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OPTIME ExpertViewer Hands-on Training

Easy in every way.

We pioneer motion

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Agenda

1 Schaeffler at a Glance

2 Learning Objectives

3 Importance of Expert Vibration Analysis & ExpertViewer

4 ExpertViewer Updates (Optional)

5 Practical Analysis Examples

6 Review of Learning Objectives

7 Q&A Round

Agenda

1 Schaeffler at a Glance

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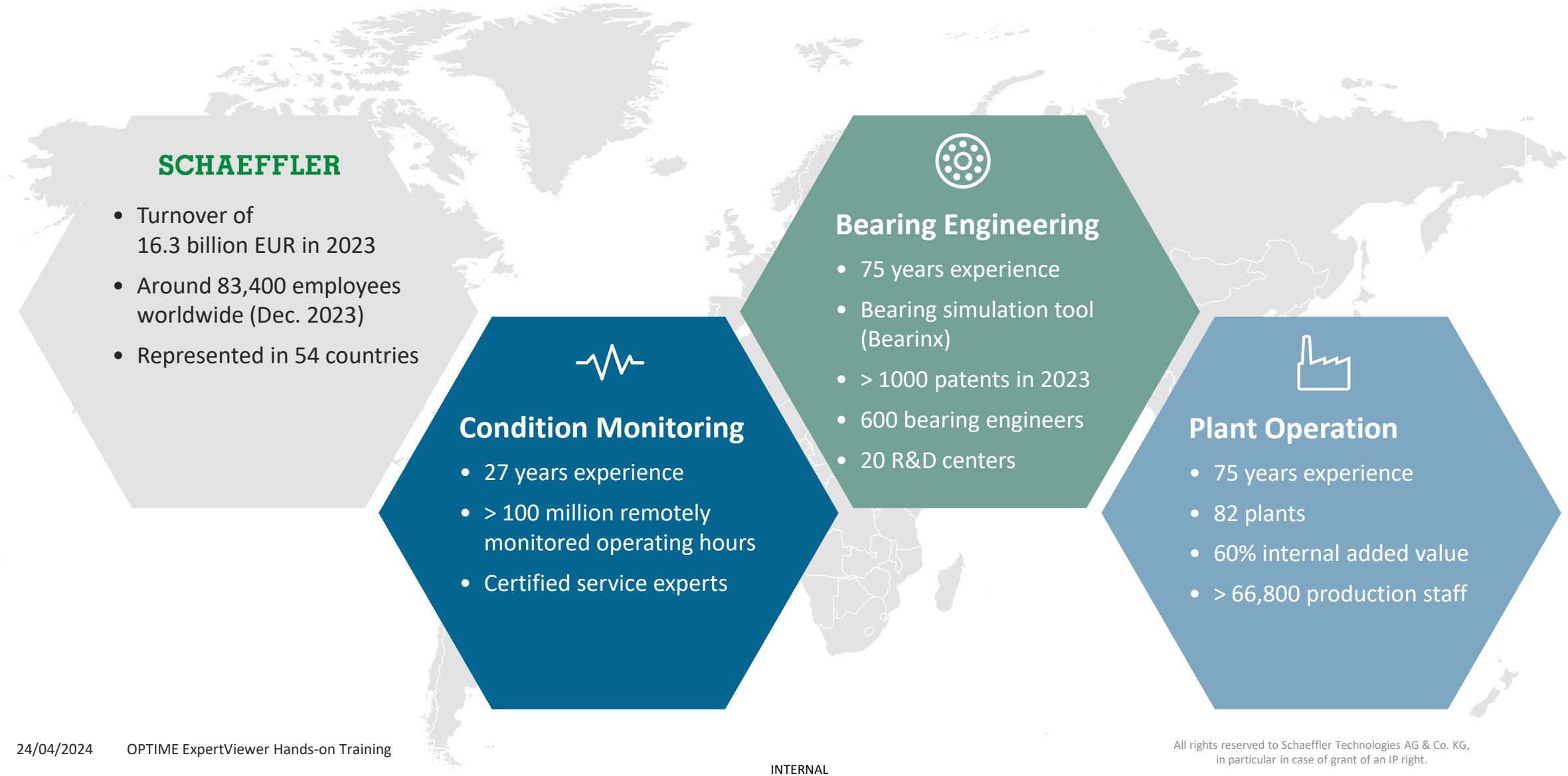
We are a multi-national company with deep understanding of core technologies and customer needs



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- Turnover of 16.3 billion EUR in 2023
- Around 83,400 employees worldwide (Dec. 2023)
- Represented in 54 countries

Condition Monitoring

- 27 years experience
- > 100 million remotely monitored operating hours
- Certified service experts

Bearing Engineering

- 75 years experience
- Bearing simulation tool (Bearinx)
- > 1000 patents in 2023
- 600 bearing engineers
- 20 R&D centers

Plant Operation

- 75 years experience
- 82 plants
- 60% internal added value
- > 66,800 production staff

