



Innovations in the Field of Vibration Monitoring and Diagnosis. Highlights of SPECTRI's Current Range of Products – Brüel & Kjær, PCH Engineering

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Abstract

Information about the innovations in the field of vibration monitoring and diagnosis and highlights of SPECTRI's current range of products is presented in the article.

Keywords: noise, vibrations, monitoring, system, products.

1. Introduction

The SPECTRI Ltd. invested in the latest generation of measuring and software equipment from the world's highest class companies to provide its Bulgarian partners and customers with a reliable, fast and flexible service to support their ambition to work accurately and deliver quality business. Today these companies offer full range of vibration diagnostics equipment, from simple data collectors to advanced vibration analyzers and on – line monitoring systems. All the data from the devices can be transferred to specific for the devices, user – friendly and easy to use software that matches their needs and budget. Based on the customer's feedback every product is improved as well as improving the customer's predictive maintenance programs.

2. Monitoring system PCH 1420

The monitoring system PCH 1420 is used to measure the condition of a machine 24 hours a day, 365 days a year. The built in alarm function secures early knowledge of all machine faults e.g. imbalances or misalignment. This allows the user to handle problems before they cause breakdowns. With PCH 1420 you can assure operational continuity of your production and avoid unplanned machinery downtime, material costs, etc.

The new protection concept from PCH has 4 real-time vibration monitoring channels, 2 process inputs (4-20 mA and tacho), 4 configuration outputs (4-20 mA or relay drivers), 1 redundant safety relay, Fully accessible by PC through USB, Compliances: ISO 10816-3, ISO 13849 – 1(PL-d), SIL 2, VDI 3832, API 678, API 670, CE, GOST – R [1].

Product characteristics:

- Vibration monitoring system which measures from 0.7 to 1000 Hz and bearing resonance frequencies;
- Monitoring unbalance and misalignment;
- Measures according to ISO 10816;
- RS485 connection and PC set – up and analyzing software;
- Alarm relays, DC output and internal watch – dog. Can be used as part of the safety chain;
- Bearing monitoring;
- Envelope 0 – 500 Hz, Crest factor, Kurtosis;
- 2 – 10 kHz All over m/s².

The vibration monitoring system has adjustable alarm levels and relays for connection to customer PLC 6 sec raw time waveform recording. The system saves the files in „.tim“ format for PCH user software.

