HEAR SDT MORE Ultrasound Solutions

# LUBExpert

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- Lubrication Nightmares
- Solution
- LUBExpert kit

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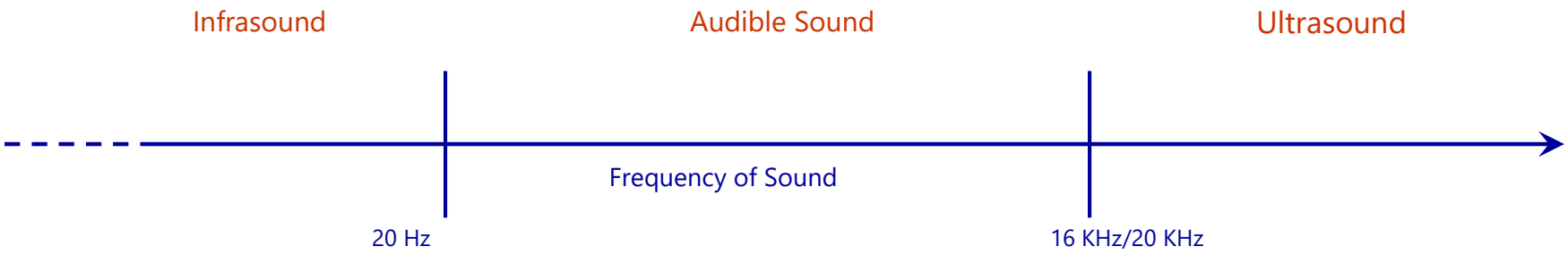
# Theory of ultrasound

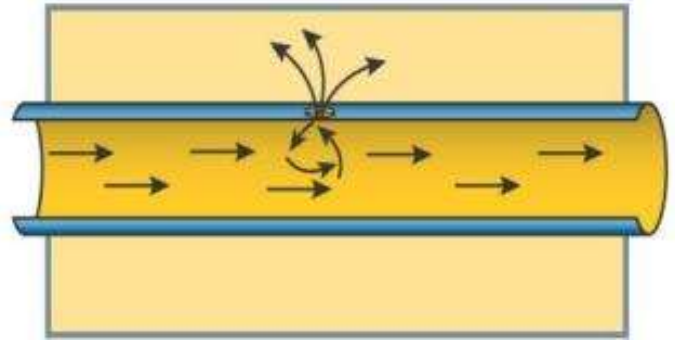
# The frequency band of sound

- Infrasound < 20 Hz.
- Audibles Sound : between 20 Hz and 20 kHz.
- Ultrasound = > 20 kHz.



# Origins of ultrasound

- **Turbulence**
  - Pressure leaks or vacuum
  - Leaks on hydraulic systems
  - Steam leaks
- **Impacts and friction**
  - Bearings and gears
  - Lubrication
- **Partial discharge**
  - Corona
  - Tracking
  - Arcing



Ultrasound Solutions

# Lubrication Nightmares

# Lubrication Nightmares

# Importance of lubrication

- **Lubrication :**
  - Direct impact on life of bearing

- **Inappropriate lubrication :**
  - 40% of the bearings are prematurely replaced due to a lubrication problem - (SKF, FAG ...)
  - 60% of mechanical failures are due to a  lubrication problem- (SKF, FAG ...)
  - 10% reach their expected lifetime
  - All industrial sectors are concerned!

# Importance of lubrication

- **The main causes of incorrect lubrication:**
  - Not enough grease

  - Too much grease

  - Inadequate interval

# Lubrication: A paradox

- **Paradox #1:**

  Although an essential requirement, lubrication is one of the most poorly managed operations in industry.

- **Paradox #2:**

  Poor lubrication is a leading cause of many mechanical failures which are easily identified through condition monitoring.

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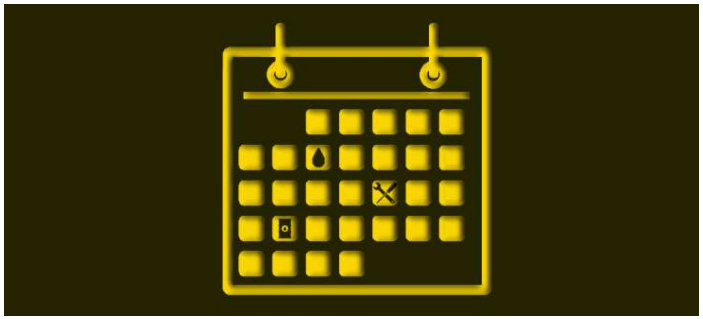


Why not treat the problem proactively?

# Lubrication, an easy task?

- A grease gun, a tube of grease and a few good pumps is enough to kill a bearing
- Calendar-based lubrication and automatic greasers?
- The current practice goes a long way to prove the statistics - 10% of bearings reach their expected lifetime.

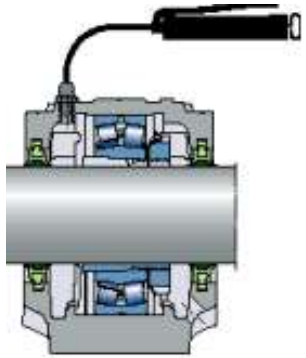
# Lubrication, an easy task?

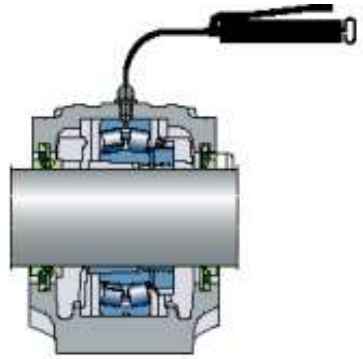
- Quantity determined by the manufacturers:
  - 90 grams / 400 hours in normal operation
- What does normal operation mean? How do we measure it?
- Correction factors: Load, Speed, Temperature, Environment

  All play a factor and all can be variable

# Calculating the amount of grease

- **Step 1: The quantity**
  - Easy to do
  - G = 0,005 x D x B (Side load)
  - G = 0,002 x D x B (central load)





- **Example: NU234**
  - Inside diameter = 170 mm
  - Outside diameter = 310 mm
  - Width = 52 mm
  - Quantity = 81 grams

# Calculating the amount of grease

- **Step 2: The theoretical interval**
  - Simple to determine
  - Rotation speed
  - Type of bearing
  - Type of grease
  - Operating hours/day
- **Example: NU234**
  - Classic grease
  - 1500 RPM
  - 24 h/d
  - Theoretical interval = 500 hours

# Calculating the amount of grease

- **Step 3: Corrected interval**
  - Correction factor %
  - Environmental conditions
  - Temperature (ambient), pollution, condensation
  - Operating conditions
  - Impacts, load, temperature (of bearing)
  - Impact of the correction?
  - Negligible ? Weak ? Important ?

