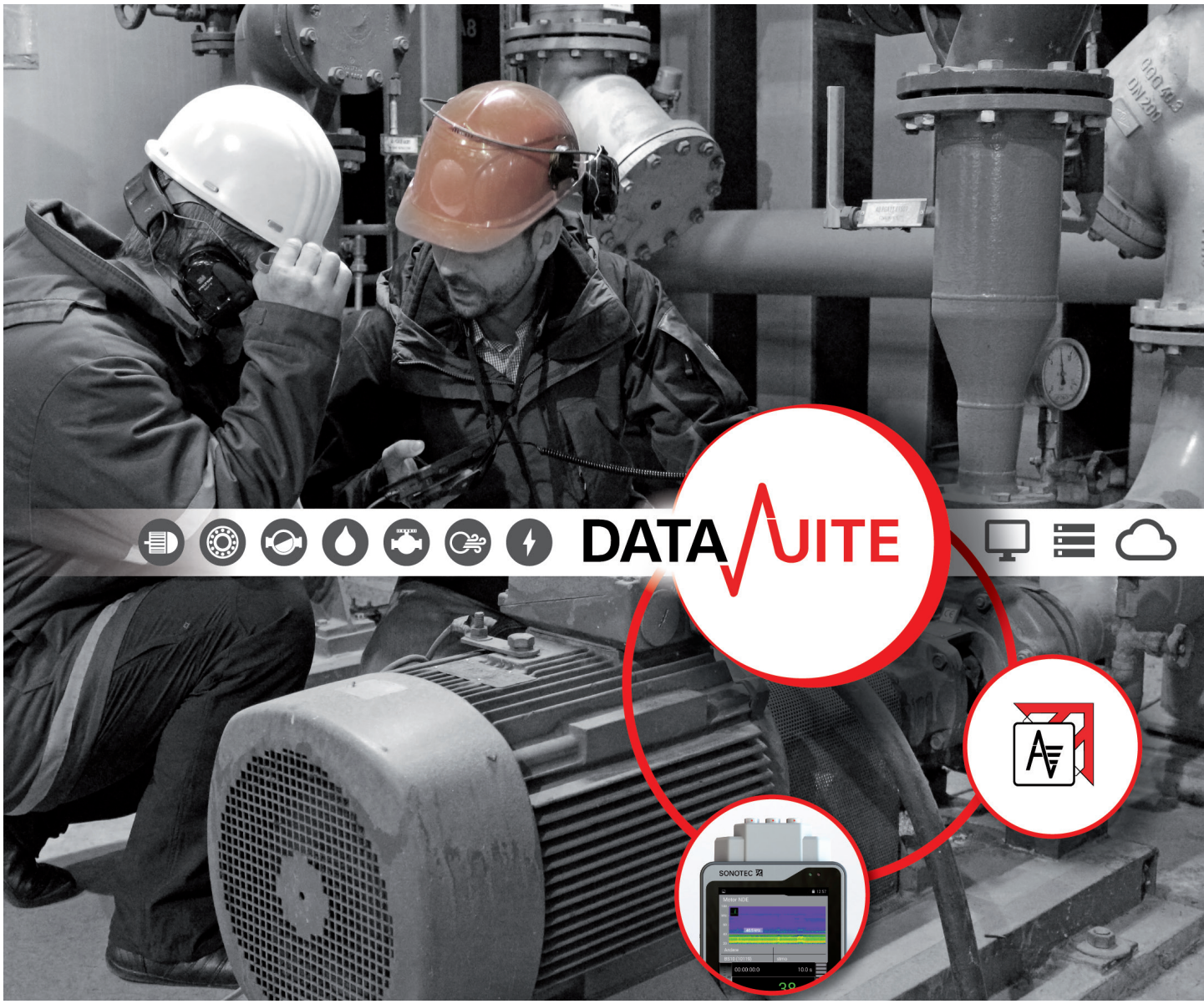

CASE STUDY

SONAPHONE DATASUITE SOFTWARE

MANAGEMENT OF ULTRASONIC DATA IN A POWER STATION

STEFFEN MOECK

SONOTEC

What's inside this book?

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Subject to modifications (rev. 1 / 2020-02-04)

Foreword

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Intuitive software for your maintenance work

In this age of Maintenance 4.0, the demands being made of technical solutions are changing. The aim is to achieve greater transparency regarding the condition of all equipment, as well as to improve the operational reliability and availability of that equipment.

