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Analysing Data

1. Measurement points
2. Evaluating data
3. Analysing successes and failures
4. Analysis options

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1. Measurement points

Measurement points collect data on the health of assets. They should always be accurate, reliable and take hidden failures into account.

Data can be measured from a variety of measurement points and with different techniques. Some practical considerations are:

- Monitor the same measure point (sample point)
- Determine the operating conditions (energised or de-energised)
- Consider the loading conditions (onload – offload)
- The viewpoint (infra-red)
- Use the same instrument (at least the same model) and the same settings
- Use calibrated instruments and ensure the instrument is functional
- Consider the safety risks when taking the measurement
- Take environmental care into consideration (eg risk of spillage)

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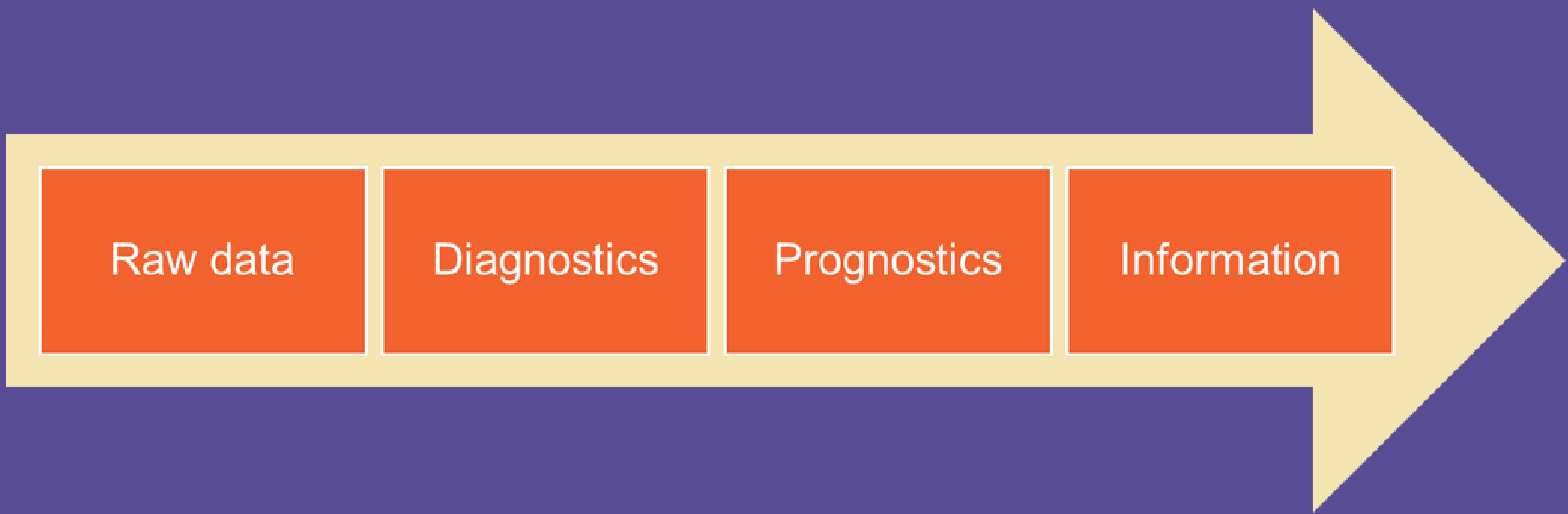
2. Evaluating data

Data must be evaluated to identify potential problems or deviations from normal operation properly.

Data evaluation process

Turning data into information



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2. Evaluating data

After the initial evaluation, multiple parameter condition data could also need further manipulation.

Evaluating data involves comparing current data to historical data or established benchmarks, looking for patterns or trends in the data, or using statistical analysis techniques to identify outliers or anomalies.

When evaluating data, consider whether an offline or online approach is best:

Offline approach

- Involves downtime
- The equipment is out of operation
- Could involve the disassembly of the plant

Online approach

- No downtime
- The equipment is in operation
- Realtime data

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3. Analysing successes and failures

Both accuracy and precision must be taken into account when measuring results.

Precision is how close measure values are to each other.

Accuracy is how close a measure value is to the true value.

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3. Analysing successes and failures

It's important to analyse both successes and failures to improve the effectiveness of condition monitoring.

When interpreting data, take the following principles into account:

- Data types (eg temperature, dB values, velocity)
- Evaluation methods (eg absolute and differential values, trending complex algorithms)
- Technology capabilities (eg accuracy, calibration, ease of on-site interpretation)

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3. Analysing successes and failures

Identify factors that contributed to successful predictions of machine failure or maintenance needs.

Best practices

- Same measure point, viewpoint, same distance, same conditions
- Getting comparative data
- Ensuring correct data is analysed
- Trending data from the same measure point (sample point)
- Online data is verified
- If it looks odd, investigate!

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3. Analysing successes and failures

Examine cases where predictions were inaccurate or incomplete.

Potential pitfalls

- Wrong measurement technique used
- Instrument was broken
- Hidden failure – measuring, but just internal noise; same value no matter the condition
- Measured in the wrong place
- Incorrect measure point
- Instrument not calibrated
- Wrong equipment
- Wrong values used in the calculation
- Analysing the wrong data

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4. Analysis options

Data is only useful when it becomes information and the data can be trusted (accuracy and repeatability).

When deciding to do a condition assessment, we need to decide what to do the analysis on.

This can first be determined with visual assessments and testing.

Once we have made these basic decisions, we can decide on the best analysis option.

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4. Analysis options

The system's specific needs and the data collected will guide the analysis type.

Some common analysis options include:

Analysis type	Analysis application
Heatmap	One of the simplest techniques one can use for analysis. Determine the indicators to use to warn the operator that something is wrong.
Fuzzy logic	Establish true/false patterns by building up a library of true and false values. Equipment specific. The computer makes decisions based on the data received
Artificial neural networks	Dependent on data mining. Pattern matching. Provides algorithms with failure detection
Expert systems	Rule-based systems. Complex algorithms.
Hybrid systems	Results are in the form of actions or recommendations, risk assessments and heat maps.
Envelope analysis	Bearing failures are one of the most common faults with industrial machines, and the envelope analysis is primarily used to detect and diagnose REB (rolling element bearing) faults.
Artificial intelligence and machine learning	Machine learning focuses on the development of computer programs that can access data and use it to learn for itself.

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