

# Condition Monitoring Systems

## S200 SYSTEM & P100 SERIES

For 24/7 monitoring and condition-based maintenance of your pump and motor equipment



# S200 Switchroom Mounted Condition Monitoring System

Designed to be mounted inside your motor starter cabinet, the S200 uses a Model-Based Voltage and Current (MBVI) technique to provide continuous, 24/7 assessment of your equipment's mechanical, electrical, and operational health.

The S200 measures the voltage and current drawn by your equipment's motor to identify a wide range of specific failure modes and assess the equipment's condition.

It also measures energy consumption and identifies a range of energy wasting parameters, allowing you to take cost-justified action to reduce energy consumption.

## Electrical parameters

The S200 provides electrical information, including:

- Active power, reactive power, and power factor
- Voltage balance
- Current balance
- Voltage THD
- Current THD

The system reports on more detailed, machine-specific information (if available).

## FAULTS IDENTIFIED

- Mechanical unbalance/misalignment
- Bearing problems
- Foundation looseness
- Transmission looseness or rubbing
- Motor rotor bar breaks
- Motor stator problems
- Electrical odd harmonics abnormalities
- Electrical even harmonic abnormalities
- Any other spectrum peak beyond the normal expected values

The S200 provides real-time assessment of the operational health of your equipment.



## S200 SYSTEM

### A wide range of benefits

#### Compact & accessible

The S200 is a compact unit (approximately 100mm x 80mm x 75mm) designed to be installed either inside your motor starter cabinet or in an adjacent electrical compartment or cabinet.

#### Convenient, remote, uninterrupted monitoring

The S200 gives you a continuous assessment of the condition of your equipment, allowing you to keep a close eye on critical equipment and avoid unnecessary maintenance work and breakdowns. It can help you plan and schedule work efficiently while optimizing the energy consumption on your equipment.



#### Convenient mounting and assessment

The unit comes with Current Transformers to measure the current drawn by the motor, which can be mounted either directly on the feeds to the motor, or on the secondary signal cables from existing CTs feeding the motor protection system where fitted. Each unit has its own local processing unit and local database, which communicates via Ethernet to a central database, allowing you to view the status of the equipment remotely.



#### Essential data for continual operation

The outputs from each unit are viewed via the B20 software system, pulling data from all of your S200 units and allowing you to view them in one place.

The system will:

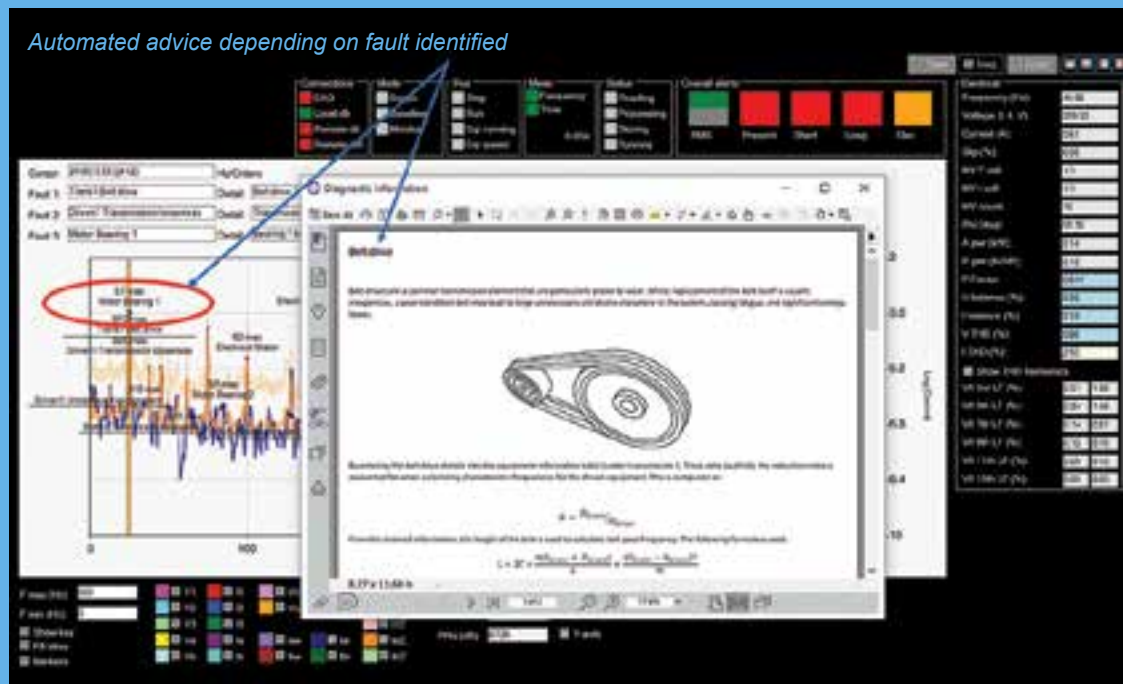
- Give an overview of the condition of one or all of your assets
- Provide alerts if faults are detected
- Provide trend graphs showing the progress of deterioration
- Give an overview of the condition of the equipment itself and the electricity supply
- Provide a forecast of the overall condition for one month and three months into the future
- For each fault identified, provide information on the nature of the fault, how and why the system has identified it, the likely impact of the fault, and the recommended corrective action



## S200 SYSTEM

# Informed decision-making with automated advice

This information can be viewed on your desktop PC, tablet, or mobile phone, either on your network server or on our cloud server. All the data can be viewed via browser, avoiding the need to install special software on your own network.