# Calculating the amount of grease

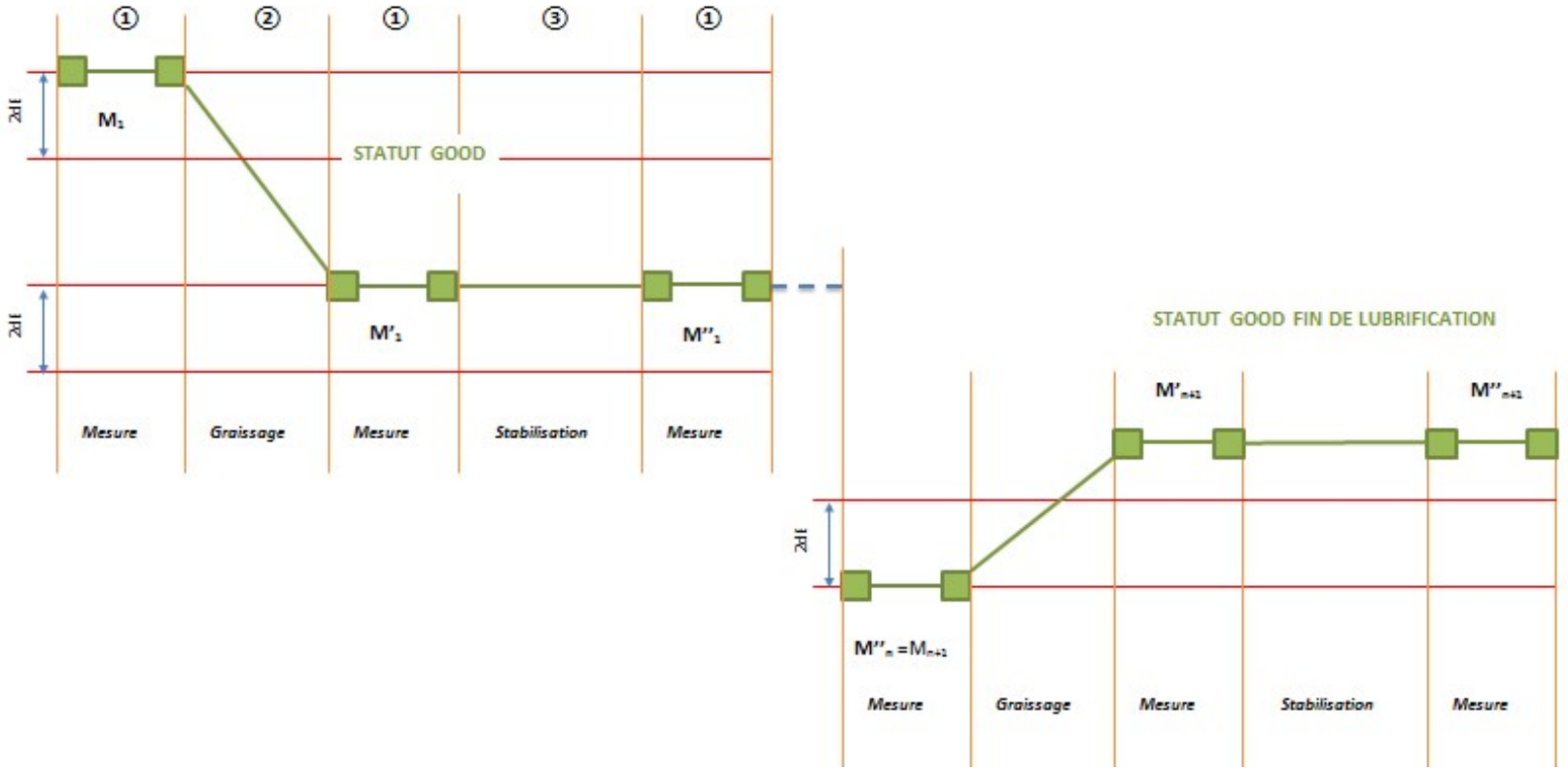
- **Example1 : NU234**
  - 1500 RPM  24 h/d
  - Load ‘’normal’’, No shocks, Contamination/moisture ‘’normal’’
  - Corrected Interval  = 500 hours

- **Exemple 2: NU234**
  - 1500 RPM 24 h/d
  - Load ‘’very high’’, presence of Shocks, contamination/moisture ‘’high’’
  - Corrected Interval = 100 hours

# Ultrasound measurements

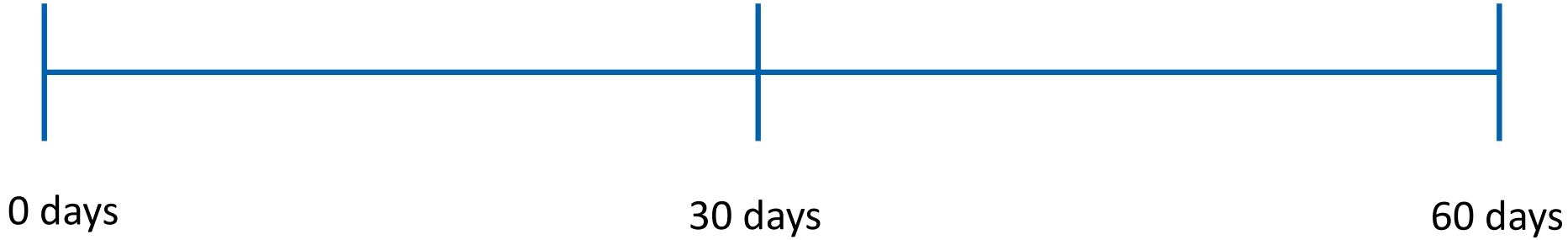
## Solution to Step 1: Quantity

- Successive grease intake until a slight rise in the US measurement
- The optimum quantity is then reached



# Ultrasound measurements

## Solution to Step 2: Interval



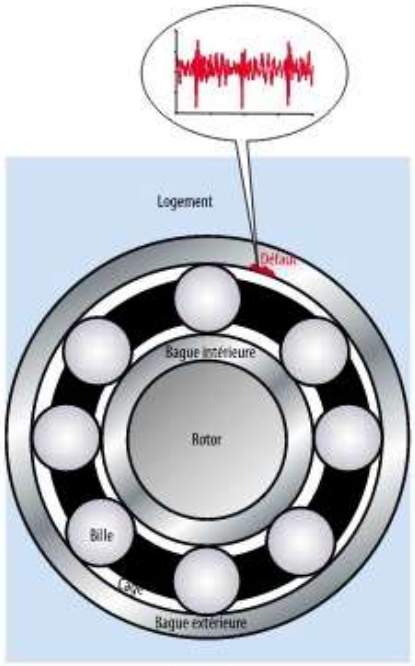
Ultrasound Solutions

# Solution

# Rotating machinery

## Fact

- Two mechanical phenomena that generate US:
  - **Friction**
  - **Impacts**



# Optimization of lubrication

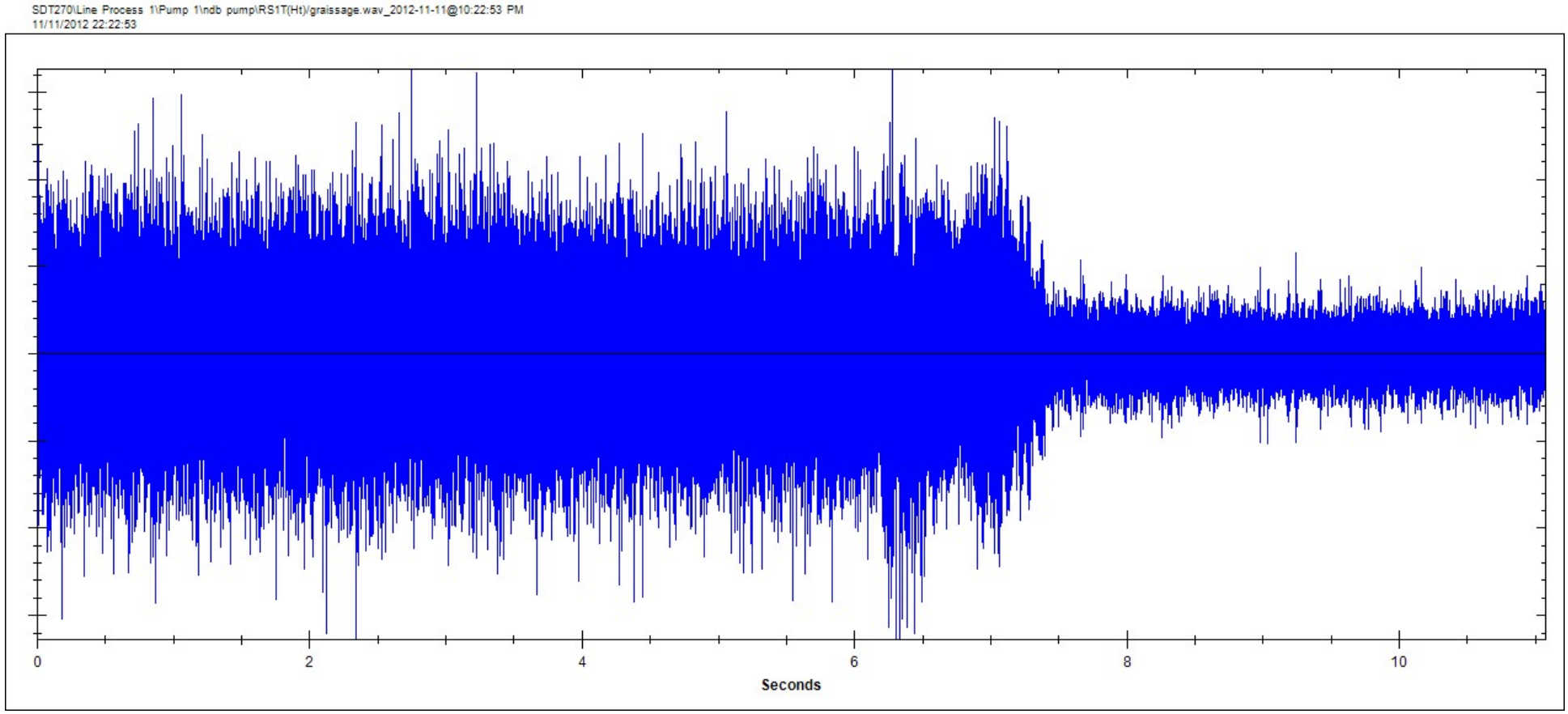
- **Ultrasound is the most effective technology for lubrication**