It is standard and widespread practice to test equipment using ultrasonic technology. State-of-the-art software like DataSuite also provides extensive tools for managing data centrally and analysing measured values. Asset condition can be captured on site and, if necessary, maintenance measures can be arranged through route-based inspections. The software therefore plays an important role in ensuring that assets and networks are able to work as intended or can be put out of service and maintained to schedule.

This case study will present and shed more light on how ultrasonic technology is used and the benefits offered by DataSuite in the context of a power station.

Steffen Moeck

Chapter 1

Universal ultrasonic testing system

It is becoming more and more important in the field of maintenance for hardware and software to interact intelligently. With SONAPHONE and DataSuite, SONOTEC is offering various industries a clever solution for collecting ultrasonic data via portable devices and managing it centrally in the software.

DataSuite software for data management

The SONAPHONE DataSuite software is the central platform for organising and analysing the measured data captured by SONAPHONE hand-held devices at the corresponding assets and machines in the power station.

The software has been configured as a state-of-the-art web app, i.e. the data can be displayed in all standard web browsers. It can also be installed on a local computer (desktop installation) or via a server set-up, if the servers are located within a company network with its own administration. The latter, in particular, provides good accessibility to the data, irrespective of platform and location.

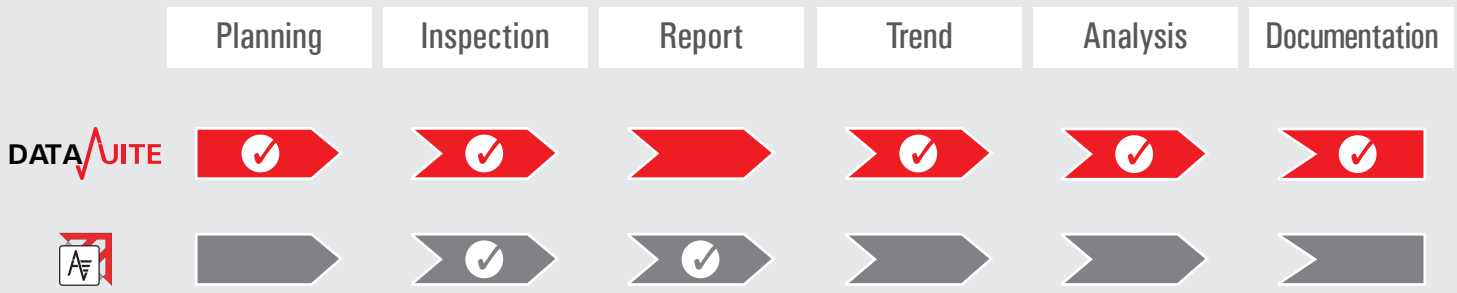
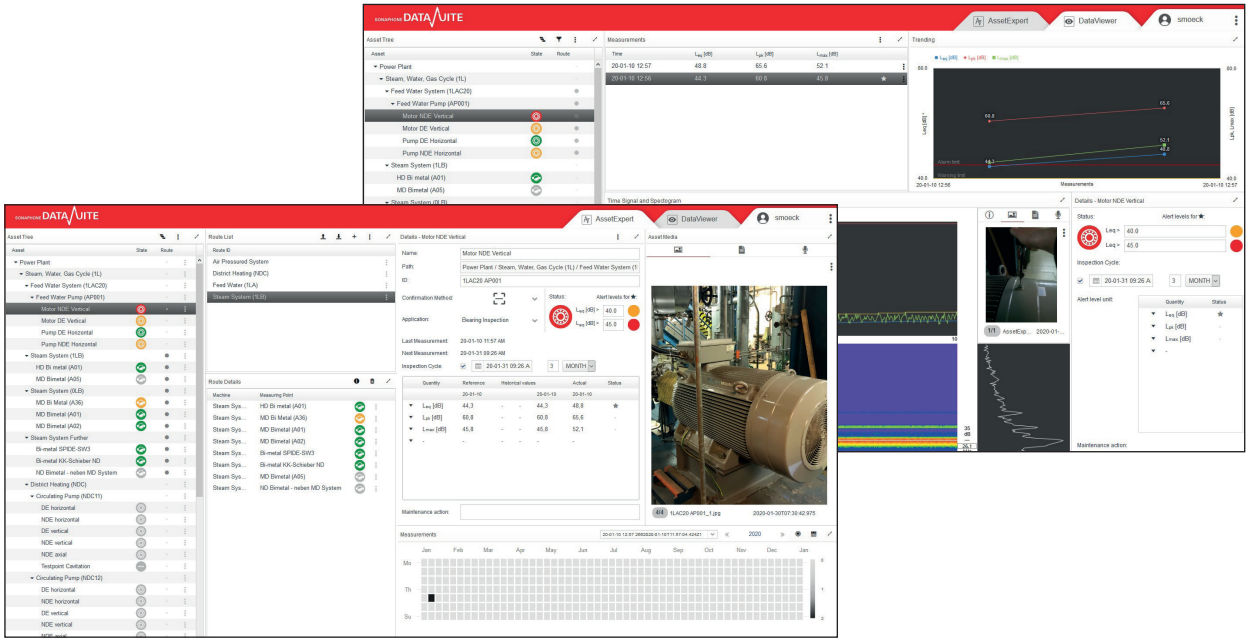