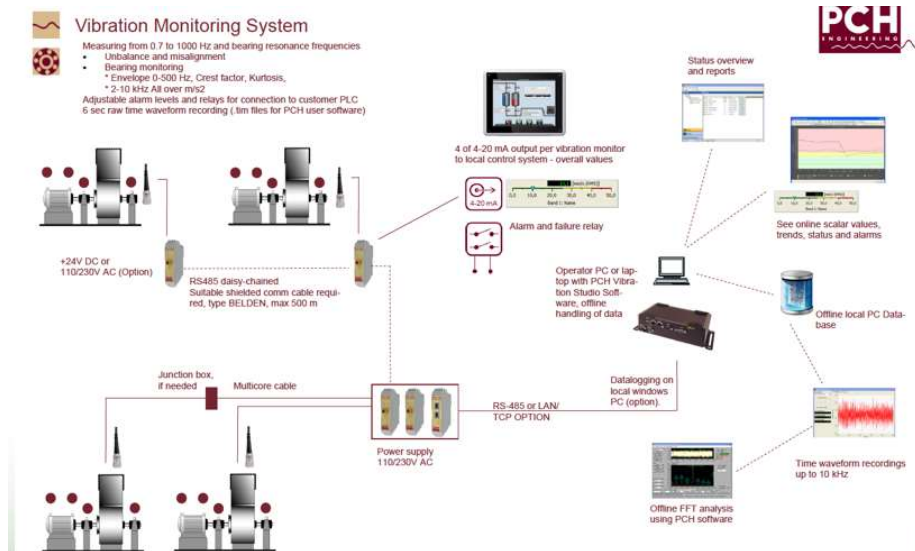


Figure 1. Principle scheme monitoring system PCH1420

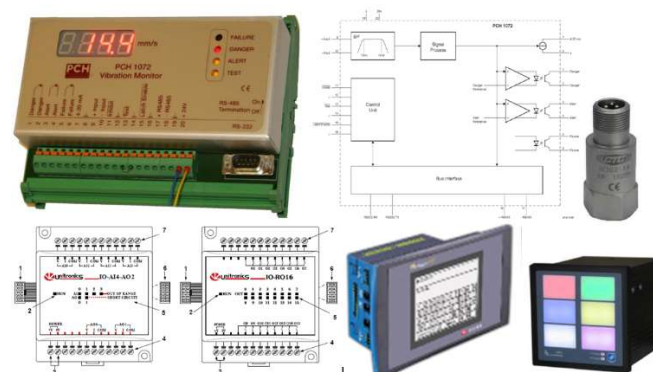


Figure 2. Components of the open vibration control system

3. PCH Vibration studio

PCH Vibration studio is the latest user software for selected PCH Vibration Monitors. The software product is used for easy overview, parametrizing and back – up of settings in up to 255 online trending, time stream recording and a FFT diagnostic and analyzing tool.

Online trending from PCH Vibration Monitors

If PCH Vibration Studio is permanently monitoring one or more vibration monitors, trend scalar values can be stored on the computer. Several detectors can be shown in the same scalar chart from any PCH Vibration Monitor connected to the same computer. The scalar values can be analyzed directly or can be exported as a comma separated file for post analysis.

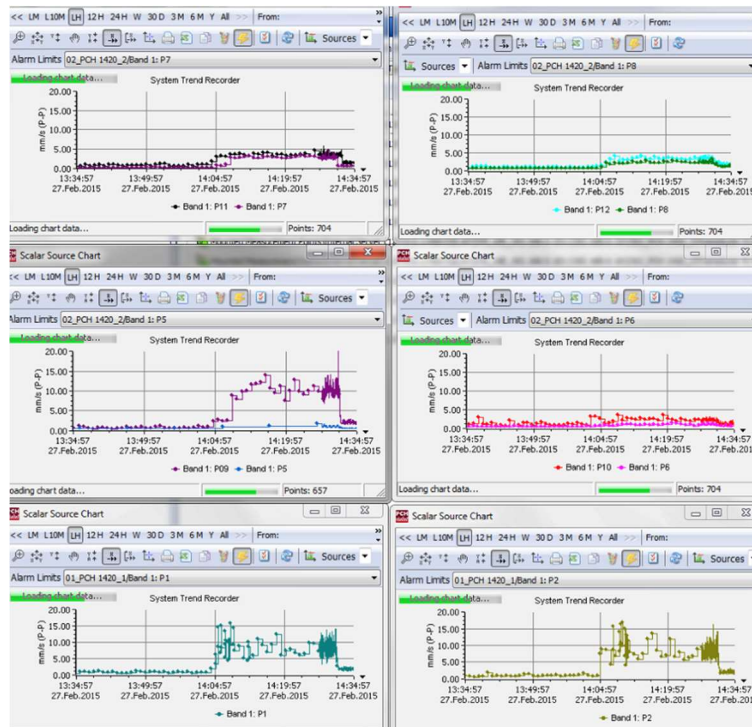


Figure 3. Configuration – trends

Off-line FFT diagnostic and analyzing tool

After recording a time signal you can analyze the data in the included off-line FFT- Envelope- and Cepstrum Analyzer. The Spectrum Analyzer offers cursors for main, harmonics, side band and delta, free Zoom within the recorded frequency range, up to 256000 lines. Other tools like linear averaging of up to 1024 spectra as well as time windows like Hanning, Blackman, Flat Top and Rectangular are available. In the time waveform the user can create pre-filters with cut-off frequencies and select amount of samples to analyze on.

Up to 10 spectrum plot markers can be set for easy check-up of critical frequencies with user defined colors and names for up to 10 frequencies. The marker setups can be stored in setup files to be reloaded with other recorded time signals.