# Optimization of lubrication

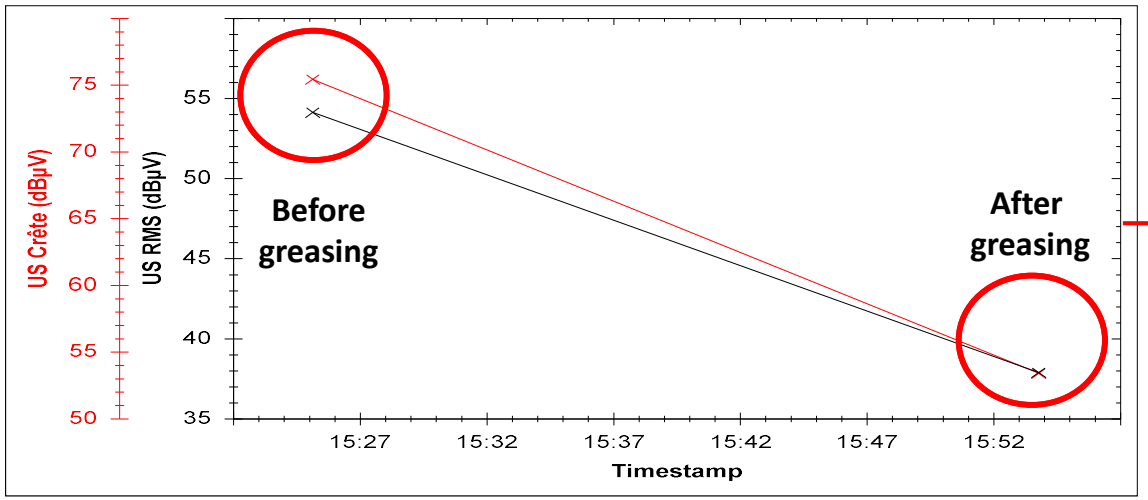
## 3 lubrication related causes of rolling element failures

- Over-lubrication
- Wrong grease
- Under-lubrication

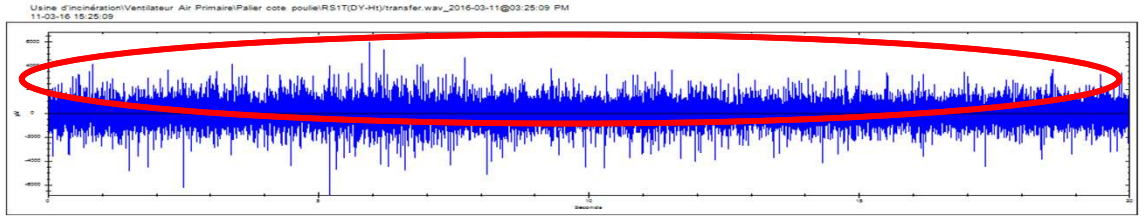
# Optimization of lubrication



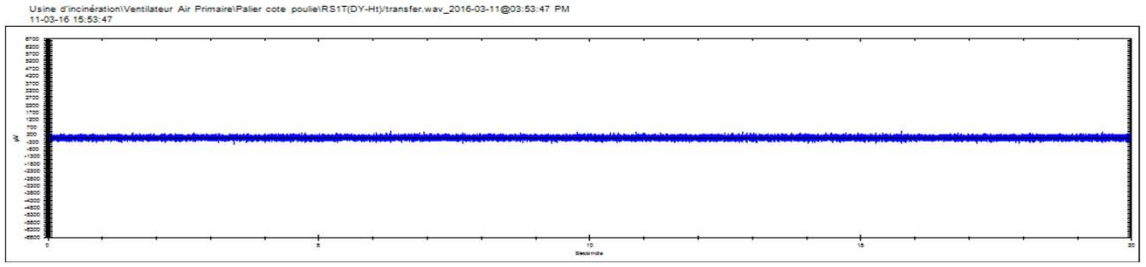
# Example of greasing



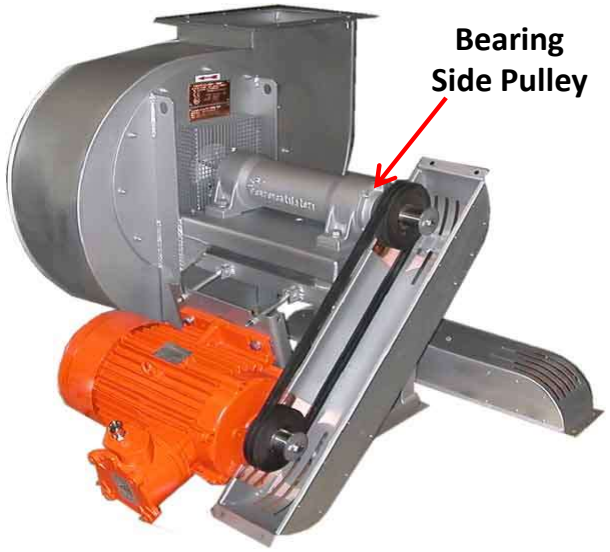

| Ultrasound Measurement Bearing Side Pulley | | |
|---|---|---|
| dB µV RMS Value | dB µV CF Value | Actions |
| 54,1 | 75,4 | Before Greasing |
| 37,9 | 53,4 | After Greasing |