### Available outputs

- Give an overview of the condition of one or all of your assets
- **Overviews of condition of all assets** (tree structure and summary).
- **Overview of condition of individual asset** – showing status of each relevant fault category for this type of equipment, and the quality of the electricity supply.
- **Simple traffic light (Green-Amber-Red) assessment** of equipment condition now, 1 month in future and 3 months in future.
- **Trend plots** for each developing fault, and for each available parameter (example: active power consumption, or supply frequency).
- **Time-domain plots** of actual voltage and current waveforms.
- **Frequency domain plots** of the fault energy spectrum, with automatic identification and labelling of significant peaks in the spectrum.

## S200 SYSTEM & P100 SERIES

# Detecting a wide range of faults

The standard fault types detected by both the P100 and S200 series are below:

KEY	
	Non-urgent fault
	Urgent fault

Fault Type	Equipment Type				Top 6 KPI					
	Motor		Generator		Motor Fault	Electrical Supply Problems	Mechanical Rotating Fault	Mechanical Static Fault	Operational Fault inc Blocked Filter	Other
	specific	generic	specific	generic						
Electrical Rotor	x	x	x	x						
Electrical Stator	x	x	x	x						
Electrical Odd Harmonics	x		x	x						
Electrical Even Harmonics	x		x	x						
Motor Rotor Bars	x		x	x						
Motor Unbalance/Misalignment	x		x							
Generic Unbalance / Misalignment		x		x						
Motor Bearing 1	x		x							
Motor Bearing 2	x		x							
Motor Journal 1	x		x							
Generic Bearing		x		x						
Motor Foundation / Looseness	x									
Generic Foundation / Looseness		x		x						
Motor Transmission Looseness	x									
Generic Transmission Looseness		x		x						
Motor Resonance	x		x							
Trans 1 Belt Drive	x		x							
Trans 1 Gearbox	x		x							
Driven 1 Unbalance / Misalignment	x		x							
Driven 1 Bearing 1	x		x							
Driven 1 Bearing 2	x		x							
Driven 1 Journal 1	x		x							
Driven 1 Foundation Looseness	x		x							
Driven 1 Transmission Looseness	x		x							
Driven 1 Resonance	x		x							
Driven 1 Impeller 1	x		x							
Trans 2 Belt Drive	x		x							
Trans 2 Gearbox	x		x							
Driven 2 Unbalance / Misalignment	x		x							
Driven 2 Bearing 1	x		x							
Driven 2 Bearing 2	x		x							
Driven 2 Journal 1	x		x							
Driven 2 Foundation Looseness	x		x							
Driven 2 Transmission Looseness	x		x							
Driven 2 Resonance	x		x							
Driven 2 Impeller 1	x		x							
Power Factor	x	x	x	x						
Voltage Balance	x	x	x	x						
Current Balance	x		x	x						
Voltage THD	x		x	x						
Current THD	x		x	x						
Active Power: Nominal Power										
Any other spectral fault with Peak exceeding zone of parameters										

### FAULT TYPES

**SPECIFIC:** Can be identified when the appropriate information has been entered into the system – typically, rotating element bearing type code numbers, number of vanes on a pump or fan impeller, and the numbers of teeth on each gear in a gearbox, or the pulley diameters and separation distance for belt drives.

**GENERIC:** Detected when there is no special information entered about the equipment apart from its normal voltage, nominal current, and nominal rotational speed.

# P100 Series Condition Monitoring System

The P100 series is a range of portable devices that give you a snap-shot assessment of the health of your hard-to-access equipment—including mechanical, electrical, and operational aspects—using a Model-Based Voltage and Current (MBVI) technique.

Ideally suited for remote or difficult-to-access equipment, the P100 Series Condition Monitoring System measures the voltage and current drawn by your equipment's motor to identify a wide range of specific failure modes and assess damage. It also measures energy consumption and identifies a range of energy wasting parameters.

Testing takes only a few minutes – at the end of which the device creates an automatic written and graphic report that can be edited and emailed.

## THE P100 SERIES CAN HELP YOU:

- Avoid unnecessary maintenance work
- Avoid unexpected breakdowns by spotting developing problems before they become critical
- Minimise energy wastage and quantify the benefits using the energy wastage figures
- Create a baseline profile of new equipment at a Factory Acceptance Test and repeat the test on commissioning to confirm no damage has occurred in the delivery and installation process
- Monitor the condition of otherwise inaccessible equipment, such as submerged pumps, borehole pumps, in-tank pumps, cryogenic pumps, roof mounted fans, etc.





