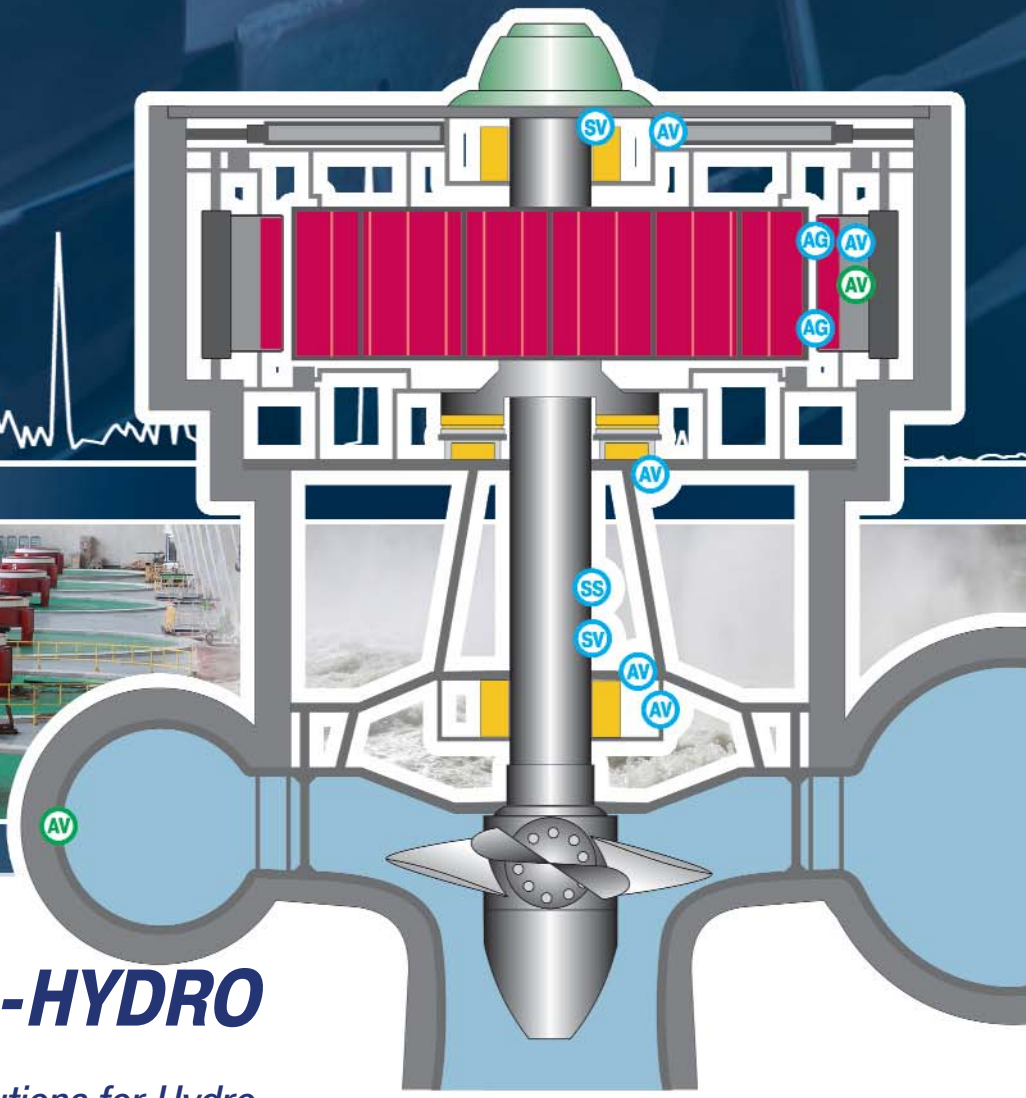
DIAMECH 2000

Vibration Diagnostic and Balancing Machines



ALMAZ-7010-HYDRO

Condition Monitoring Solutions for Hydro Generating Machines

DIAMEX 2000

Hydropower engineering is currently characterized by growth of quantity of the equipment, which has fulfilled the resource that demands its modernization and replacement.

