



# Plant Condition Monitoring Solutions & Applications 2025

Industry 4.0 Process Automation

Networking | Sensing | Monitoring Solutions



Industry 4.0 - the game changer - let us show you how.



# ifm is committed to help your business succeed!

German quality industrial product, ex-stock NZ

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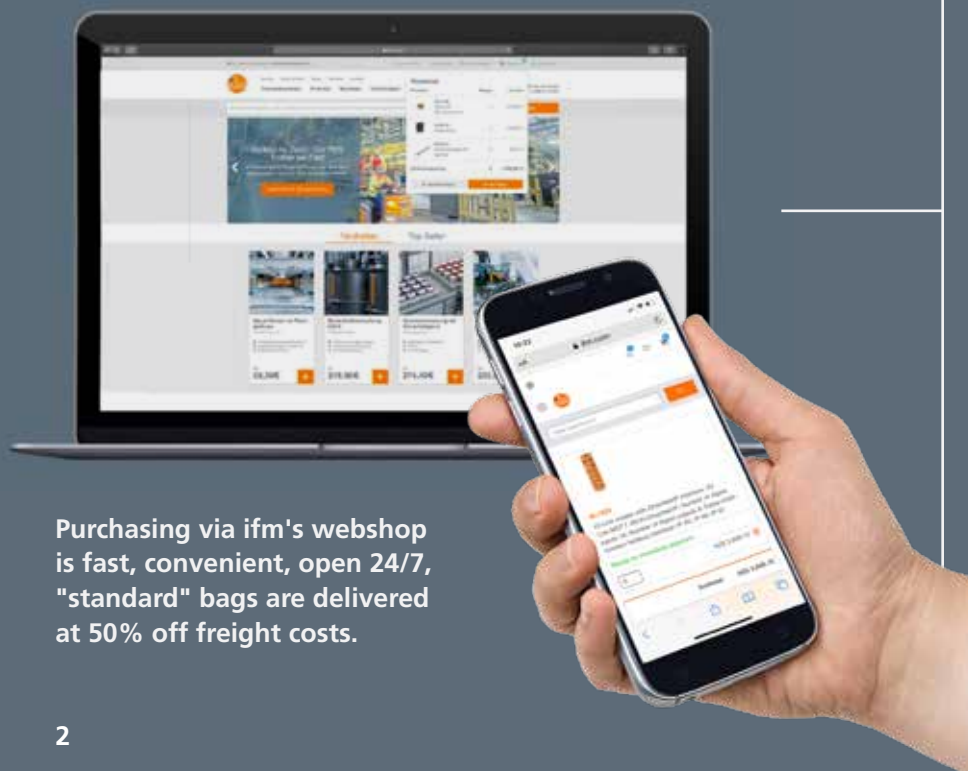
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Interested in discovering new possibilities for your business or production process? Wish to discuss advanced technologies and solve technical problems? Or seek practical insights into the latest automation practices? Why not meet one of our engineers - either at your premises, or at our customer service centre. Or visit us at a Tradeshow. Whichever is your preference - we will look forward to hearing from you!

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Browse, select, order  
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ifm's wide product range is clearly structured via individual Product Groups.

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## Compare:

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# Introduction

## ifm electronic ltd:

Proudly support the New Zealand potable water and waste water treatment industry with high quality instrumentation and control products. We carry an enormous local stock to ensure fast delivery.

We wish to thank our customers for their support and loyalty over the years. This wouldn't happen without the incredible group of Kiwis that have developed the business into the successful operation it has become over the last three decades.

We employ a dedicated team of 24 local employees, committed to helping you and your business succeed. Our team is located throughout the country in Auckland, Hamilton, Hastings, Levin and Christchurch. Servicing thousands of local businesses, by delivering 73% of all PO's overnight via couriers - nationwide! The remainder come to our customers after 7-10 days via UPS courier shipments from Germany.



## ifm electronic - global:

ifm electronic gmbh remains a family owned private business, founded in Germany in 1969. From the start, the company has continuously invested in R&D product development & automated manufacturing.

While marketing an incredible range of electronic sensors, control products & connection solutions for industrial automation and process control applications. The company now supports customers from virtually every industry, especially those where quality and reliability are not negotiable!

ifm employ 7,600 dedicated staff, located in 90 countries and servicing >180,000 customers worldwide. But despite having grown into a large company, we maintain the virtues of the founding years. The flexibility and individuality of a small enterprise, with quality and professionalism central to the group. Our customers remain the centre of our work - close to you.

## ifm Innovation:

As one of the world's largest manufacturers of industrial sensors & control products, ifm made its name by developing robust, compact industrial quality products with user friendly interfaces, and flexible electronic outputs. With massive annual investments in R&D, ifm currently owns >1000 registered world-wide patents. Regularly winning numerous prestigious design awards for innovations & break-through technologies!



## Our commitment to you:

ifm products are distinguished by the highest precision & reliability. You have our word on that – hence the 5-year factory under written warranty!

We want you to use our products, confident that ifm is the right partner for your automation goals.

**ifm – close to you!**



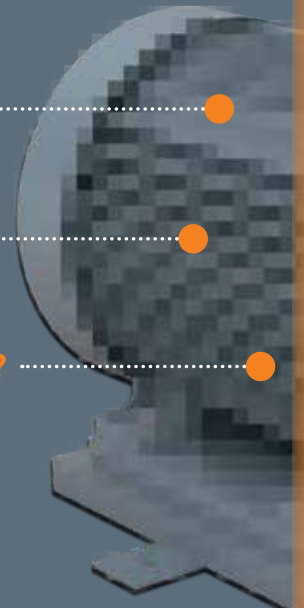


Before

Machine availability: ?

Energy consumption: ?

Process quality: ?



# Do you know when your engine will fail?

With moneo you know! Prevent unplanned downtime by predicting failures and increasing your **machine availability**.



### Predictability

Your operating resources are available as planned.



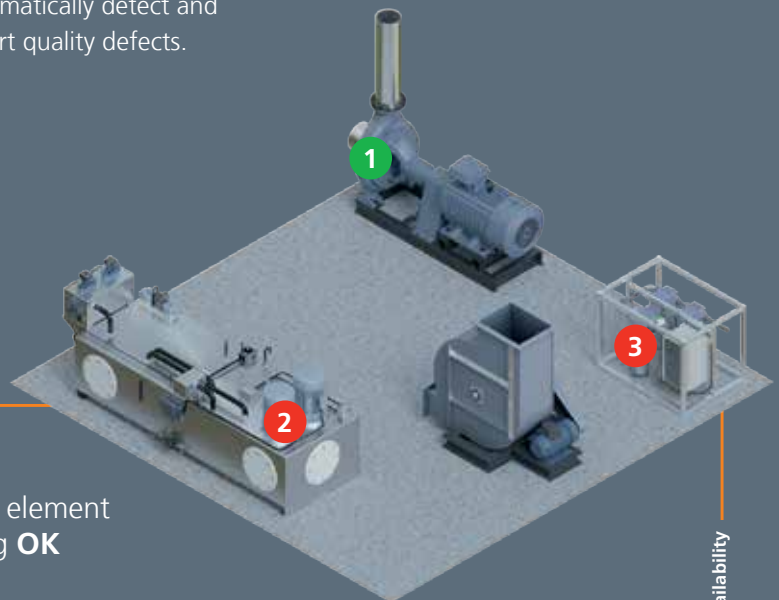
### Self-monitoring

Your production systems automatically detect and report quality defects.



### Process stability

Your cycle times are not affected by damaged machines.



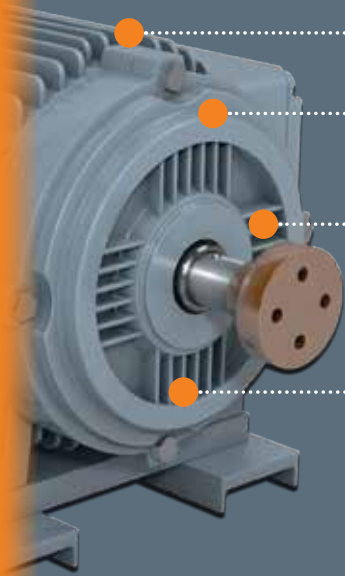
- 1 Rolling element bearing **OK**
- 2 Pressure loss: **oil leakage**
- 3 Filter service life **ends** in 7 days



[ifm.com/cnt/moneo-availability](https://ifm.com/cnt/moneo-availability)



## After



Operating hours: 8324 h

Temperature  
very high: 105 C°

Energy consumption  
rising power  
consumption

Warning:  
bearing damage detect

# How many product recalls can you afford?

If a quality problem goes unnoticed, it can jeopardise entire batches – or trigger a recall. With moneo, you can detect deviations in real time and intervene immediately. While reducing rejects and avoiding costly errors, this enables you to ensure **product quality** based on data.

**1** Change the IBC in WAREHOUSE B

**2** Tank level **low**: 5 % capacity

**3** CIP process temperature: **OK**



[ifm.com/cnt/moneo-quality](https://ifm.com/cnt/moneo-quality)



### Detecting process deviations

Monitor deviations in real time to avoid rejects, reworking and product recalls.



### Ensuring product safety

Monitor critical components by using intelligent sensors and visualisation software.



### Meeting customer requirements

Ensure the highest quality standards to exceed customer expectations.

