
DATASHEET

BRIDGE SCOUR MONITORING

Model EBSM-101M MAGNETIC COLLAR/PROBE SYSTEM
Model EBSM-101S SONAR SENSOR SYSTEM



INTRODUCTION

Bridge piers over rivers are embedded in the riverbed and are susceptible to be affected by scour depending on bed soil type and river water flow velocity. Scouring is wearing away of riverbed material that supports piers or abutments. It results from erosive action of water flow against bridge support structures and abutments and scoops away or excavates the riverbed material around these structures. The piles or pier foundation get exposed down to significant depths due to large scale scouring. This may destabilize the foundation of the bridge causing bridge failure.

Scouring compromises the safety of the bridge. It has been the cause of failure of several bridges around the world. It is thus, critical for the stakeholders to detect the occurrence of stream/riverbed scour at bridge piers and monitor the scour depth variation. Encardio-rite offers innovative bridge (streambed) scour monitoring solutions that provide crucial information in near real time on the dynamics of sediment scour and aggregation. Model EBSM-101M uses a magnetic collar on an embedded stainless steel body tubular probe while EBSM-101S uses an active sonar sensor to monitor the depth of the riverbed. Each system has its own application and is used based on the site requirement. Their rugged design is ideal for safety monitoring of structures such as bridges that are located in high-current or deep-water environment.

FEATURES

- Designed for long-term deployment in harsh conditions
- Useful in critical structural health monitoring of bridge where real time monitoring and early warning is required in order to protect valuable life and infrastructure
- Can operate as a standalone system.

APPLICATIONS

- Underwater scour detection around bridge pier foundations and abutments
- Under water scouring of reservoir or stream bed around dams and water intake chutes.
- Scour maybe monitored along with rainfall, water level and flow.

MAGNETIC SCOUR MONITORING SYSTEM

Encardio-rite model EBSM-101M magnetic scour monitoring system comprises of:

- Magnetic collar that slides over a stainless steel (SS) support pipe inserted vertically into the streambed. The bottom end of the SS pipe is a heavy duty pointed cone for ease in driving into the streambed.
- Sensor probe consisting of a switch array at 45 mm intervals inside the SS support pipe
- Data acquisition system

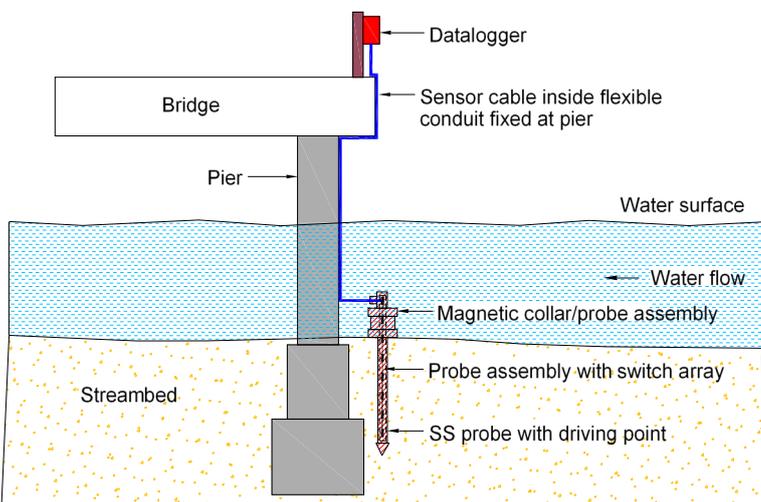
The magnetic collar assembly slides over the SS support pipe. It follows the level of the streambed, as scouring takes place. However, if subsequently any silt built-up takes place over the scouring, the magnetic assembly stays in its previous lowest position. Thus, this system records the maximum depth of scouring that has taken place since the system was installed. The tubular magnetic switch assembly probe monitors the downward movement of magnetic collar. As the magnetic collar comes in proximity, a switch at that particular depth closes. The location of the magnetic collar i.e. streambed depth is thus determined and recorded.

Wiring from probe is routed through a tee-fitting at the top of the SS pipe. It is recommended to route the cable through a conduit to the Data Acquisition System (DAS) on the bridge deck. The system is watertight and suitable for installation in shallow/deep waters. The DAS provides excitation voltage to the probe, processes the data and transmits it to a remote server for monitoring and control action.