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2 Learning Objectives

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Learning objectives

What you will learn in this session

- Reinforce and refresh knowledge previously acquired from OPTIME ExpertViewer web-seminars
- Gain guided and practical experience with the ExpertViewer
- Understanding its basic functionality, key features, recent updates, and reporting features
- Learn the best practices for vibration analysis, data annotation, and analysis with OPTIME ExpertViewer
- Enhance personal workflow efficiency by understanding how to effectively integrate OPTIME ExpertViewer into daily routines

Link to Schaeffler Training Campus to connected Training

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3 Importance of Expert Vibration Analysis & ExpertViewer

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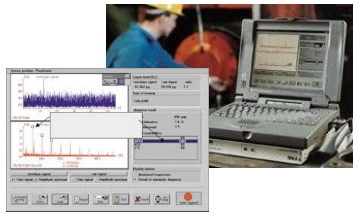
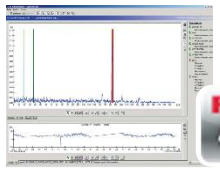
The ExpertViewer follows a long lasting legacy of Schaeffler expert analysis tools

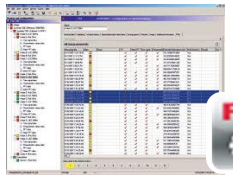
1999
Bearing Analyzer
Bear-An.
- Pioneering PC-based mobile vibration analysis



2005
X1 Administrator
X1 / X1s
- Complete suite for data management and analysis
- Localized SQL database
- Multi-user capable



2008
Administrator 4.x
X1 / X1s
ProCheck
- ∑ > 400 users
- Min. 2 updates per year
- Multiple OEM adaptations



2020
OPTIME Dashboard
SmartCheck
ProLink
OPTIME
tba.
- Web based KPI and data visualization

2021
OPTIME ExpertViewer
SmartCheck
ProLink
OPTIME
tba.
- Seamless integration with complete portfolio
- High performance for in-depth analysis

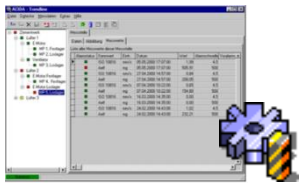
V2 V3

V2 V3 V4.2 V4.4 V4.6 V4.8 V5

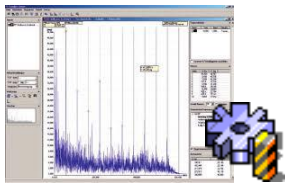
V3.2 V3.4 V3.6 V3.8

V1.05 V1.10 V1.16 V1.20 V1.22

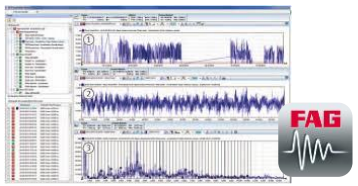
2005
Trendline
Detector
- Route planning
- Bearing database



2008
Trendline 3.0
Detector
- ∑ > 1500 users
- Min. 2 updates per year
- 3 major feature updates



2011
SmartUtility
SmartCheck
ProLink
- ∑ > 1000 users
- Min. 1 – 2 updates p. a.
- > 10 major feature upgrades
- Multiple OEM adaptations



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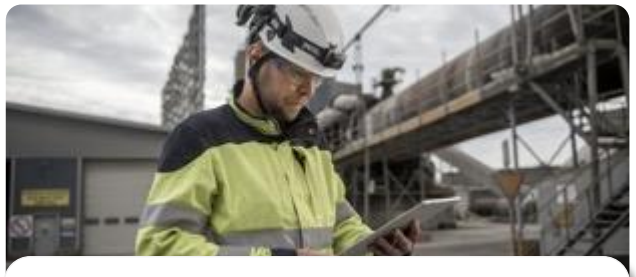
OPTIME ExpertViewer 2024 – Customers' view: customer problem, value proposition

The perfect tool for every user and task!



OPTIME Mobile App

Use cases

- ✓ Sensor & gateway commissioning
- ✓ Receive alarm notifications
- ✓ Check alarm information
- ✓ Data overview
- ✓ Issue ExpertService requests*

Platform

- ✓ Smartphone App (iOS & Android)

Availability

- ✓ Included in OPTIME Tenant Base Fee Subscription

Users

- All OPTIME users

OPTIME Web-UI

Use cases

- ✓ Dashboard visualization
- ✓ Basic data analysis
- ✓ Check alarm status
- ✓ Asset Management

Platform

- ✓ Browser Dashboard (Edge, Chrome, Safari, …)

Availability

- ✓ Included in OPTIME Tenant Base Fee Subscription

Users

- All OPTIME users
- System administrators

OPTIME ExpertViewer

Use cases

- ✓ **In-depth data & root cause analysis**
- ✓ Monitoring of more complex machines
- ✓ Data correlation and comparison
- ✓ Data labeling & reporting
- ✓ Processing of ExpertService requests*