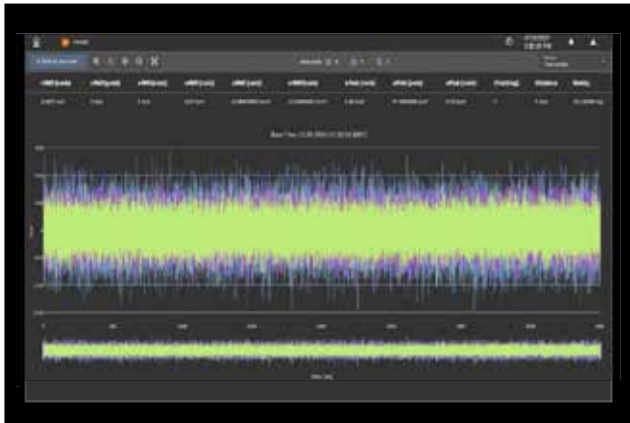


# Plant Condition Monitoring Innovations

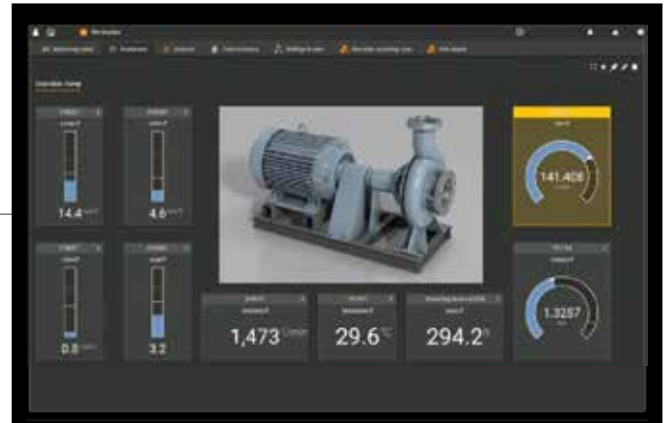
TAKING COMPLEXITY OUT OF SIMPLE MACHINE MONITORING

## Turn your real time data into actionable insights

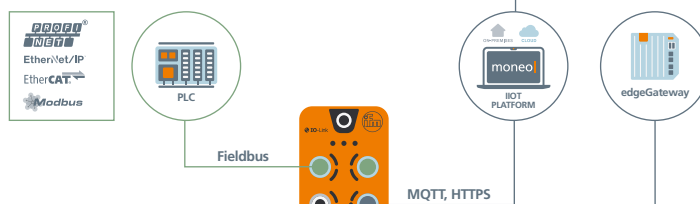
- Machine health - continuous transparency of machine reliability.
- With the new VVB and the IIoT platform moneo, maintenance is easier than ever before.



moneo Analytics

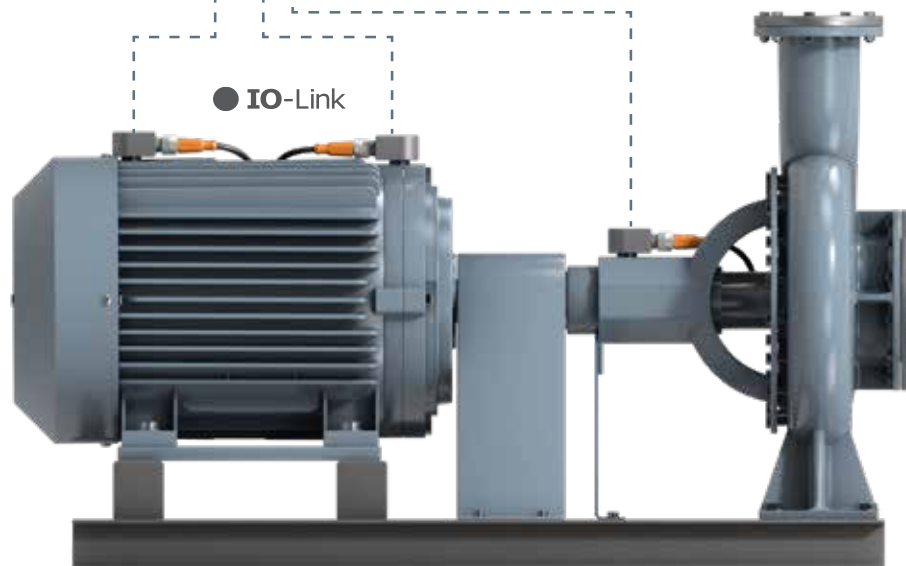


moneo: Your maintenance co-pilot



- Trend values**
- Fatigue | v-RMS – xyz
  - Impact | a-Peak – xyz
  - Friction | a-RMS – xyz
  - Crest – xyz'
  - Surface temperature

- Advanced analysis features**
- Unbalance Detector
  - BearingScout™
  - Raw waveform
  - Machine operation time
  - Trend history





# moneo | application reports

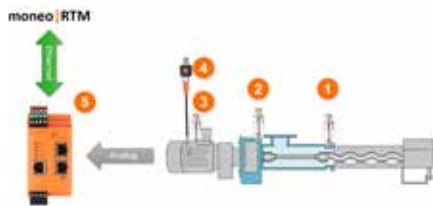
Continuous condition monitoring of sludge and drainage pumps in the waste water industry



## Waste water treatment plant Kressbronn, Germany

At the waste water treatment plant Kressbronn, numerous pumps with various characteristics are used to convey liquid media through the various areas of the waste water treatment plant. Unplanned downtime can have severe repercussions, potentially disrupting the entire municipal waste water disposal system or even causing a complete halt to its operations.

In the case of liquid pumps, bubbles can form if the pressure difference between the inlet and outlet side is too high: Resulting in cavitation. The tiny bubbles filled with vapour collapse suddenly due to the high pressure. This sudden collapse creates shock waves that repeatedly erode the pump element and the pump housing from the inside. If the damage becomes too great, the pump can no longer work properly. In the worst case, expensive repairs or even the replacement of the pump may become necessary.



1. Vibration sensor pump bearing NDE VSA001
2. Vibration sensor pump bearing DE VSA001
3. Vibration sensor motor bearing VSA001
4. Temperature sensor motor TP3232 + TS2229
5. Diagnostic electronics for vibration sensors VSE150

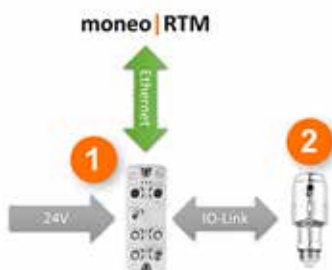


1. Vibration motor bearing [mg]
2. Cavitation recognition pump DE [mg]
3. Time counter cavitation DE [h]
4. Vibration pump bearing DE [mg]
5. Cavitation recognition pump NDE
6. Time counter cavitation NDE [h]
7. Vibration pump bearing NDE [mg]
8. V-effective pump bearing NDE [mm/s]
9. V-effective pump bearing DE [mm/s]
10. V-effective motor bearing [mm/s]
11. Motor temperature [C°]

## Continuous radar level measurement of CIP tanks, with moneo RTM



The non-contact level measurement principle with radar offers many advantages for monitoring a CIP system. Contact with media (acids, alkalis) and heating coils is avoided so that the measurement is independent of the temperature and density of the media. These advantages complete the quality assurance of the CIP cleaning process.



1. IO-Link master (e.g. AL1351)
- 2.1 LW2720 level sensor LW2720



1. Level in metres
2. Volume in litres



# Plant condition monitoring

WHY PREDICTIVE MAINTENANCE MAKES SENSE

## VIBRATION CAUSES:



**Looseness,  
unbalance**



**Misalignment**



**Rolling element  
bearing**



**Gearbox  
Meshing,  
tooth fault**



**Pump  
Eccentricity,  
cavitation**

## Imagine:

- If your production equipment was always available as planned?
- If your cycle time was never compromised due to a damaged machine?
- If your production equipment self-detected and alerted you of quality defects?

Applying Real-time Maintenance (RtM) technologies to your production equipment increases equipment availability, maintains machine throughput, and minimizes material losses.

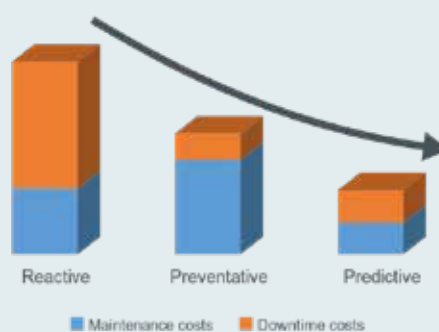
## COMMON INDUSTRIAL MAINTENANCE STRATEGIES

There are 3 basic types of industrial maintenance processes and each have costs associated with them.

1. **Reactive maintenance** -- highest total cost of ownership. Run-to-failure strategy and unplanned downtime is usually more expensive than planned downtime and typically there is secondary damage to other components.
2. **Preventative maintenance** -- downtime is scheduled prior to failure. Carries a high cost because parts and labor are consumed prematurely.
3. **Predictive or Condition-based maintenance** -- uses RtM technology to optimize equipment use. Maintenance is performed only when necessary without production loss.

## TOTAL COST OF OWNERSHIP BY MAINTENANCE STRATEGY

Total cost of ownership by maintenance strategy



## RTM TECHNOLOGIES FOR PREDICTIVE MAINTENANCE

Advances in technologies for industrial networks, reduction in size and cost of computational power, and advances in smart sensors are making predictive systems a reality. These innovations are changing the way companies manage their equipment maintenance.

