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18TH EDITION VIRTUAL

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Under the theme of

The Integration of Maintenance and Asset Management

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ORGANIZER

OMAINTEC المجلس العربي للتشغيل والصيانة Arab Council of Operations & Maintenance

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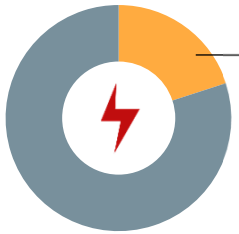
EXICON VIRTUAL Specialist

Condition Monitoring using the Variable Speed Drive as a Sensor

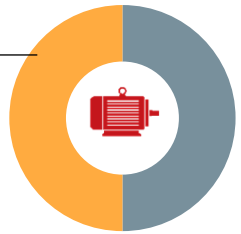
Dr. Norbert Hanigovszki
Danfoss Drives

For a better tomorrow



20%
of the world's energy consumption is **electrical energy**

50%
of electrical energy is used by **electrical motors**



Variable speed drives control power supply to electric motors and typically save **15-40%** of energy consumed

TODAY:
75%
of AC drives are used on pumps, fans and compressors

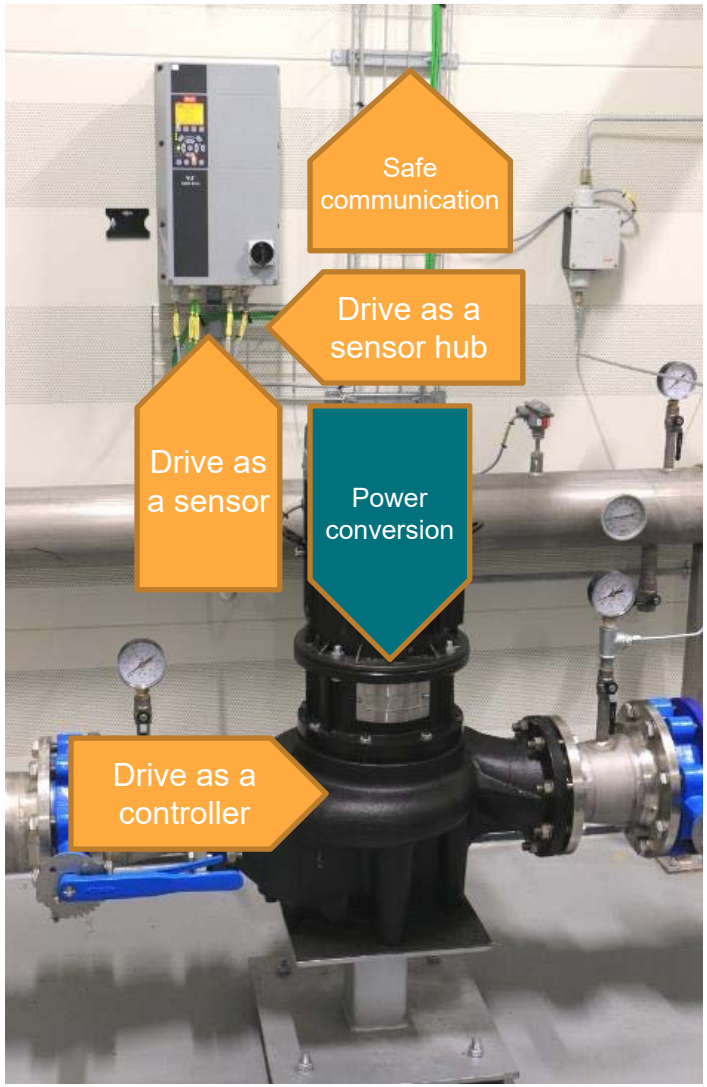
TOMORROW:
AC drives have the potential to save
8%
of global electricity consumption by 2040

Electricity consumption of water and wastewater sector is:
~ 30 – 40 % of local authority's total use
~ 8 % of total electricity consumption global, UN

Source: IEA World Energy Outlook 2016

The intelligent drive

- Traditional role is power conversion, energy saving through variable speed is 15 – 40 %
- Drive as a sensor: use information from motor current signature analysis
- Drive as a sensor hub: connecting external pressure, vibration, temperature sensors to the drive
- Safe communication to cloud, PLC, SCADA
- Drive as a controller: controlling applications such as multi-pump cascade



New maintenance models

CORRECTIVE MAINTENANCE

The component is changed after it fails.

PREVENTIVE MAINTENANCE

The component is changed before it fails, without any notification from the product.

CONDITION BASED MAINTENANCE

The product provides a warning if the component lifetime estimation varies from the normal lifetime and indicates possible root causes.