Platform

- ✓ Windows 10 Client Application

Availability

- ■ Optional digital service subscription on demand

Users

- Condition Monitoring Experts
- Vibration Analysis Experts
- System administrators

* Features to be added in future updates

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4 ExpertViewer Updates (Optional)

4.1 ExpertViewer Updates

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4 ExpertViewer Updates (Optional)

4.1 ExpertViewer Updates

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5 Practical Analysis Examples

- 5.1 Workbook introduction
- 5.2 Example 1: Basic Asset Analysis
- 5.3 Example 2: Basic Frequency Based Analysis
- 5.4 Example 3: Advanced Frequency Based Analysis
- 5.5 Example 4: Advanced Frequency & TWF Based Analysis
- 5.6 Example 5: Combined Damage Analysis

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5.1 Workbook introduction

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Workbook introduction

PLACEHOLDER FOR TRAINING WORKBOOK – possible layout based on Schaeffler CM Report – please do not exactly replicate as this is our standardized report template for customer reports

3-FB_101 (valid from 16.01.2023)

Workbook

OPTIME ExpertViewer Hands-on Training

Performed by: Klicken oder tippen Sie hier, um Text einzugeben.
certified to ISO 18436-2 category III

Date of: Klicken oder tippen Sie hier, um Text einzugeben.

Analyzed by: Klicken oder tippen Sie hier, um Text einzugeben.
certified to ISO 18436-2 category III

Checked by: Klicken oder tippen Sie hier, um Text einzugeben.
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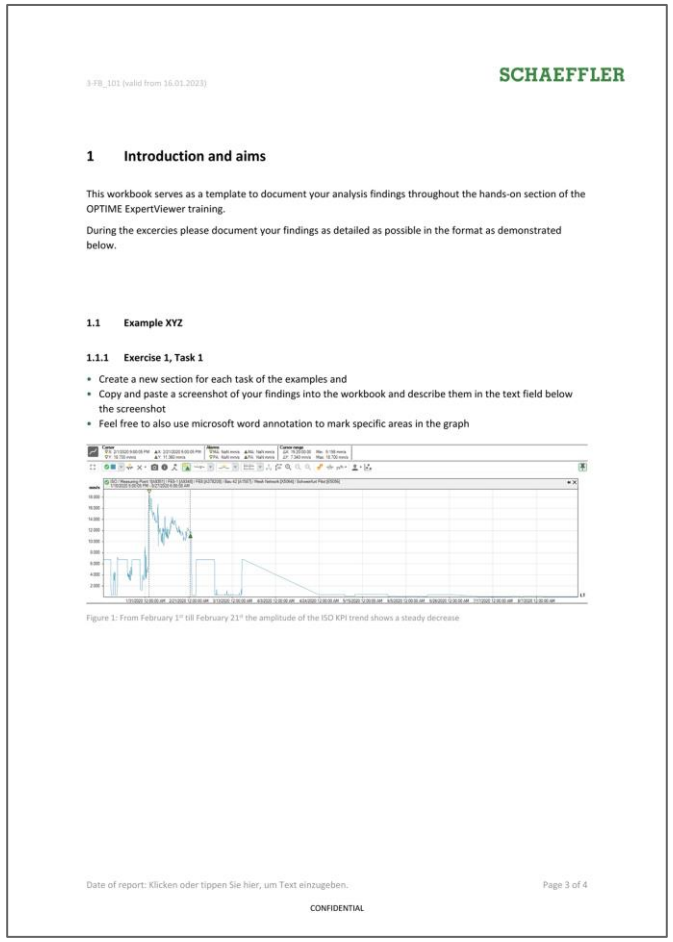

3-FB_101 (valid from 16.01.2023) SCHAEFFLER

1 Introduction and aims

This workbook serves as a template to document your analysis findings throughout the hands-on section of the OPTIME ExpertViewer training.

During the excercies please document your findings as detailed as possible in the format as demonstrated below.

1.1 Example XYZ

1.1.1 Exercise 1, Task 1

- Create a new section for each task of the examples and
- Copy and paste a screenshot of your findings into the workbook and describe them in the text field below the screenshot
- Feel free to also use microsoft word annotation to mark specific areas in the graph

Figure 1: From February 1st till February 21st the amplitude of the ISO KPI trend shows a steady decrease