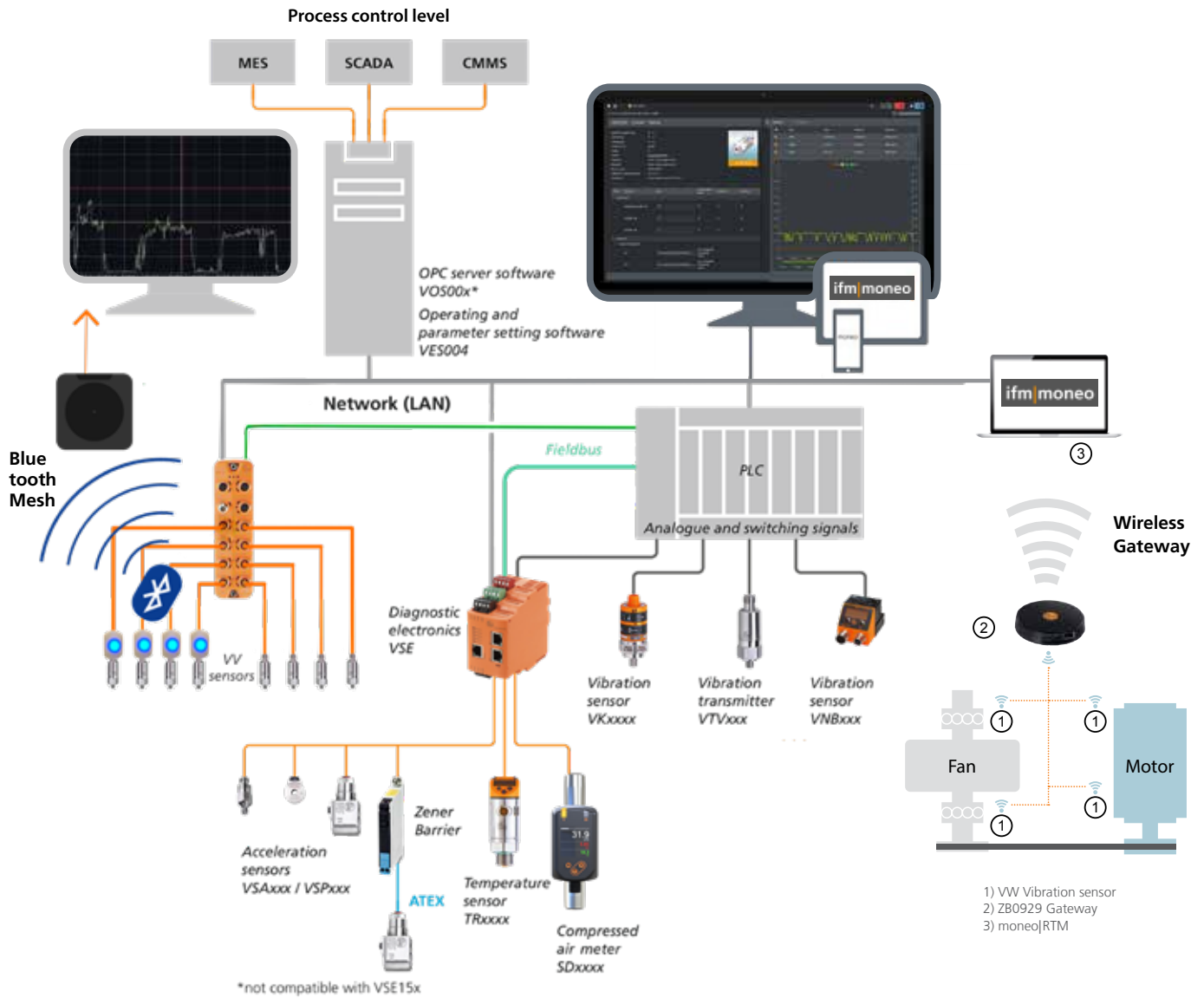
Operational worthiness in real time is key to improving OEE (Overall Equipment Effectiveness) and increasing profits. Implementing RtM is at the core of any Industry 4.0 initiative. With ifm RtM products, machines can communicate their operational status in real time, automatically plan maintenance, reduce downtime, and improve quality – all improving your bottom line.



# Plant condition monitoring: component overview



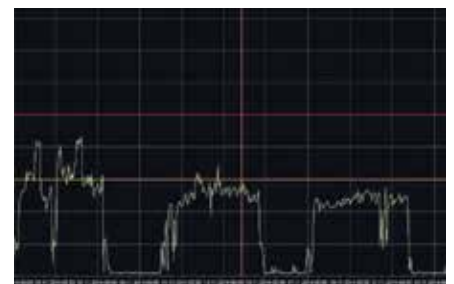
Vibration accelerometers for all applications



Vibration sensors on the drives detect even smallest vibrations.



The VSE100 evaluation unit evaluates the signals from up to four vibration sensors.
























Vibration characteristics can be visualised via PC in a control room. Operators can set limits (yellow & red lines for pre-alarm and main alarm).



# Plant condition monitoring: selection chart

FROM SIMPLE TO COMPLEX MONITORING

Machine classification	Application		Single-point measurement	IO-Link	Multi-point measurement	Prog. diagnostic electronics
			VN	VV	VSA / VSP	VSE
						
			<i>Intelligent vibration sensors type VN</i> On board display, history storage for documentation, for rotating machines >120 rpm.	<i>Intelligent vibration sensors type VV</i> Detection of numerous vibration parameters with optional raw data acquisition (BLOB) for extended analyses as well as integrated machine uptime detection based on the vibration values.	<i>Acceleration sensors type VSA / VSP / VSM</i> Different types, also for mounting in difficult to access areas. Various measuring ranges with voltage output (100 mV/g) or current loop (0...10 mA). Connection to the VSE diagnostic electronics.	<i>Diagnostic electronics type VSE</i> 4-channel diagnostic module with additional process value inputs, integrated history memory and networking possible.
<b>Type 1 - simple machines</b> <ul style="list-style-type: none"> <li>• Single-shaft machines</li> <li>• Predominantly constant speed</li> <li>• Low process and design-related forces</li> </ul>	<ul style="list-style-type: none"> <li>• Electric motors</li> <li>• Gear motors</li> <li>• Fans</li> <li>• Centrifugal pumps</li> <li>• Reduction gears</li> <li>• Separators</li> <li>• HVACs</li> <li>• Conveyor belts</li> <li>• Vacuum pumps</li> </ul>					
<b>Type 2 - process machines</b> <ul style="list-style-type: none"> <li>• Different processes (load/no load operation)</li> <li>• High process forces</li> <li>• Variable use (higher load / speed)</li> </ul>	<b>High process forces</b> <ul style="list-style-type: none"> <li>• Decanter centrifuges</li> <li>• Centrifugal compressors</li> <li>• Industrial mixers</li> <li>• Homogenisers</li> <li>• Crane applications</li> <li>• Extruders</li> </ul>					
	<b>Very high process forces *</b> <ul style="list-style-type: none"> <li>• Machine tools</li> <li>• Crushers</li> <li>• Milling machines</li> <li>• Storage and retrieval systems</li> <li>• Sorting machines</li> <li>• Vibrating conveyors</li> <li>• Sawing machines</li> <li>• Hydraulic presses</li> <li>• Filling systems / Bottling lines</li> </ul>					
<b>Type 3 - complex machines</b> <ul style="list-style-type: none"> <li>• Multiple shafts and complex kinematics</li> <li>• High design-related forces</li> </ul>	<b>Reciprocating compressors</b> <ul style="list-style-type: none"> <li>• Screw-type compressors</li> <li>• Multi-stage gearboxes</li> <li>• Combustion engines</li> <li>• Turbines</li> </ul>					

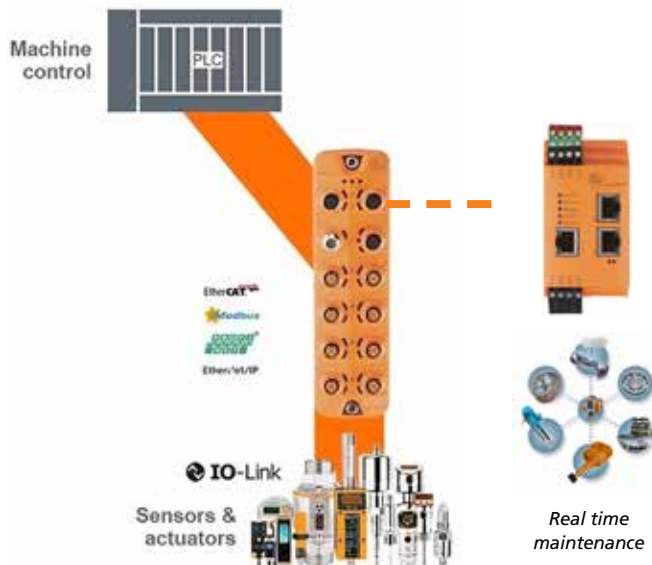
\* Use VVB only for process force monitoring



# Moneo: IIoT platform for industry & production

A NEW APPROACH TO COLLECTING SENSOR DATA

## Talk directly to your IIoT system without PLC intervention



Digital communication technology allows you to get more detailed information from your sensors. But, overloading your PLC will limit the amount of that data you can actually receive and use.

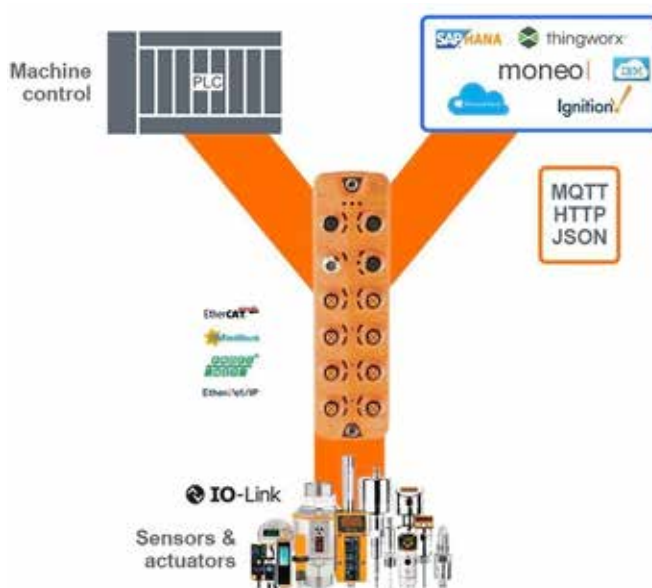
Using IO-Link technology with a Y-path connection gives you full access to real-time machine information without overloading your system.

### Don't let your PLC carry the entire burden!

The PLC has been a mainstay of automation since the 1970's and it is used to control industrial automated equipment. With the advent of Ethernet technologies and IIoT applications, the PLC has been forced to carry more and more information that is not necessarily used to control the machines.