PREDICTIVE MAINTENANCE

The product provides a warning before the component's designed hours of operation are reached.

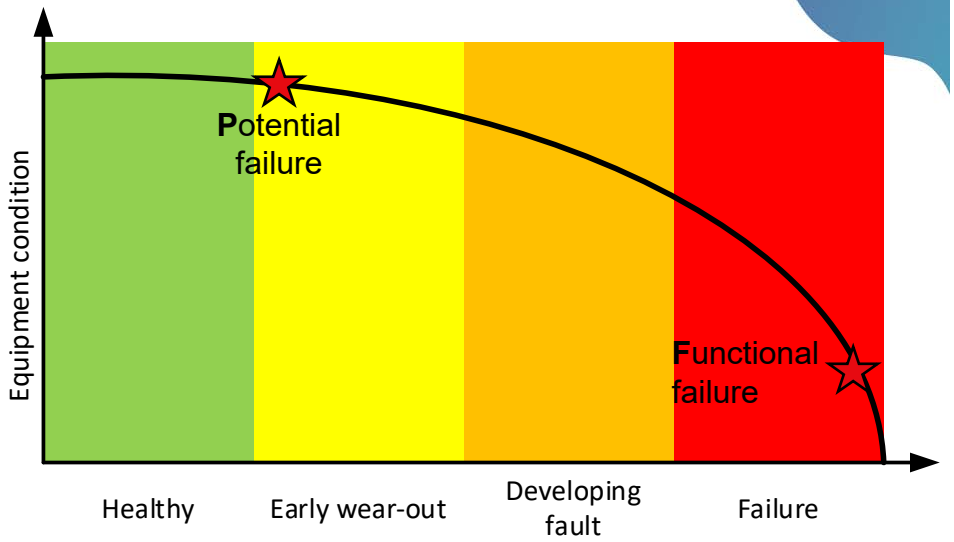
3. Automation

4. Networking

Condition monitoring

- Condition monitoring detects faults at early stage
- Optimize the use of resources and enable advance planning
- Reduce cost of unexpected downtime
- Reduce total cost of ownership

- **Condition based maintenance requires trained maintenance technicians and implementation of maintenance processes**



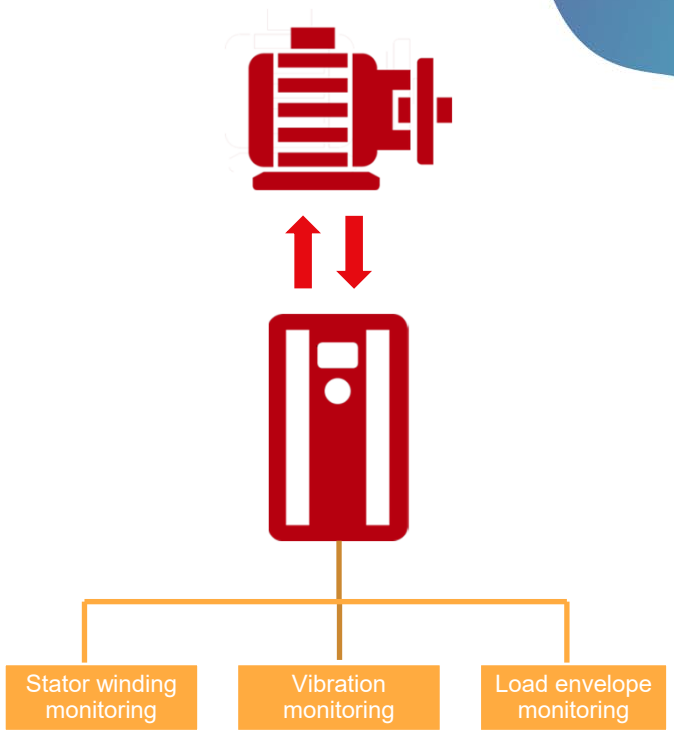
Embedded condition monitoring

- Danfoss has pioneered condition monitoring functions embedded in the drives:

- **Stator winding monitoring**
- **Vibration monitoring**
- **Load envelope monitoring**

