

Everywhere

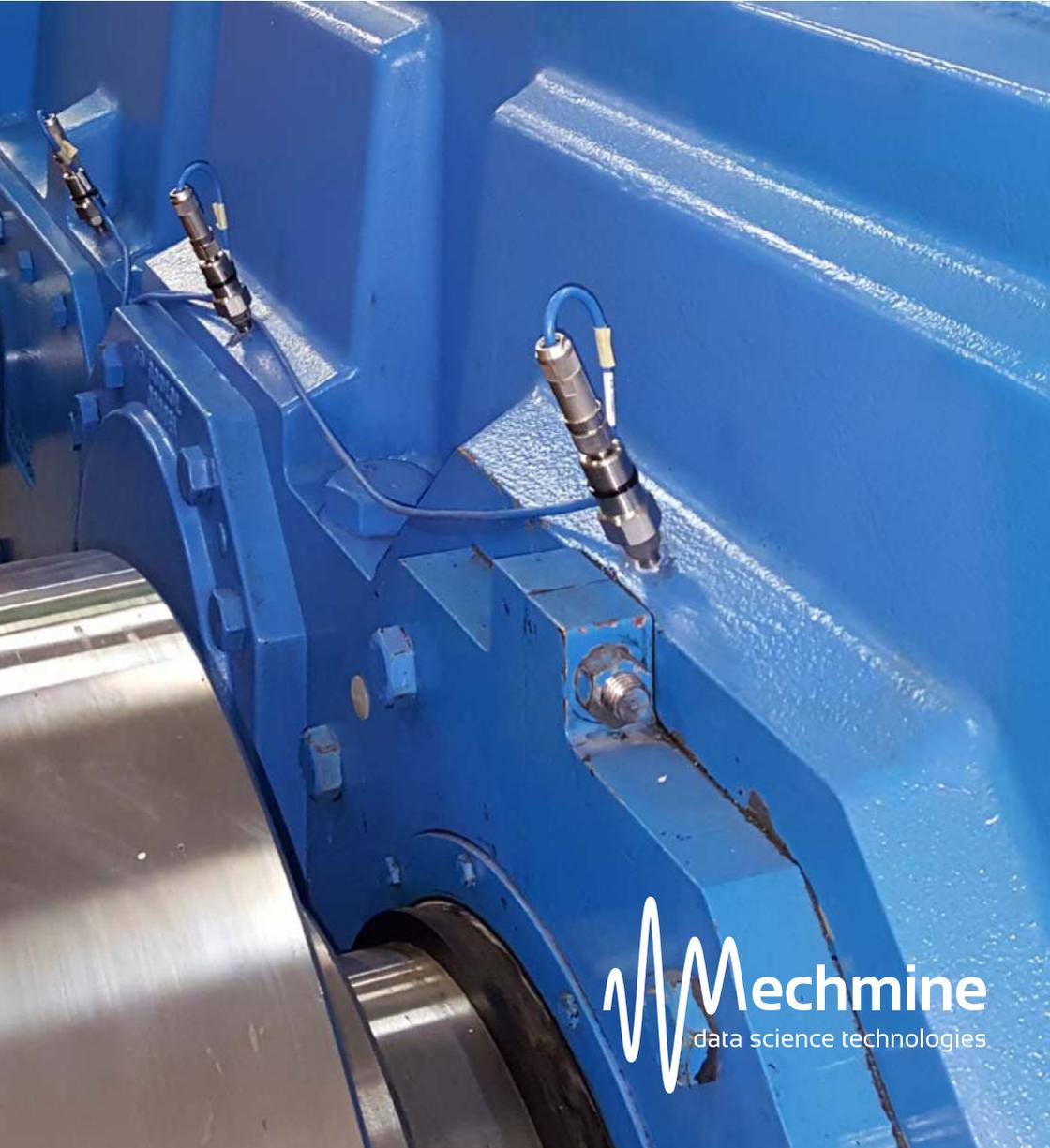
Anytime

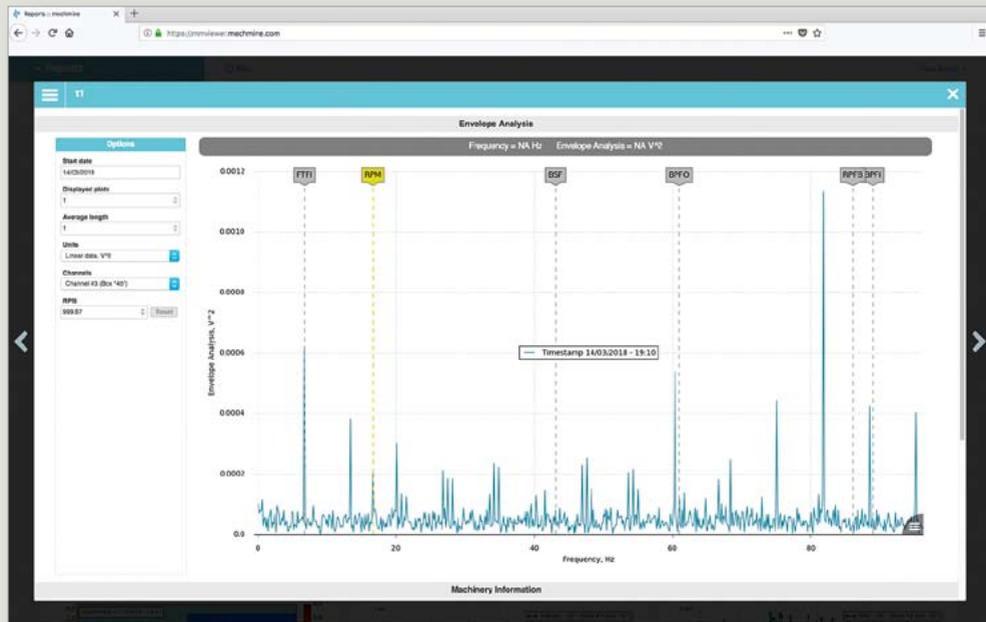
Everything

Predictive Maintenance

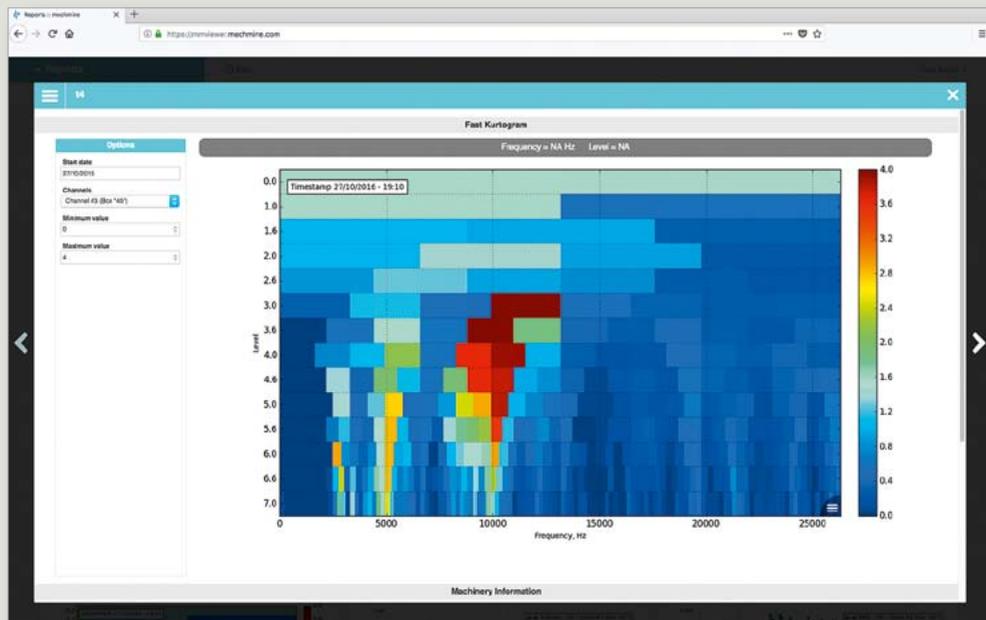
Condition Monitoring

Vibration Analysis





The envelope analysis amplifies periodic signals and eases the detection of defects in gears and bearings.



