Sonardyne's autonomous monitoring system is used for a wide number of low-cost, long endurance subsea monitoring applications. Operations can range from the simplicity of a single tidal gauge to the complexity of a large transponder network designed to monitor long-term trends in pipeline movement or seabed settlement. The autonomous functionality of the system enables it to operate for several years without human or system intervention. This removes the requirement and cost overhead associated with the presence of a surface vessel or subsea ROV throughout the monitoring period.

System Overview

The system is built around Sonardyne's 6G® (Sixth Generation) Acoustic Monitoring Transponder platform (AMT), Wideband® 2 acoustic range measurement techniques and proven sensors. This combination enables centimetric positioning accuracy, sub-centimetre ranging precision and long term stability over 3km distances. The integrated wireless acoustic communications means that data can be quickly recovered in near real-time without recovering the AMTs by ROV.

Sonardyne's Monitor software guides the operator through set-up, deployment and retrieval operations giving full control of the AMT at every stage of use during the project.

AMTs can be programmed with a user defined logging configuration via one of two methods. A serial link enables transponders to be pre-configured prior to deployment for quick and efficient back-deck operations. An acoustic link enables transponders to be re-configured once in the water to facilitate for evolving projects, removing the need for unnecessary retrieval operations.

Data can be acquired and recorded autonomously subsea without system or human intervention for significant periods of time. This data can then be recovered via the integrated high speed acoustic telemetry link enabling low data recovery costs.

Features at a glance

6G Sonardyne Wideband® 2

- Autonomous operation – acquires acoustic ranges and sensor data without surface command

- User defined log configuration

- Integrated precision sensors

- Standard transponders rated to 3,000m (5,000m and 7,000m options)

- Transponders are Sonardyne USBL/LBL and HiPaP® compatible

- Up to 6 years deployment battery life

- High speed data retrieval (Up to 6,000bps depending on transceiver)

Survey Planning

Sonardyne's autonomous monitoring system benefits from a range of set-up options so that the most appropriate one can be chosen for the budget and resources available for the survey.

Transponders can be pre-configured with the chosen log regime prior to deployment using a simple laptop, a serial test cable set up and minimal user interaction. Each transponder can be programmed to the desired settings within minutes to allow for rapid and effective deployment operations.

Once programmed, the transponders are generally deployed in frames and lowered to the seabed. During deployment, the supplied software provides a number of QA checks to ensure that the transponder is operating correctly, instilling the user with confidence that the unit will provide the data necessary for successful monitoring.

Precision pressure, temperature, sound velocity and dual-axis inclinometer sensors are integrated and are intelligently powered up at the requested time and sampling period, providing an ultra-low power platform for surveys lasting up to six years.

Compatibility with both Sonardyne Wideband® and HiPaP® signal architecture ensures that the transponders can be tracked during deployment to establish accurate drop coordinates whatever the USBL tracking system available on the vessel.

Monitor Software

The system is controlled by Sonardyne's Monitor software application which can run on a range of platforms from a basic laptop to a high specification Sonardyne Navigation Computer. It is compatible with both Windows XP and Windows 7 operating systems.

Monitor is easy and intuitive to use, offering tools to allow the user to assess the performance of the system, including real-time acoustic quality indicators. Offshore operations can be efficiently planned with minimal operator training as the intelligent software allocates appropriate performance settings according to the specifications of the proposed deployment.

The software uses a wizard to guide the user through planning an AMT deployment and data logging regime. This includes highlighting factors such as the estimated pages of data to be logged on a daily basis and the yearly battery consumption. This enables a log regime to be easily configured and the specifications of the planned survey operation (frequency of logged data, time available for data upload, duration of deployment) to be met.

The log regime can be as simple or as complex as the survey demands, ranging from single logs from a single sensor to multiple repeat logs from a variety of sensors.

Data Measurement

The system is designed to acquire the following types of data:

Horizontal Distance / Displacement

• Highly precise acoustic ranges are measured autonomously, repeatedly and simultaneously between multiple instruments to monitor lateral displacements. Temperature and sound velocity are recorded simultaneously to compensate the time of flight range measurements.