Figure 1: Interaction between the DataSuite software (web app) and the AssetExpert special app on the SONAPHONE hand-held device

Main functions of the SONAPHONE DataSuite web app:

- Mapping of the asset structure within the power station with test points (asset tree)
- Specification of test point details (contextual data, alignment method)
- Compilation of routes for systematic testing of areas of the power station
- Synchronisation of measuring point information with the SONAPHONE hand-held device (historical data, status, contextual data)
- Monitoring of characteristic values for evaluating conditions (trends, statuses based on the traffic light principle)
- Representation of all measurement results and analysis of the same (spectrogram)



Tab structure

Separate tabs have been customised for the different fields of activity covered by maintenance:

- AssetExpert: Asset structure and planning
- DataViewer: Display and analysis of test data

SONAPHONE testing device for various applications

The SONAPHONE testing device is used in power stations to maintain different plant units. An airborne sound sensor or a structure-borne sound sensor is used, depending on the application.

Main fields of application:

- Testing rolling-contact bearings on standard machines
- Testing steam traps in steam systems
- Locating and evaluating leaks in compressed-air networks
- Electrical inspections of air-insulated assets

First of all, the digital testing device captures high-resolution raw data via the sensor at 256 kHz. The measurement results are then displayed as characteristic values (e.g. levels) and represented visually in the form of a spectrogram. This information enables the maintenance engineer to make an initial assessment of the condition of the equipment in the power station right there and then on site.

DATASUITE IN THE POWER STATION

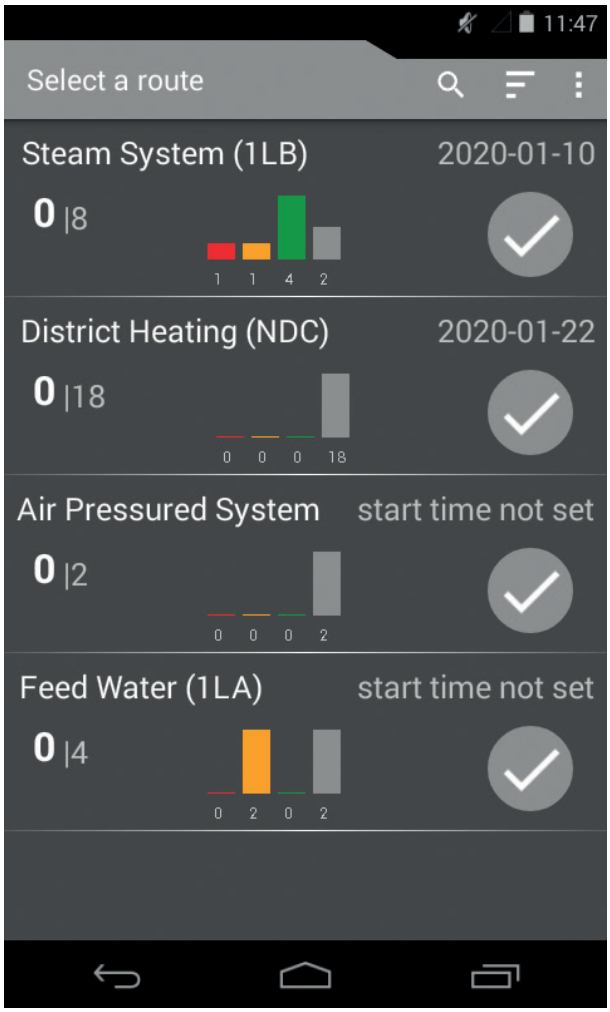
www.sonotec.eu

SONAPHONE AssetExpert special app

SONAPHONE runs on an Android operating system, thus combining the advantages of an ultrasonic testing device with state-of-the-art app-based user navigation.