Fan Bearing Side Pulley - Before Lubrication



Fan Bearing Side Pulley - After Lubrication



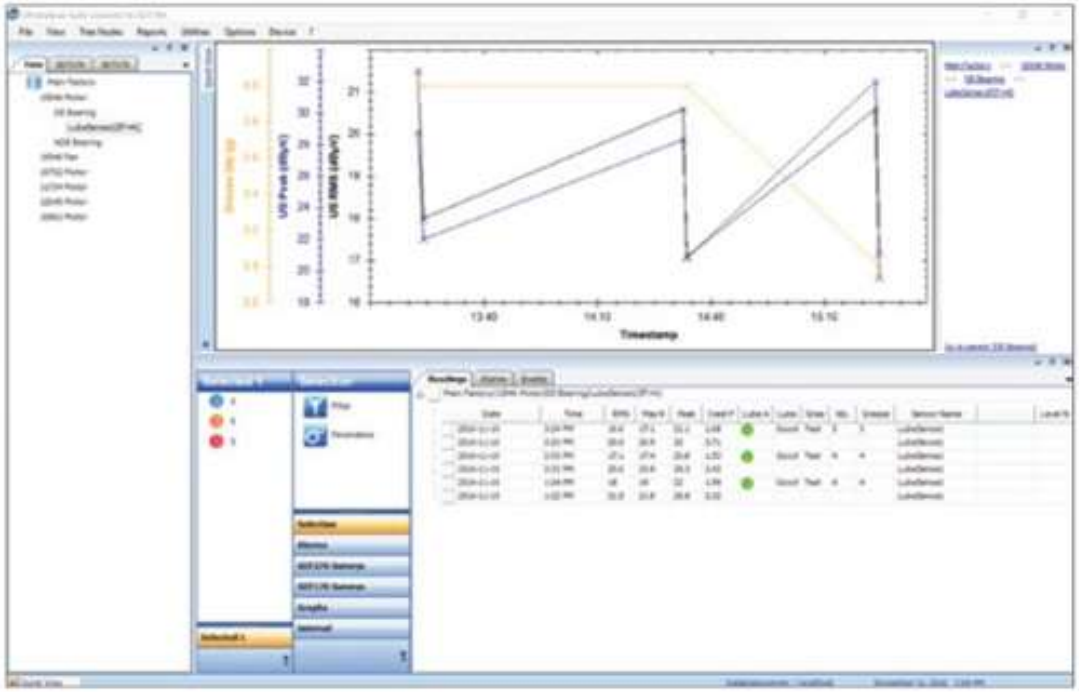
# LUBExpert

# Philosophy

## Grease Bearings Right

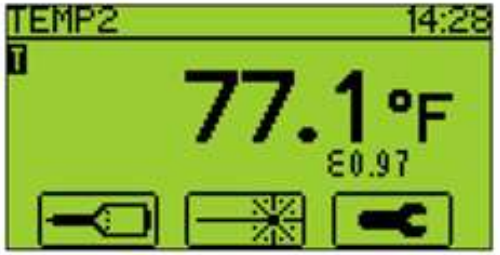
# Dedicated UAS software

## Program Management with Ultranalysis Suite



### Specify Grease Type and Quantity per Asset


### Record Asset Temperature



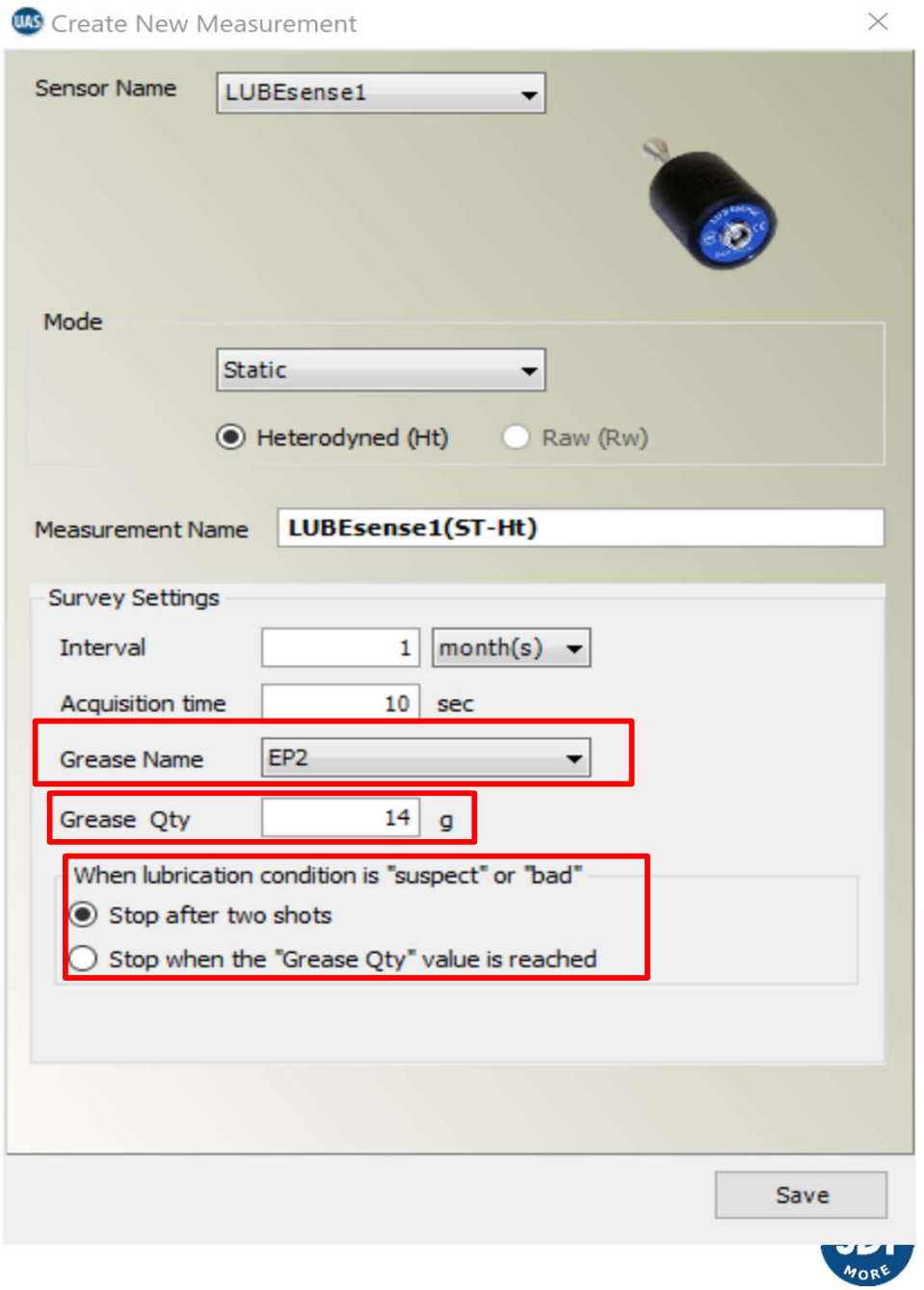

- Create hundreds of databases and surveys
- Track grease types and grease consumption
- Precise diagnosis with SDT's 4 Condition Indicators
- Sort assets as GOOD, BAD or SUSPECT

