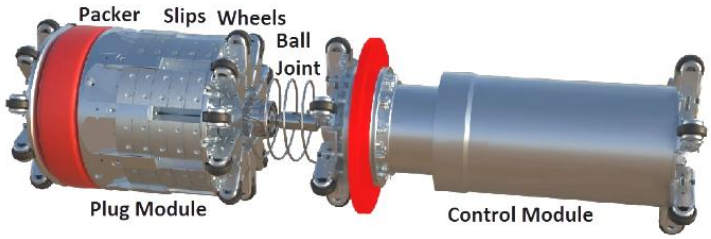
T.D. Williamson
Pipeline Performance™

Service Data Sheet

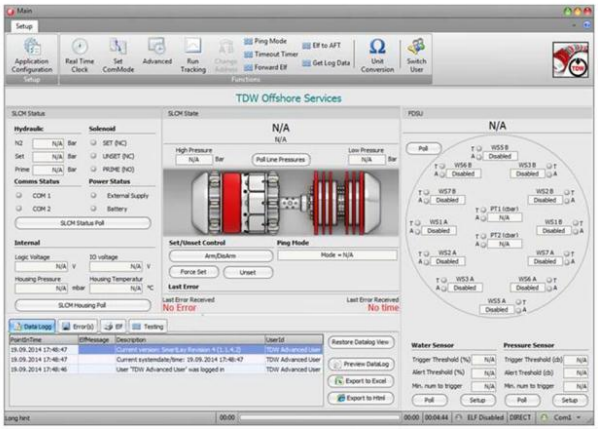
SmartLay™ Pipeline Flooding Prevention System



The T.D. Williamson (TDW) SmartLay™ system protects pipelines from accidental flooding caused by wet buckle during pipe lay operations and dramatically reduces the consequences of such an event. If an offshore pipeline being laid is breached at the over bend or sag bend, seawater will enter and flood the line (e.g., wet buckle). In such cases, the water depth, pipeline size, and barge tensioner capacity may combine to create an undesirable situation where the lay vessel may lose control of the pipe and suffer topside damage. Seawater and soil contaminants will enter the newly laid line, compromising its long-term integrity. In this scenario, expensive and time-consuming commissioning spreads will be required to clean and dewater the pipeline before it can be picked up by the vessel to continue the lay operation. It is therefore critical to control and protect the pipe as it is laid. The TDW SmartLay system, when inserted into a pipeline, protects it by activating as soon as the system sensors detect seawater or pressure increase. The plug module of the SmartLay system will immediately seal off the pipe, preventing further entry of seawater and other damage to the pipe and lay equipment.

BENEFITS

- **Prevents line flooding during pipe lay** in both shallow and deep waters, thereby protecting the newly laid pipe
- **Eliminates costs associated with standby dewatering spreads**
- **Customized to meet project requirements.** One or more SmartLay systems can be deployed at any position in the lay pipe
- **Operates automatically and independently of lay vessel**
- **Sets rapidly on detection of seawater or pressure changes**
- **Readily interfaces with client-preferred towing and communication arrangements**
- **Versatile** and can function with either a cable/umbilical or a remotely operated pulling device
- **Can be reused and reset multiple times without recovering the equipment to the surface**
- **Allows remote monitoring of water ingress through the use of an umbilical or an ROV-held SmartTrack™ transceiver**
- **Easy to operate through a Graphical User Interface (GUI).**



View of SmartLay™ control interface

FEATURES AND FUNCTIONS

- The plug module is based upon the well-proven DNV GL Type Approved SmartPlug® technology.
- The entire system is towed inside the pipeline behind the lay vessel, with the interface flange at either end being connected to client-supplied towing arrangement.
- The wheel support systems have been tested to support the weight of the plug module up to a distance of 1200 km (745 mi).
- If required, a “weak link” can be incorporated to allow the tow line to disconnect in the event that tool sets.
- The system is directly controlled from an onboard laptop operated through a GUI. The system can actuate valve operations, check tool function, send signals when tool sets, and monitor pipeline pressures on both sides of the tool.
- There are two possible methods of communication: primary communication is through an umbilical, while secondary is through TDW’s proprietary SmartTrack system, based on extremely low frequency (ELF) through-wall signals that can be detected by an ROV-held or diver-held transceiver. ELF communication is mainly for contingency purposes.
- Functionalities:
  - ✓ **Rapid setting of plug module (ca. 1 sec but tool size dependent)**
  - ✓ **Automatic setting upon contact with seawater**
  - ✓ **Automatic setting on detection of pressure increase above a configurable pressure threshold**
  - ✓ **Automatic setting on meeting an obstruction in the line, such as a dry buckle**
  - ✓ **Forced setting and unsetting of plug module at any time through commands sent to control module**
  - ✓ **Preconfiguration allows the system to set automatically in case of communication failure.**

