

# **TDW SMARTTRACK™ SYSTEM REVOLUTIONIZES PIG TRACKING BY USING TWO-WAY, THROUGH-WALL COMMUNICATION BETWEEN THE TRANSPONDER AND RECEIVER**

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## **SUMMARY**

Traditionally pig tracking has been limited to transmission of a signal from a transmitter device located on the pig, generating a signal of fixed frequency which can be detected by a receiving device located on or in close proximity to the pipeline.

In general these systems are set up prior to the pig run at which point signal frequency is selected relative to the type of tracking required. As a general rule a higher frequency is required to track pigs moving at a high velocity to ensure detection as the pig passes the detection unit. Lower frequency settings are utilized when a pig is to be monitored in a fixed location for a greater period of time. With the exception of radio active sources, battery life for the transmitters is almost directly proportional to the frequency of the signal hence a higher signal rate will reduce battery life.

The TDW SmartTrack™ system was developed to overcome the limitations of these systems by introducing through wall communication which allows the transmitter signal frequency to be modified externally. The result is greater flexibility during operations, particularly where these operations require extended monitoring over longer periods of time or where the unit can be put into sleep mode then re-awakened when critical operations re-start.

The units will also uniquely identify each passing pig in multiple pigging operations, log data such as pressure, allowing real time monitoring through the pipe wall.

## **HISTORY**

The TDW SmartTrack™ system was developed originally for use in conjunction with the TDW Offshore SmartPlug™ Pipeline Isolation Tools where monitoring the position of the tools and supporting pigs is critical. Many of the isolation projects required the isolation tools to be located in position for extended periods until pipeline modifications could be completed. In some cases this could be upto 12 months duration.

Utilising SmartTrack™ the plugging modules could be located accurately (+/- 2cm) prior to isolation, then during isolation, the units would be left in sleep mode until the plug train was ready for removal from the pipeline.

The SmartTrack™ System is now available as a stand alone service for general pigging operations and is already being utilized in the field in more challenging projects.

## **TECHNOLOGY**

### **SmartTrack Transponder**

The SmartTrack™ Transponder is attached to the pig and emits an electro magnetic Signal which can be received from outside the pipeline.

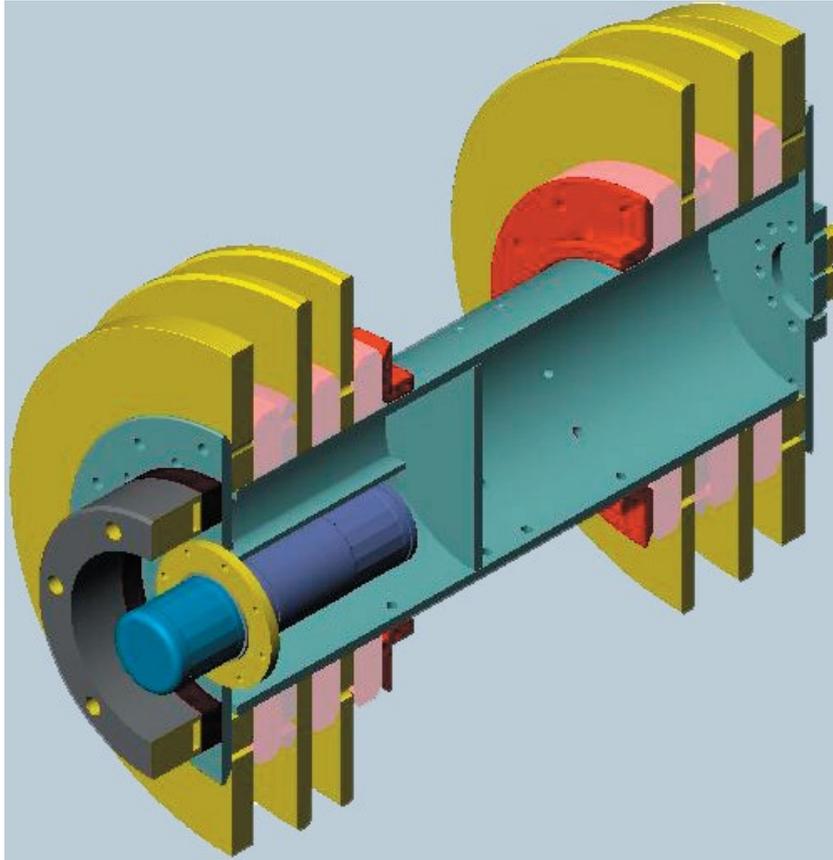


Fig.1 D116 Transponder with a typical installed setup in a service pig. Unit is held in a flange plate with two spring clips as a typical application.

