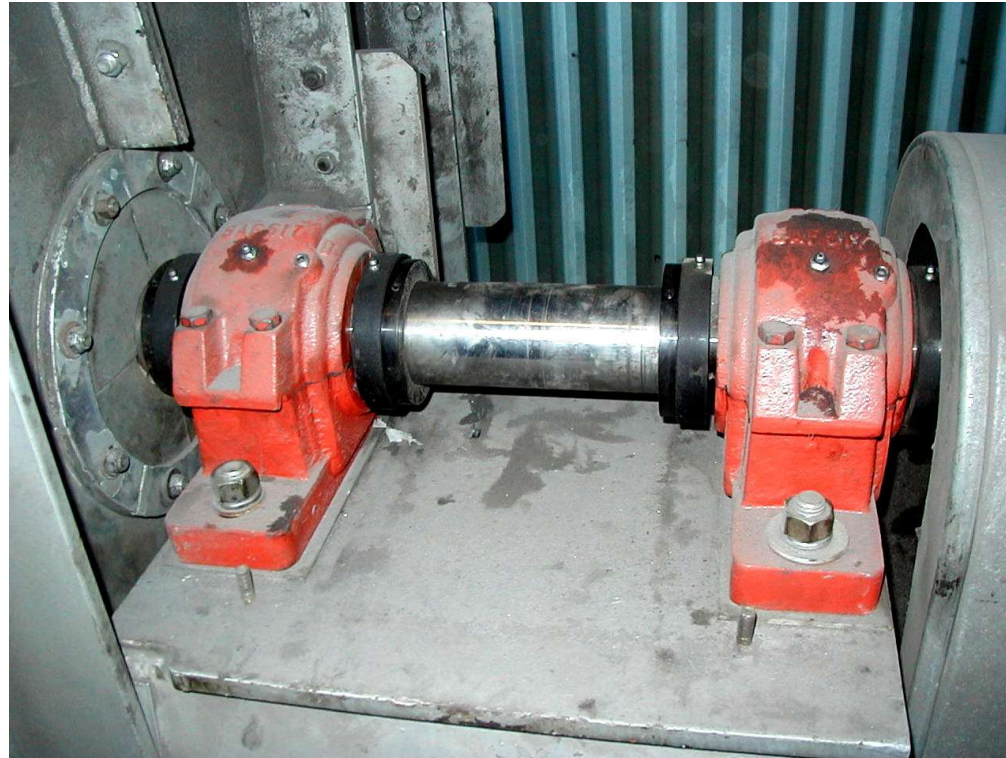
Acoustic Lubrication



Before Grease
55 dBuV



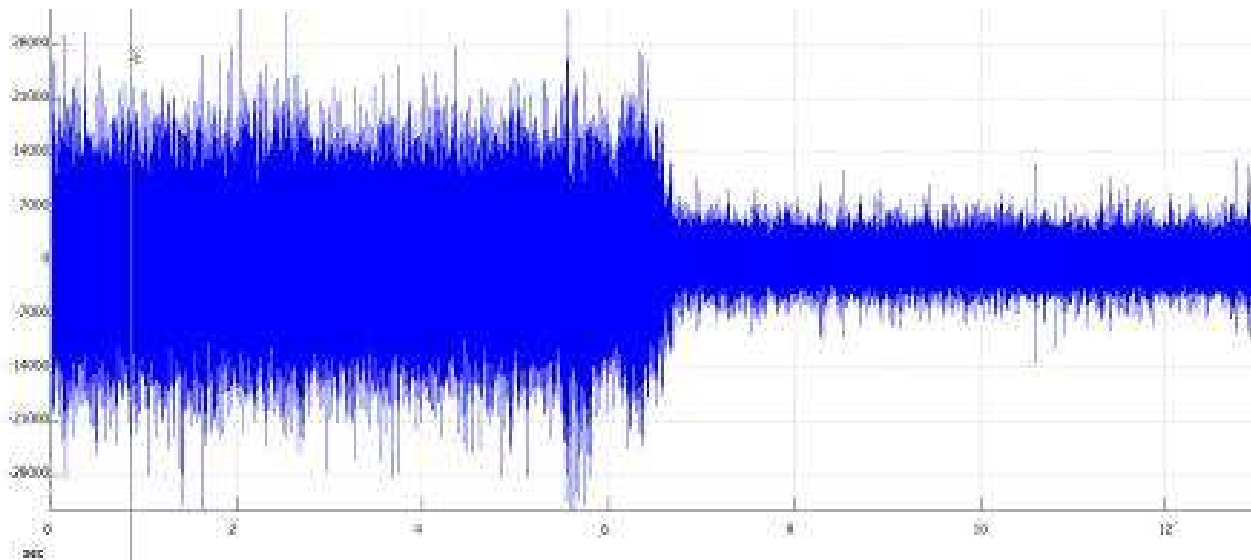
After Grease
38 dBuV



Lubrication



A picture is worth a thousand words
What is the value of this picture?



Benefits Of An Acoustic Lubrication Program

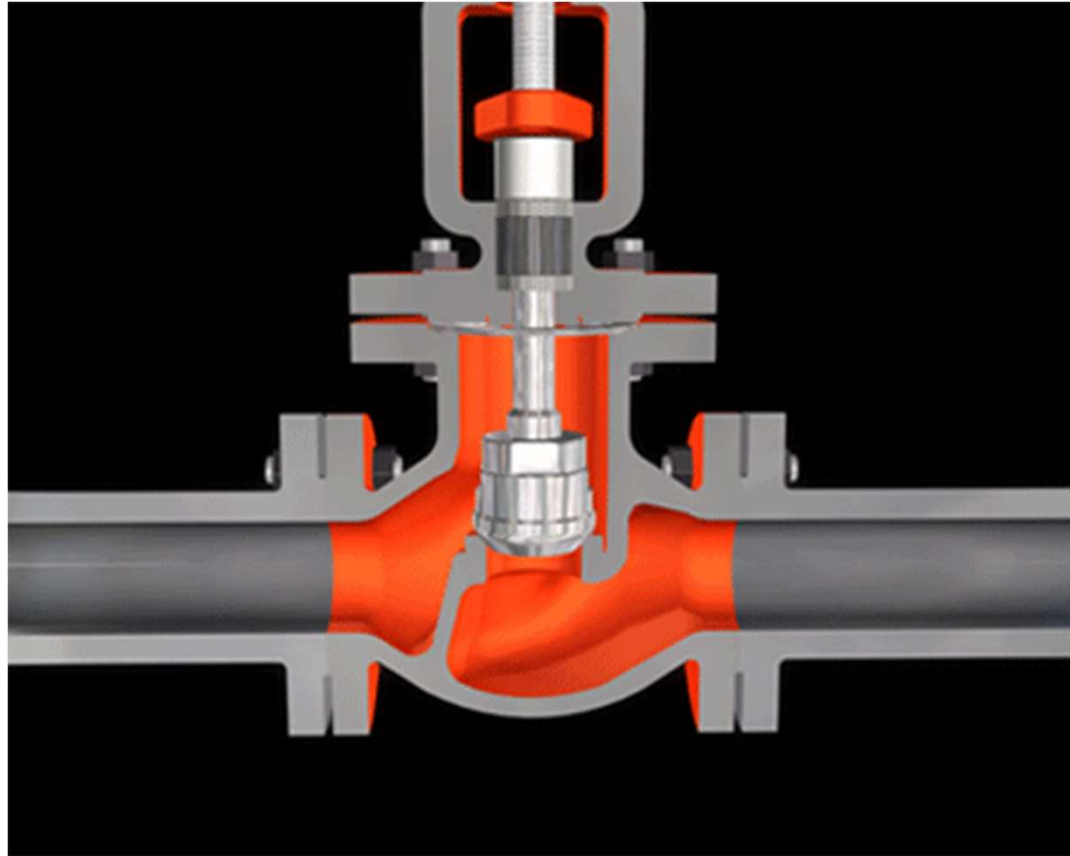


- Grease Bearings With Right Amount Of Grease
- Remove Over Lubrication
- Prevent Under Lubrication
- Reduce Grease Consumption
- Reduce Spend On Grease
- Increase Bearing Life
- 1st Line Of Defense On Bearing Monitoring
- Saves Time

Steam Traps



- Friction?
- Impacting?
- Turbulence?