The SONAPHONE AssetExpert app has been specifically optimised for processing routes on site. All relevant areas/systems in the power station can be tested at defined points according to a defined plan and the associated measured values can be captured. It is possible to save contextual information such as photos, text memos and voice memos for every measurement.

The data is also synchronised with the SONAPHONE DataSuite platform via the SONAPHONE AssetExpert app.



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Chapter 2

Structuring and planning in DataSuite

Every single industrial maintenance concept is based on mapping asset structures with test points and planning routes, whether they are time-based or condition-based.

Creating test points in the power station

The test points that are relevant to the ultrasonic measurements are created in the asset tree. The basic structure can be adapted to the KKS or RDS-PP designation system, both of which are commonly used in power stations.

To help the user find their feet in the software, corresponding symbols are provided for different ultrasonic applications, while a traffic light principle enables the user to quickly see the status of each individual test point.

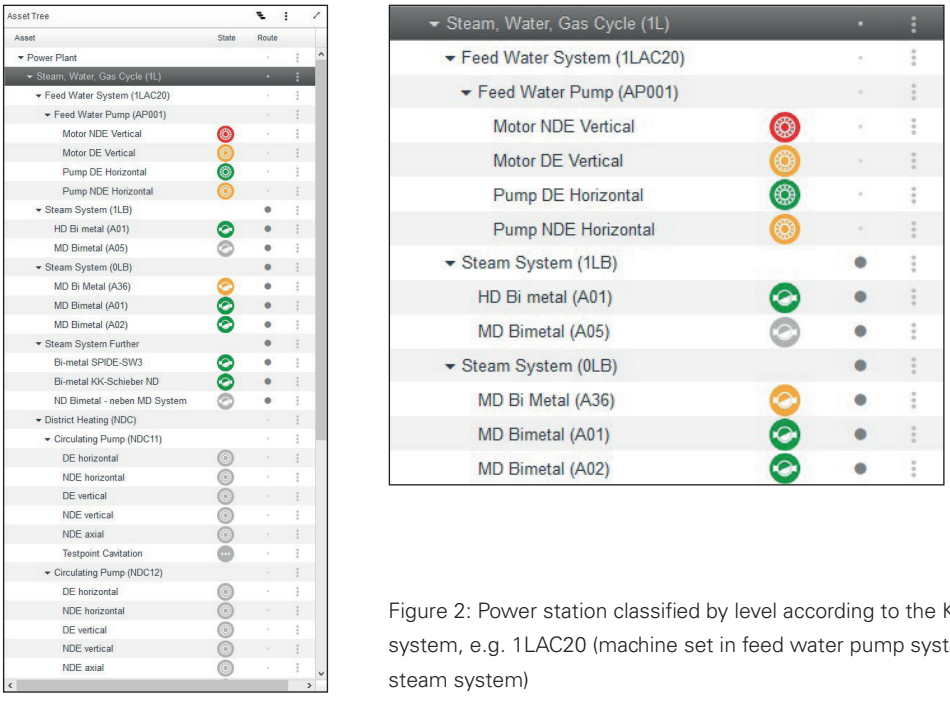
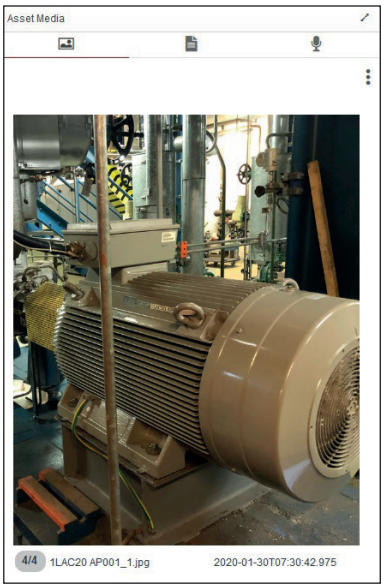