Date of report: Klicken oder tippen Sie hier, um Text einzugeben. Page 3 of 4

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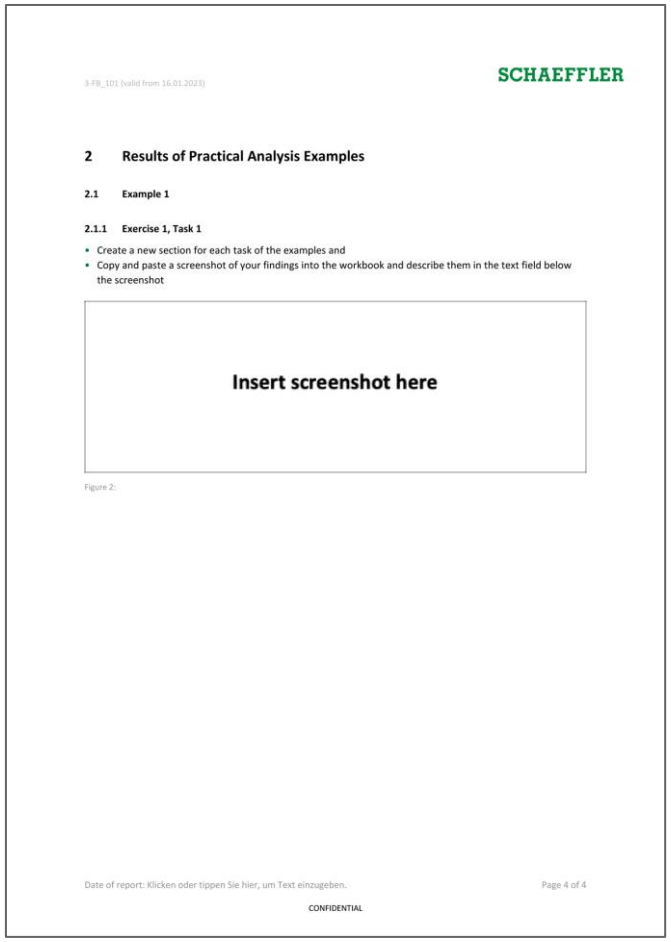

3-FB_101 (valid from 16.01.2023) SCHAEFFLER

2 Results of Practical Analysis Examples

2.1 Example 1

2.1.1 Exercise 1, Task 1

- Create a new section for each task of the examples and
- Copy and paste a screenshot of your findings into the workbook and describe them in the text field below the screenshot

Insert screenshot here

Figure 2:

Date of report: Klicken oder tippen Sie hier, um Text einzugeben. Page 4 of 4

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5 Practical Analysis Examples

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5.6 Example 5: Combined Damage Analysis

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General rules for tasks

- In the next section you will be asked to accomplish task in ExpertViewer on your own
- Accomplishing each task
- Please present to the trainer your finished tasks

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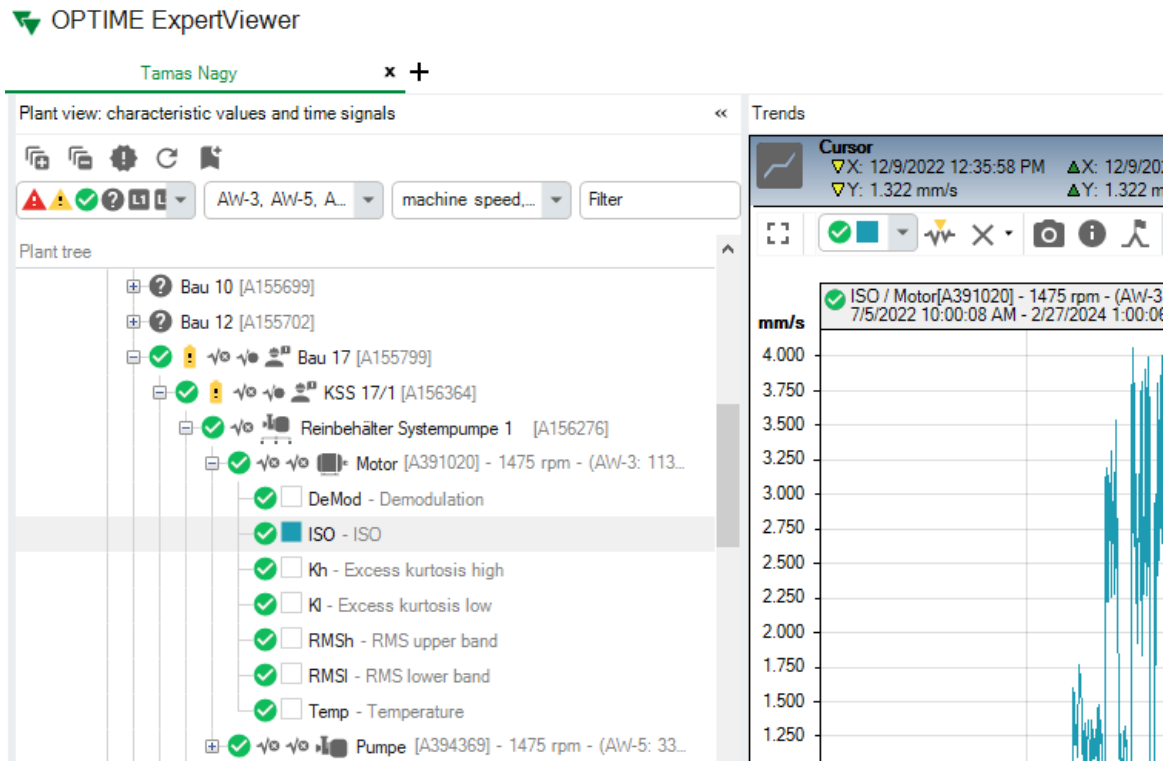
Practice cursor function

Task 1:

You want to analyze a signal to understand the range of the amplitude. You also want to understand how long the measurement time span is.