In the period of crisis and post-crisis, we can see that reduced maintenance — leads to minor and major accidents.

The vibration control of the hydro units against excessive vibration after the Sayano-Shushenskaya hydropower station disaster became an active concern of most companies and condition monitoring experts all over the world.

Now there is no doubt of the urgent need for full scale online vibration control equipment for the hydro units.

DIAMECH company, one of the leading suppliers of mobile and online vibration diagnostics, has developed the new of online system ALMAZ-7010-HYDRO for hydroelectric power.

ALMAZ-7010-HYDRO is capable of supporting hydroelectric power stations with the most difficult working conditions.

System introduction was preceded by installation at specially selected hydroelectric power stations having the most difficult working conditions.

Zagorsk hydropower station was chosen with a 200 MW generator, heaving several difficult modes (generating, pump, synchronously-compensatory, as from a generator mode, and a pump mode) with big dynamic loadings and frequent start-ups (design number of start-ups of the generator-engine within a year, not less than 1400, number of transients within a year to 2750).

Other stations for working off low-frequency channels of measurement of vibration are chosen such as the Saratov hydropower station, whose hydro units have the lowest rotation speed in the world (50 rev/min – 0,83 Hz).

ALMAZ-7010-HYDRO

Technological control, protection and diagnostics of hydro units and ancillary equipment of the hydroelectric power stations by vibration and mechanical parameters


11в
1
2
3
4
5

- Signaling on channels from the raised noise stability
- Independence of the measuring equipment at the bottom level
- Full self-testing measuring a component (Including the sensors and connecting cables). Diagnostics possible malfunctions
- Automatic updates of channel characteristics
- The dry contacts of the relay providing the automatic operation of the precautionary alarm system and emergency stop
- Compatibility with Process Control System
- Work in the standard or expanded frequency range
- Programmed analog exit (pressure or a current)
- Bright alphanumeric display with possibility of regulation and the scale level indicators
- Split-hair accuracy of measurement using 14-bit analog-to-digital coders with automatic gain control with a digital control from DSP
- The complex is equipped with a certified calibration process
- Multistage protection against the unapproved access to equipment
- Possibility to use the logic module for maintenance of any difficult algorithms of protection

Integration of hardware and software that displays current equipment status and the demands of the power station personnel to use the online monitoring system rotary equipment parameters.

The unified intellectual measuring converters are based on microprocessor (specialized signal handling processors) modules, providing independent work in real time with the possibility of back-up.

Possibility of expanding the complex during its normal operation by connecting additional measuring channels and software modules.

Specially developed gauges for extra low frequency measuring, displaying vibration on frequency from 0,5 Hz.

The optimum dynamic range provided at the expense of the developed analog and digital path allows the ability to solve not only problems of vibrating control and vibro-protection, but to also diagnose a rising defect and to carry out balancing works.

Multiple algorithms of analysis and diagnostic. Each control-measuring module of system ALMAZ-7010-HYDRO is in essence multi-channel analyzer of a spectrum of the signals, realized on special processors of signal processing

Additional possibilities of the ALMAZ-7010-HYDRO system

The stationary system has all necessary functions for vibration analysis. This system carries out the following operations:

Tests. Status tests of the unit before and after repair.

Balancing. Balancing of “system of rotors” in own bearings.

Diagnostics. Each hydro unit system employs past data to create accurate and up to date diagnostics.

The technological alarm system and protection. Control and measuring modules are equipped by four groups of discrete switched contacts (“the dry contacts”) for connection to system of technological alarm and protection of the unit with loading ability to 250 V and 2 A.

The complex allows realizing practically any difficult analysis algorithms and protection.