*The PLC only uses 5% of the sensor information.  
Data size is in bytes and cycle time in msec.*

## Y-Path Connectivity



Imagine if your sensors could talk directly to your SCADA, MES, ERP, CMMS systems directly without the PLC intervention and still send the information to the PLC for machine control?

### This is now possible with the Y-path from ifm.

ifm IO-Link masters come with a separate IIoT port with a dedicated IP address for the IT infrastructure. This works in any number of industrial applications without affecting the machine control side of the system. This unique approach allows you to send information and data directly to where it is needed.

*HMI, visualization computers, servers, PCs, etc. use 95% of the sensor information.  
Data size is in Mbytes and cycle time is in seconds.*



# Coca-Cola digitalises down to the sensor

PREDICTIVE MAINTENANCE USING IFM IO-LINK SENSORS



*"The numerous installed sensors enable us to significantly increase system availability," says a delighted Kohlhofer. "Maintenance is no longer time-based, but condition-based. This significantly reduces our costs."*

Coca-Cola, the world's largest beverage producer, operates over 50 filling plants in Western Europe alone. To address maintenance and faults quickly and precisely, the group is digitalising all filling systems and developing a digital twin for this purpose.

This enables production processes to be monitored in real time and optimised immediately if necessary – even remotely, from anywhere in the world. Coca-Cola works closely with the automation specialist ifm to develop and implement the necessary reliable sensors.

*Edelstal in Austria is home to one of the flagship locations. "We are a licensed filling plant for Coca-Cola and fill almost all products here," explains Christian Kohlhofer, Plant Manager, Coca-Cola HBC Austria.*

Filling over 500 million litres of beverages each year, the plant is one of the group's largest.

*"We are increasingly focussing upon automation and digitalisation. Much of what we implement is also later implemented by the group's other plants".*

The plant in Edelstal also operates as a contingency plant: if production bottlenecks occur at other locations, the Austrian plant can step in to help.



*A wireless vibration sensor on the circulating pump for reliable, intermittent monitoring of the total vibration in accordance with DIN ISO 10816.*

## Condition monitoring prevents unplanned downtimes

*System availability is a top priority for the international beverage producer. "At our location, we pick up on every single system downtime immediately," explains the plant manager.*

The plant follows the principles of just-in-time manufacturing, rather than working to stock. This is why predictive maintenance with condition monitoring is so important. In other words, the condition of machines and systems is constantly monitored so that maintenance can be carried out exactly when it is needed.

Real-time sensor data is used to promptly recognise wear, tear and other maintenance requirements. The aim is to avoid unplanned downtimes, reduce maintenance costs and extend the service life of the systems. Modern technologies such as IO-Link, IoT (Internet of Things) and machine learning enable maintenance work to be planned to take place at exactly the right moment – not too soon and not too late.



*IO-Link-capable valve sensors not only detect the flap position, but also recognise wear, blockages or build-up on the valves, thereby supporting preventive maintenance.*

## IO-Link sensors monitor complex processes

Sensors with an IO-Link interface are the first choice when it comes to digitalising systems. These intelligent sensors use a standardised, bidirectional communication interface to communicate with controllers and other systems. In contrast to conventional sensors, they not only enable the exchange of simple switching signals, but also of extensive process data and diagnostic information. Because the transmission of the measured values is digital and not analogue, it is also interference-free and accurate, as no conversion losses occur as with analogue transmission.



# Coca-Cola digitalises down to the sensor

## PREDICTIVE MAINTENANCE USING IFM IO-LINK SENSORS



IO-Link sensors are utilised throughout the plant to provide real time performance data.

The sensors are easy to install and configure and provide precise data in real time. Acyclically retrievable diagnostic data such as minimum or maximum values, pollution degree or errors such as wire breaks or short circuits optimally support condition-based maintenance. IO-Link sensors also ensure high flexibility and efficiency in automation. Their high level of compatibility allows them to be seamlessly integrated into existing systems and easily integrated into the IT level through digital communication.

One example is the use of IO-Link vibration sensors in the can sealing process.

*“Quality in the can sealing process is a matter of thousandths of a millimetre,” explains Gerhard Wieszmüllner, Maintenance & Spare Parts Manager at Coca-Cola HBC Austria. “The ifm predictive IO-Link sensors enable us to detect the smallest vibration deviations and thereby guarantee a completely, permanently sealed can.”*

ifm’s IO-Link valve sensors are used on the bottle washing system flap valves.

*“We notice in advance if a flap seal is broken or needs to be replaced – without any loss of material,” says Gerhard Wieszmüllner. “This means, for example, that we don’t need to drain any alkaline baths and can thereby avoid protracted machine downtimes. This saves time and money.”*



Decentralised IO-Link modules bundle the sensor signals while enabling a detailed insight into the digital sensor from the IT side, which allows for extensive diagnosis.

### Digital twin via the Y path

All of the system’s sensor data is recorded in order to accurately assess the condition of the machines and their components. The Y-path is used to split the sensor data into two paths in real time: the first path transmits the data to the PLC, which handles the conventional control and regulation of the system. At the same time, the digital sensor data is channelled into the IT level via a second path. At Coca-Cola, the signals from the numerous sensors are automatically transferred in this way to the “Pocket Factory” IT platform. As a digital twin, this virtual image mirrors the real system exactly and is continuously updated with real-time data.

Digitalisation down to the sensor level gives Coca-Cola full transparency over its global production. The digital twin, based on data from ifm’s IO-Link sensors, enables condition-based maintenance of the systems. Machine learning and artificial intelligence are used to promptly predict wear, production errors and other anomalies in the process.

### Close partnership with ifm

Coca-Cola has been working closely with ifm as automation partner at its Austrian site for many years. Plant Manager Christian Kohlhofer praises this partnership: “ifm’s slogan is ‘Close to you’. This fits in with our company value ‘We over I’. We work together well and are both keen to find quick solutions,” says the manager. “ifm is always there when you need it and the response time is extremely fast when there are problems.”

Another important aspect of digitalisation at Coca-Cola is sustainability. By using digital technologies, the group can reduce its ecological footprint. For example, the precise monitoring and control of production processes enables more efficient utilisation of resources such as water and energy. This not only benefits the environment but also helps reduce costs.



# Coca-Cola digitalises down to the sensor

PREDICTIVE MAINTENANCE USING IFM IO-LINK SENSORS

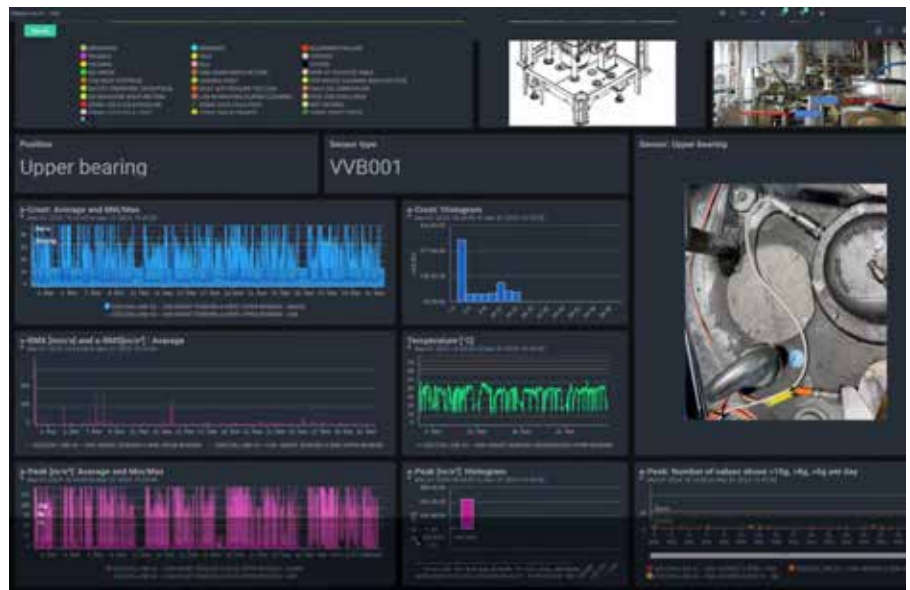


LED signal lights provide a quick overview of the machine status on site.

## Cybersecurity requirements met

Cybersecurity plays a central role in a production plant such as Coca-Cola's, as it is not only important to protect sensitive company data, but also to protect critical production processes from unauthorised access and manipulation. The increasing networking of machines and systems in Industry 4.0 increases the risk of cyberattacks on infrastructures. A successful attack could not only result in production downtime, but also considerable financial damage or loss of reputation. Plants also often use systems that process production-critical data for quality assurance or to increase efficiency, for example. Protecting this data ensures that company secrets are safeguarded and processes run securely and stably. In a highly regulated environment such as Coca-Cola's, all components, including sensors, must meet strict cybersecurity requirements to ensure the safe operation of the plant and the integrity of production.

"In collaboration with our internal cybersecurity team, ifm has found ways to comply with all standards," praises Plant Manager Christian Kohlofer. "Data is stored, processed and analysed in such a way that all cybersecurity guidelines are adhered to."



Maximum transparency: The digital twin allows global access to the filling system right down to the digital IO-Link sensor. Anomalies are promptly detected.

## Conclusion

Digitalisation and automation at Coca-Cola is an ongoing process that is steering the group into the future. By using state-of-the-art technologies and working closely with partners such as ifm, Coca-Cola can increase efficiency, optimise its production processes and ensure the quality of its products. Simultaneously, digitalisation is helping to improve sustainability and reduce environmental impact. The clear focus upon innovation and continuous improvement means the partnership between Coca-Cola and ifm is ideally equipped to continue successfully into the future.