# Lubrication point configuration

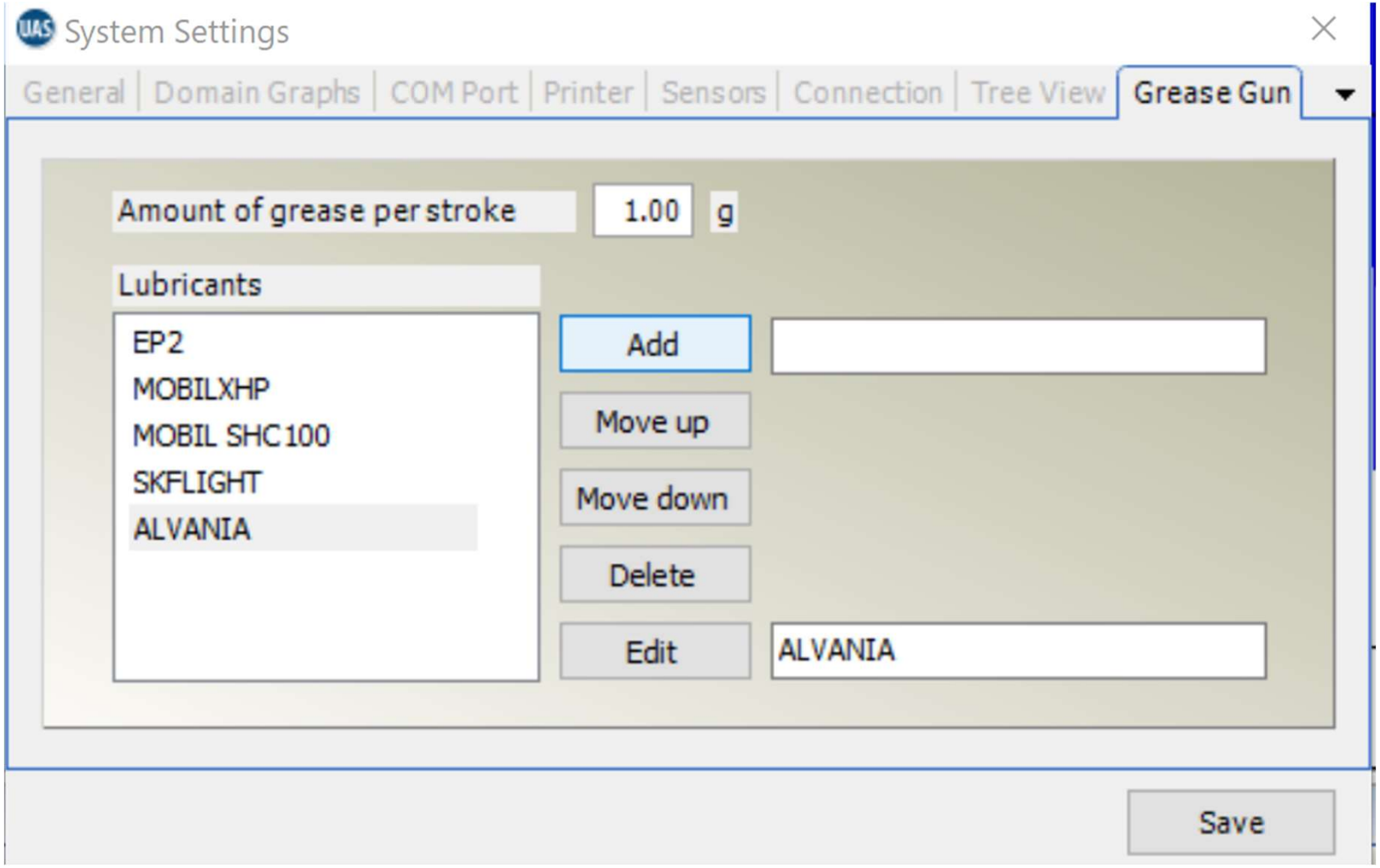
Type of grease

The theoretical calculated quantity

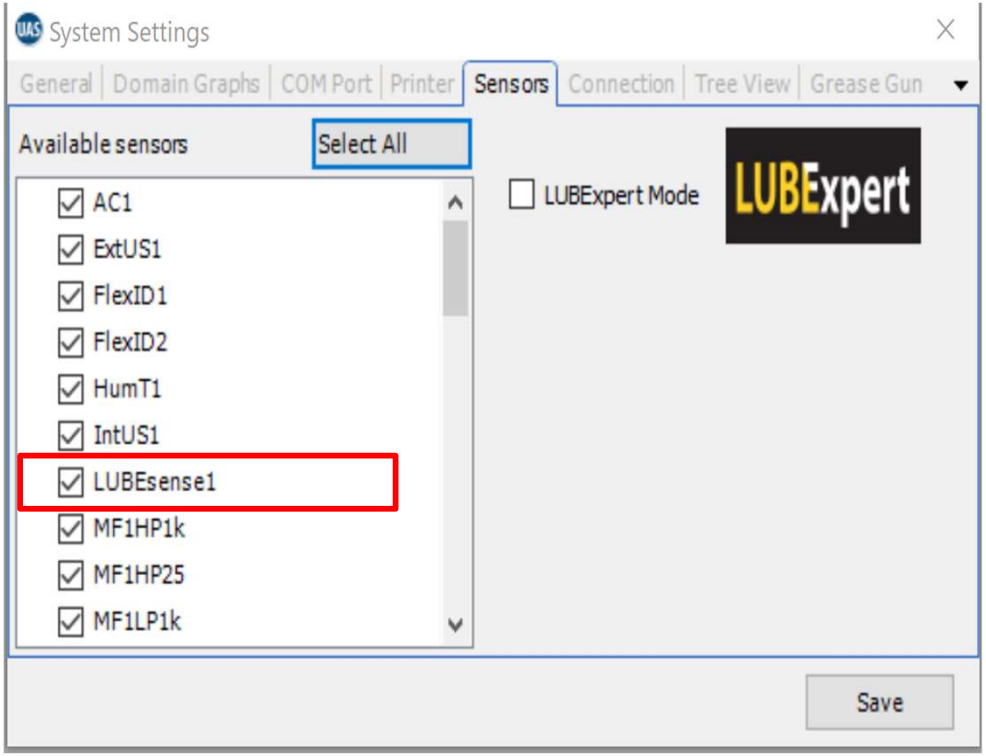
Lubrication state

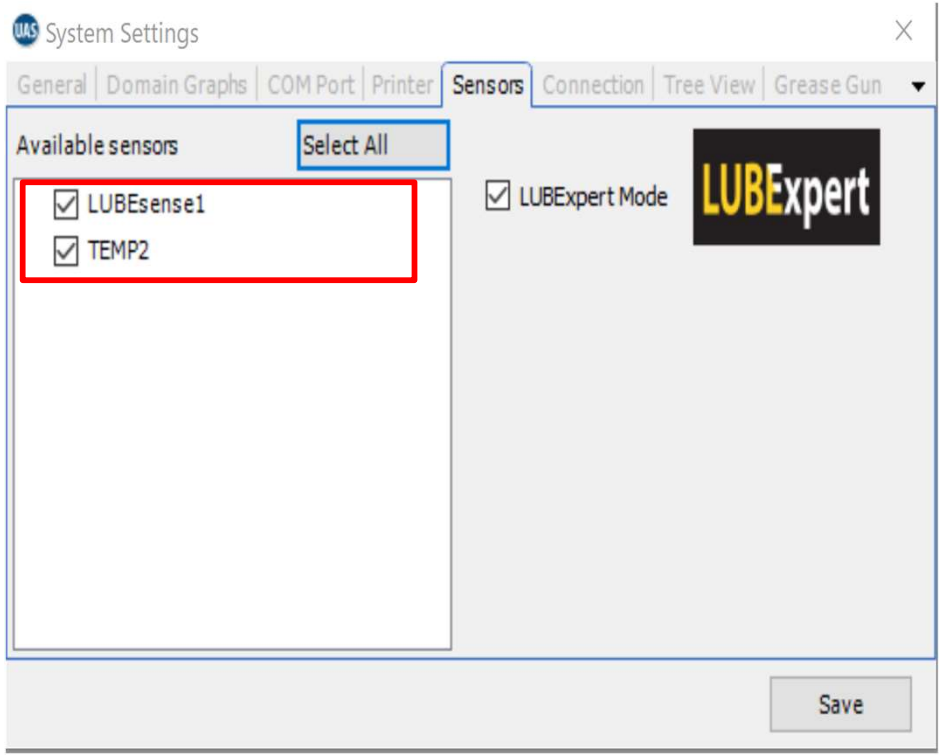


# Setup of greases and quantities



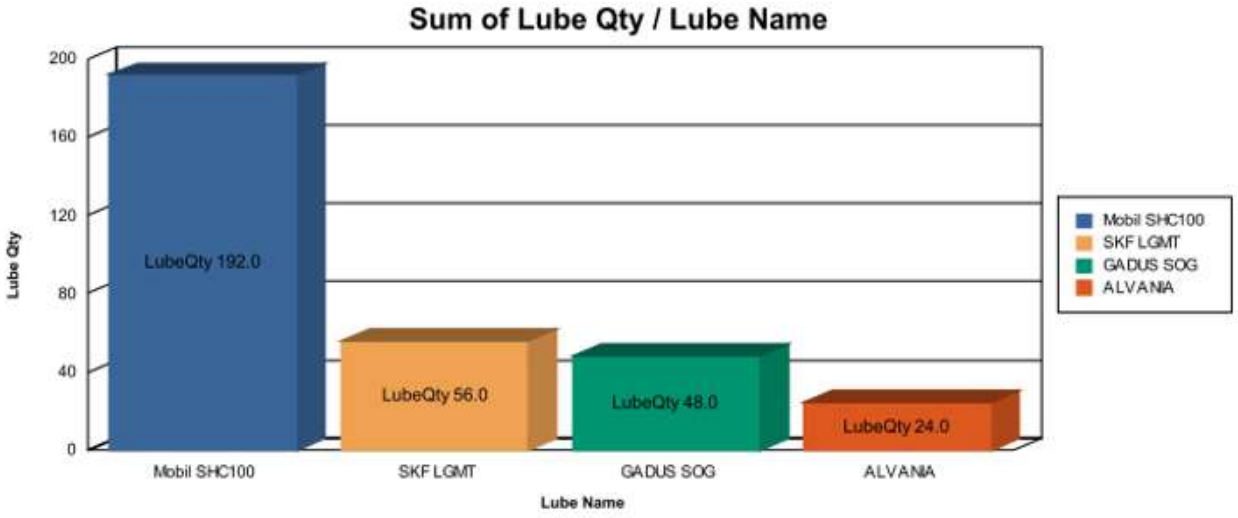
# Setup of LUBEsense and / or Temperature sensors