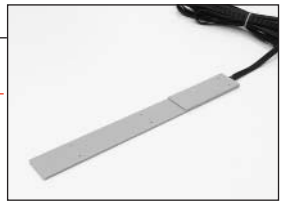
The signal on the alarm system and-or switching-off the hydro unit produced:

- at excess of the overall level of vibration
- at excess of vibration level in any frequency range
- at excess of preset values of a shaft beats
- on limiting values of parameters of an air gap
- on limiting distortion of the electromagnetic form of a rotor
- exit for borders of an admissible range of rotation

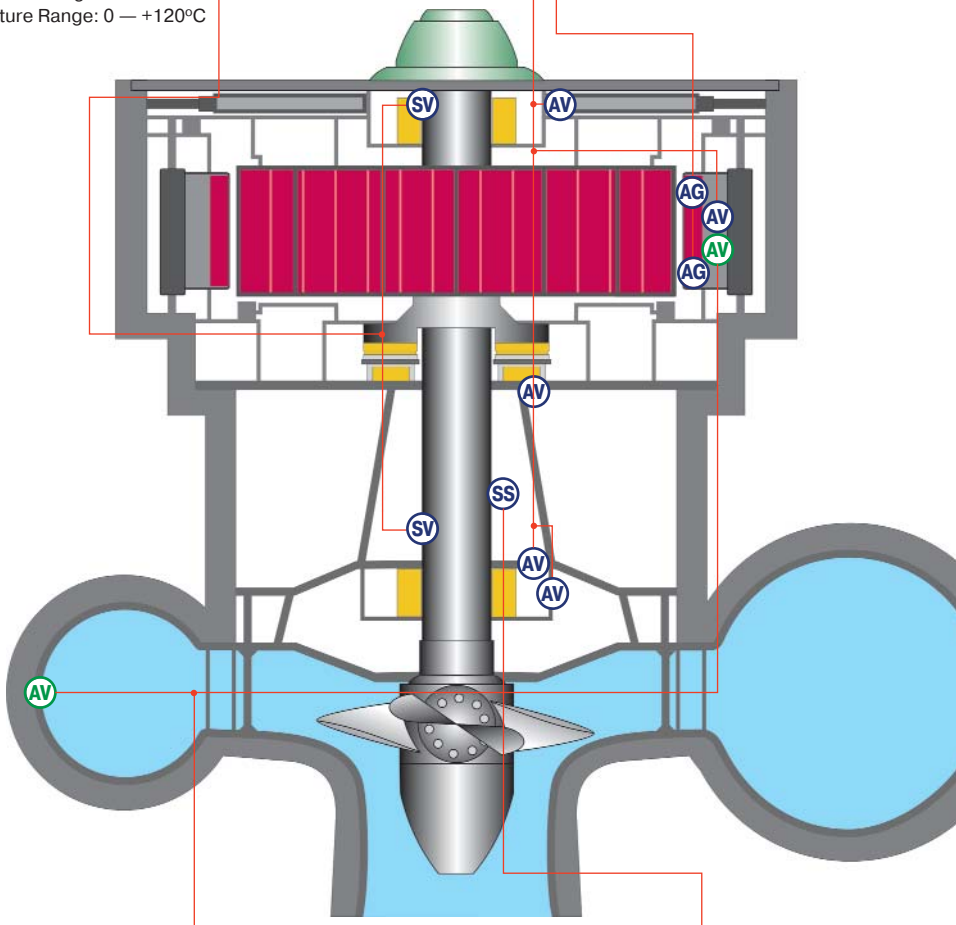
Thresholds of operation of the relay alarm system and protection change in all measured range for the concrete parameter.

Shaft Vibration Sensor
Measurement range: 0 — 5 mm
Temperature Range: 0 — +120°C

Absolute Vibration Sensor
Frequency range: 0,5 — 200 Hz.
Possibility of work in the conditions of flooding by water



Air Gap and Magnetic Flux Sensor In one DIAMECH air gap sensor two functions are combined: control of the mechanical form of a rotor and control of the electromagnetic form of a rotor



Stator core vibration sensor and cavitation sensor The sensor established on the spiral chamber allows to fix and inform about abnormal operating modes on hydraulic part.

