



Remote Vessel Impact Detection on Piers and Fenders

with Resensys Wireless Monitoring System

Key Monitoring Capabilities

- Detection of barge and vessel collisions using wireless vibration/acceleration SenSpot™ sensors.
- Monitoring vibrations and impacts on fenders, dolphins, and bridge piers.
- Visual confirmation of vessel impacts with wireless solar-powered cameras.
- Real-time alerts and detailed collision reports for proactive response.

Vessel Impacts is not Infrequent

Bridge collisions, both from barges/vessels and vehicles, are more common than expected and pose serious risks. From 1987–2011, barge/vessel impacts accounted for about 2% of all bridge failures in the U.S., with 31 major incidents globally between 1960–2002 resulting in over 342 fatalities and significant economic losses. Vehicular collisions, particularly from over-height vehicles, also cause costly disruptions. Despite these risks, there are no clear guidelines to help bridge authorities assess damage and make repair decisions, highlighting the need for improved detection and response systems.

Resensys has the Solution!

The Resensys proposes reliable and robust wireless system for vessel collision/impact detection:



[Wireless Solar Powered Camera](#) on bridges for vessel collision detection and monitoring

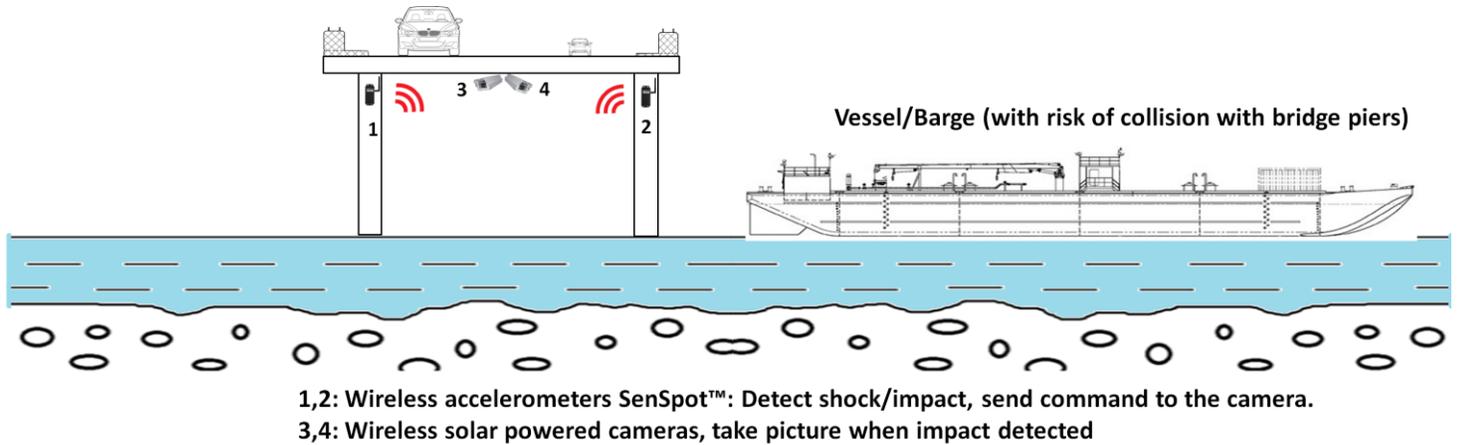


Resensys [Wireless Vibration/Acceleration SenSpot™ sensor](#) on fenders of bridges for measuring fender vibration and barge/vessel collision detection and monitoring



Resensys [Wireless Vibration/Acceleration SenSpot™ sensor](#) on dolphins of bridges for measuring dolphin vibration and barge/vessel collision detection and monitoring

Approach of Impact Detection



Vessel Collision Detection approach using [Wireless Accelerometer](#) and [Wireless Solar Powered Camera](#)

