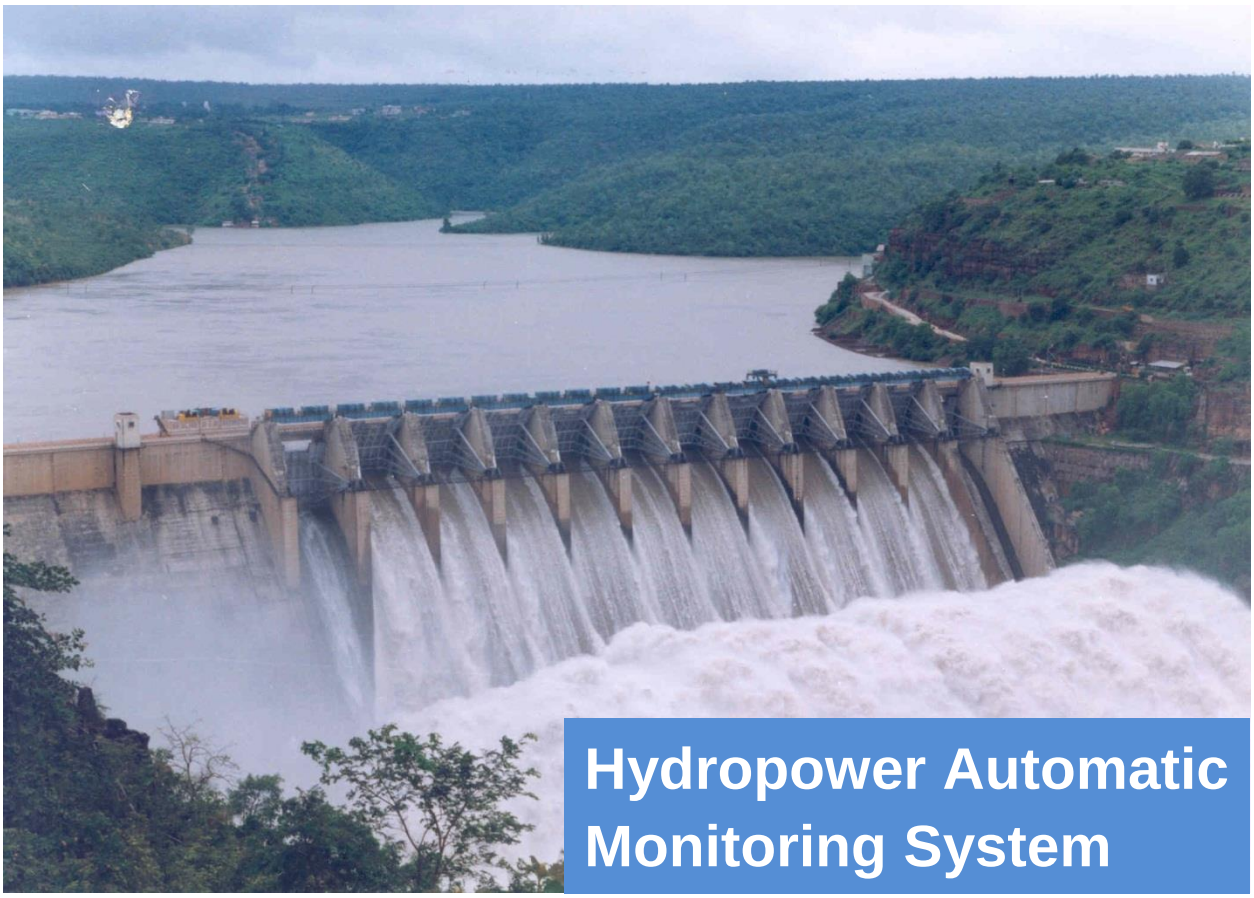
CHC HYDROPOWER DEFORMATION MONITORING SOLUTION



Hydropower Automatic Monitoring System

Safety is first in hydropower. Large earth fill and concrete dams are critical infrastructures for continuous water supply and power generation. Loading and unloading forces on a dam cause stress on the structure and must be monitored. The stress can be due to fluctuations in the water level, settlement of the structure, nearby landslides or seismic activity. CHC hydropower deformation monitoring system enables early detection of a potential problem allows repairs or remedial measures to be taken before a disaster occurs.

THE MECHANICS OF MONITORING

In a monitoring project, the use of geodetic, geotechnical and other sensors provides periodic observations of objects to detect physical changes such as unusual stress and strain, cracks and other deteriorations which occur due to factors such as loading, corrosion, fatigue, temperature and time. At user-specified intervals, the sensors take measurements to determine any changes in position, length or tilt. When the expansion/contraction properties of a geotechnical instrumented body are known, the additional use of prisms/GNSS to also monitor the position-related changes greatly enhances the quality control of the monitoring system. The data is collected by software that computes and records the results, visualizes the changes and alerts stakeholders when needed.