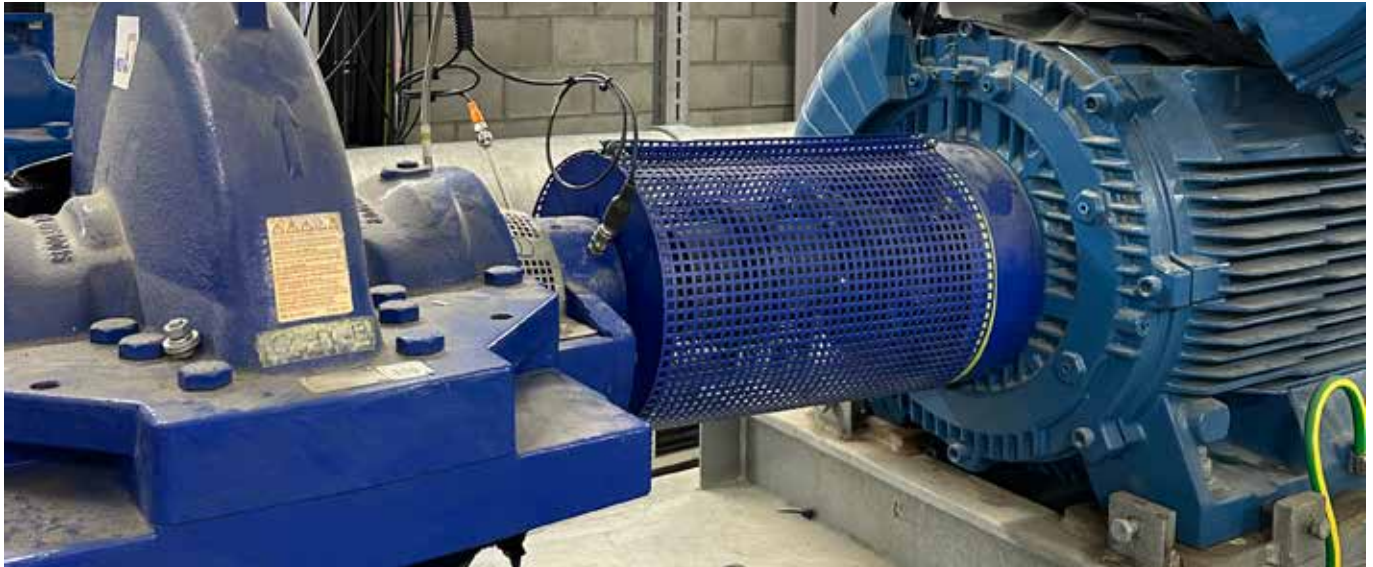


# Condition monitoring systems

## WaterCare - Snells Beach

Snells Beach is a new WWTP designed and built by WaterCare to cater for the growing population of Auckland's North Shore. Vibration and temperature monitoring of essential pumps utilises ifm vibration monitoring equipment that operate DAF (dissolved air flotation).

Monitoring for bearing health to plan maintenance periods while reducing unplanned stoppages. In addition ifm temperature probes are used to monitor cooling fans on KSB pumps. These use ifm VSA001 sensors and VSE150 diagnostic evaluation units.



### Plant condition monitoring products used on site:

#### VSE150

Diagnostic electronics for vibration sensors



#### VSA001

Acceleration sensor



#### TT1081

Temperature probe sensor



#### EVT003

Connecting cable with socket





# Condition monitoring systems

## Hamilton City Water - Waste Water Treatment Plant

Hamilton Water Treatment Plant has been using ifm sensors in multiple applications for several decades. These solutions have generally replaced mechanical instruments that were prone to failure, resulting in avoidable stoppages. Implementation of fixed vibration monitoring and associated diagnostic controllers are used to protect key assets.



### Plant condition monitoring products used on site:

#### VSE151

Diagnostic electronics for vibration sensors



#### VSA001

Acceleration sensor



#### EVC003

Connecting cable with socket





# Condition monitoring systems

## New Plymouth District Council - Plant condition monitoring and flow measurement

NPDC selected an IO-Link system to simplify installation and collection of critical device data, while improving plant operations. IO-Link Performance-Line masters, simplified the design vs traditional designs. Specifically, by powering valves directly from the IO-Link Master. Components that are common points of failure - terminal strips and relays - were no longer required. In addition, ifm's field masters now provide operators with immediate indication of where a sensor or wiring fault has occurred, resulting in improved plant up-time.



### Plant condition monitoring products used on site:

#### VSE151

Diagnostic electronics for vibration sensors



#### VSP004

Acceleration sensor



#### AL1333

IO-Link master with EtherCAT interface



#### EVM005

Connecting cable with socket





# Condition monitoring systems

## Red Stag Timber - Rotorua

Red Stag Timber is a highly automated saw mill employing ifm condition based monitoring instrumentation across the site. This is used to track the live continuous condition of roller bearings in pumps, drives and other rotating plant across the site and used on all rotating equipment. The entire site is networked to provide live machine status 24/7, to avoid unplanned stoppages due to failure.

Operating conditions are harsh and often outdoors, where ifm equipment has been on many occasions been operating for over a decade. Testament to the robust quality of ifm solutions.



### Plant condition monitoring products used on site:

<p><b>VSE151</b> Diagnostic electronics for vibration sensors</p> 	<p><b>VSA001</b> Acceleration sensor</p> 	<p><b>VSP004</b> Acceleration sensor</p> 	<p><b>EVC088</b> 25m connecting cable with socket</p> 
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# Condition monitoring systems

Red Stag Timber - Rotorua





# Condition monitoring systems

## Palmerston North District Council - Wet well level control and water overflow detection

The district council selected LMC400 back mounted level switch. To give reliable switching during water overflow scenarios. This robust solution overcomes common issues experienced with the use of mechanical float level switches.



**The simple way to achieve low or high level switching in a wet well application!**  
*LMC400: Rear installation of the LMC400 sensor in a pipe allows variable installation depths.*

LMC400 with back mounting thread

### Plant condition monitoring products used on site:

<p><b>AL1333</b> IO-Link master with EtherCAT interface</p> 	<p><b>VSP001</b> Vibration Sensor</p> 	<p><b>EVC018</b> Connection cable</p> 	<p><b>EVM005</b> Connecting cable with socket</p> 
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# Condition monitoring systems

Goodman Fielder - Longburn

Pumps are one of the most common pieces of equipment in all sectors of industry. Uninterrupted flow from pumps is vital to keep operations running in applications from heating and cooling systems to product storage and delivery.

Most often, pumps are overlooked until they stop working. Remote monitoring for wear on motors, bearings, shafts, impeller unbalance, or cavitation can reduce unplanned downtime events and improve overall operational effectiveness.

Customer has installed ifm's VSE solution on water supply pumps and motors. Both motors are controlled by a VSD and are critical to their operation. The VSE system can track and log the process, construction and damage forces and provide alarms and alerts for the below conditions.



## Pump shaft monitoring

Accelerometer monitors bearing frequencies and provides alerts of damaged or worn bearings that cause mechanical stress and unbalance conditions.

## Pump impeller assembly monitoring

Accelerometer monitors forces to detect degradation of the impeller that causes out-of-balance conditions.

## Pump cavitation monitoring

Accelerometers monitor the damaging vibration of cavitation. Pump operation can be altered to eliminate conditions that cause cavitation.

## Pump motor monitoring

Accelerometer monitors motor bearings for proper lubrication and operation. Accelerometer monitors mechanical system for loose foot or other structural issues.

## Pump coupling system

Accelerometer monitors shaft coupling and alignment for proper operating condition.



## Plant condition monitoring products used on site:

### VSE151

Diagnostic electronics for vibration sensors



### VSA001

Acceleration sensor



### TP3231

Evaluation unit for PT100/PT1000 temperature sensors



### IGS205

Inductive sensor





# Condition monitoring systems

Kiwi Lumber - Masterton

The monitoring of equipment within hazardous or dangerous environments has historically presented significant technological challenges. The integration of ifm's VSE solution with their Real-Time Monitoring software, moneo, provides a comprehensive monitoring capability for the customer. This system allows for the installation, configuration, and continuous monitoring of both speed and vibration parameters across four large quad motors. These motors are subject to variable speed profiles under load and operate with movement along an X-Y axis within the facility. The system's modular and scalable design ensures ease of expansion, accommodating future additions to the monitoring infrastructure.



## Plant condition monitoring products used on site:

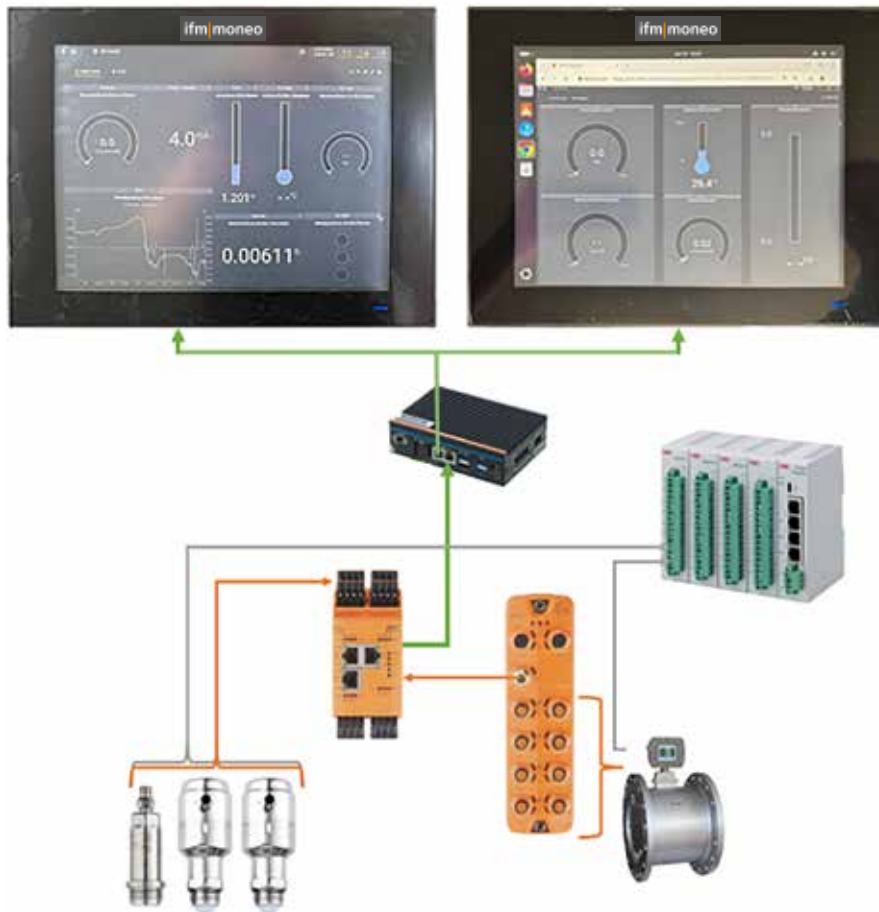
<p><b>VSE152</b> Diagnostic electronics for vibration sensors</p> 	<p><b>VSA001</b> Acceleration sensor</p> 	<p><b>AL1900</b> IO-Link master with PROFINET interface</p> 	<p><b>TP3231</b> Evaluation unit for PT100/PT1000 temperature sensors</p> 	<p><b>TS502A</b> Temperature cable sensor with bolt-on sensor</p> 	<p><b>moneo QMR001</b> System condition monitoring RTM tool</p> 
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# Condition monitoring systems