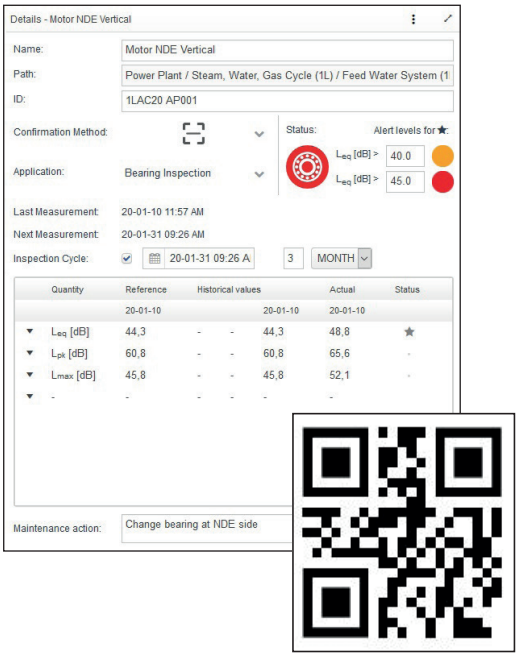
Figure 2: Power station classified by level according to the KKS power station designation system, e.g. 1LAC20 (machine set in feed water pump system) and 1LBA01 (steam trap in steam system)

Compilation of measuring point details

Additional information

Additional information about the asset not only helps maintenance planners, it also assists those actually maintaining the routes on site. This information can be saved as photos or text memos and synchronised with SONAPHONE, e.g. the position of the sensor coupling can be defined to ensure reproducible measured values are recorded.





Identification of plant units

It is important to uniquely identify a test point within the power station. An ID and the type of alignment in the asset can be specified in the measuring point details for this purpose (by means of a QR code, for example). This is a way of ensuring that measured values and additional information are available for the correct test point.
Power stations often use the KKS or RDS-PP designation system, which can also be saved here as ID text.

As in any process based on data, it is important to have information available at every measuring point.
Another key factor in achieving high-quality measurement results is to have plant units that are uniquely identified.

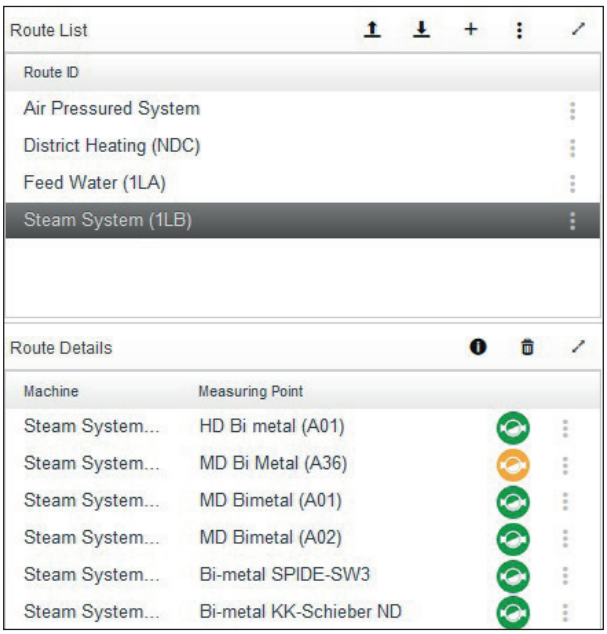
Definition of alarm thresholds

Empirical values obtained either from initial measurements or from comparisons with equipment of an identical type are usually available; these can be used to define threshold values and, consequently, to display the condition of equipment (according to the traffic light principle). A characteristic value (KPI) is determined from all the available variables and then compared with the alarm thresholds as a reference variable.

Historical values on the testing device

Historical and reference values of defined measured variables can be synchronised with SONAPHONE to facilitate evaluations on site.

Compilation of routes



Routes give the inspector a concrete work plan to follow. They are sent to SONAPHONE for processing according to the maintenance plan.

Routes can be compiled individually, e.g. filtered by critical measuring points, or can follow a recurrent test plan. It is easy to add test points to the corresponding routes using drag and drop. There is no limit on the number of routes that can be created and managed.

DATASUITE

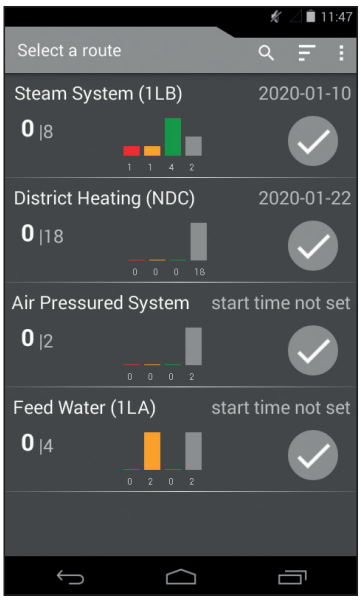
Synchronisation of information
with the SONAPHONE testing device
(historical measured data, photos, text memos, etc.)