Pigs with transponders can be loaded into launchers in dormant mode and activated at a later date.

The output power of the SmartTrack™ transponder is adjustable at any time during a project to optimize battery lifetime, pigging speed, burial depths and positioning accuracy. The transponder sends out a unique identification code to enable the simultaneous tracking, locating and identification of multiple pigs. SmartTrack can be used to monitor pipeline parameters (such as pressure), store the data or allow interrogation from the vessel.

Offers active monitoring of pressure during applications (e.g. such as pipeline isolation with a high friction pig train or pressure testing a new pipeline)

Designs are ATEX compliant with certification anticipated Q1 2009

#### Specifications

- Pig size range >10"
- Ping repetition rate 0.4 – 8 seconds. Adjustable according to pigging speed
- Ping frequency 8 – 22Hz. Adjustable according to pipeline wall thickness
- Typical operational range 9 meters (30 ft) in air  
4 meters (13 ft) through pipe with 16 mm (5/8") wall  
2 meters (7 ft) through pipe with 25 mm (1") wall

- Positioning accuracy geometry Better than  $\pm 50$  mm ( $\pm 2$ " ), depending on pig body geometry
- Battery life active mode 4 – 400 days depending on setup
- Battery life dormant mode > 1 year
- Pressure rating 300 bar (4351 psi)
- Operating temperature 0 – 60 °C (32 – 140 F)
- Weight in air / water 18.2 / 13.8 kg (40 / 30 lbs)
- Housing Material Stainless steel

### SmartTrack™ Topside Transceiver

The SmartTrack™ Topside Transceiver is used in combination with the SmartTrack™ PDA to locate, track and identify pigs inside pipelines both topside and onshore.

The unit communicates wirelessly with the SmartTrack™ PDA using Bluetooth technology. The light weight and small size of the Topside Transceiver make it perfect for applications where the operator needs to move freely.

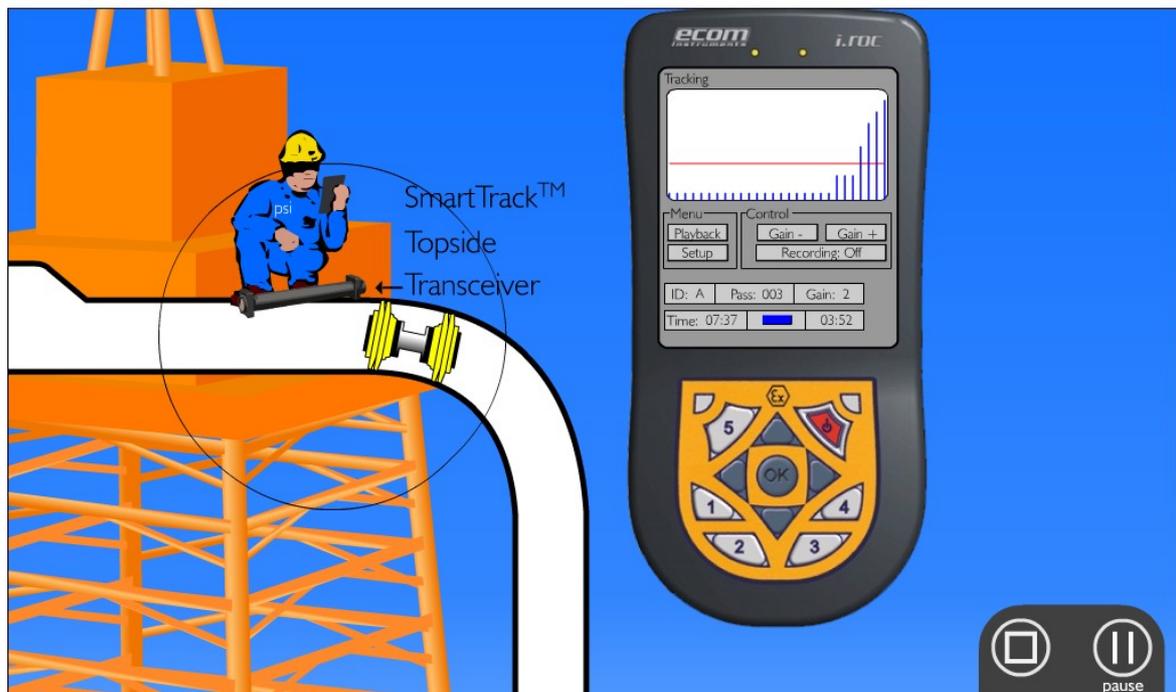


Fig.2 Image displaying the Transceiver and the Hand Held PDA used to control, monitor and record from it.