Kurtogram: High values are easily spotted and then subjected to further FFT analysis.

Artificial Intelligence works 24/7

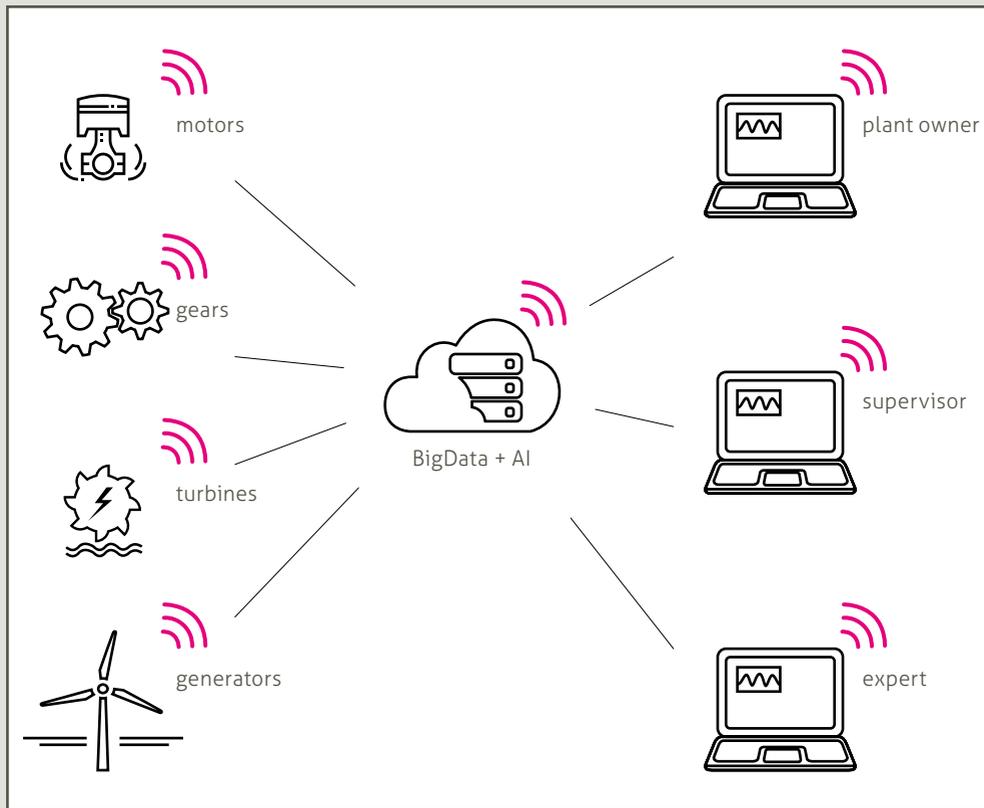
Mechmine's service rests on data-mining and big-data methods. We collect data from any sensor and produce insight round the clock. The data-mining approach comes in stages, from pattern extraction and selection to classification followed by smart post-processing.

Small sensors collect continuously data

Different sensors collect data for Mechmine's M2M (Machine-to-Machine) Cloud application. Mechmine's system is sensor manufacturer agnostic. Our sensors exploit the latest technologies like MEMS (Micro-Electro-Mechanical Systems), but we also employ popular piezo-electric sensors. Our MEMS sensors are suited for many industrial applications and have, for example, improved shock resistance. We perform intelligent pre-processing of the raw data at source to reduce data volume sent in the Cloud, without loss of information, which is a unique approach.