Chapter 3

Testing with SONAPHONE

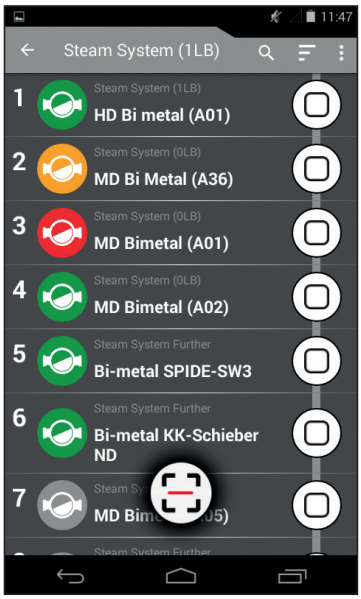
Different areas of power stations can be processed systematically by means of routes. If the routes have been planned well, reproducible measurements can be taken quickly. Current values can be compared with historical ones on site.

Display of routes to test



The AssetExpert app on SONAPHONE shows all the routes available for processing on the testing device at a glance. The following information is displayed in summary at this level:

- Number of routes to be processed
- Date by which the route should be processed
- Number of measuring points tested/to be tested
- Statistics on the status of all measuring points (traffic light principle)



Display of test points in a route

The test points to be processed are listed inside each route. The order of the points corresponds to the specifications made by the planner in the SONAPHONE DataSuite web app. The following information is displayed in summary at this level:

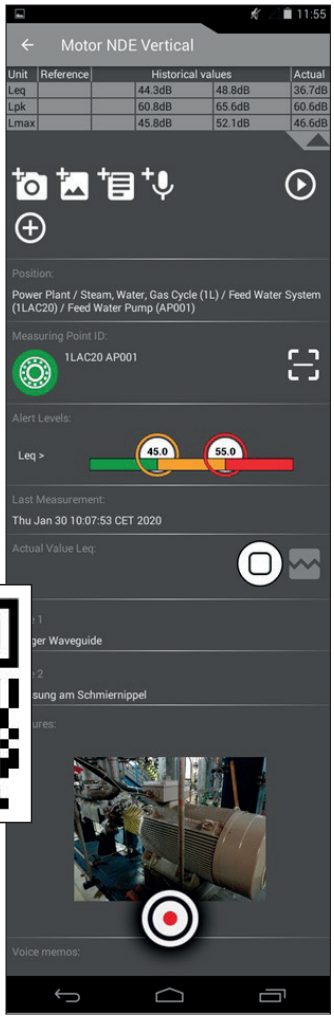
- Number/order of test points to be processed
- Location of test points in the asset (asset structure)
- Test status (test point processed or outstanding)
- Status of the measuring point before/after the test (traffic light principle)

Display of detailed information for a test point

The AssetExpert app shows comprehensive information about a test point to help the inspector in performing the test task. The planner can control the quality of the information in the DataSuite web app. Current measurement results are displayed too.

The following information is available:

- Reference variable with threshold values and current status (traffic light principle)
- Historical values from the last three measurements and reference values
- Current values from a new measurement
- ID, photos, text memos, voice memos for the test point

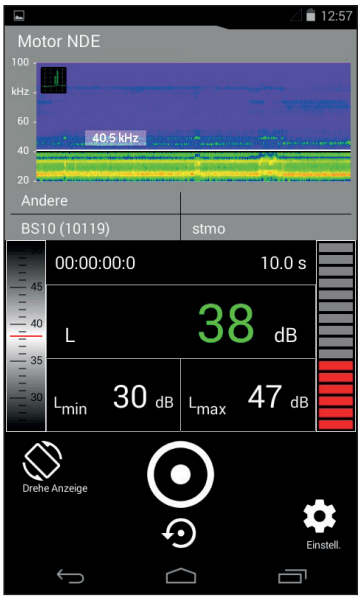


Display of results from current measurements

Measurements are taken via the SONAPHONE functions with which users are already familiar. The application will determine which sensors are used (structure-borne sound or airborne sound sensors as appropriate). The following information can be shown for or added to a current measurement:

- Spectrogram display and level records
- Current measured values (different levels, temperature)
- Photos, text memos, voice memos for the measurement

It is also possible to play back and, if applicable, overwrite the current measurement.



