

Wireless Subsea Data Communications

The case studies of Baker Hughes and i-Tech 7

Ian Crowther

June 2014

About WFS

- Wireless For Subsea

Seatooth PPC

- Pipeline pre-commissioning
- Case study

Seatooth Video

- Subsea Intervention
- Case study

Seatooth Pipellogger

- Pipeline integrity
- Case study

WFS Background



WFS – Wireless For Subsea

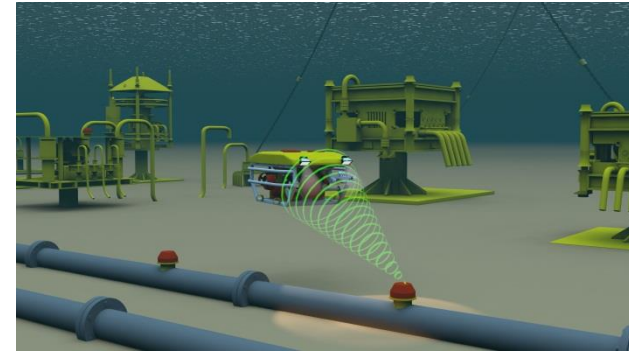
- Founded 2003
- Operations in UK & USA

Wireless Solutions

- Control and Instrumentation
- Communications
- Power Transfer
- Location and Navigation

Field proven product

- 3,000+ systems delivered worldwide
- North Sea, Gulf of Mexico, SE Asia, Australia



- Logs multiple parameters including pressure, flow, temperature
- Stores up to 400,000 data points
- Continuous logging whilst data is uploaded
- User-adjustable logging interval
- Ad-hoc data retrieval by ROV or diver
- High Speed data downloading
- Reliable & Quick data harvesting

Bandwidth	Seawater Range	Antenna	PCB Size mm
2.4kbps	1.5-5m	Internal	100x50

Power Consumption	Hybrid Radio-Acoustic	Input Voltage Range	Comments
Transmit: 1-7W Receive: 86 μ W Sleep: 360 μ W	Yes	3.6V—28V DC	Compact, low power

- Using **Seatooth® PPC** for pipeline data logging is a time, size and cost effective solution in collecting logged data and deploying assets.
- **Seatooth® PPC** can provide a reliable wireless communications link in the most challenging subsea environments such as:
 - In shallow water or turbid water
 - In the presence of bubbles or contaminants
 - Near to large subsea structures
 - Through the seabed, concrete and metal structures



Baker Hughes Project Background



- WFS supplied a **Seatooth® PPC** system for wireless datalogging during pipeline pre-commissioning on a project in the Liwan 3-1 gas field South China Sea at water depth of 1000m.
- The transmitter included a **Seatooth® PPC** connected to a hydrotest skid and the receiver comprised a **Seatooth® PPC** mounted on the remotely operated vehicle (ROV).



Project Technical Specification



Range through sea water	5m
Depth Rating	1000m
Data Rate	2.4kbps
Power Supply	24V DC
Power (source level)	PPC on skid battery powered, PPC on ROV powered by ROV
Dimensions	350m enclosure: 261mm x 76mm 4000m enclosure: 249.5mm x 91mm
Antenna	Internal 10cm
Data Communication Interface	RS232
Operating Temp. Range	-10-60°C
Storage Temp. Range	-20-60°C