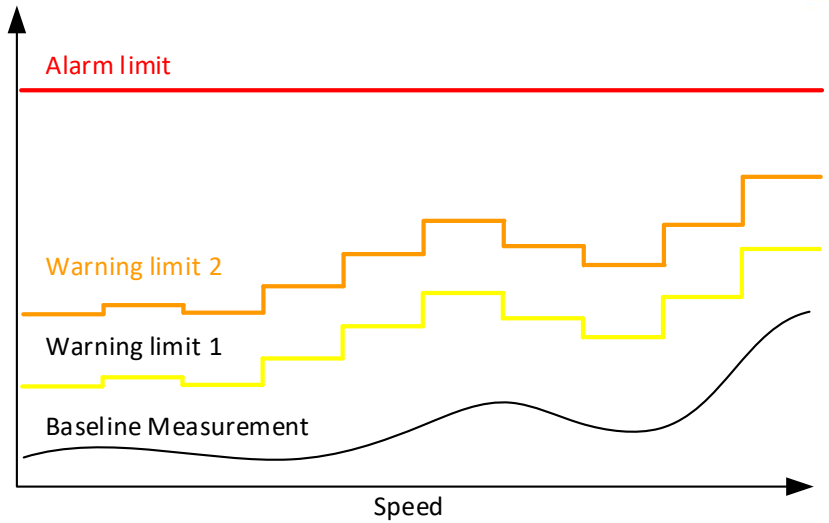
- Dedicated commissioning plug-in in the programming tool

- Possibility of cloud dashboard through Remote Monitoring service



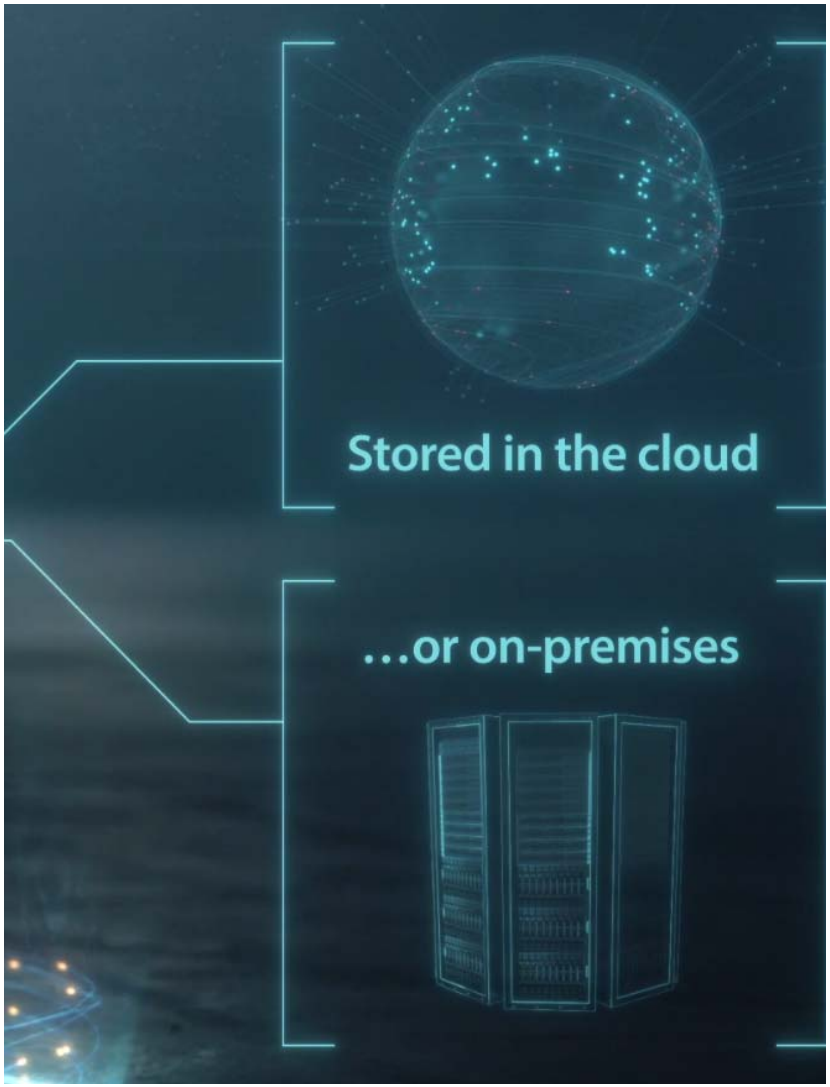
How does it work?

- Each function (motor winding, vibration and load monitor) is represented by an analogue numeric value
- The drive needs to run a ”baseline measurement” to learn the baseline values
- Baseline run (speed sweep) and online baseline
- Based on the baseline, three thresholds lines are created: two warning levels (1 and 2) and an alarm level (corresponding to VDMA 24582 color code)
- Absolute, factor and offset thresholds
- During operation the actual value is compared to the thresholds



User interface

- Drive control panel
- Wireless display via user smart device
- Fieldbus
- Remote monitoring / IIoT
- PC tool for drive programming



Q & A Session

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