Vertical Displacement

• Highly precise and stable pressure measurements are recorded to enable long term monitoring of vertical displacements by analysis of differences in average water column height between different instruments. A by-product is precise tidal amplitude and period within the field area.

Acoustic Monitoring Transponder

6G® Autonomous Monitoring Transponders can be deployed for oceanographic or infrastructure/ integrity monitoring surveys. Sensor data is logged autonomously whilst integrated high speed telemetry enables near real-time, intervention-less and low cost data recovery.
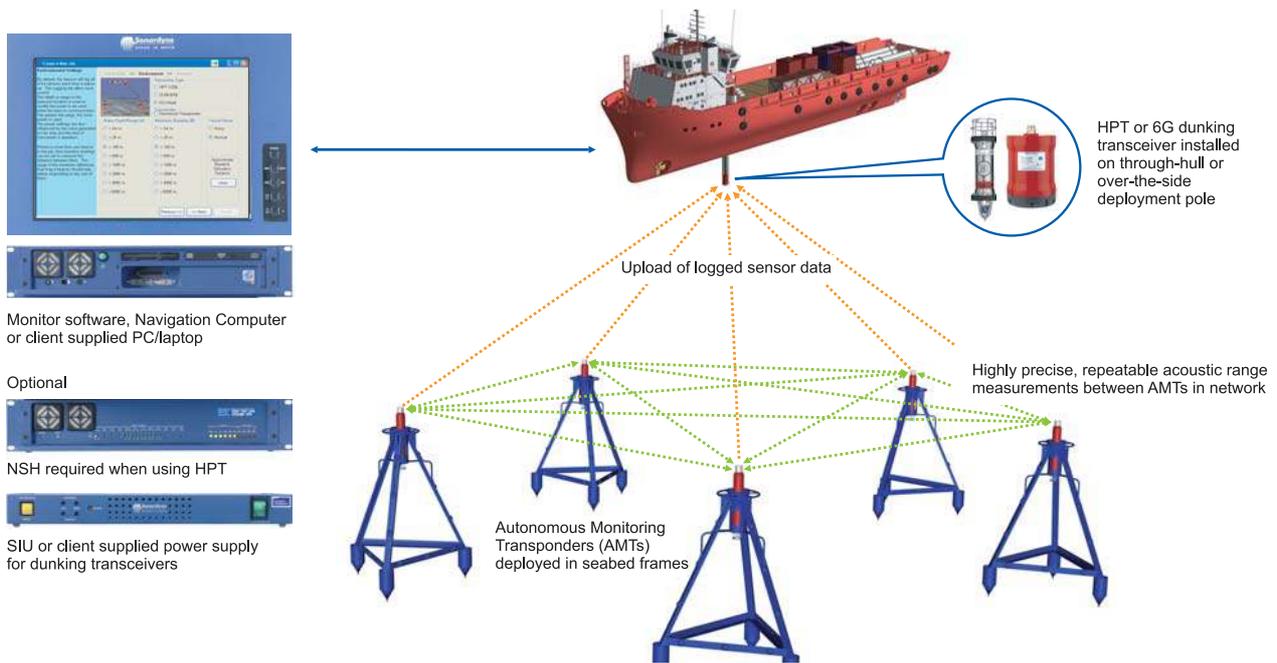

Monitor Software

Monitor software guided the operator through set-up, deployment and retrieval operations giving full control of the AMTs at every stage of the project.

Long Life Deployment

Part of a network of AMTs deployed in deep water for six years.

Monitor software, Navigation Computer or client supplied PC/laptop

Optional

NSH required when using HPT

SIU or client supplied power supply for dunking transceivers

HPT or 6G dunking transceiver installed on through-hull or over-the-side deployment pole

Upload of logged sensor data

Highly precise, repeatable acoustic range measurements between AMTs in network

Autonomous Monitoring Transponders (AMTs) deployed in seabed frames

Inclination
• Highly precise inclinometers record changes in roll and pitch to monitor motion of structure and/or integrity of coupling to the seabed.