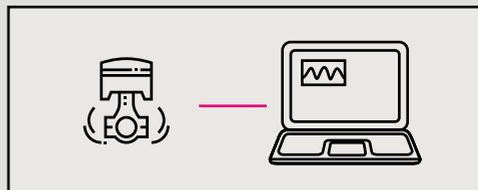
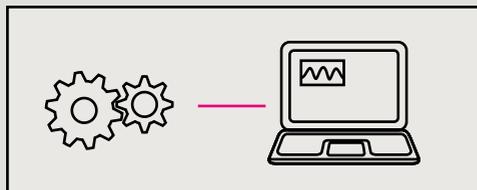
Learning to automatically detect defect patterns

A vibration signal from a device like a ball-bearing is sent in the Cloud at regular intervals, or if at source an anomaly was detected. A pre-processing method like the Fast Fourier Transformation, (FFT), yields a vector with, for instance, 1024 spectral lines. Imagine a



Top:
A large network of assets generate huge amounts of data, building the base for machine learning. Artificial intelligence benefits all users.

Bottom:
Users can perform their own analysis using provided tools.



1024D space instead of a 3D space, where such a high-dimensional signal is like a star in the universe. Signals of similar healthy bearings cluster within a confined space in the high-dimensional space. One hypothesis claims that signals from defective bearings lie (far) outside this cluster. Pattern recognition can differentiate the various signals and, ideally, classify the bearing's health status and going one step further, predict when it may fail. Mechmine is operating a unique 8-device test bench to generate such training data in a controlled environment.

Neural networks predict Remaining Useful Life (RUL)

Data of a diverse set of machines are used to train a neural network to improve accuracy and precision. Various methods and combinations can be used from artificial intelligence, statistics, linear algebra and digital signal processing. Data variety, the possibility to exploit prior knowledge and to fuse intermediate results yield an universal predictor, whose forecast accuracy surpasses human abilities.

Results are available everywhere and anytime

The desired information, the health state of an asset, is online accessible 24/7 to maintenance engineers, operators and management. White label solutions are possible where the service can be offered to licensees.

Pricing

Plan	Service	Status	Pricing
Free	Data processing and display in mmViewer. Access to selected analysis functions and generation of max. 9 reports per asset. Data goes typically through customer's IT network.	Activ	free
Free+	"Free" plus safe connectivity (wireless data transport and not through customer's IT)	Activ	380 € for SIM+UMTS Dongle per year per mmBox
M1	"Free" or "Free+" plus alarm function with SMS/Email triggered through thresholds.	Activ	950 € per year per mmBox
M2	M1 plus automated bearing/gear defect detection and fault classification.	3Q2018	TBA
M3	M2 plus automatic Remaining Useful Life (RUL) prediction.	1Q2019	TBA
O1	Vibration expert analyses the data history in mmViewer and produces a health report.	Activ	250 € per analysis per device

Not included are any expenses for data acquisition hardware and its installation, like mmBox (Mechmine's data acquisition box) and Sensors.



Early replacement...



...spares downtime.

In summary, repair or replacement planning becomes predictable.

Prevent loss or consequential damages

Vibrations exists everywhere, where mechanical parts rotate and are the earliest indicator of problems. Their sources are manifold: imbalance, cavitation forces, bearing faults, wear on gears, fractions or cracks in components, loose mounts, broken oil film, material fatigue or misalignment and assembly errors. The resulting damage can lead to production losses, total loss of assets like machines or buildings or worse, physical injury.

We value your data

The broader our data base, the better we will perform. More data enable us to predict better. Thus we offer our basic service for free. This is attractive to customers with in-house experts in vibration monitoring. Other clients may choose from our automated services or book an expert to carry out an analysis within our Cloud on their behalf.

- ^ Maintenance 4.0
- ^ Predictive Maintenance
- ^ Condition Monitoring
- ^ Safety from 4G/5G wireless
- ^ Access through browser in the Cloud
- ^ Simplicity from automatic analysis
- ^ Reliability through RUL prediction
- ^ Performance through machine learning

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