SYSTEM COMPONENTS

SENSORS ON-SITE

GEODETIC SENSORS

- N71
  - GNSS Positional Monitoring Sensor

Designed for seamless integration, the CHC N71 is a powerful multi-application GNSS sensor which delivers state-of-the-art positioning features in a rugged enclosure. The CHC N71 GNSS sensor provides a cost-effective answer to demanding applications such as deformation monitoring, geodetic reference station, marine survey, dredging or any machine guidance when high performances and reliability are required.

C220GR

- GNSS Choke Ring Antenna

The CHC C220GR antenna is ideal for control work. The C220GR incorporates a large Trimble Stealth™ Ground Plane, which literally burns up multipath energy using technology similar to that used by Stealth aircraft to hide from radar. The C220GR antenna's quality performance and extreme accuracy are achieved through sub-millimeter phase center repeatability, robust low-elevation tracking and significantly reduced ground-based multipath. The C220GR is extremely rugged. It is protected by weather-resistant materials and a low profile design, so when the antenna is used for a permanent installation, you can count on many years of continuous operation.

GEOTECHNICAL SENSORS

INCLINOMETER

Inclinometer is an instrument for measuring of dam's slope (or tilt) and it measures both inclines (positive slopes, as seen by an observer looking upwards) and declines (negative slopes, as seen by an observer looking downward) using three different units of measure: degrees, percent, and topo.

Seepage Sensor

Seepage sensor is an instrument for measuring seepage line of earth fill dam. When the seepage velocity is great enough, erosion can occur because of the frictional drag exerted on the soil particles. Vertically upwards seepage is a source of danger on the downstream side of sheet piling and beneath the toe of a dam or levee. Erosion of the soil, known as "soil piping", can lead to failure of the structure and to sinkhole formation.

Atmospheric Sensors

Rain Gauge

A rain gauge (also known as a udometer) is a type of instrument used by meteorologists and hydrologists to gather and measure the amount of liquid precipitation over a set period of time.

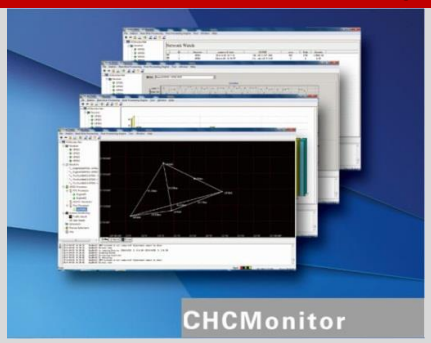
Ultrasonic Water Level Meter

Installed at 50 meters above the water surface, the transmitter unit measures the water level and temperature using an ultrasonic sensor.

Water Current Meter

A current meter is oceanographic device for water flow measurement by mechanical (Rotor Current Meter), tilt (Tilt Current Meter), acoustical (ADCP) or electrical means.

Software in Office PC / Server



CHCMonitor

- Office-based components installed in office environment
- Check and filter incoming data
- Process raw data and compute any positional displacement

CHCMas

- Tabulate measurement data into graphical view.
- Trigger alarm if any data point values exceed pre-defined trigger levels.
- Send notification to nominated recipients via e-mail/SMS.
- Generates kinds of report for data.
- Reports generates list of the displacement.

CHCSim

- Reports generates list of the displacement.
- Preserve the coordinate of each monitoring point and data from other geotechnical sensors.