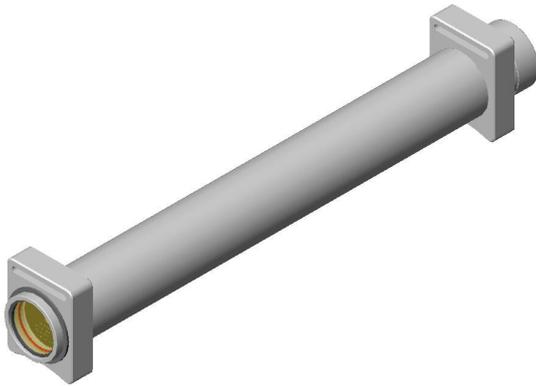


Fig 3. The transceiver is both light and robust. It can be attached to the pipeline or riser at specified locations or utilised manually.

#### Specifications

• Ex designation	II 2 G EEx ib IIB T4
• Battery type	5 C-size alkaline
• Battery lifetime	24 hours
• Operating temperature	0 – 60 °C (32 – 140 F)
• Weight	2.7 kg (6.0 lbs)
• Housing material	PEHD

#### **SmartTrack™ PDA**

The SmartTrack™ PDA is used for monitoring pig ID and pig location.

All transponder functions such as ID code, power output, on/off etc., can be set and modified through the use of the PDA in combination with the Topside Transceiver.

The pigging data is recorded and can be interpreted by playing back the log file in the SmartTrack™ software on the PDA. The log file can be transferred to a PC and, by using the SmartTrack PC software, it could be further inspected.

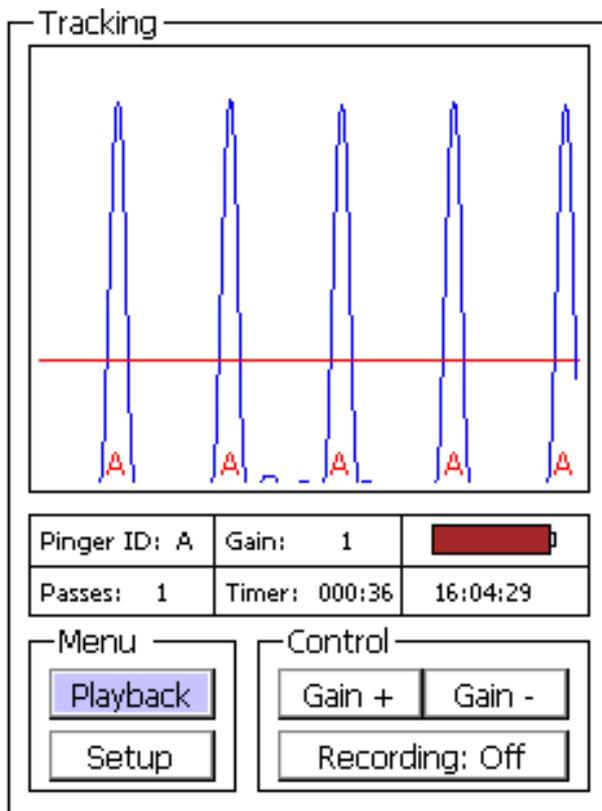


Fig.4 Log from PDA. In this scenario the readout is from a stationary pig "A"

## Diver Held Receiver

The Diver held receiver enables the diver to locate, track and identify pigs subsea.