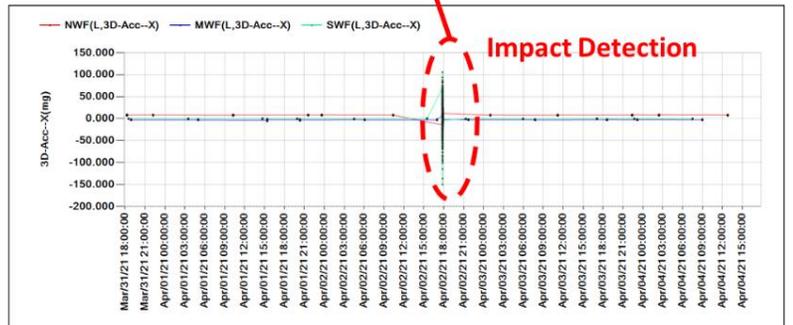
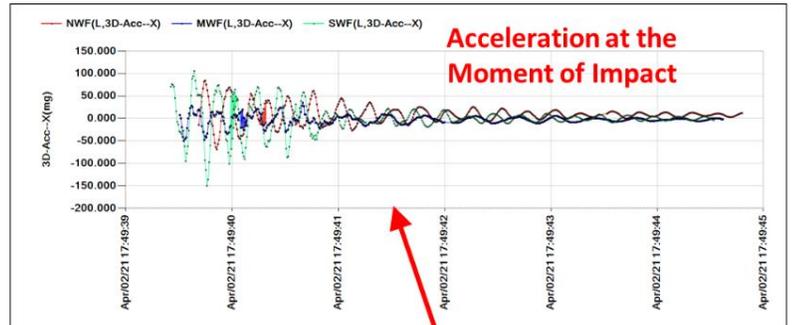
- **Sensor group 1, 2:** These are wireless vibration SenSpot™ sensors (accelerometers). These devices constantly monitor acceleration on the pier, taking up to 400 samples of tri-axial acceleration per second. Vessel collisions are reliably detected using the 3-dimensional acceleration data.
- **Device group 3, 4:** These are wireless solar powered cameras. While vessel collision and assessment of the damage upon an impact is initially done using accelerometer, a confirming and surrounding visual assessment and identification of the responsible source can be provided using cameras.

Notification Report of Impact Detection



The fenders of the bridge on Canal Bridge were hit by a large barge

- The impact caused acceleration levels up to 150mg at the monitored location.
- Normally, the background acceleration levels are below 3-5 mg and the accelerometer data shows a clear impact.



Wireless Accelerometer SenSpot Sensors measurements

Sample of collision detection notification report with recorded measurement and picture at time of the impact at bridge



A typical picture taken by Resensys [Wireless Solar Powered Camera](#) indicating the fenders of the bridge was hit by loaded barge/vessel.



A typical picture taken by Resensys [Wireless Solar Powered Camera](#) indicating the field of view when a barge hit a pier of a bridge
(This kind of picture can be time-stamped)



A typical picture taken by Resensys [Wireless Solar Powered Camera](#) that shows a barge at very small clearance of the bridge pier is passing (at the time of the detected impacts)
(This kind of picture can be time-stamped)



How Resensys System Works?

A typical vessel Collision/Impact Monitoring and Detection system includes the following components:

- **[Wireless SenSpot™ Sensors and Devices](#)**: are attached to piers, girders, and other members of a bridge structure. The number of gauges required per structure is usually dependent upon the design, existing issues on members and possibility of vessel/vehicular collision and needs:
 - [Wireless Vibration/Acceleration SenSpot™ sensor](#)
 - [Wireless Solar Powered Camera](#)
- **[SeniMax™](#)**: is a wireless data logger gateway that is connected to the cellular, Ethernet, or satellite networks; it wirelessly collects SenSpot™ data at the site and sends it to a cloud database server (one SeniMax™ can cover as many as 100 SenSpot™ sensors and devices within its wireless communication range).
- **[SenScope™](#)**: software for data analysis and visualization, data export, automated alert management, thermal analysis, and vehicular/vessel collision detection, monitoring and corresponding data analysis. For vehicular/vessel collision, Resensys monitoring software can be set to provide alerts notifications with visual feedbacks when pre-established thresholds have been exceeded to allow proactive and timely action to be taken.

Resensys Benefits

- 10+ years Battery Life
- Easy to install & self-adhesive
- Small in size & lightweight
- Usable on different kinds of materials
- For short- and long-term monitoring
- No need for calibration in the field
- Quick Testing
- Rugged, weatherproof, & corrosion resistant
- High precision
- Lightweight design
- Immediate alert services
- Infrastructure less & energy self-sufficient system