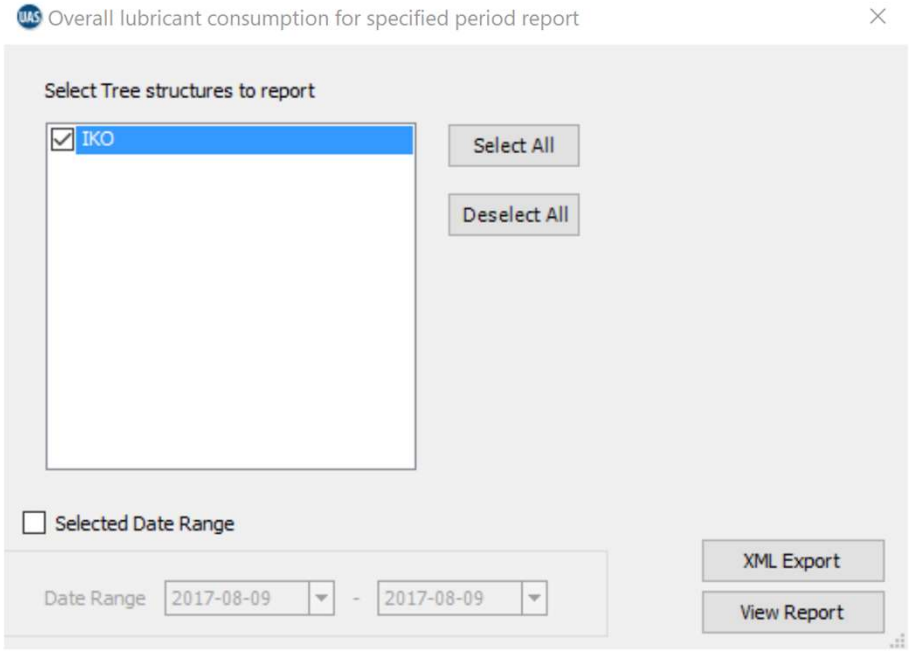


# Specific Lubrication Reporting

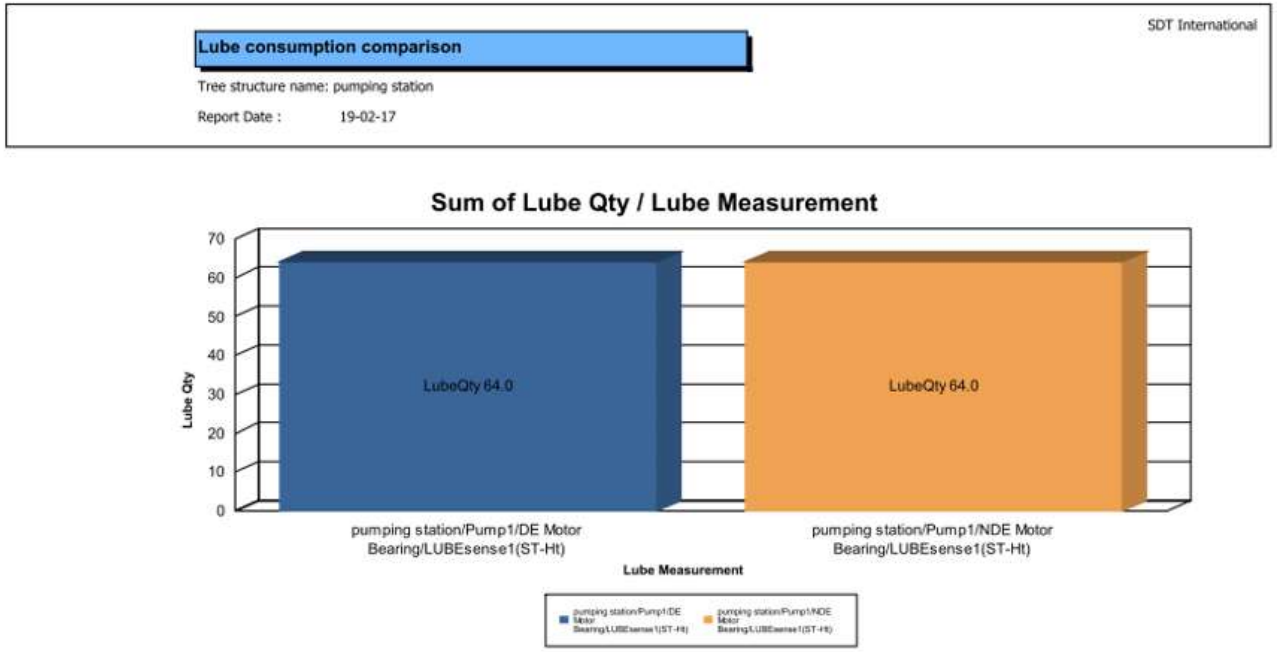
- Average grease consumption

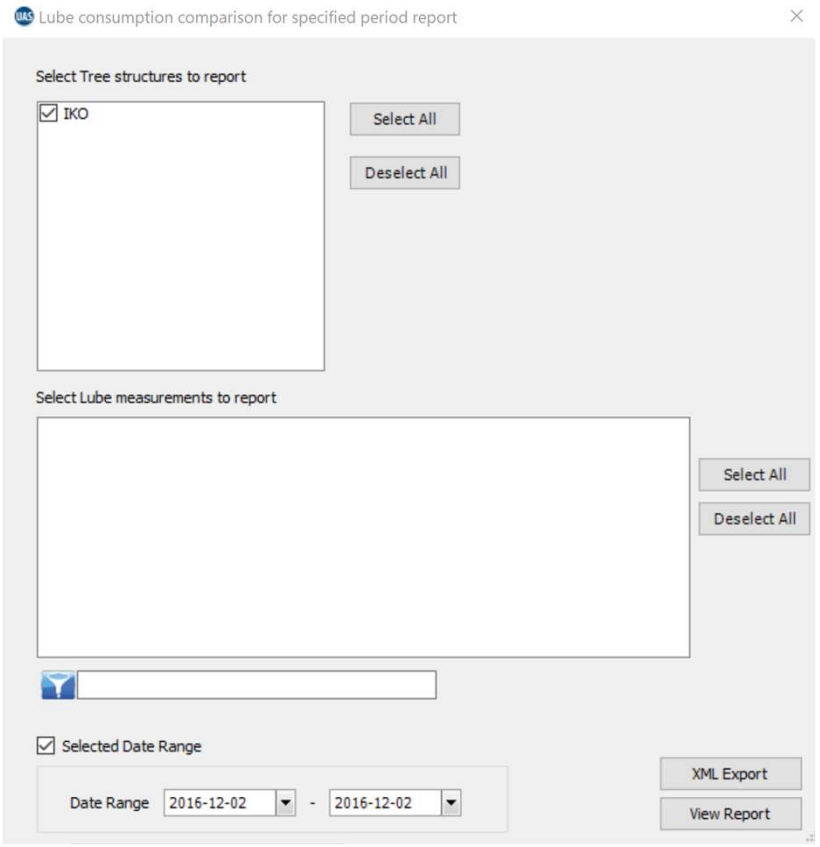


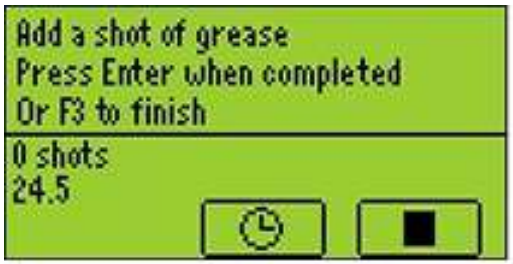
# Specific Lubrication Reporting

- Consumption per lubrication point

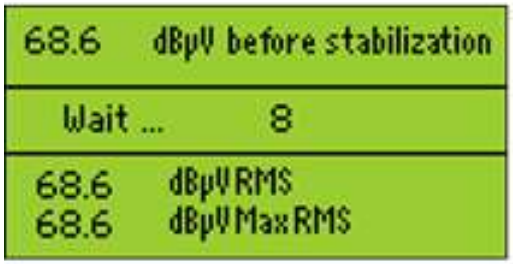


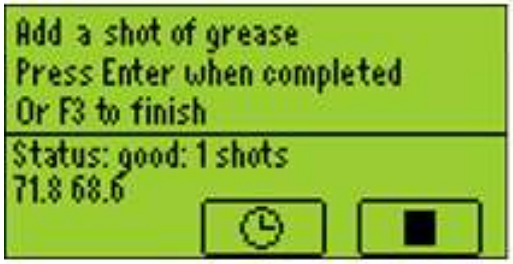
# LUBExpert: Dedicated firmware











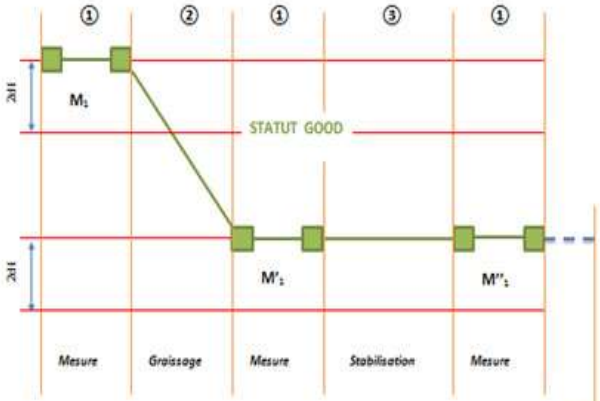


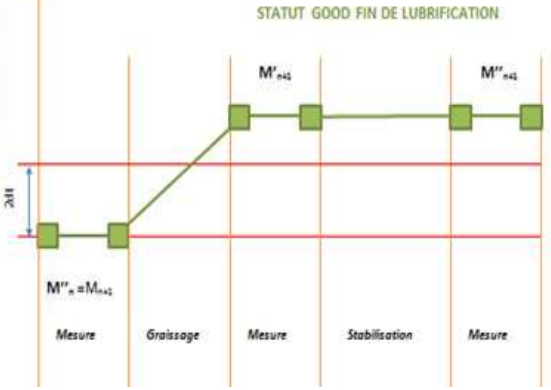

# LUBExpert: Dedicated firmware

- **Main Features :**
- Create Lubrication route task lists
- Grease reference and expected amount (UAS)
- Amount of lubricant added
- Automatic signal and audio preset
- Evolution of the measurement during the lubrication process
- Indicators related to lubrication are: “GOOD" - “SUSPECT" and “BAD"
- Complete traceability of measurements