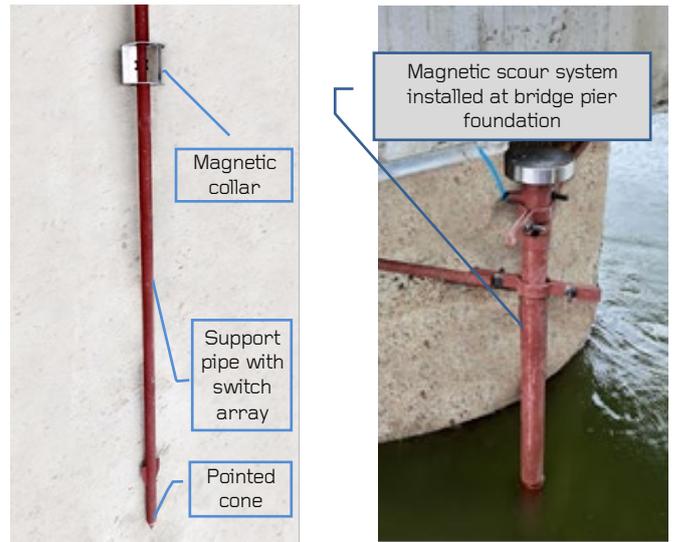
SPECIFICATION

EBSM-101M magnetic scouring monitoring system

Sensor	Magnetic switch array with switches at 45 mm intervals, inside support pipe
Resolution	45 mm
Level uncertainty	± 25 mm
Probe & support pipe	Probe, SS housing, 60.3 mm dia. x 2.75 m deep. Additional 60.3 mm dia. SS support pipes 2.75 m long can be supplied as per requirement depending upon depth of riverbed.
Size of magnetic collar assembly	OD: 165 mm, ID: 63 mm and Height: 176 mm (typical)



Typical installation scheme for magnetic scour monitoring system



Magnetic scour monitoring system

SONAR SCOUR MONITORING SYSTEM

The Encardio-rite model EBSM-101S sonar scour monitoring system comprises of:

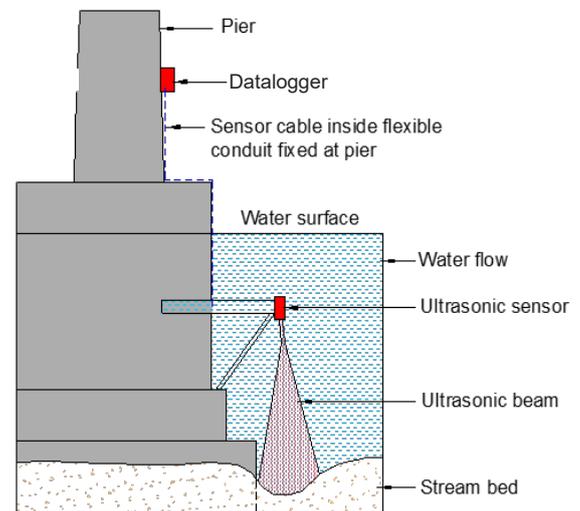
- Sonic sensor installed on a bracket fixed to pier to monitor stream/river bed (scouring) depth
- Data acquisition system that receives depth data from the ultrasonic sensor and transfers it to central server.



Installation of sonar scour monitoring system

The sonar sensor should always remain immersed in water to avoid failure. It should be at least 2 m above the streambed for proper readings.

The sonar sensor monitors the stream/river bed depth by acoustic echo ranging based on speed of sound in water. It measures the elevation of the stream/river bed at programmable time intervals by sending acoustic pulses from the sonar sensor to the streambed.



Typical installation scheme for sonar scour monitoring system



The sonar device uses a narrow 8 degree beam to provide sufficient sonar beam clearance while allowing for reception of the reflected pulses. It is mounted on a bracket at a suitable angle (depending on site conditions), away from the pier.

SPECIFICATION

EBSM-101S sonar sensor

Operating depth	20 m
Resolution	Better than 50 mm
Resonant frequency	200 kHz (Nominal)
Beam width	8° ±1°, Conical
Minimum depth of streambed from probe	2 m.
Precaution	Probe should always remain immersed in water to avoid damage
Operating temperature range	0°C to +40°C
Protection	IP-68

DATA ACQUISITION AND TRANSMISSION

The Encardio-rite model EBSM-101 datalogger is programmed to accept input from up to three magnetic probes and/or sonar scour monitoring sensors. The magnetic and sonar monitoring sensors are connected to the datalogger through separate individual serial bus cables. The sensors should be within a maximum distance of up to 200 m from the datalogger.