- With the help of the **Plant tree** on the right side select an arbitrary asset – you may use the **filter** functions to find a specific asset – and drilling down to the **KPI**`s level. Select any KPI value, where you can identify a peek, and low point in the **trend**.
- Using the **cursor** functions identify highest KPI value in the trend, **please note the value.**
- Using the cursor functions identify lowest KPI value in the trend, **please note the value.**
- Use trend difference cursor function to measure complete measurement time of the trend and **note it.**



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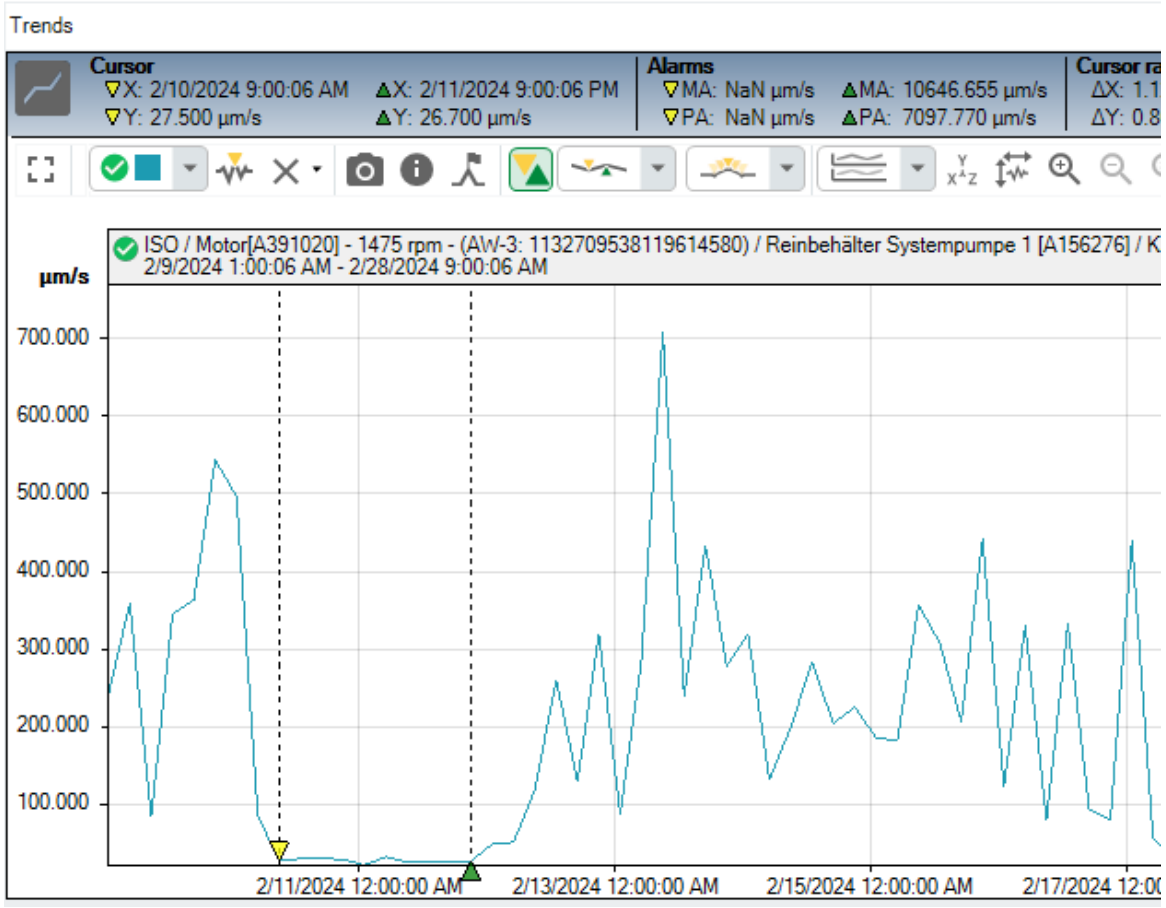
Practice cursor function

Task 2:

You want to use the trend tool to analyze the machine operation (running/not running) behavior, and perform a general trend behavior analysis.