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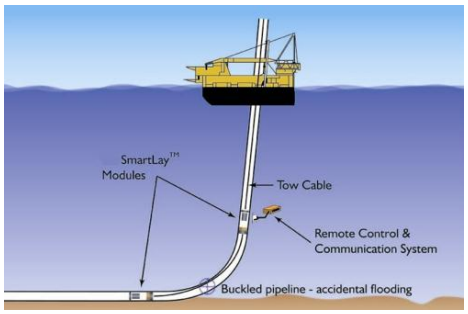
OPERATIONAL OUTLINE

One or more SmartLay™ systems can be used to protect the riser (suspended section), laid section, or both sections of the pipeline during either J-lay or S-lay operations (shown below).

Typical Use in J-Lay Operations

In a J-lay operation, two SmartLay systems can be used as there is only one bend.

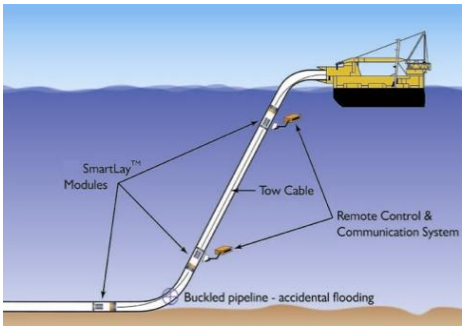
- The first can be deployed to a point above the sag bend to protect the riser from flooding if a sag bend buckle occurs.
- The second can be deployed to a point past the sag bend to prevent the already laid section of the pipeline from flooding if a wet buckle occurs at the sag bend.



Typical Use in S-Lay Operations

In an S-lay operation, three SmartLay systems can be used to ensure maximum safety during the operation.

- The first can be deployed to a point past the overbend to protect the pipeline, including the riser, from flooding if an overbend wet buckle occurs.
- The second can be deployed to a point above the sag bend to protect the riser from flooding if a sag bend buckle occurs.
- The third can be deployed to a point past the sag bend to prevent the already laid pipeline section from flooding if a wet buckle occurs at the sag bend.



APPLICATIONS

- Prevents damage consequent to flooding of riser section during pipe lay from vessel (by S- or J-lay method)
- Prevents flooding of laid section of a pipeline on the seafloor during pipe lay
- Allows pipe lay activities to be temporarily abandoned in inclement weather and later resumed

Indicative dimensions and weights of a typical SmartLay™ system

Size (inches)	Dimensions L × D (mm)	Weight (kg)
24	2566 × 567	1300
29	2808 × 711	2100
32	2850 × 735	2300
36	2854 × 904	2900
42	3004 × 1024	3900

OPERATING SPECIFICATIONS

Compatible pipeline materials	X52 – X70 or equivalent; tools for stainless steel pipes on request
Operating pressure	Up to 250 bar (3600 psi)*; higher pressures require special configurations
Operating temperatures	Min. 0 °C (32 °F) Max. +50 °C (122 °F)
Water depth	Currently 2500 m (8200 ft); greater depths can be evaluated
Activation (setting) time	ca. 1 sec but tool size dependent
Pipeline length	Currently qualified for 1200 km (745 mi); longer pipelines can be evaluated
No. of settings/unsettings	Multiple activations possible based on project requirements
Interface with other tools	Configurable interfaces
Configurable Flooding Detection Sensor Units (FDSU)	Water (fresh water vs. saline) High accuracy pressure sensors
Battery type	Lithium (UN-certified for shipping)
Battery life of the control module in standby mode	More than 1 year
Communication	Primary: Cable Secondary: ELF
Contingency release	Through ELF

*Operating pressure is dependent on dynamic loads