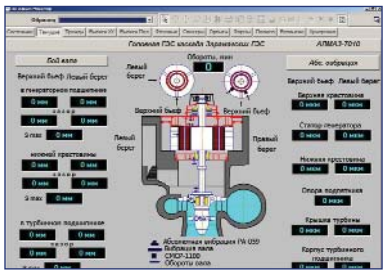
Inductive Sensor
intended for impulse formation at label passage (a ledge or deepening on a shaft)

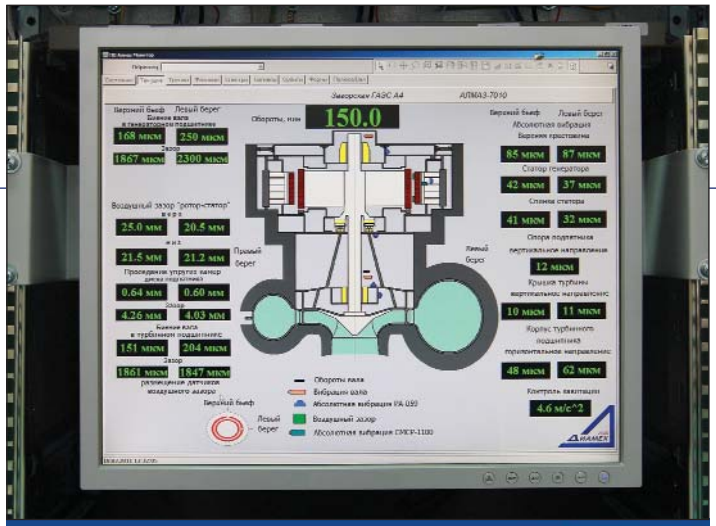
The control-measuring module ALMAZ-7803

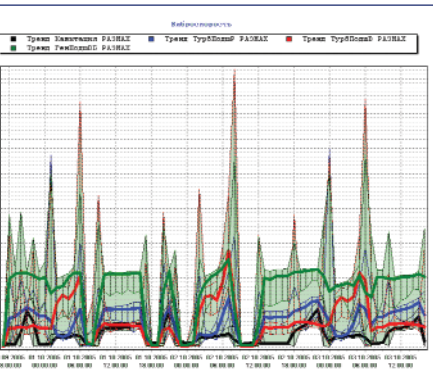
Digital processing of an entrance signal with use DSP processors – integration, calculation spectrum, calculation mean square value in the preset strip of frequencies, amplitudes and phases of the three first harmonics.

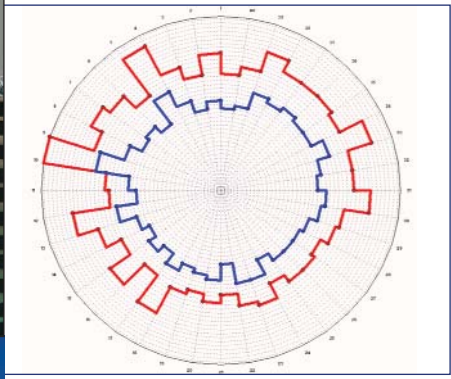
The control-measuring module ALMAZ-7803 accepts a signal from two channels absolute and-or two relative vibration and, in addition, from two tachometer channels.

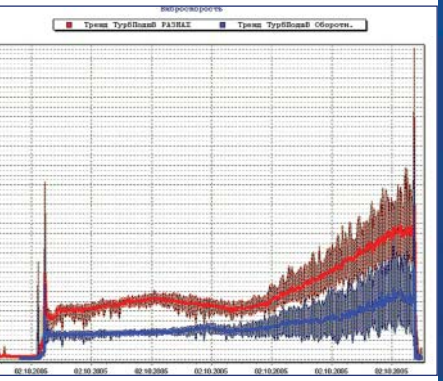
Transfer the measurement data to the upper level system