- Use trend difference cursor function to identify longest standstill of the asset.
- Use trend difference cursor function to identify longest in operation phase of the asset.
- Perform trend analysis and point out the following trend characteristic:
  - Trend increases
  - Trend decrease after downtime
  - Changes in trend behavior
  - Single peaks in the trend



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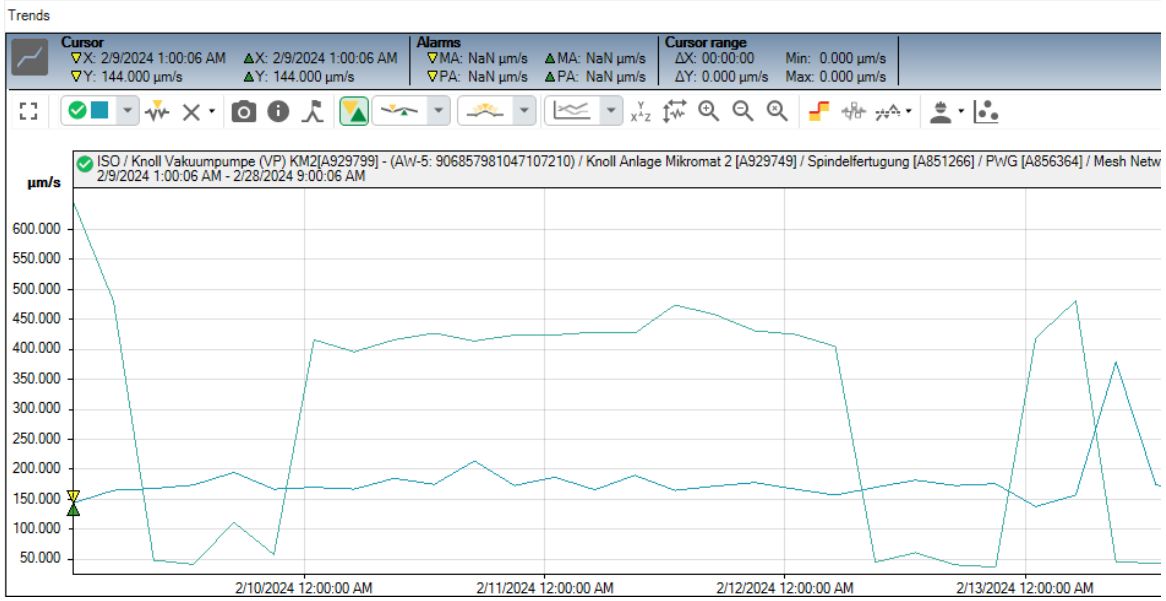
Practice cursor function

Task 3:

You want to compare the same type of KPIs from two or more different sensors, preferably on the same machine, to find something suspicious. Your goal is to practice the trend pinning function to plot different views like overlapping, stack, etc... (alternatively, you can compare the same type of machines with each other)

- Compare two or more KPI trends.
- Change diagram view of multiple KPI trends (stacked overlapping, matrix,…).
- Identify the most conspicuous trend of a single sensor.
- Extra task, compare 2 different type of signals (for example vibration and temperature).
  Which trend view is the best to use for this?



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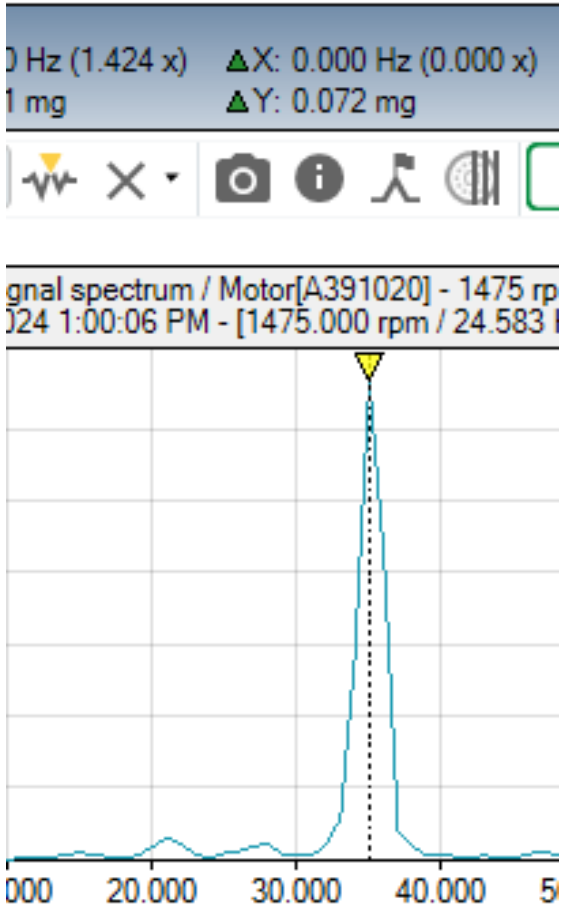
Example 2: Basic frequency based analysis



Task 1:

*You want to analyze basic machines to see if the **unbalance** condition persists. You are looking for a machine where you can easily identify a high peak around the machine base rotational speed on the raw spectrum view.*

- Use the time signal marker feature in the trend view to identify a specific time signal with a high KPI value.
- Navigate to spectrum section of a measurement KPI.
- Identify RAW and DEMODULATED signal in the spectrum section.
- Perform spectrum analysis for both raw & demod signal and find the following data:
  - Use basic cursor function to identify the 2 frequency peaks with the highest amplitude; write down frequency and amplitude.
  - Use difference cursor to measure the frequency delta between two of the highest peaks.
- Search for a data set that clearly shows a RPM peak (e.g. at 50 Hz) and identify the exact rotational speed by using the micro step cursor function.