# LUBExpert: Status indicator Good

- GOOD if:
- Second measurement * <Initial measurement - 2 dB
- * = After the first injection of grease
- STOP when last measurement *> previous measurement + 2 dB
- * = After stabilization

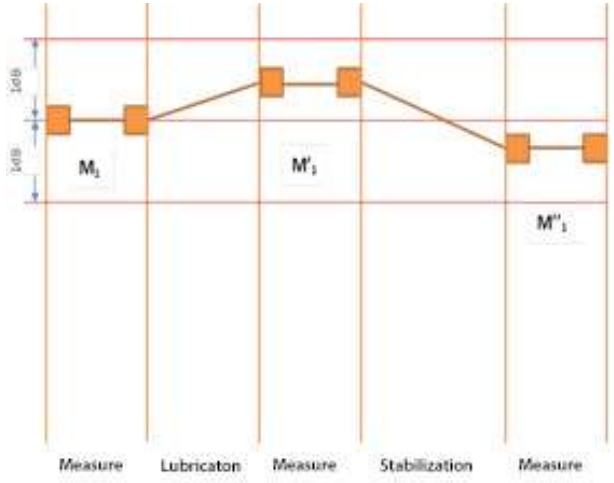




- Information on the amount of grease
- from UAS is not used in this case

# LUBExpert: Status indicator SUSPECT

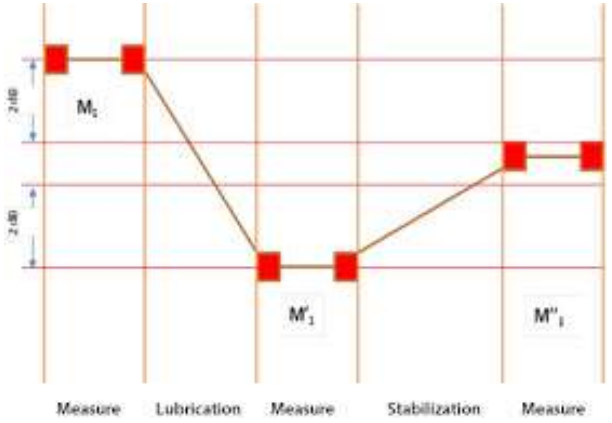
- SUSPECT if:
- The initial measurement + 2dB <the second measurement * <initial measurement -2dB
- * = After the first injection of grease
- If the measurement remains stable or increases then do not inject more grease

# LUBExpert: Status indicator BAD

- BAD if:
- The second measurement * <initial measurement - 2 dB
- * = After the first injection of grease AND
- Measurement> Second measurement + 2dB
- * = During stabilization

- The greasing process stops

Ultrasound Solutions

# LUBExpert KIT

# LUBExpert

# LUBExpert

# LUBExpert



- Be a LUBExpert!
- Improve lubrication practices
- On-board lubrication assistant
- Laser Temperature
- Dedicated lubrication management software
- Complete kit dedicated to lubrication
- Cradle LUBExpert to grease gun
- Lube adaptor connects sensor to grease nipple

# Lubrication key for SDT 270

## Compatible with versions :

- SU and DU
- MK2 only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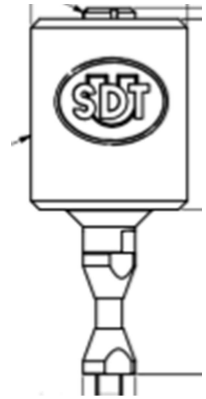
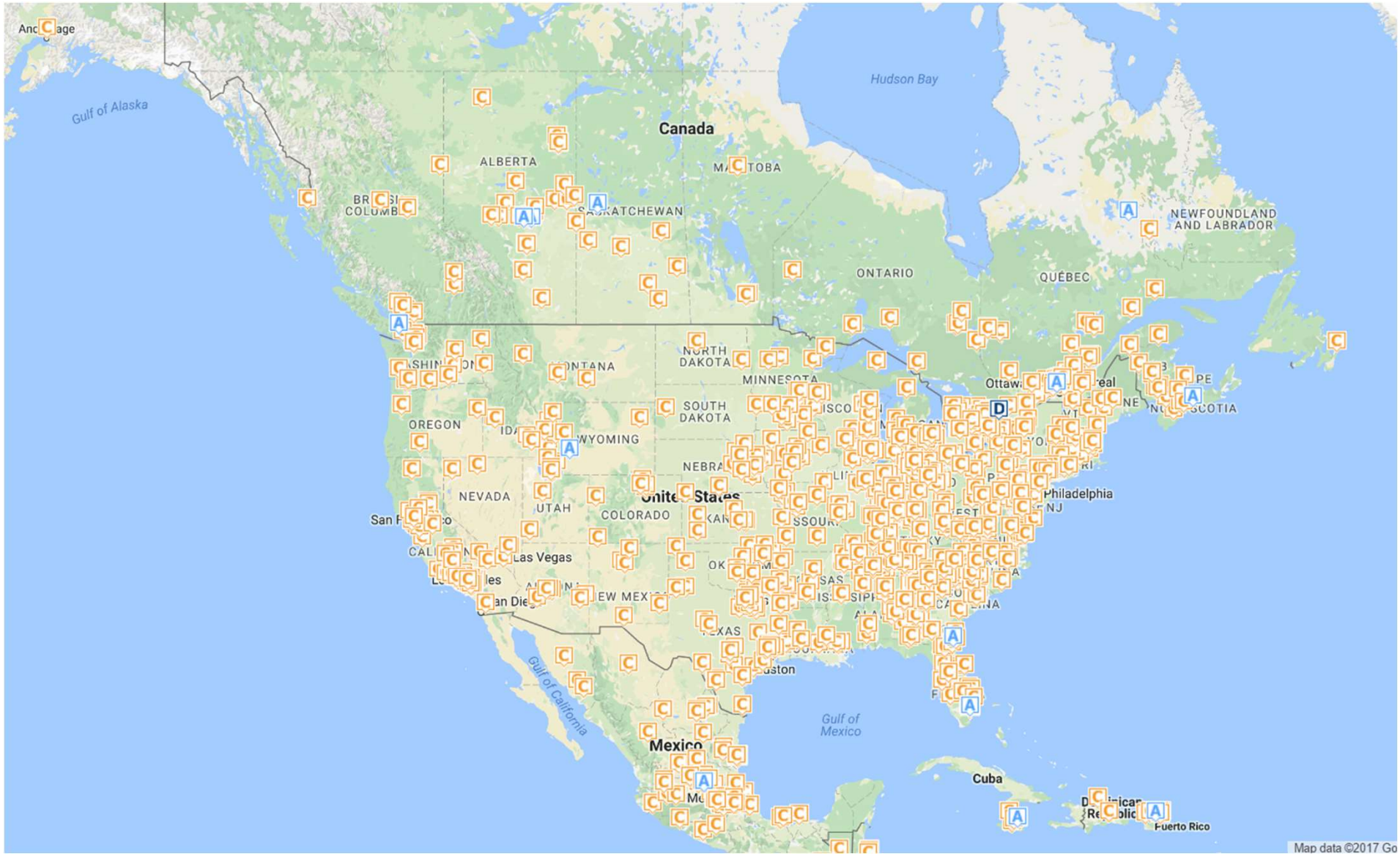