## P100 SERIES

Easy setup. Robust results.

### Simple installation

The only connections required to operate the P100 series are current clamps to measure the current, and dolphin connectors to measure the voltage.

All connections and testing are done in the switch room and are taken from the low voltage and low current signals feeding the protection system. There is no need to disconnect or disturb any existing connections.

### Fast, precise reporting

By entering only a few simple parameters, the Health Assessor will rapidly create an automated report of:

- Unbalance/misalignment
- Bearing problems
- Foundation looseness
- Transmission looseness or rubbing
- Motor rotor bar breaks
- Motor stator problems
- Electrical odd harmonic abnormalities
- Electrical even harmonic abnormalities
- Any other spectrum peak beyond the normal expected values

### Electrical parameter information

- Active power, reactive power and power factor
- Voltage balance
- Current balance
- Voltage THD
- Current THD

The machine will report additional specific information (if available).

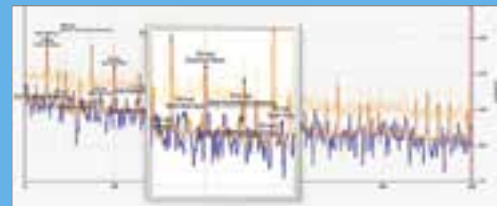
### Available outputs

The P100 series Equipment Health Assessment kit provides a wide range of outputs, ranging from basic electrical parameters to advice on corrective action on any faults found. Examples include:

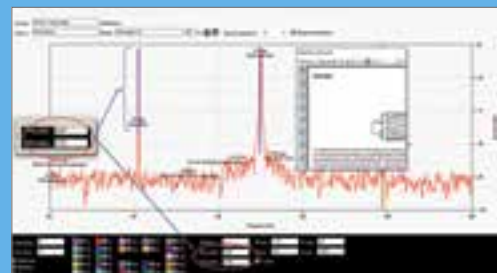
*Automated advice depending on fault identified*



*Automatic identification of spectral peaks*



*Automatic identification of rotor bar condition and provision of supporting information*



*Overview of condition and automatic provision of information on faults detected*



# Stay in control with better data for better detection and decision making.

Improve availability and Mean Time Between Failures (MTBF) with accurate, up-to-the-minute knowledge of the health and remaining useful life of your equipment.

## A predictive approach

Users of the S200 and P100 Series shift their maintenance philosophy from reactive maintenance to a predictive strategy. As they calculate the Remaining Useful Life (RUL) of equipment, these systems determine the optimal time to perform maintenance, helping operators make better decisions.

## Additional diagnostic support and training

The units are designed to provide easy-to-understand outputs; however, and in-depth interpretation of the data can provide much greater insights into the behavior of your equipment. This information can help you make decisions on the best course of action.

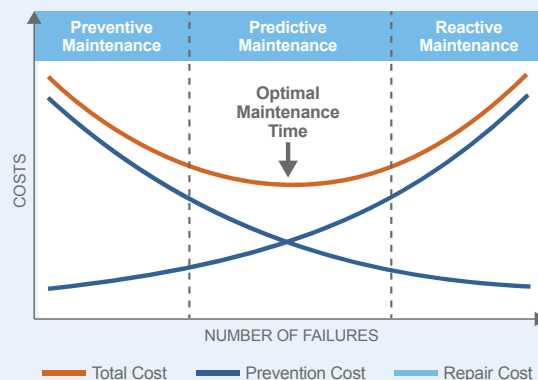
Training courses can be provided for you and your staff, which can be tailored to your specific requirements. Typical training courses for diagnostic staff are two days.

Hayward Tyler can also provide diagnostic support via our support contracts, which give you regular reports and feedback on the condition of your equipment, along with recommendations on the best course of action.

## PREDICTIVE MAINTENANCE STRATEGY:

### Maximum productivity. Minimum costs.

A conservative preventative maintenance strategy results in a high cost of maintenance and low cost of failure, while a reactive strategy results in a low cost of maintenance, but a high cost of failure. Our predictive approach reveals the optimal maintenance time to help maximize availability without performing unnecessary maintenance.



Engineered solutions for the global energy sector

### USA

Hayward Tyler Inc.  
Vermont, USA

+1 (802) 655 4444  
vermont@haywardtyler.com

### ENGLAND

Hayward Tyler Ltd.  
Luton, England

+44 (0)1582 731144  
luton@haywardtyler.com

### SCOTLAND

Hayward Tyler Fluid Handling  
Glasgow, Scotland

+44 (0)1355 225461  
glasgow@haywardtyler.com

### INDIA

Hayward Tyler India  
Delhi, India

+91 11 4575 6831 / 4507 5971  
delhi@haywardtyler.com

### CHINA

Hayward Tyler Kunshan  
Kunshan, China

+86 512 57723311  
kunshan@haywardtyler.com



N NPT NS