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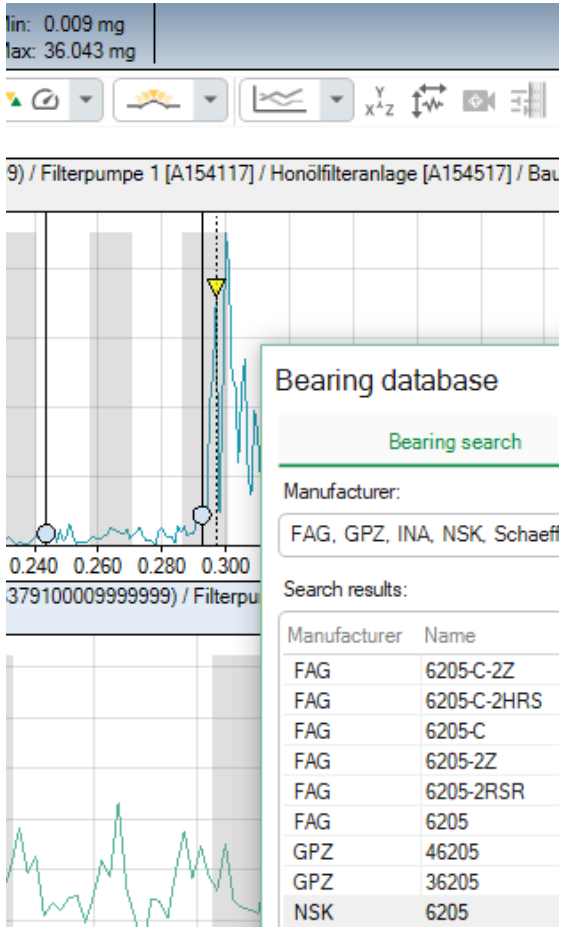
Example 3: Advanced frequency based analysis



Task 1:

*You want to perform a **bearing damage** analysis, so you search for an asset that preferably has the bearing type and machine speed metadata defined. In the absence of these, you use your best guess.*

- Find dataset with configured speed information.
- Alternative: Set speed information for a selected sensor.
- Login to bearing database.
- Search for a bearing (e.g. 6205) in the bearing database.
- Use basic trend analysis to identify a data set that shows a harmonic group in the spectrum.
- Use the harmonics cursor to identify the harmonics group and define frequencies.
- Use the bearing database UI to overlay kinematic bearing information on the previously identified harmonics group.
- Continue looking for conspicuous signals in the database.
- Bonus points for successfully identified bearing damages.
- Cross-reference findings with trend and time signal information.

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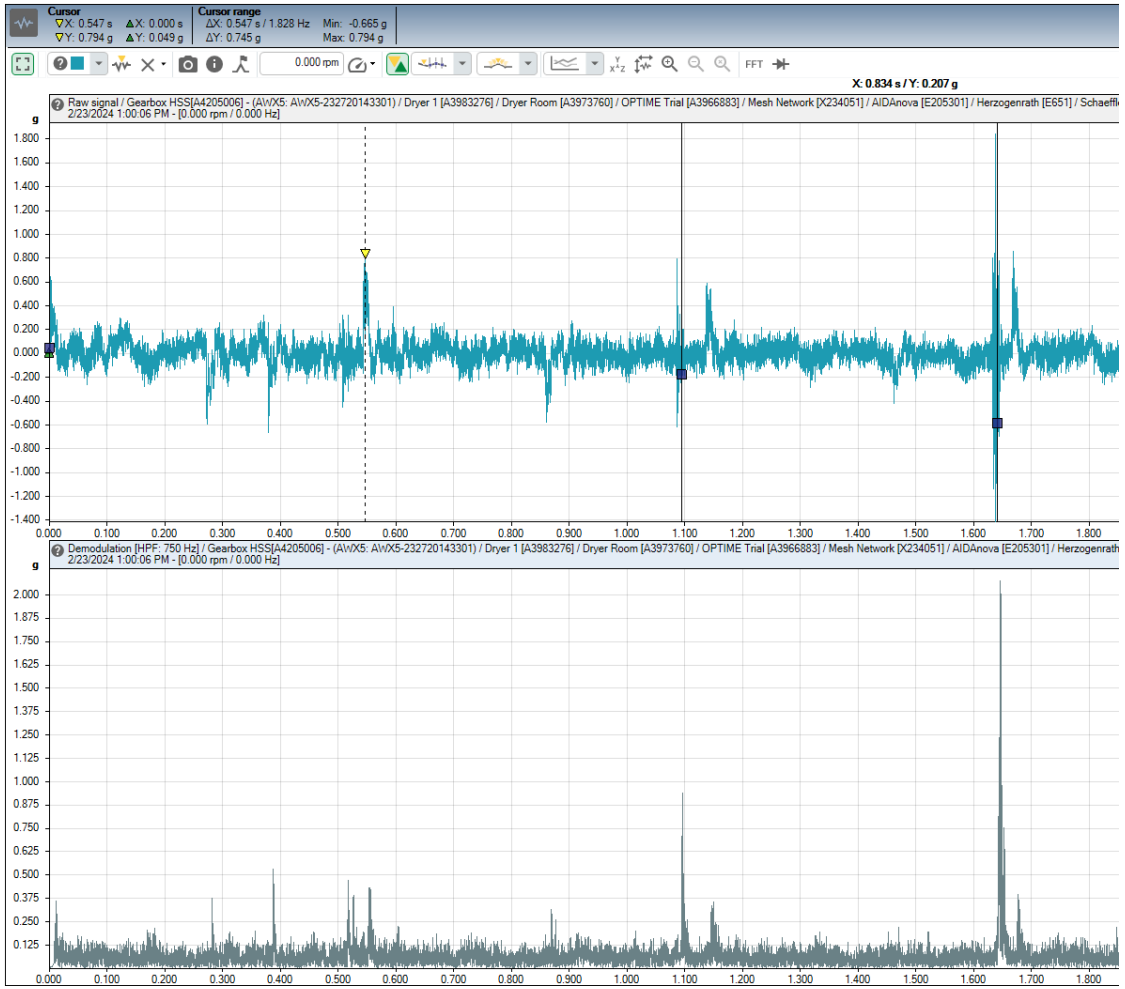
Example 4: Advanced frequency & TWF based analysis