## Standardising Pump Stations - HMI's for maintenance teams


The below design was done by a major City Council to upgrade their water pump stations during an upgrade. The objective was to standardize maintenance HMI's, and record data for the maintenance team. Using ifm MONEO monitoring software requires no assistance from 3rd party integrators. This system is for End User with customized dashboards, and an HMI to suit their requirements, without any interference to the process while in operation.



### Plant condition monitoring products used on site:

<p><b>QHA210</b> Hardware for operating moneo in the production environment</p> 	<p><b>AL1920</b> IO-Link master with Ethernet/IP interface</p> 	<p><b>AL1322</b> IO-Link master with Ethernet/IP interface</p> 	<p><b>LW2720</b> Continuous level sensor</p> 	<p><b>PM1707</b> Pressure sensor with analogue display G1</p> 	<p><b>EVC927</b> Ethernet connection cable</p> 
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**QMP010**  
moneo configure license: Stand-alone licence for online/offline parameter setting of IO-Link devices



- For all IO-Link devices and IO-Link masters
- Integrated, manufacturer-independent **IODD management** for time-saving sensor parameter setting.
- Cockpit for parallel display of parameters and process values.



# Condition monitoring systems

Wellington Water - Remote pump station, 24/7 condition monitoring of critical assets

## Ensuring a reliable town water supply. Proactive approach in Pump Maintenance and Data Collection

Wellington Water is responsible for providing safe and healthy drinking water, collection and treatment of wastewater, and to ensure that the stormwater network is well managed. Preventative pump maintenance is crucial to improve efficiency and reduce unplanned expenditures or defects.

### Eliminate unplanned downtime due to equipment failures

- Monitor key machine condition indicators to predict and plan maintenance activities.
- Implement advanced real-time vibration monitoring without the complexity of traditional systems.
- Integrate easily into your process systems



### Plant condition monitoring products used on site:

#### VSE151

Diagnostic electronics for vibration sensors



#### VSA001

Acceleration sensor



#### EVM005

Connecting cable with socket





# Condition monitoring systems












## Alliance Farmers Produce - Plant condition monitoring - Industry 4.0 networking system and sensors

ifm Vibration monitoring systems (VSE+VSA) is used for condition-based maintenance of Alliance Farmers Produce’s critical effluent pumps 24/7. The site is also using IO-Link to connect multiple sensors to monitor Flow, Level, and Pressure of their effluent system.

IO-Link masters come with a separate IIoT port, with a dedicated IP address for the IT infrastructure. This allows the site to send information and data directly to Moneo, without the need for a PLC. ifm Moneo is used to monitor sensor data gathered from field based instruments, which can be read and processed easily and used as a basis for sustainable corporate decisions.



### Plant condition monitoring products used on site:

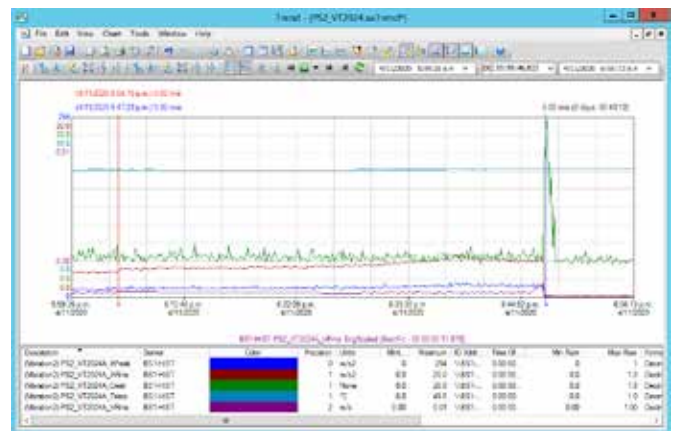
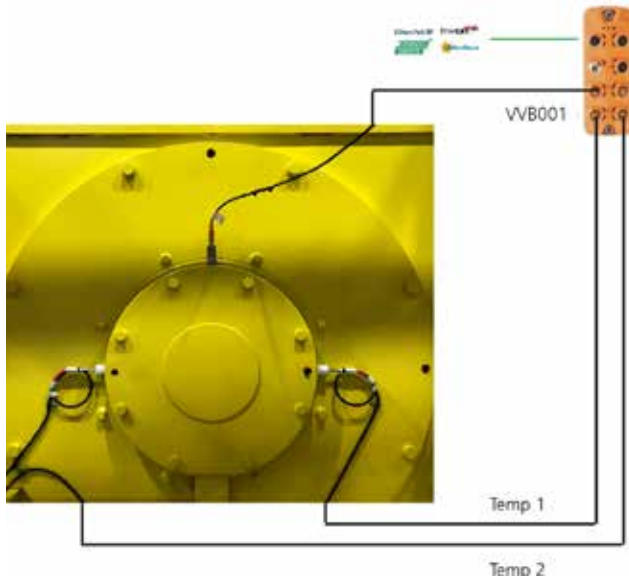
<p><b>DN4033</b> Switched-mode power supply 24 V DC</p> 	<p><b>AL1326</b> IO-Link master with EtherNet/IP interface</p> 	<p><b>AL3050</b> Ethernet switch</p> 	<p><b>VSE151</b> Diagnostic electronics for vibration sensors</p> 	<p><b>VSA001</b> Acceleration sensor</p> 	<p><b>EVC927</b> Ethernet connection cable</p> 
<p><b>SA4300</b> Flow sensor</p> 	<p><b>E40260</b> Progressive ring fitting</p> 	<p><b>EVT003</b> Connecting cable with socket</p> 	<p><b>EVF565</b> Wirable socket</p> 	<p><b>EVC029</b> Connection cable</p> 	



# Condition monitoring systems

North Otago Irrigation - Plant condition monitoring - Industry 4.0 networking system and sensors

North Otago Irrigation pump station was built by the local authority to provide reliable irrigation to the region. They saw the advantages of using an IO-Link condition based monitoring system to continuously monitor the health of their primary plant 24/7. This state of the art pump station transfers 2.0 m3 per second.



## Plant condition monitoring products used on site:

<p><b>AL1324</b> IO-Link master with EtherNet/IP interface</p> 	<p><b>VVB001</b> Vibration sensor</p> 	<p><b>TA2105</b> Temperature transmitter</p> 	<p><b>EVC006</b> Connecting cable with socket</p> 
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# Condition monitoring systems

## Pioneer Energy Flatt Hill Wind Farm - Bluff Hill

Pioneer Energy Flatt Hill Wind Farm, Bluff Hill (8 No. turbines annual generation 25.2 GWh) and Mount Stuart (9 No. turbines annual generation 21 GWh) Wind Farms: Design, Installation, remote monitoring and monthly remote condition monitoring assessment.

Proximity probe monitoring for high speed input shaft rotating speed, multi axis vibration monitoring with acceleration sensors on bearing housings and gearbox, temperature monitoring of critical bearing housings.

Re-Generate remote parameter monitoring, engineering support and monthly reporting on baseline vibration and temperature footprints. Advanced forecasting of asset degradation and engineering judgement on operational parameters for best equipment lifetime.



### Plant condition monitoring products used on site:

#### IFS240

Inductive sensor



#### VSE100

Diagnostic electronics for vibration sensors



#### VSA001

Acceleration sensor



#### TR2439

Evaluation unit with display for PT100/PT1000 temperature sensors





# Condition monitoring systems

Wye Creek Power Station - Lake Wakatipu

Pioneer Energy Wye Creek Power Station, Lake Wakatipu, Queenstown (single Pelton turbine station annual generation 8 GWh).  
Proximity probe monitoring for turbine speed, multi axis vibration monitoring with acceleration sensors on bearing housings



## Plant condition monitoring products used on site:

### IFS240

Inductive sensor



### VSE100

Diagnostic electronics for vibration sensors



### VSA001

Acceleration sensor





# Case study: South West Water, England

How South West Water achieves condition monitoring across the entire water cycle

South West Water provides reliable, efficient and high-quality drinking water and wastewater services for a population of around 1.7 million in Cornwall, Devon, the Isles of Scilly and parts of Somerset and Dorset.



To meet the needs of its customers the company stores water in more than 20 reservoirs and treats it in around 40 water treatment works to produce drinking water for the region.