Chapter 4

Evaluation of test results in DataSuite

All the measured values and contextual information (photos, text memos, etc.) captured during a route-based inspection are transferred to SONAPHONE DataSuite. They are therefore available in a central location for analysis and documentation purposes.

Audiovisual analysis using time signal and spectrogram

Recorded test data can be played back again in SONAPHONE DataSuite. Such data is displayed in the form of a time signal graph and a spectrogram. Certain time ranges can be zoomed out for analysis.

Important measurement settings, photos, text memos and voice memos are shown as well. The user is also able to play back the ultrasonic signals in the audible frequency range.

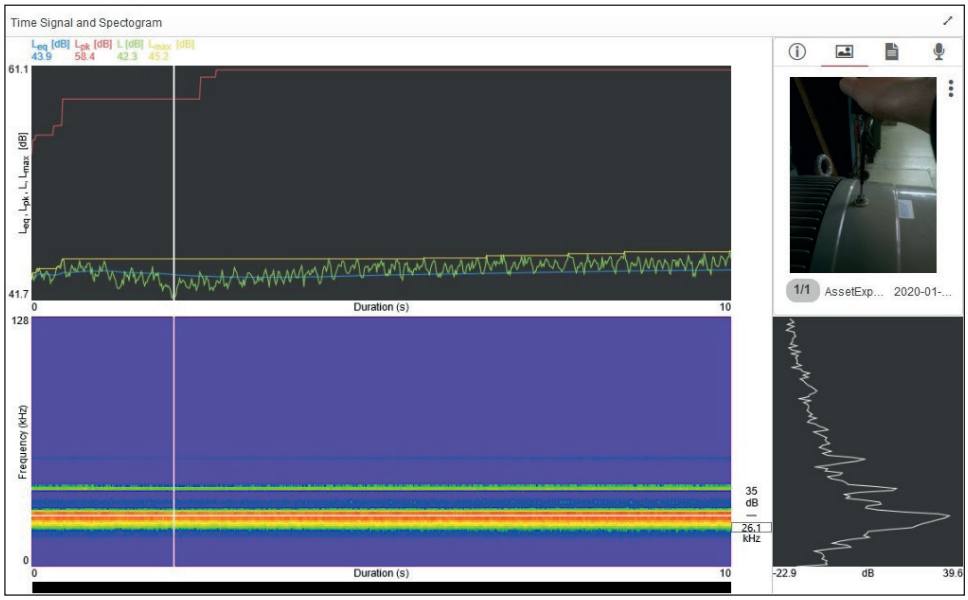


Figure 3: Time signal and spectrogram view, as well as contextual information for a measurement

Broadband characteristic values for trend monitoring

Characteristic values are available for every application. This makes it easy to spot deviations from an initial measured value (recorded after an installation or a repair, for example) or from other previous trend values.

Such changes point to errors, damage or operation that is no longer as intended, e.g. insufficient lubrication on rolling-contact bearings, defects in steam traps or faulty insulation on electrical systems.