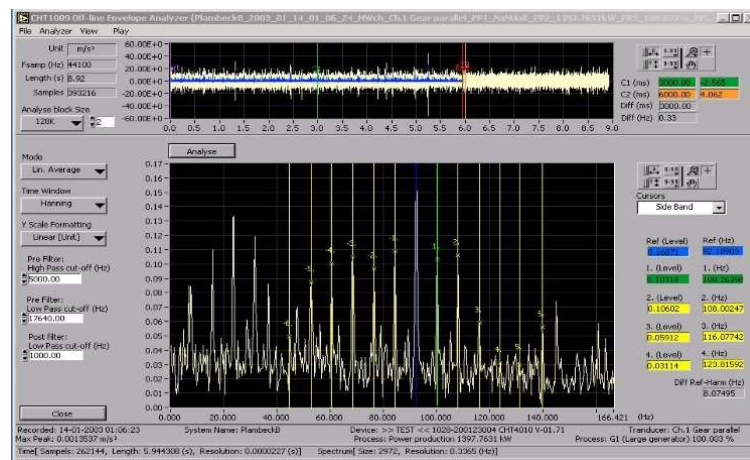


Figure 4. FFT Off – line diagnostics

Configuration in vibration studio

According to DIN 4150 – 3:1999 “Structural vibration – Part 3”, for maintaining the functionality of reinforced concrete structure requires vibrations to be up to 15 mm/s for frequencies above 4 Hz and 20 mm/s for frequencies above 15 Hz [2].

The vertical vibrations above the plates in front of the sieves have maximum values of 2.6 – 6.9 mm/s (maximum: 7.4 – 8.2 mm/s for the 4th sieve).

The maximum values of the transverse vibrations of the columns between screens are 1.0 – 1.6 mm/s.

The maximum values of the transverse vibrations of the elevation columns are 1.1 – 1.8 mm/s (maximum: 1.9 – 5.2 mm/s).

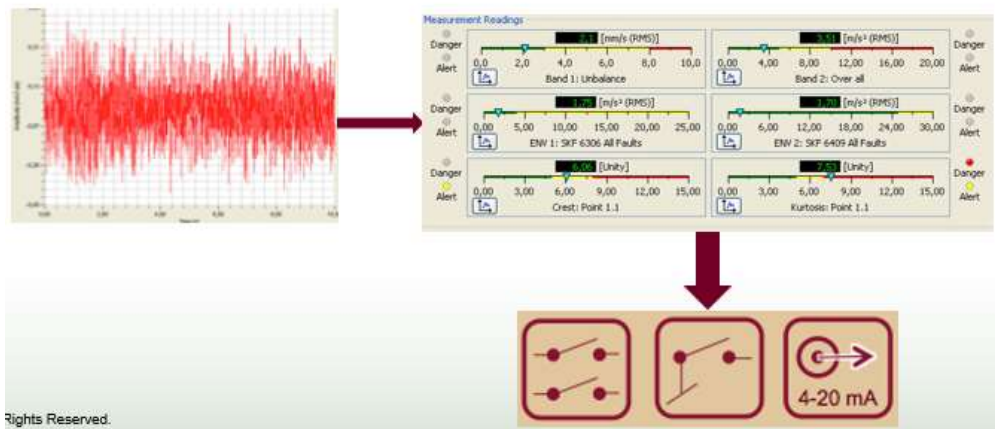


Figure 5. Configuration

3. New monitoring logger of seismic and structural vibrations, type 3680 by Brüel & Kjær

The structural vibrations and seismic monitoring logger has protection against structural damage in result of earth vibrations, caused by construction and mine activities. Also it has evaluation of the effect on people as a result of rail and road traffic impacts. Other ability of the device is the monitoring of the environmental vibrations. This ability provides reliable operation of the sensitive equipment.



Figure 6. Monitoring logger of seismic and structural vibrations

Main characteristics of the structural vibrations and seismic monitoring logger are the following ones:

- Continuous monitoring 24/7;
- Vibration alarms and warnings in real time (based on the day and night levels);
- Remote access real time reports and data;
- One 3 – axial sensor (geophone);
- Wireless communication, works on battery, protection for working outside;
- Built in self – defense and power supply control.

4. News about the products by Brüel & Kjær

News about the product Photon+ dynamic signal analyzer

The product Photon+ is a versatile analyzer for sound and vibration measurements, recording, and signal post – processing. It consists of a small data acquisition hardware unit and PC software. Each specific noise and vibration application has a corresponding software package designed and optimized for ease of use. The Photon+ analyzer is compact, light and easy to carry. It's designed for plug – and – play setup, using a USB connection. The USB connection gives power at the same time – avoiding the need for an external power supply. Meanwhile, power for CCLD sensors is built in, avoiding the need for external signal conditioning. Up to four transducers can be connected, and there is an additional connection for an output signal. All inputs have both analogue and digital filters, providing complete alias protection and ensuring full data integrity.

The device comes with PULSE Reflex PC software for data viewing, time editing and data management, with software maintenance updates [3].