# Large and growing network of users



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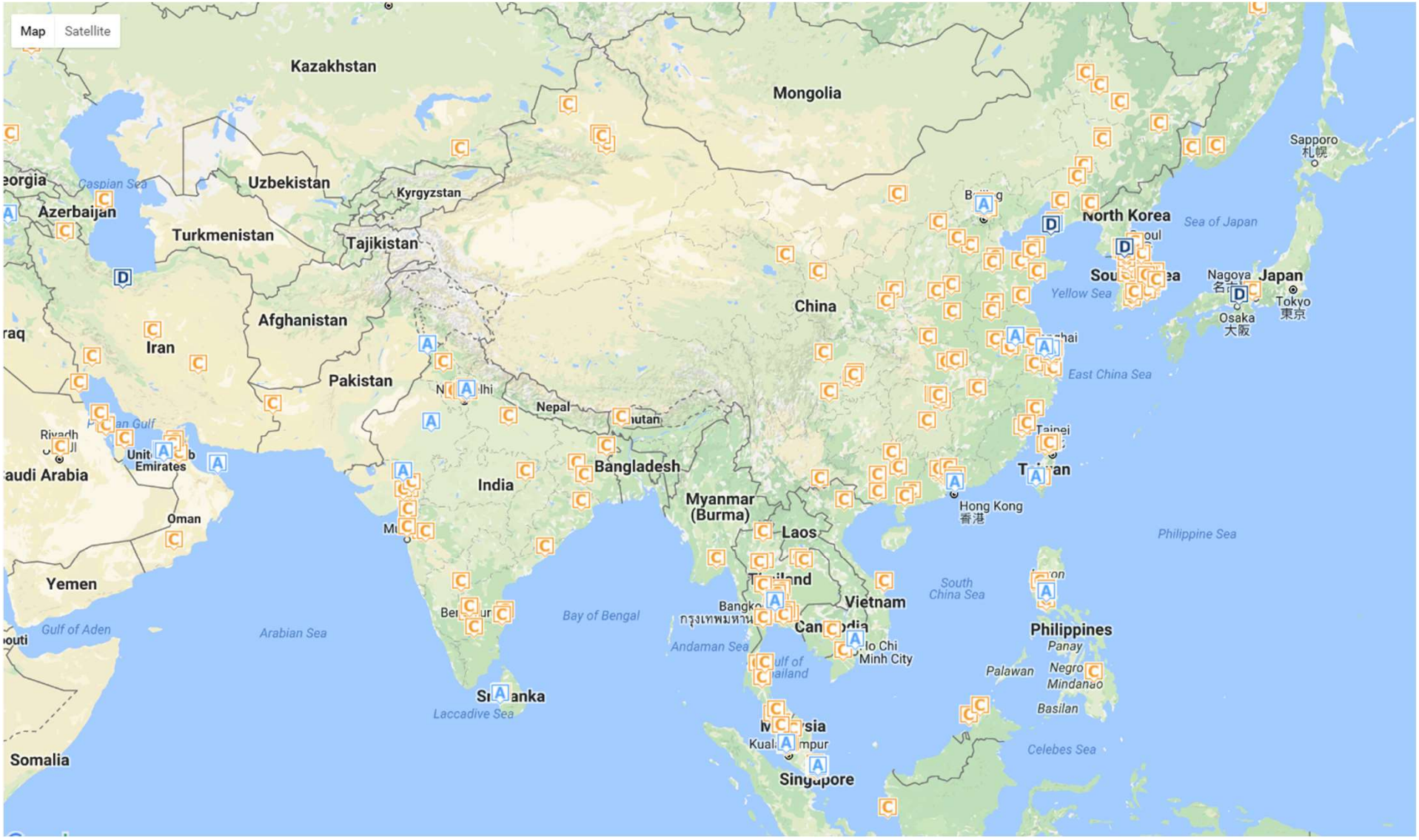
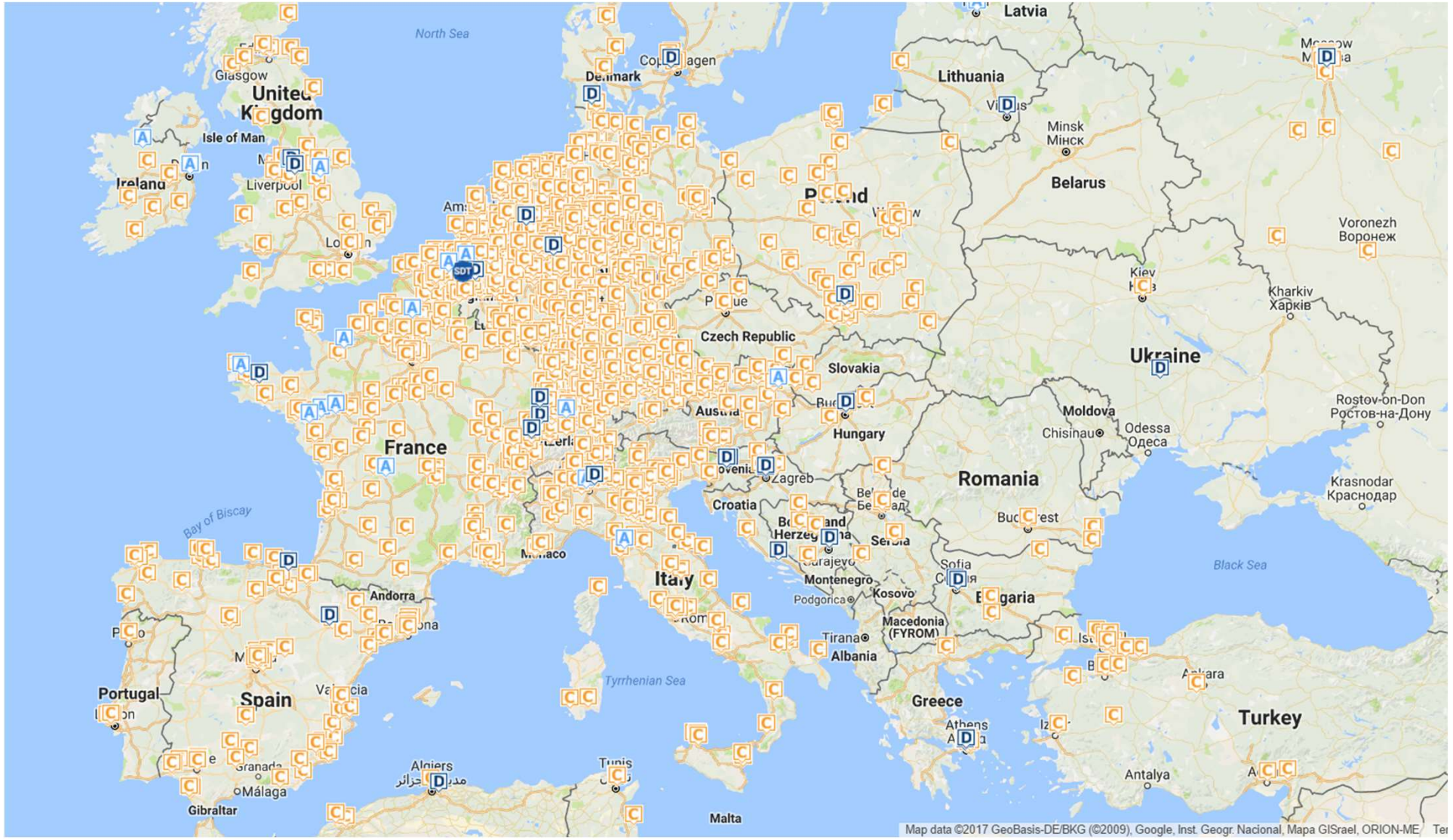


# Large and growing network of users



# References


ABB
FESTO
ELECTRABEL
DOW CORNING
ArcelorMittal
DAIKIN
TOTAL
bp
CARGOTEC
MACGREGOR
Kalimbassieris Maritime
JCP Marine
DAMEN
INTERSHIP NAVICATION
Coca-Cola
P&G
InBev
GOODYEAR
Coca-Cola
Ford
Eni
Atlas Copco
OWENS CORNING
spirax sarco
mactac
Holcim
BASF
The Chemical Company
GAZPROM
YARA
TTS
SGS
IMCS
KEM ONE
DAF
CATERPILLAR
SCANIA
Audi
VOLVO
Ferrari
ARKEMA
The world is our inspiration

# SDT International

**Questions?**

**www.sdtultrasound.com**