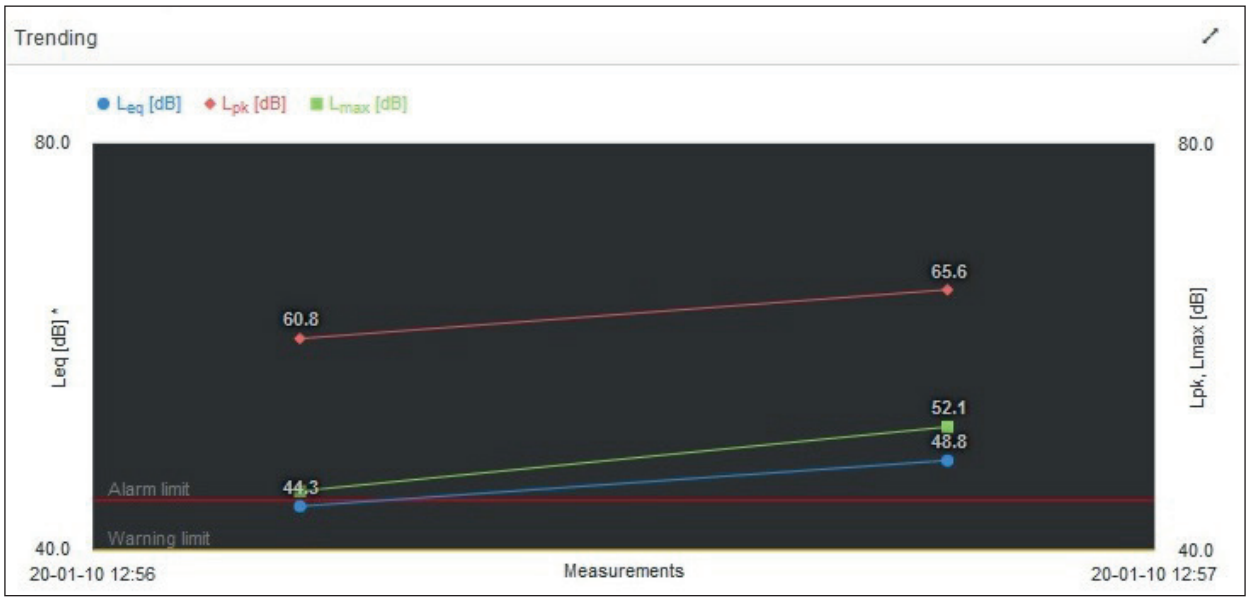


Figure 4: Trend graph for monitoring characteristic values over time

Display of all measurements

Measurements belonging to a test point are shown in a clear table together with time stamps. All measurements and their associated data can be selected for further analysis.

Test results for planning maintenance

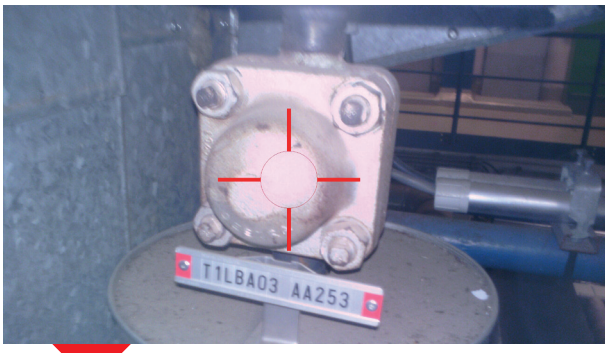
Test object: Machine (rolling-contact bearing)

Data analysis

Result & maintenance action

Increased level (carpet value):
Lubricate the bearing

Test object: Steam trap

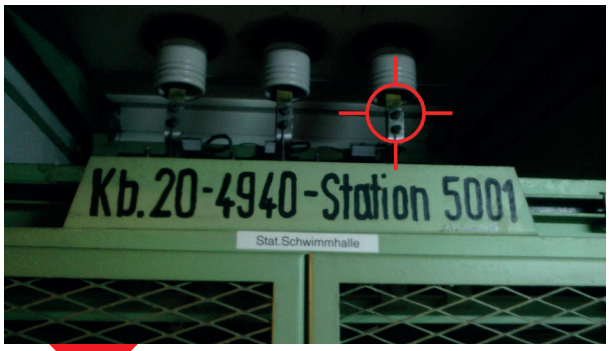


Data analysis

Result & maintenance action

Defective trap (leak):
Replace the steam trap

Test object: Busbar



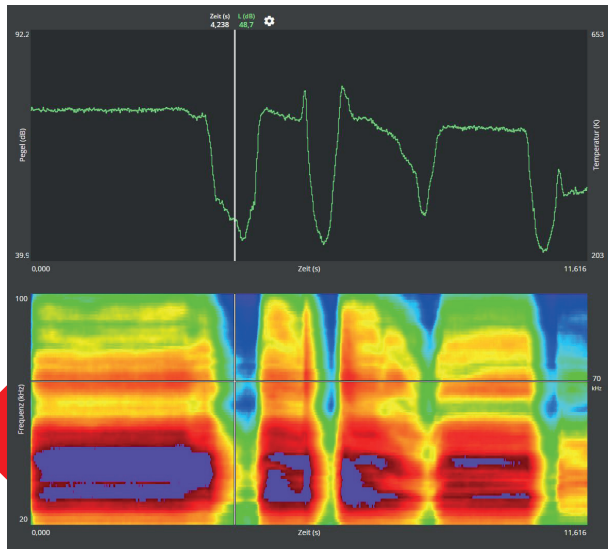
Data analysis

Result & maintenance action

Surface discharge on rail/feed-through:
Check the screwed joint, clean if required

Test object: Compressed-air pipe

Data analysis



Result & maintenance action

Leak at compressed-air pipe:
Check the pipe joint, replace if required

Sound library

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