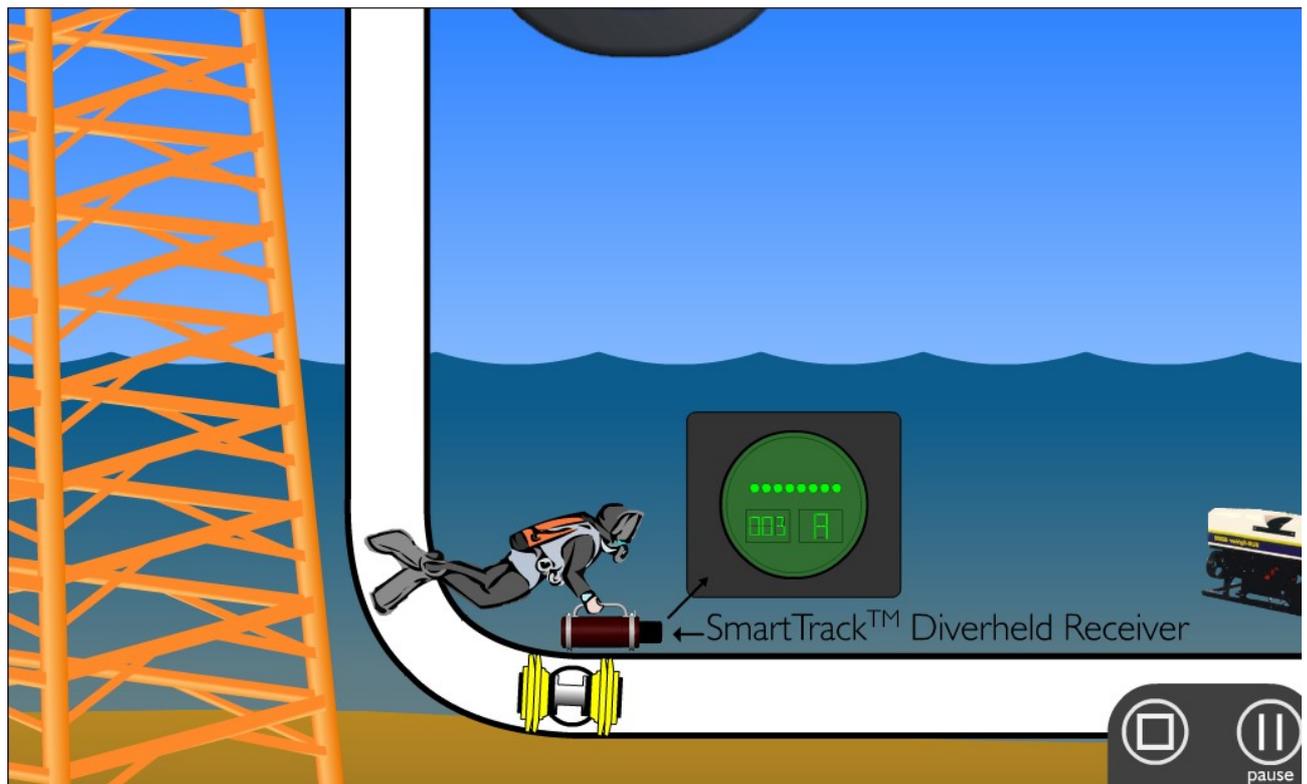


Fig. 5 Diver Held Receiver

It has a high intensity LED display that shows the unique ID of each pig, transponder signal strength, and number of pigs/transponders that have passed and been identified.

### Specifications

- |                         |                                    |
|-------------------------|------------------------------------|
| • Battery life          | 5 days                             |
| • Max water depth       | 300 meters (1000 ft)               |
| • Operating temperature | 0 – 60 °C (32 – 140 F)             |
| • Weight in air / water | 15.2 kg / 7.0 kg (33.5 / 15.4 lbs) |
| • Housing Material      | POM-C                              |



Fig. 6 Diver Held Receiver showing actual display.

### **SmartTrack™ Remote Transceiver**

The Remote Transceiver is used in conjunction with a standard laptop and signal converter to communicate with the transponder in the pipeline.



Fig. 7 SmartTrack™ Remote Transceiver

The Remote Transceiver can be mounted on an ROV body or held in an ROV arm while signals are fed through the ROV umbilical. Communication can be through acoustic modem, cable or ROV umbilical. In this configuration the Remote Transceiver offers all the functionality afforded by the Topside Transceiver stated above.