South West Water also operates 650 wastewater treatment works. Among them is the Marsh Mills facility on the outskirts of the city of Plymouth. Around one third of the wastewater of the city's 230,000 inhabitants is treated here in several stages before being fed back into the water cycle. After initial mechanical treatment, South West Water relies on a biological treatment using the activated sludge process at Marsh Mills. Microorganisms decompose the organic substances dissolved in the water.



"As these are aerobic microorganisms, it is crucial that sufficient oxygen is permanently added to the water so that the decomposition process can take place in the required quality," says Brendon Teague, Condition Based Maintenance Manager at South West Water. This task is performed by nine Roots blowers, which supply a large volume of air at low pressure. With a total power of 615 kW, they pump up to 390 cubic litres of air per minute into the activated sludge tanks.



## Fans – an unjustly overlooked piece of equipment

So far, each blower and motor were checked about once a month in terms of their need for maintenance. Nevertheless, plant failures between maintenance intervals could not be excluded, as bearing damage was either unforeseen or developed between the intervals."

Another problem exists in that the noise which could indicate deterioration of the motor condition cannot be heard from the outside. "The motors are soundproofed, so people can literally walk past them undisturbed. Perhaps this is also one reason why fans and blowers in the water and wastewater treatment industry are often overlooked, even though they perform a task that is just as critical as, for example, the work of the pumps used in the drinking water supply."

Brendon Teague finally decided to equip nine blower units in Marsh Mills with vibration diagnostics from ifm. This first step is, therefore, logical and does not come as a surprise.



Scan here to visit  
the ifm Water page



# Case study: South West Water, England

How South West Water achieves condition monitoring across the entire water cycle



## Condition monitoring: keeping an eye on the health of the plant

“I have been working with ifm for a long time to safeguard South West Water’s plants against unforeseen downtime by using condition monitoring,” says Brendon Teague. Together with his team, he has installed over 200 VSE100 evaluation unit devices, plus the acceleration sensors connected to it, in South West Water’s water and wastewater treatment works.

The vibration monitoring system consists of acceleration sensors and an evaluation unit. The sensors – South West Water uses sensors of the types VSA001 – are positioned at relevant positions in the system and transmit the data to the evaluation unit, in this case the VSA001. The latter permanently evaluates information from up to four sensors and sends corresponding switching signals to the control system when limit values are exceeded. The data and alarms can also be transmitted to a central control room via an Ethernet interface.



*“I have been working with ifm for a long time to safeguard South West Water’s plants against unforeseen downtime by using condition monitoring.”*

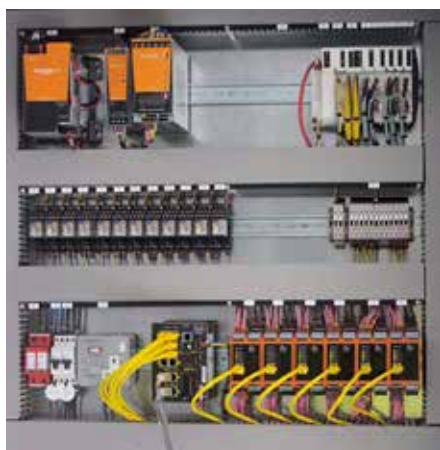
## Easier troubleshooting and maintenance planning remotely

By means of vibration diagnostics, the state of health of a machine is permanently recorded. Thanks to the monitoring of the occurring vibrations in the time and frequency range, incipient damage is registered at an early stage and can be analysed in real time by ifm’s own software in a more detailed FFT analysis (Fast Fourier Transformation). As an exact frequency can be assigned to the individual plant components or damage patterns, the sometimes time-consuming troubleshooting on site is no longer necessary and maintenance work can be prepared effectively, even remotely. This drastically minimises the amount of work and downtime.

## Sensors help to achieve the company goals

“It is a real benefit to have a central overview of the status of all relevant machines via the software and to be notified as soon as a value exceeds a critical limit,” says Brendon. The site Maintenance Manager can thus quickly get an update of the situation, assess the need for action and, in an emergency, inform the maintenance team on site. “Condition monitoring in this form is already helping us to achieve the company goals relating to the environmentally friendly handling of water and wastewater.

By detecting damage at an early stage, we have often been able to react in time and thus avoid downtime and costly repairs. Overall, we expect that due to the implementation of condition monitoring, we can reduce the cost of maintenance and replacement of damaged assets on average by between £100,000 to £150,000 per year.



## Condition monitoring: standard on newly installed machines

In order to benefit even more comprehensively from the advantages of condition monitoring in the future, South West Water has defined condition monitoring on pumps and fans as a technical standard. “Every new plant must be equipped accordingly with sensor and evaluation technology that can be integrated into our existing infrastructure. This not only creates more operational certainty for large, important treatment works, but also helps us to efficiently and effectively maintain the quality and keep everything in perfect condition at smaller treatment works in rural areas.”



# Case study: South West Water, England

How South West Water achieves condition monitoring across the entire water cycle

*“Every new plant must be equipped accordingly with sensor and evaluation technology that can be integrated into our existing infrastructure.”*

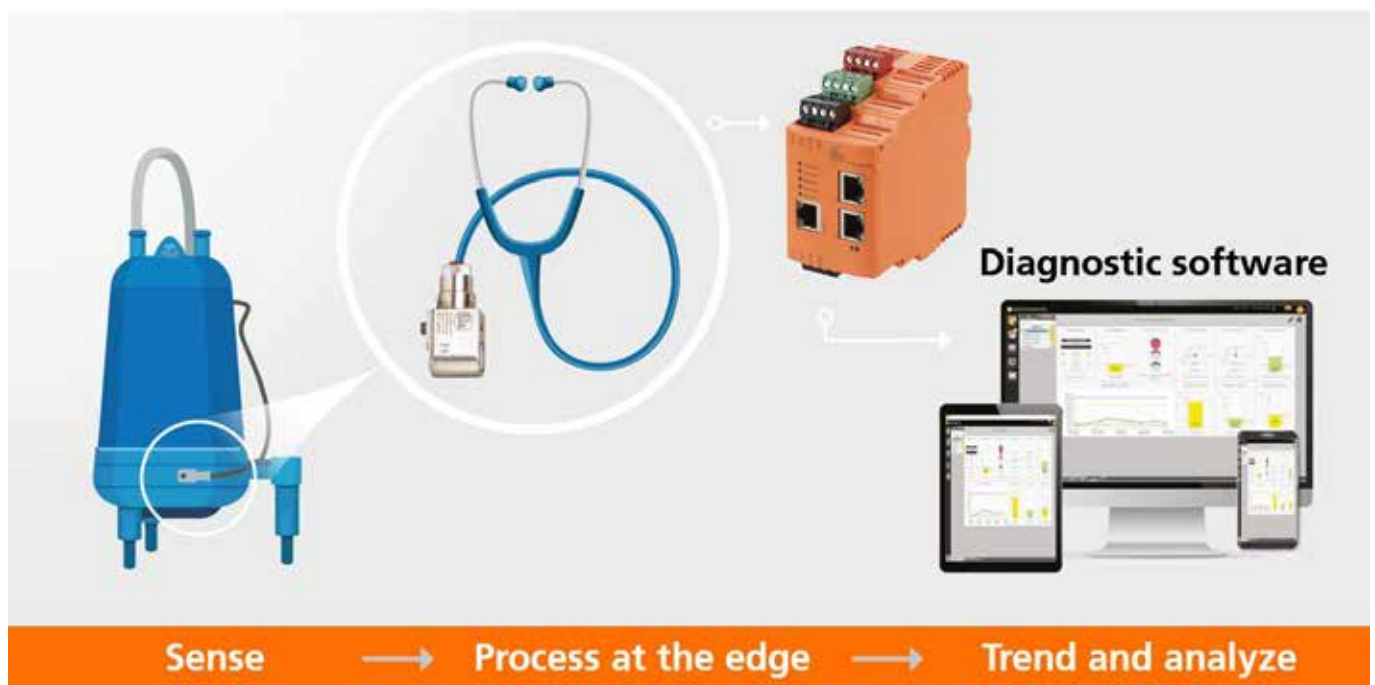
## The future: collaboration via the IoT platform

As a further development step, Brendon Teague can very well imagine switching to the new ifm moneo IoT platform. With moneo, even complex sensor infrastructures can be easily mastered, while the optional moneo RTM module offers far-reaching possibilities for an even more comprehensive vibration analysis. “In combination with the new edgeGateways from ifm and thus the possibility of making the data available in a cloud environment, I would be able to share the relevant data even more effectively with my maintenance colleagues in the supply area, so that the maintenance quality and the reaction speed in the event of an alarm would again increase significantly.”

## Conclusion

South West Water has been able to effectively prevent serious failures of critical water supply and wastewater treatment equipment such as pumps, centrifuges and fans with their comprehensive condition monitoring system. This saves the company significant costs for repair or replacement of equipment. At the same time, plant monitoring supports the company's goals regarding the responsible use of water as a resource.

## Submersible pump



Submersible pumps do the essential (but dirty work) of transporting sewage to treatment plants. This process is prone to unwanted blockages, ragging, and general wear and tear. Pumps need to be monitored to avoid events such as overflow and environmental contamination of public and residential areas.

ifm IP69K protected accelerometers and connection technology, with panel mounted diagnostic electronics and proprietary software provide a well proven solution. ifm edgeGateways provide cloud based monitoring services.



# Pentair – condition monitoring: win-win-service

A precise look at pump health



At Pentair in Winterswijk, the Netherlands, pumps have been manufactured for over 118 years. The company has grown from a family-owned business into a global leader in water solutions. The pumps and pump systems are designed, produced, and tested entirely in-house.

By responding effectively to customers' needs and developments in the market, the company already has many innovations attached to its name.

Under the Pentair Fairbanks Nijhuis brand, the global company produces smart and sustainable pumping solutions for municipal and industrial water supply.