External Sensors
• A range of other high precision sensors can be integrated with the system by connection to the transponders via serial connection. This makes the system highly versatile and easily customizable to a variety of monitoring needs.

Data Retrieval
Data retrieval operations can be planned at any time during the deployment period.

When recovering data, the user has a choice of transceivers to use. They range from a Sonardyne 6G® dunking transceiver which can be easily deployed and retrieved, to a fixed USBL transceiver (HPT), installed on a through-hull or over-the-side deployment pole. For monitoring-only projects, the transceiver does not need to be rigidly mounted therefore often, if conditions permit, the dunking transceiver is the ideal option. This makes the system highly versatile as it can be easily transferred from vessel to vessel.

When using an HPT transceiver, data can be retrieved at up to 6,000bps. It also provides the user with the capability to precisely configure the system to ensure that data can be retrieved, even in difficult acoustic environments. Retrieval can also be via serial connection for time efficient, low cost deploy and retrieve operations.

The modem data transfer protocol implements forward error correction to allow the receiver to detect and correct a limited number of errors and a number of master retries are available to ensure that the system re-retrieves any data packets that have been received in error. This enables efficient data retrieval operations to take place with minimal operator interaction.

Once the desired number of data pages have been retrieved from a transponder, Monitor compiles the data and translates it to .csv format, enabling the data to then be imported to a wide variety of data analysis applications.

Data Recovery Transceivers
(Above) HPT is a combined USBL positioning and modem transceiver. (Below) Dunker 6 can be rapidly mobilised on almost any type of vessel in order to retrieve logged data.

Performance Summary

Operating Range	Baselines >1,000 metres proven
Operating Depth	3,000 metres (5,000m or 7,000m available)
Ranging Precision	<15mm
Minimum Log Period	1 minute
Operating Frequency	MF (18-36KHz)
Data Export Format	Comma Separated Values (.csv) File Format
Maximum Data Transfer Rate	6,000bps with Sonardyne HPT Transceiver 900bps with Sonardyne Dunking Transceivers

Equipment List   Key: ● = Required   ○ = Optional

● Software
Monitor

● Type 8038
Surface
Interface Unit

○ Type 8026
Navigation
Computer

○ Type 8098
Navigation
Sensor Hub

● Type 8309
Dunker 6
Transceiver

○ Type 8310
RovNav 6
Transceiver

○ Type 8035
AvTrak 6
Transceiver

○ Type 8142
HPT USBL
Transceiver

○ Type 7950
Deployment
Machine

○ Type 8097
Over-The-Side
Deployment Pole

● Type 8305
AMT
Transponder

○ Type 8035
Fetch
Transponder

Other Acoustic Monitoring Systems from Sonardyne

● Ocean Bottom Node

● MRAMS

● Wideband Data Logger

Key Technology

6G®
Sonardyne's new sixth generation (6G®) technology platform provides robust performance, ease of use, greater functionality, equipment flexibility and compatibility with aided inertial technologies. Its features reduce operational risk, deliver more efficient operations and lower the cost of ownership.

Wideband 2®
Sonardyne Wideband® 2 is an ultra-wide bandwidth signal architecture exclusively developed for 6G® hardware. Delivering seamless acoustic navigation and telemetry of subsea data, the technology offers a host of benefits; fast and robust transmission of data, precise ranging, wide area coverage, mitigation from multipath signals and greater immunity to noise from vessels and other acoustic systems.

Autonomous Operation
AMTs can be programmed to operate autonomously, without any control or commanding from an ROV or vessel. Acoustic ranges to other transponders and sensors data can be programmed to be acquired at specific intervals, logged internally and uploaded on-demand.

High-Speed
Data acquisition time is dramatically shorter for both calibration and measurement phase. Ranges, diagnostics and sensors data is acquired simultaneously to multiple instruments in a fraction of the time previously taken.

Battery Life
Do more for longer. 6G® products are designed using the latest low power electronic architecture saving time and money by not having to recover equipment to recharge or replace transponder battery packs.