The datalogger has the facility to collect and store recorded data and transfer it to a central remote server at desired intervals over a wired or cellular telemetry link.

If specifically requested, the datalogger at additional cost can be programmed to process inputs from Encardio-rite tilt meter, rain gauge and water level sensors. Please consult factory with your specific application/requirement.

The datalogger is housed in a weatherproof enclosure making it suitable for harsh environment.

A data management software (Drishti) can be installed at a central server to processes and analyses the data. In case any value breaches programmed alert level, the system sends an alarm to the stakeholders via SMS or email.



Power supply & datalogger installed at bridge pier

Data transfer options

- EBSM-101 datalogger can transmit the collected data to a central server (local or Cloud based) via GSM/GPRS or cellular network.
- Data can be downloaded with RS-232 interface from EBSM-101 datalogger using a USB port.
- If specifically requested, Data from EBSM-101 datalogger can be transmitted to a local central server using Ethernet via optical fiber cable.

Power supply options

The EBSM-101 datalogger has different power options like battery power, mains power supply and solar power supply. For monitoring scour on a bridge, it is recommended to use mains power supply or solar power.

Depending on the project requirement, installation location and other sensors being used at the project, choice of communication network and power supply can be made.



Scour monitoring system (magnetic and sonar with datalogger) installed at a bridge in India



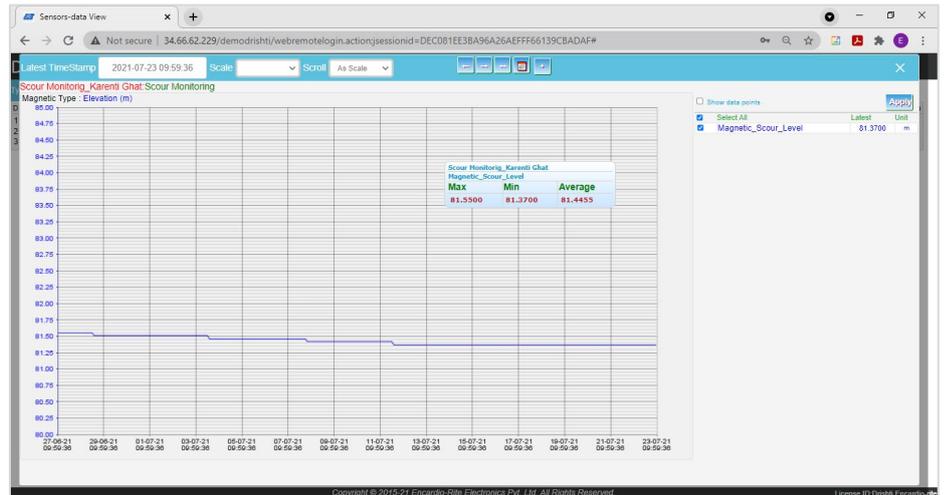
REAL-TIME WEB-BASED DATA MANAGEMENT SYSTEM

Drishti, our cloud-hosted data management software, is available to process and manage the data collected at project site for further analysis and evaluation. The real time data is accessible to all stakeholders 24X7, with instant alarms on critical events. The early warnings help in taking timely corrective action to prevent damages and minimize delays and operational costs.

Drishti is a powerful tool that gives the user complete control of their project data. It offers an interactive user interface, taking care of all database interactions automatically.

The real time display, graphs & reports can be viewed using popular web browsers like Microsoft Internet Explorer, Google Chrome or Mozilla Firefox amongst others. It allows multiple authorized users at different locations to view any data or report from the same project site simultaneously. Data can be accessed from any type of device, like a desktop, laptop, tablet or smart phone, that supports a standard web browser.

Encardio-rite cloud service is available on a rental model. User has to pay a small setup fee for first time and then a monthly rental has to be paid for accessing the data over the cloud as long as required.



Data on Drishti from scour monitoring system (with magnetic collar/probe) installed at a bridge in India



Data on Drishti from scour monitoring system (with sonar sensor) installed at a bridge in India

ORDERING INFORMATION

Following information will be required to place the order

- Number of sonar sensors required
- Number of magnetic collar system with magnetic probe required.
- Number of tilt, water level and rainfall sensors required
- Distances between the piers/sensors and dataloggers
- Data transmission option required

Type and number of dataloggers will be decided based on above information.

Fixtures for installation of the sensors are site specific and will have to be sourced/made by the user.

*All specifications are subject to change without prior notice

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