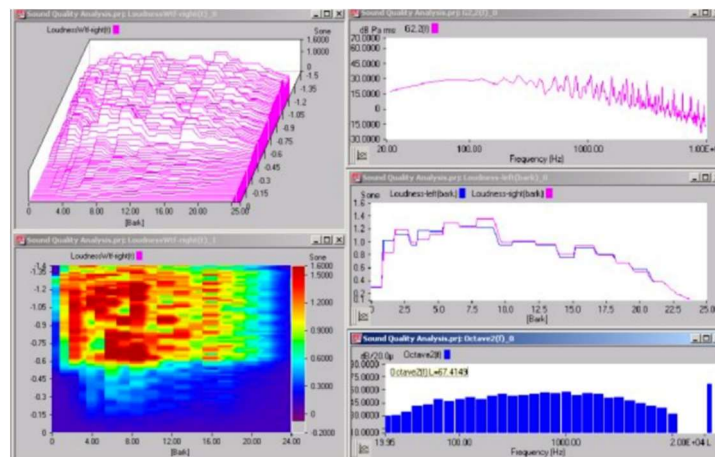


Figure 7. PULSE Reflex PC software

The Photon+ dynamic signal analyzer can be used in different scenarios such as:

- General sound and vibration recording and analysis, such as troubleshooting;
- Production quality testing of consumer goods;
- Recording of vehicle intake and exhaust noise levels for benchmarking competitor vehicles;
- Hammer testing for structural analysis of components in the laboratory or in the field.



Figure 8. Photon+ dynamic signal analyzer

News about the product Sonoscout

Sonoscout is a system that uses an app on an iPad to control a wireless data acquisition unit. This rugged front end can connect up to 12 transducers, such as a binaural headset for in-vehicle recording at the user’s ear positions, or two independent CAN bus inputs and up to eight transducers (depending on the front-end configuration).

The front end is battery-powered and transmits data to the iPad for recording or records directly to SD card inside the front end, avoiding the need to use Wi-Fi. The intuitive app makes it simple to either perform basic analysis, or to replay and listen to files in order to validate recordings before exporting them for further analysis and archiving in BK Connect and PULSE Reflex [4].



Figure 9. Sonoscout – iPad – based data recorder

The Sonoscout can be used in different scenarios such as:

- General sound and vibration recording and analysis, such as troubleshooting;
- Single-handed recording of vehicle intake and exhaust noise levels for benchmarking competitor vehicles;
- Making quick recordings at the ear position and quickly replaying them, such as interior cabin noise during flight testing;
- Gathering raw data (including CAN data for internal combustion, electric and hybrid vehicles) for incorporation into NVH simulator models of current vehicles and future potential designs.

News about the product A440 VA4 PRO II

The A4400 VA4 PRO II is a unique analyzer for machinery vibration diagnostics. The A4400 VA4 PRO II includes modules for analyzing, data collecting and vibration signal recording.

The device is enhanced by modules for dynamic balancing, measurement of run up and coast down, acoustic measurement mode, ultrasound measurement, monitoring and control of lubrication process and listening to the vibration signal with the stethoscope feature. The instrument is equipped with an expert system developed by Adash, which automatically detects machinery faults [5].



Figure 10. A440 VA4 PRO II

Some of the key features of the product A440 VA4 PRO II:

- 4 Channels simultaneously;
- FFT 3 276 800 lines in real time;
- Frequency range up to 90 kHz;
- 20 hours recording of 4 channels;
- ISO 10816 – 3 included;
- Bearing database included;
- Input for triaxial sensor;
- ACMT – very low speed bearing analysis;
- User defined frequency bands.

5. Conclusions

The sound and vibration challenges that face companies around the world are diverse, including vibration engines, machinery vibration diagnostics, machinery condition monitoring and many others. This is why SPECTRI works with products from the worldwide leaders in sound and vibration – Brüel & Kjær, PCH engineering, Adash. They provide the highest quality products for sound and vibration measurement as well as turnkey solutions as stand – alone products.

References

1. PCH Engineering A/S: Monitoring modules type PCH 1420 documentation
2. International standard for defining of the vibration condition DIN 4150 – 3:1999 “Structural vibration – Part 3” of industrial building with technological equipment.
3. Brüel & Kjær: Photon+ Dynamic signal analyzer documentation.
4. Brüel & Kjær: Sonoscout – iPad – based data recorder documentation.
5. Adash: A4400 VA4 Pro II documentation.