Electric power system is a backbone of today’s economy which relies on stable, uninterruptable supply of electric energy that is needed both in industry and in most areas of our private lives. According to its importance, electric power system has to be maintained, controlled and protected against possible faults and other abnormal phenomena. The most important parts of every electric power system are electrical rotating machines, especially those involved in the production of electrical energy. Constant increase of the reliability and availability of such machines is of utmost importance. Also, the current practice is to extend periods between planned outages of the machines. Any malfunctions and unnecessary and unplanned outages can cause extensive material damage. The way to alleviate or even prevent such events is implementation of various condition monitoring systems.

**SHCM Features**
- Comprehensive on-line monitoring system
- Applicable to all types of small hydro power plants
- Modular and upgradeable system for new, as well as for existing, power plants
- Long-term data storage and important events tracking (trends, waveforms, alarms ...)
- Local and remote system access

**SENSORS:**
1 – vibration sensor
2 – temperature sensor
3 – speed sensor (tacho)
4 – relative displacement sensor
5 – current sensor

**Operator panel - HMI**
(real time data, trends, spectrums, alarms )

**Web HMI**
(real time data, trends, spectrums, alarms )

**Remote user**
(computer, smartphone, tablet ...)

**Ethernet**

**SHCM – Processing/protection unit**
(real time processing, database, web server, HMI, inputs/outputs)
1. SHCM specification

Architecture:
- Data acquisition unit with the real time controller and local visualization

Inputs:
- Two vibration inputs (IPE)
- Two voltage inputs for relative displacement sensors (0-10 V)
- One voltage input for speed sensor (0-10 V)
- Two RTD (pt100) or thermocouple inputs
- Three voltage inputs (0-500 V) and three current inputs (1A/5A) for power measurement
- Four voltage (0-10 V) or current (4-20 mA) inputs for process measurements

Digital/relay outputs:
- Number of outputs: 2 to 8
- Continuous current: 6 A
- Maximum switching power: 1500 VA
- Maximum switching voltage: 250 VAC/DC
- Maximum switching frequency: 0.1 Hz
- Rated isolation voltage: 300 V overload (category III) by EN 50178
- Surge withstand: 4 kV (1,25/50 µs), by IEC 5017

Communication:
- Ethernet 10/100
- Supported protocols: Modbus TCP slave, FTP server, IEC 60870-104, HTTP server (other on request)

Power supply:
- DC: 80 V to 370 V
- AC: 85 to 264 V, frequency 47 to 63 Hz
- Maximum allowed power supply interruption: 100 ms for 230 VAC/20 ms for 115 VAC
- Test voltage: 3 kV (2 kV against ground)

Temperature range:
- Operational temperature range: -20°C to +70°C
- -0°C to +55°C (for SHCM variant with touch screen)
- Storage temperature range: -40°C to +85°C

Dimensions:
- Cabinet IP 54 (IP 66 on request) – typical dimensions WHD: 400x400x200

Data visualization:
- Web browser for remote access and local client application through touch screen

Data logging:
- Database for long-term data, alarm and events archival

Standards compliance:
- EMC immunity/emission (EN 61000-6-2/EN 61000-6-4)
- Vibration/shock resistance (EN 60068-2-6/EN 60068-2-27/29)

2. Sensors

Accelerometers and velocity sensors
This sensor is used for measurement of absolute bearing vibrations.

Temperature sensors Pt100, RTD, thermocouple
This sensor is used for measurement of bearing temperature.

Relative displacement sensor
This sensor is used for measurement of shaft relative displacements (orbit).

Speed sensor
This sensor is used for measurement of rotating speed and as a reference for a signal processing.

Current measuring sensor
This sensor is used for measurement of generator current.

Process value transducers
Different transducers and sensors are used for measurement of important process values of the power plant (voltage, flow, pressure…). SHCM system can receive and process any analog and digital signal from sensor or transducer which features standard voltage or current signal (on request).
3. Software

Users can get insight into measuring data through local touch display (local HMI) and through web server (web application). Local visualization enables insight into real-time data, waveforms, vibration spectrums, trends and setup. All screens can be modified according to the Customer’s requests which includes native language.

The SHCM system is equipped with a multiuser web server which enables remote access and overview of all system data through standard web browser. This web server provides access to the SHCM system from any desktop or a laptop computer (with Windows or iOS operating system), tablet (with iOS, Android OS...) or smartphone (with iOS, Android OS...). System access is provided without the need for installation of any additional software, using a standard web browser (Google Chrome, Internet Explorer, Mozilla Firefox, Safari ...). Web server enables insight into real-time data, vibration spectrums, trends, waveforms and alarms for measurement values increase as well as for fault detection.

4. Documentation

Complete documentation required for system installation, maintenance and usage of the SHCM system. Usual scope of the documentation:

- Mechanical documentation (book I)
- Electrical documentation (book II)
- User instructions (book III)
- Initial state records (book IV)
- Certificates, test reports... (book V)

5. Services

Complete services required for system installation, commissioning and usage of the SHCM system. We offer the following services:

- Consulting services on how to select an optimal monitoring system for new and existing power plants
- Installation and commissioning
- Staff training
- Expert interpretation of the acquired monitoring results

We offer the Customer complete services for machine diagnostics. This is enabled through automated reports, which is one of SHCM expert functions. Also, through web application we can remotely connect to the SHCM system and provide the Customer expert analysis of measured (recorded) data.