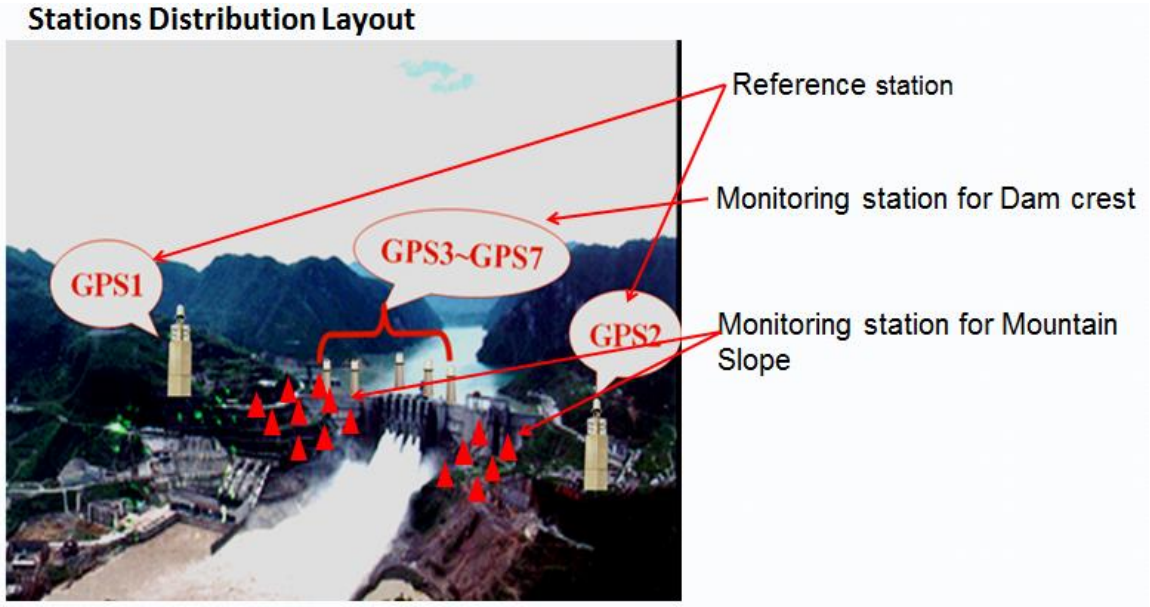
Web

CHCMas

CHCMas allows the subscriber to download processed data, print reports and view data graphically. With a CHCMas internet service subscription, the user does not require CHCMonitor and CHCSim modules. CHCMas services include monitoring data analysis, customized report generation and technical support for RAPID ADMS Software via e-mail. All alerts will be sent to any nominated recipients if any displacement values exceed pre-defined trigger levels.

KEY FEATURES OF CHC DEFORMATION MONITORING SOLUTIONS

Effectively performs displacement and deformation monitoring using the most advanced automated measurement technology available.



Truly Real Time

Sampling interval 1S on every monitoring point provide automated real-time and continuous monitoring around 24 hours and 7 days.

No Weather Restraint

The system can operate well in extremely weather condition, like in heavy rain, snowy, thick foggy and dusty day.

High Accuracy

- Real Time Kinematic Monitoring
  - Horizontal: 8mm
  - Vertical: 15mm
- Post-Process Static Monitoring
  - Horizontal: 3mm
  - Vertical: 5mm

Support Multi-Constellation System

- GPS: Simultaneous L1C/A, L2E, L2C, L5
- GLONASS: Simultaneous L1C/A, L1P, L2C/A (GLONASS M Only), L2P
- SBAS: Simultaneous L1C/A, L5
- Galileo: Simultaneous L1BOC, E5A, E5B, E5AltBOC1
- BeiDou: B1, B2
- QZSS: L1 C/A, L1 SAIF, L2C, L5

N71 GNSS POSITIONAL MONITORING SENSOR

TECHNICAL SPECIFICATIONS

GNSS Characteristics	
220 channels with simultaneously tracked satellite signals	GPS: Simultaneous L1 C/A, L2E, L2C, L5
	GLONASS: Simultaneous L1 C/A, L1 P, L2 C/A (GLONASS M Only), L2P
	SBAS: Simultaneous L1 C/A, L5
	Galileo: Simultaneous L1 BOC, E5A, E5B, E5AltBOC1
	BeiDou: B1, B2
	QZSS: L1 C/A, L1 SAIF, L2C, L5
Advanced multipath mitigation technology	
Low noise carrier phase measurement with <1mm precision	
Performance Specifications	
Real Time Kinematics (RTK)	Horizontal: 8 mm + 1 ppm RMS
	Vertical: 15 mm + 1 ppm RMS
	Initialization time: typically < 10 s
	Initialization reliability: typically > 99.9%
Post Processing Static	Horizontal: 2.5mm + 1ppm RMS
	Vertical: 5mm + 1ppm RMS
	Baseline Length: ≤ 300 km
Communications	
1x LAN port	
1x Lemo 10 pin 1 shell, 3 wire serial with power input, 1 USB 4 wire	
Integrated GPRS modem	
Optional radio modem	
Physical	
Size (LxWxH)	195 x 145 x 51 mm (7.7 x 5.7 x 2.0 in)
Weight	1 kg (35 oz)
Operating temperature	-40 °C to +65 °C (-40°F to 149°F)
Storage temperature	-55 °C to +75°C (-67°F to 167°F)
Humidity	100% condensation
Waterproof and dust proof	IP67 and MIL-STD 810F
Shock	survives a 2-meter drop on to concrete
Electrical	
Power consumption	< 4 W nominal, dependent on user settings
External power input	9-13.5 VDC
User Interface	
PC Control Utility via Serial	
Web User Interface	

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