Project Technical Specification

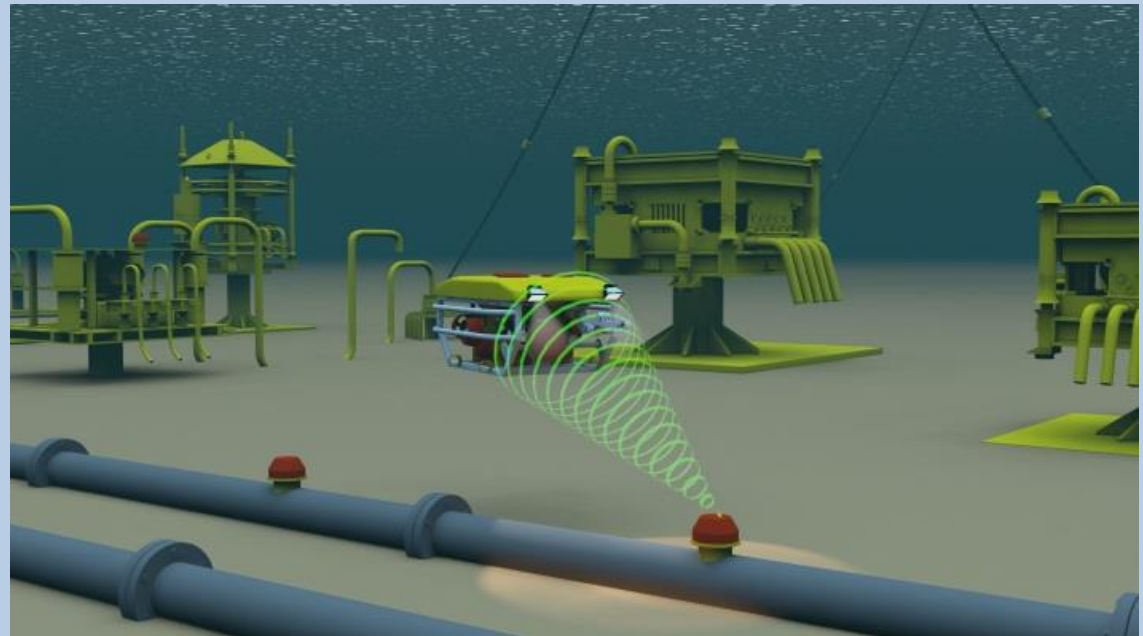


**Transmitter location,
receiver location**

Seatooth PPC integrated with hydrotest skid on pipeline asset at seabed.

Receiver located on ROV.

**Project layout
diagram**



Project Outcome



- Both units were bidirectional and no configuration was required
- The system was ready to plug in and deliver serial communications wirelessly between the test skid and the ROV.
- Hydrotest data was downloaded at high speed despite the high levels of salinity and turbidity.
- Data were collected quickly and safely, freeing up the ROV to undertake other tasks.

Project Success



- The project was successful because the small, low power units can be installed easily on any ROV or subsea system, and the data can be downloaded fast and reliably without any physical connection.

“Use of the Seatooth® PPC optimized the pipeline precommissioning process by enabling a high rate of data to be transmitted over a short distance, providing information quickly in order to make informed decisions,” said *Baker Hughes Process and Pipeline Services Director Andrew Barden.*



- Wireless video streaming up to 4.5m
- Control module integrates with ROV Ethernet port
- Integrates with standard subsea cameras
- **Seatooth[®] Video ON/OFF** controlled by:
 - - ROV mounted **Seatooth[®] S300 Modem**
 - - Internal real time clock
 - - External trigger (Digital input to video)
- Optional wireless network control of external lights



Seatooth[®] Video
PTZ Version



Seatooth[®] Video
fixed camera

Bandwidth	Seawater Range	Antenna	PCB Size mm
78kbps	4.5m	Standard: Internal Option: External 2m rod	484mm X 150mm

Power Supply	Battery Life	Input Voltage Range	Power Consumption
24V	8 Hours	3.6V—28V DC	<p>Seatooth[®] Video: Transmit: 19W Receive: 7.5W Sleep: 350μW</p> <p>Seatooth[®] S300 Modem: Transmit: 15W Receive: 4.5W Sleep: 350μW</p>

i-Tech 7 Project Background



i-Tech 7 was seeking a small subsea wireless camera to mount on an intervention tool. The camera would provide visibility on a subsea structure and at the same time support removal of an internal plug and make the inside of the tool visible during actuation.



A normal tooling camera could have been used but would have required a cable for data transfer between the camera and the ROV, causing a snagging hazard and limiting the movement of the ROV. If the cable had become snagged, the ROV would need to be recovered to replace it, adding additional time and cost to the project.