What is steam?

An essential energy source

Provides heat for cooking, drying, chemical reactions

Provides motive power

Steam requires a lot of energy



Steam requires energy

- **1lb of water by 1°F = 1BTU**
- **141BTU to get to boiling point**
- **970BTU to make 1lb of steam**
- **1kg of water by 1°C = 4,186J (4.186kJ)**
- **330.7kJ to get to boiling point**
- **2,257kJ to make 1kg of steam**



Latent heat of vaporisation

The energy required to turn liquid to gas

At 100C=212F, the latent heat of water would be 970BTU/lb or 2,257kJ/kg

When steam condenses back to water, this energy is released

What is a steam trap?



An automatic valve which is supposed to

- Open to purge air, CO₂ and condensate
- Close for steam



Air in a steam system

Occupies precious space in the steam line

Air/steam mix has a lower temperature

Insulating property of air acts as heat transfer barrier



CO₂ in a steam system

CO₂ enters the system as carbonates from the feed water

A few ppm stays after the de-ionisation or demineralisation processes and mixes with the cooled condensate to form carbonic acid which is corrosive.



Condensate in a steam system

Dramatic decrease in temperature

Water hammer in steam lines leads to noise and possible pipe breakage

Steam traps



Many different types of steam trap

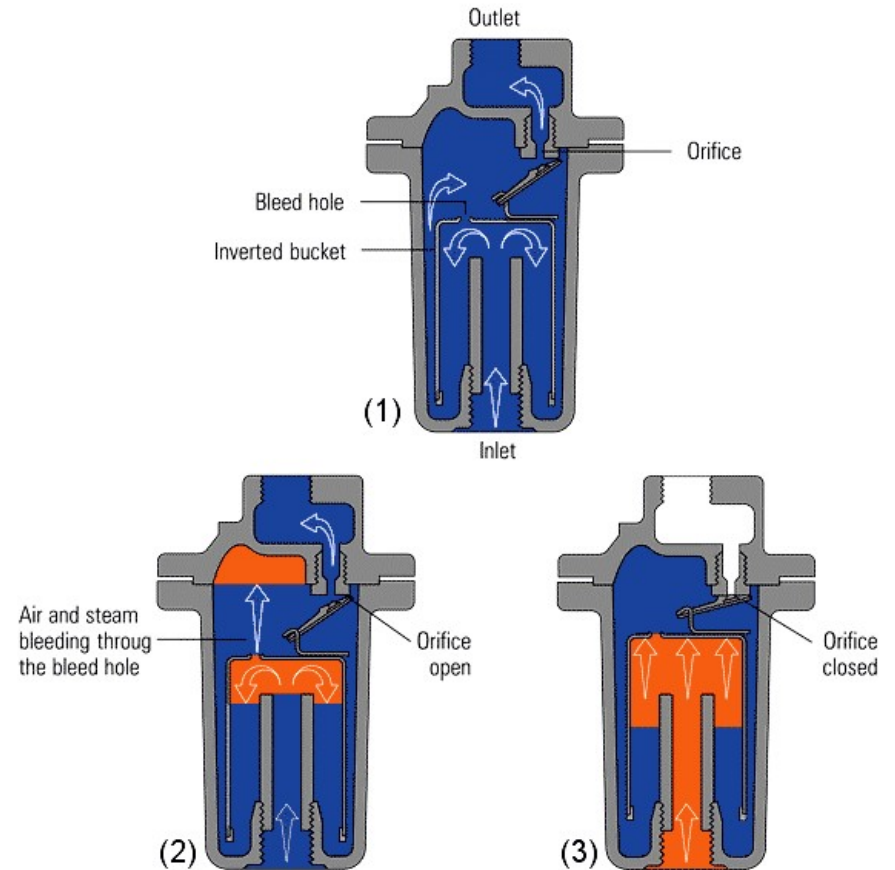
Work on changes in density or temperature or both

Most common are:

- Inverted bucket
- Thermostatic
- Float and thermostatic

Inverted Bucket Trap

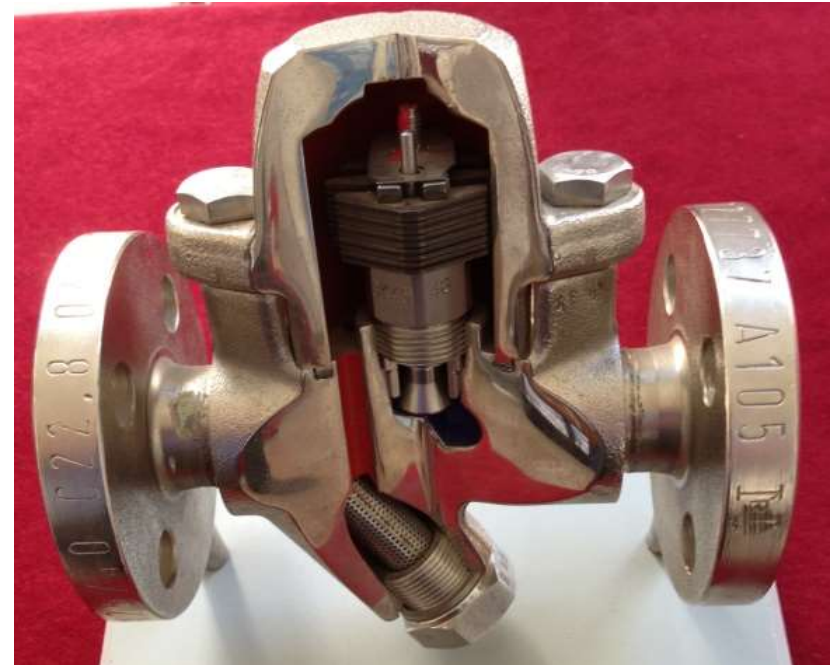
- Inverted bucket acts as a float
- When sufficient condensate collects, the float sinks and operates a discharge valve which purges the condensate





Thermostatic Trap

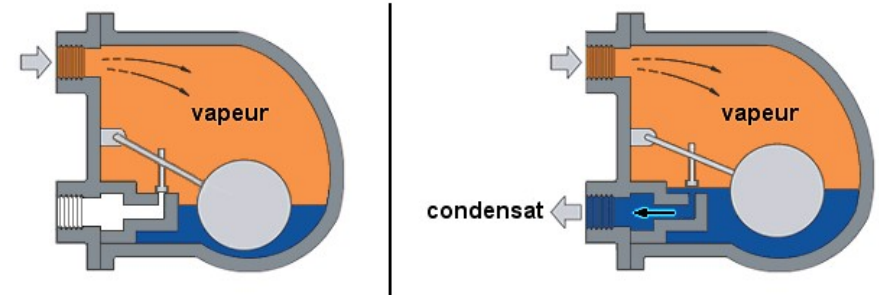
- Condensed steam and gases are cooler than steam
- Their presence operates a purge valve
- This design requires a “cold” reference – do not insulate!



Float And Thermostatic Trap



- Combines the two principles
- Float removes condensate
- Thermostat removes air and non-condensable gases





Steam Trap Failure Modes

Stuck open – you are losing steam and possibly control

Stuck shut – you have reduced steam temperatures and water hammer

Unmanaged systems could have 30% of traps defective

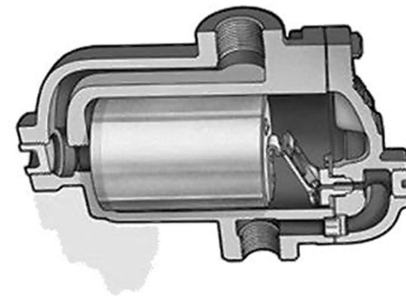


Steam Trap Failure Modes

A steam trap is directional – make sure that it is installed the right way around

A float trap needs gravity

A thermal trap cannot be lagged



Inspection methods



Working with steam is dangerous

Consider approaching in airborne mode in order to catch any leaks

Pay attention to air leaks on valves too



Inspection methods



Use ultrasound to listen to the operation of the trap – should hear collection and purge

Be patient – the cycle time is on-demand

Combine with temperature for more information



You Decide



1



2



3



4



Partnered Ultrasound

Thank You

Questions?