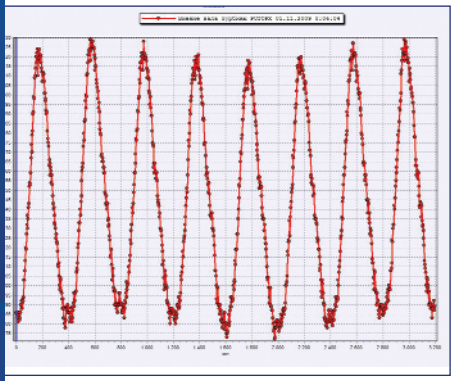


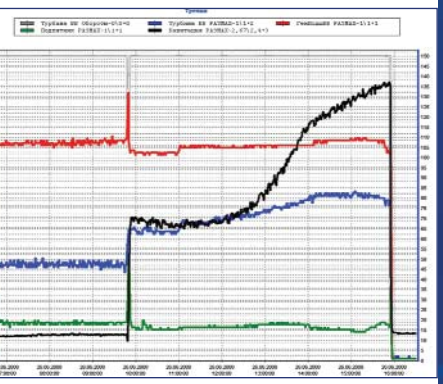


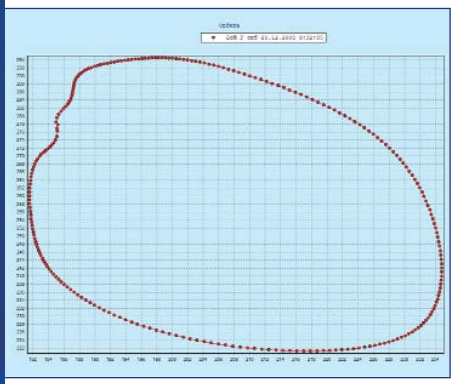


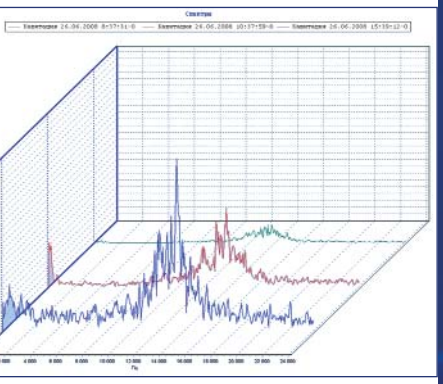


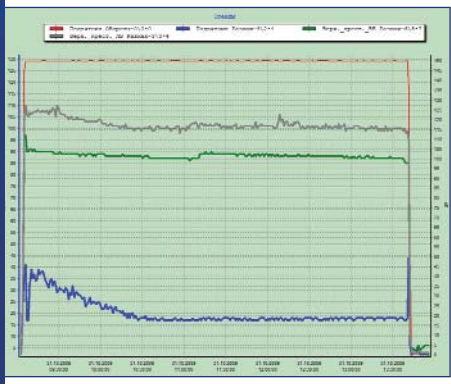












Powerful Software

- Accumulation of the measuring data
- User-friendly data structuring and archiving
- Display of spectra, forms of signals, construction of shaft beat orbits
- Balancing in the own bearings
- Visualization of beat of system “a generator shaft + a turbine shaft”
- Visualization mechanical rotor forms (beats of poles) in rotation process
- Visualization of the electromagnetic form of a rotor in rotation process
- Estimation of efficiency of carrying out of modernization of a rotor
- Possibility of comparison of a condition of the unit on the identical modes (generator mode, compensatory-generator mode)
- Formation of the reports accessible on a local network (Standard report TCP/IP or others is used data exchange reports in coordination with the customer with use of physical reports Ethernet, RS-422/RS-485, USB, LVDS etc.)
- Possibility the setting of operation threshold of the alarm system and emergency protection over the special algorithms considering various vibration parameters.
- The harmonious analysis
- Possibility of definition functions interrelation of signals in various channels
- Reliable preservation of the data
- Protection against the unapproved access

DIAMECH 2000
Vibration Diagnostic & Balancing Machines

2-nd Kozhukhovsky proezd, 29, korp. 2, str. 16,
Moscow, 115432, Russia

Phone: +7 (495) 223-04-20
Fax: +7 (495) 223-04-90
e-mail: contact@diamech.ru

www.diamech-2000.com