"The pumps are used, for example, in drinking water supply, water treatment, firefighting, regional heating water distribution, and in the onshore and offshore industry," says Jeroen Munnik, head of the Pentair Service Centre in Zevenbergen, which – together with the Service Centres in Beverwijk and Tynaarlo – ensures that customers receive all the support they need when dealing with pumps: from inspections, preventive and corrective maintenance, the procurement and replacement of pumps to prompt support in the event of acute maintenance needs. In case of emergency, the experts are ready around the clock.



## Condition monitoring complements on-site service

For the past three years, Pentair has no longer relied solely on manual service by on-site specialists for customer support. "With our condition monitoring solution Pentair CMD19, we also offer our customers the modern possibilities of efficient demand-oriented maintenance based on the evaluation of the vibration behaviour of the system. This can be a pump and an impeller or an industrial fan," says Jeroen Munnik.

Pentair CMD19 was developed together with the automation solutions provider ifm.

"At the beginning of our development, we looked around the market and identified ifm as the supplier that completely convinced us in terms of their portfolio, technical support, and assistance."

## Plant condition monitoring products used on site:

### DN1031

Switched-mode power supply 24 V DC



### VSE151

Diagnostic electronics for vibration sensors



### VSA001

Acceleration sensor



### EVC003

Connecting cable with socket



### QHA210

Hardware for operating moneo in the production environment



### QMS001

moneo IIoT platform



# Pentair – condition monitoring: win-win-service



## A precise look at pump health



And so, the complete condition monitoring package includes sensors, diagnostic electronics, and software for vibration monitoring, as well as additional temperature sensors.

“The fact that we have been able to considerably expand our expertise in vibration analysis in the past three years is due on the one hand to ifm’s support, but also to the detailed presentation of the values in ifm’s software. Once configured, the traffic light system provides a transparent view of the current health status of the monitored system. It doesn’t get any better than this,” says Jeroen Munnik.



### Early detection of maintenance requirements saves money

Customers are also convinced of the automated condition monitoring using sensors.

“I remember an incident at a customer’s who installed the modern variant of our solution, the CMD19-M. Through the modem, we directly receive the actual data of the customer’s system. One day we received an alarm and found foreign matter in the pump’s impeller. We informed the maintenance manager, and he was amazed because he had not noticed any change himself. After maintenance and the confirmed findings, he was thrilled that we had saved the company from a more costly repair with possible pump parts replacement.”

This customer saved around 40,000 euros because condition monitoring helped prevent damage to the mechanical seals. Thanks to the expertise gained in vibration analysis, Jeroen Munnik’s team can also forecast error patterns occurring at short notice and take the necessary maintenance measures.

“If we detect foreign matter in the impeller, we can assess whether the blockage will clear up on its own or if the pump needs to be shut down and serviced.”



*Jeroen Munnik is also convinced by the clear presentation of the vibration values in ifm’s software: “It doesn’t get any better than this,” says Munnik.*

### Investment in the future pays off quickly

Thanks to all these benefits, Munnik sees the future of pump monitoring in condition monitoring.

“Whether it is operated on-site by the customer, or whether we act remotely as a service provider, the solution is win-win. The customer and our service team can act in time before significant damage to a pump occurs. At the same time, maintenance staff can be deployed where there is a real need. The early alarm and the condition-based replacement of wear parts ultimately lead to low operational costs. Furthermore, vibration behaviour helps us determine the degree of wear and assess whether a component needs replacement at the scheduled time or if it is still functional. The bottom line is that condition monitoring is an investment in the future that pays off very quickly.”

### Conclusion

With the help of ifm’s solution portfolio for condition monitoring, Pentair has developed a solution for its customers that maximizes the maintenance effort’s efficiency for both sides. Thanks to the acquired expertise in vibration analysis, Pentair’s Dutch team can support its customers with precise fault assessments and recommendations for action to lower the total cost of ownership.

# Case study: Pump monitoring with IO-Link

Condition monitoring ensures regional water supply in South Africa



Although about two-thirds of the earth's surface is covered by water, there is an equally large proportion of the world's population living in areas that suffer water scarcity. The groundwater is increasingly polluted for different reasons. As a result, drinking water is the most common cause of illness worldwide. If current usage trends don't change, the world will have only 60% of the water it needs in 2030.

Therefore, ifm's goal must be to help their customers to save water. Innovative automation solutions are easy to implement and help companies to achieve savings in water, energy and maintenance.

The Midvaal Water Company is a water service provider supplying potable water in bulk to South Africa, serving an area of some 900 km<sup>2</sup>. Situated on the banks of the Vaal River, the company purchases raw untreated water and after purification, delivers it to consumers. In addition to this, Midvaal renders operation, maintenance and consultancy services for water treatment plants and sewage works.



The five newer motor-pump sets (grey motor housing) were equipped with IO-Link-sensors and condition monitoring solutions. The three older sets were used for production while the installation of the new sets.

## Contemporary, simple system for remote monitoring

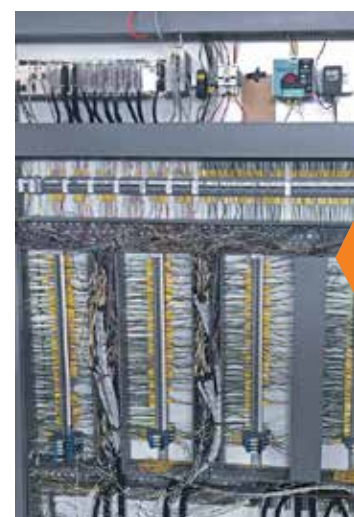
In September 2019, the non-profit organisation decided to refurbish one of its high-lift pump stations. Traditionally, these stations were equipped with analogue sensors and standard infrastructure. "In the past, it took our technician a week to connect a pump in the station to the PLC due to the complex wiring structure", said Mark Richards, Maintenance Manager at Midvaal. "In addition, wiring failures could easily occur due to the significant amount of cables, resulting in complex reworking."

Midvaal wanted an innovative and easier solution that would enable reliable control of the pumps and motors of the high-lift pump station as well as remote monitoring to schedule timely maintenance tasks, ensuring performance and preserving the value of the pump station for the long term.



In a pilot project, five sets with motors and pumps were equipped with control and monitoring sensors as well as the corresponding infrastructure. Each of these sets consists of a 600 KW motor with 3.3 KV supply and a pump that can raise 43,000 litres of water per minute to a height of 60 metres.

In addition, condition monitoring, sump level control and pressure monitoring of inlet and outlet was implemented.



BEFORE

*"From the sensor to the infrastructure to the IT level, ifm provides an integrated system, from a single source."*

Panel wiring - before.



# Case study: Pump monitoring with IO-Link

Vibration monitoring expertise at ifm: everything from a single source



Several factors led Midvaal to choose ifm as their automation partner for project implementation. "ifm initially presented their solution to us at a trade fair and we were convinced right away. The smart wiring with lower cable requirement, the possibility of transmitting data to the PLC via Ethernet and the storage of historical data in the diagnostic electronics all represented real added value for us," said Richards. "The collaboration also meant that we didn't have to hire an external vibration expert, as ifm delivered professional advice and full implementation support, e.g. by ensuring that all limit values were set correctly. Even today, ifm's experts assist us with their long-standing expertise in vibration diagnostics whenever we need help in analysing the historical data."



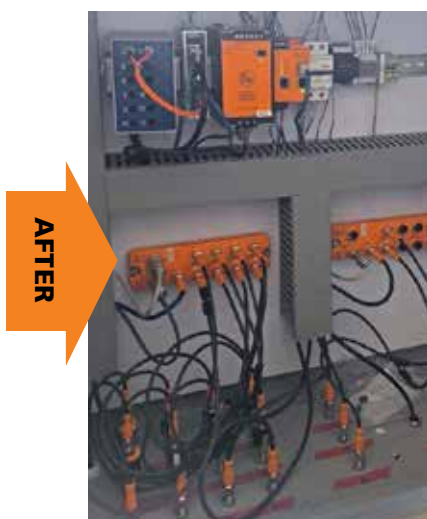
Together with the engineering office Wasterspec cc and system integrators from APJ Automation, the ifm experts implemented the automation and condition monitoring solution. It comprises VSA001 vibration sensors whose data are evaluated by a VSE151 diagnostic unit. Combined with the temperature sensors, they provide the required data to ensure continuous monitoring of system health and visibility of the maintenance requirements of the motor and pump. In addition, PG2454 pressure sensors are used for pressure monitoring at the inlet and outlet of the pump – both remotely and on site via an analogue display.

The pressure and temperature sensors are connected to AL1122 IO-Link-Masters using standard M12 connection technology. This type of master features an EtherNet/IP interface enabling simultaneous data transfer to the PLC and IT system. The same applies to the vibration sensor data, since the VSE151 diagnostic unit also communicates directly with the PLC and the IT system via an EtherNet/IP interface.

*"With the modern wiring structure, which is primarily based on IO-Link, the time required is also one week – but for all five pumps"*

## Installation time reduced by 80% to one week

The installation time of the sensors was significantly reduced thanks to IO-Link. "The installation time of five pump and motor sets used to be five weeks with hardwired technology. With the modern wiring structure, which is primarily based on IO-Link, the time required is also one week – but for all five pumps," said Richards. In addition to saving installation time, the condition of the pump station can now be monitored remotely. The condition monitoring software is also provided by ifm. "From the sensor to the infrastructure to the IT level, ifm provides an integrated system, from a single source. This means that we have a single point of contact at ifm for all questions that may arise and receive fast and competent support at all times."



AFTER

Panel wiring - after.

## Conclusion

The motor-pump monitoring solution meets the customer's requirements for predictive maintenance, online condition monitoring, sump level control and pressure monitoring of the inlet and outlet. Also, the fault-finding time is reduced thanks to IO-Link and less terminations. This helps to reach a reliable protection of valuable assets of motors and pumps. The Midvaal Water Company is rightly very proud of what it has achieved in owning a plant that is one of the most innovative pumping stations in South Africa.



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