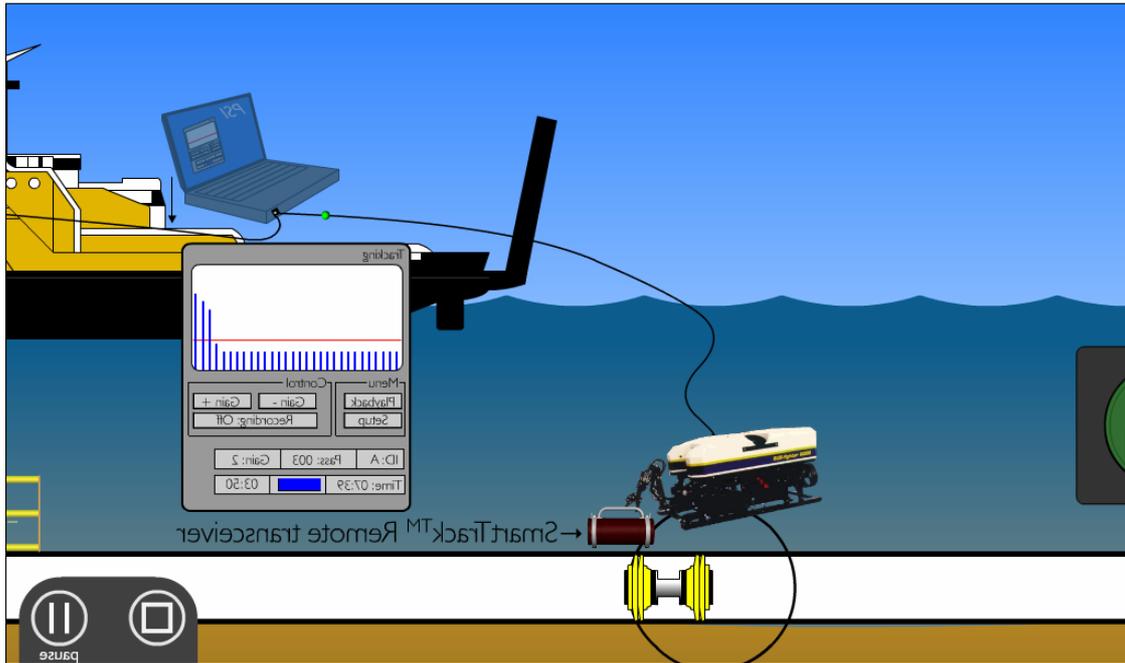


Fig. 8 ROV mounted Remote Transceiver

**Specifications**

- Power supply (Cable) 90 – 260 VAC / 50-60 Hz for cable connections
- Power supply (ROV) 24 VDC / 0.5A for ROV connections
- Interface RS485 and RS232
- Max cable length 1200 meter (4000 ft)
- Max water depth 1000 meter (3300 ft)
- Operating temperature 0 – 60 °C (32 – 140 F)
- Weight in air / water 15.4 / 7.3 kg (34.0 / 16.1 lbs)
- Housing material POM-C

## SmartTrack™ Subsea Communications Skid

The primary application for this system is wireless offshore pig tracking during projects that otherwise require the vessel to be moved or vessels to be added



Fig. 9 SmartTrack™ Subsea Communications Skid

The skid incorporates a Subsea Transceiver, modem and batteries and an acoustic transducer which allows control and communication with a vessel within the vicinity of the operation. The same vessel can communicate with more than one of these skids at different locations on the sea bed during more complex operations.

## APPLICATIONS

The flexibility of the SmartTrack™ system lends it's self to many applications. The following examples show what is possible with the system.

### High Friction Pig Train

The use of High Friction Pigs and pig trains has always relied upon knowing the characteristics of the pigs in the specific pipeline where isolation is to be achieved. Traditionally this application requires that the High Friction Pigs are purpose built and thoroughly tested prior to use in the field. Assuming that this is done correctly, the High Friction Pig provides a good solution for low pressure isolations.

Traditionally the High Friction Pig train is pigged into position and once isolation is achieved, there is little indication to tell what is happening to the train during the course of the isolation. In the offshore environment, specifically where divers are involved, the need to monitor the parameters across the isolation is a requirement to ensure that any changing state becomes apparent as it happens.

In the case of the High Friction Pig Train, SmartTrack™ can be utilized to provide constant monitoring across the isolation.

Typically each High Friction Pig in the train is fitted with a SmartTrack™ Transponder which is set up to measure pressure throughout the operation. Once in place SmartTrack™ Transceivers are secured to the pipeline allowing real time monitoring of the pressure across the train in addition to individual pig movement should it occur.

This reassurance provided throughout the operation has not been possible in the past



Fig.10 TDW Offshore High Friction Pig

## **CONCLUSION**

Through Pipe Monitoring offers significant advantages when pig tracking specifically allowing control of the tracking device parameters and interrogation as required from a remote location.

The corresponding flexibility offered by such a system can save significant time in critical subsea operations by allowing the transmitter frequency to be changed mid operation or by putting the tracking unit into sleep mode when not required. This extends battery life to allow optimum settings for any given situation to be selected.

In addition to the flexible functionality the units can record and transmit pipeline parameters such as pressure to allow real time monitoring during critical operations.

During High Friction pig isolations, a high degree of confidence is assured by constant through pipe real time monitoring of the pressures at each point in the train and detection of any pig movement for the duration of the isolation.