Project Technical Specification



Range in sea water	4.5m
Depth Rating	350m
Data Rate	78kbps
Power Supply	24V DC
Power (source level)	PPC on skid battery powered, PPC on ROV powered by ROV
Dimensions	690mm x 170mm
Antenna	Internal
Data Communication Interface	Ethernet
Operating Temp. Range	-10-60°C
Storage Temp. Range	-20-60°C
Weight	Seetooth Video Module: 12.6 Kg Seetooth S300 Modem: 16.1 Kg

Project Technical Specification



Camera Specification	High Resolution Colour 650 TVL, 10 Bit Digital Processing, 6 High Intensity LEDs, 50° Diagonal Angle of View, 4,000 or 6,000 Metre Rated Titanium Housing
Additional Features	PTZ function - 360° pan rotation, 90° tilt and 3x digital zoom
Battery Life	8 hours
Seatooth Video deployed by an ROV during the i-Tech 7 project	

Project Outcome



- **Seatooth® Video** streamed live video from inside the tool while it was operational, providing additional accuracy.
- The camera provided visibility throughout the project and without it there would be no way of knowing if the plug had been grasped by the tool or had been successfully unscrewed.
- The project was completed the first time and no additional actions were required, reducing cost and time.

Project Success



- i-Tech 7 engineers knew that cabling would be a hazard in the conditions where the job was located. **Seetooth® Video** transmits data and imagery wirelessly, removing the need for a cable between the ROV and camera and eliminating any downtime needed to repair damaged cables.
- **Seetooth® Video** removed the need for second ROV, which would add cost and complexity to the task.
- **Seetooth® Video** provided immediate recognition of the problem and showed that the plug was not captured by the tool. The tool could be repositioned and the task reattempted straight away.

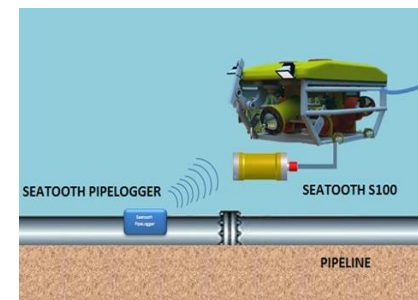
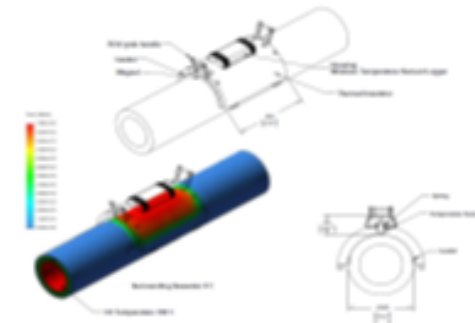
“The camera was a very valuable asset as it allowed us to see what the tool was doing inside the guide. At one point while the tool was removing the threaded plug, the camera showed that we hadn’t fully got hold of it which if the camera wasn’t there the operator would have not been aware”, *commented James Christie, ROV Vessel Project Manager of i-Tech 7.*

Seatooth[®] Pipellogger

The wireless solution in temperature monitoring



- Pipe mounted sensor that measures temperature and pressure
- Options:
 - Wall Thickness
 - Sand Erosion
 - Flow
 - Self Powered
 - Compatible with insulated pipes
- Easy deployment/retrieval by ROVs and divers using magnets or tie-wraps, for temporary or permanent solution
- Data received wirelessly by ROV, diver or AUV at a download rate of 10,000 samples per minute. ROV/diver up to 5m away.
- Up to 400,000 time-stamped temperature data points can be stored in a datalogger
- Can be networked to collect data from sensors in difficult-to-access locations
- Alternative to intrusive hardwired monitoring, no shut down required



Case Study: Pipeline Integrity Management



Seatooth® Pipelogger is due to be deployed by a major oil & gas operator in the North Sea.

This product is successful and appropriate for pipeline monitoring because:

- Provides flexible retrofit of temperature sensors to monitor subsea pipework
- Wireless data recovery subsea by an ROV, AUV, Diver or topside
- Benefits:
 - Low cost deployment & recovery
 - Low cost, flexible data collection
 - Wireless sensor networks to access remote locations



Specification:

Bandwidth	Seawater Range	Data Connection	Datalogger
2.4kbps	5m	RS485	400,00 data points
Power	Battery Life	Upload Rate	Temperature Sensor
18—30VDC	5 years	1500 samples per minute	+/- 200°C

Thank You



WFS Head Office



7 Houstoun Interchange Business Pk, Livingston,
Edinburgh, EH54 5DW, UK
Tel: +44 (0) 845 862 6600



WFS Houston

777 N. Eldridge Parkway, Suite 280, Houston, TX
77079-4497, USA
Tel: +1 (832) 460 4435

www.wfs-tech.com