Task 1:

You want to perform a "Gearbox" damage analysis, so you look for an asset identified as a gearbox, and preferably with recognizable impact signals on the time waveform and on the spectrum.

- Find dataset with configured speed information.
- Look for dataset with conspicuities in time signal & spectrum
- Combine analysis methods of examples 1 – 3.
- Explain the correlation between the signal characteristic of the TWF and the spectra.

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5 Practical Analysis Examples

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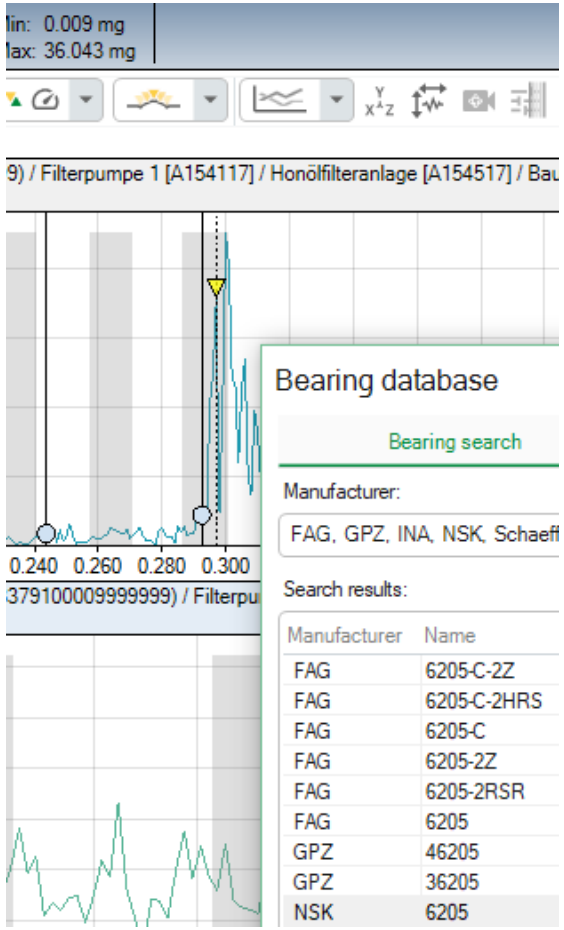
Example 5: Combined damage analysis



Task 1:

You want to perform a combined damage analysis where multiple damages are represented, such as unbalance, bearing damage, or cavitation.

- Find dataset with overlapping signal conspicuities.
- Annotate a signal with more than one damage criteria.

Agenda

6 Review of Learning Objectives

Learning objectives

What did you learn in this session

- Reinforce and refresh knowledge previously acquired from OPTIME ExpertViewer web-seminars
- Gain guided and practical experience with the ExpertViewer
- Understanding its basic functionality, key features, recent updates, and reporting features
- Learn the best practices for vibration analysis, data annotation, and analysis with OPTIME ExpertViewer
- Enhance personal workflow efficiency by understanding how to effectively integrate OPTIME ExpertViewer into daily routines

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7 Q&A Round

Feedback and Q&A

- Please share your thoughts on this training.
- Feel free to give us a feedback.
- Is there any question left after this session?

Questions? We are there for you!

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Technical Support

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We pioneer motion