



**Success Story**

# INTEGRATED VIBRATION & PROCESS MONITORING AT HPP MOMINA KLISURA

The COMPASS condition monitoring system was recently installed at the Momina Klisura hydropower station in Bulgaria as a part of a major refurbishment.

The Momina Klisura hydroelectric power station is the lowest in elevation of a total of four hydropower stations on the Belmeken-Sestrimo-Chaira cascade on the Maritza River. The Momina Klisura power generation is heavily influenced by the perennial climatic changes.

This case story demonstrates that an advanced condition monitoring system is critical for peak load applications.

**MACHINE/INDUSTRY/PROCESS**

Machine	2x 60MW generating units with Francis turbines
Company/Process	NEK EAD, Bulgaria
Monitoring System	COMPASS condition monitoring system with radial & axial accelerometers, displacement sensors, tacho, air gap, magnetic flux, cavitation; data acquisition & conditioning units, a monitoring system server with a database and remote access
Monitoring strategy	Detection: first and second order magnitude and phase for shaft fault detection... Diagnosis: FFT & CPB spectrum, time signal, Bandpass, RPM, DC, Smax, high frequency emissions

**OBSERVATION/DIAGNOSIS**

The main machine components generator, turbine shaft and bearings were observed. COMPASS utilized an adaptive monitoring strategy so a measurement was monitored to alarm limits specific for each respective machine state. "Tighter" alarm limits gived earlier fault detection with less risk for false alarms.

**BENEFITS**

Only a conditioned-based maintenance strategy can be used on a multiple role hydropower application such as Momina Klisura. The numerous starts and stops puts extra loading on the machine components and the varying duty cycles make machine component wear unpredictable. This kind of application requires an advanced machine condition monitoring system such as COMPASS that is capable of detecting and diagnosing faults at an early stage of development using a number of vibration and process inputs from many machine components. Because of the risk of cavitation occurring at part load at Momina Klisura, COMPASS is also used for optimizing at which loads the hydro generating units can be safely operated. The COMPASS condition monitoring system also improved machine uptime, reliability and efficiency, and reduced maintenance costs.



Figure 1. Momina Klisura 2x 60MW generating units.



Figure 2. Mounting of the air gap sensor (green plate) and the magnetic flux sensor to the right of the air gap sensor between two poles on the stator laminates.

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