

Subsea automatic pig launcher (SAPL)



NOV has extensive experience in design, fabrication and operation of subsea pigging systems. Our pigging system experience helps us to see the total picture.

PRODUCT BENEFITS

PRE-COMMISSIONING PIGGING

Field proven technology

- Use field proven topside pigging technology with standard PLR design, interfaces and operation.

High reliability

- Controlled and simple pigging operations.
- Lay down pad-eyes on PLR, no need for (FLT) flow line lifting tool.

SUBSEA AUTOMATIC PIG LAUNCHER

Cost reduction

- Enable low cost pigging operation by minimise use of vessel with ROV.
- The high OPEX associated with pigging operations often deter operators from using the technology leading to failures, production losses, and expensive repair operations.
- Lower CAPEX by using single flowlines. No round pigging.

Enhanced integrity

- Lower cost allows frequent pigging operations, thus enhancing integrity.

Availability

- Pig any time and on-demand.
- Reduction in lead time in preparing for pigging operation.

Health, Safety and Environment

- Improved safety/minimum vessel activity above launcher.

Broader applicability

- Applicable for pre-commissioning, inspection, liquids and solids management and brownfield retrofit applications.

Faster operation vs. conventional topside pigging

- Shorter time to complete pigging operation.
- Pig at higher operating pressure.

Subsea automatic pig launcher - Pre-commissioning and operational pigging

NOV offer pig launchers and receivers for RFO/commissioning operations and operational pigging including pig sensor technology. The pig launcher designs are characterized by reliability, in addition they offer flexibility for a variety of pig types. Our experience enables us to provide a field-proven design that will save critical vessel time during operations.

Cost effective pigging includes planning for any subsea operational and/or inspection pigging up front in the field layout design phase. Our Pig Launcher Systems are reliable and safe, and will meet the field pigging requirements. The Subsea Automated Pig Launcher (SAPL) is an operational pigging system designed for individual subsea launching of pigs, from a barrel/cassette containing several pigs to a pig receiver. The process is controlled from a remote control centre, typically a platform. The SAPL is now under qualification and will be first of its kind for subsea operations.

The SAPL will simplify operations related to:

- Wax control
- Slug control
- Intelligent pigging (inspection)
- Pre-commissioning pigging

Pre-commissioning pigging

The commissioning pig launcher/receivers (PLR's) are engineered and produced mainly for the start-up phase of a project, thus primarily used for dewatering (Flooding Cleaning and Gauging) pig-trains. NOV has delivered between 90-100 PLR's to a variety of installation contractors.

Solutions for cost effective pigging operations:

- Standardized PLR design.
- Standardized interface for valves and stabs.
- Standardized pigging operation procedure.
- Lay down pad-eyes on PLR, no need for (FLT) flow line lifting tool.

Operational pigging

NOV has developed operational pigging systems, which can be used for both cleaning and intelligent pigging without causing production shut down. The operation can be performed from subsea to topside or from subsea to subsea, such as:

1. Intelligent inspection pigging operations for inspection of the pipelines, e.g. monitoring of corrosion inside the pipeline.
2. Cleaning of pipelines to keep the pipeline open for production and remove wax, slug or other debris.

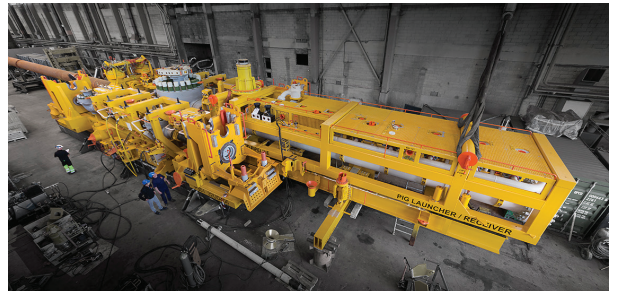
Solutions for cost effective intelligent pigging:

- Use of carbon steel pipelines normally requires intelligent pigging for corrosion monitoring, thus subsea pigging enables low cost carbon steel pipelines (Corrosion Resistant Alloy (CRA) → Carbon Steel (CS)).
- Avoid production shut down during pigging.
- Field specific solutions for kicking pigs into the production fluid.
- Avoid/minimize harmful release to sea.
- Improved safety, e.g. Minimize use of support vessel during pigging operations.
- Ensure reliable production and clean pipes.

A Subsea Automatic Pig Launcher has been developed for individual launching of cleaning pigs.



Pre-commissioning pigging



Polarled pig launch receiver (PLR)



Gjøa: subsea-to-subsea intelligent pigging operation

Subsea automatic pig launcher - SAPL

SUBSEA AUTOMATIC PIG LAUNCHER (SAPL)

As a response to the need for smarter, more automated and less expensive subsea solutions, NOV is qualifying the SAPL for remote launching of individual pigs, from a cassette containing 2-10 pigs. The pig launcher control system will interface with a topside control system using a standard communication interface.

Interfaces

The base case interface for the SAPL is a PLEM structure. Additionally, the SAPL offers a possibility of being installed directly onto the manifold structure or connected to a manifold via a spool.

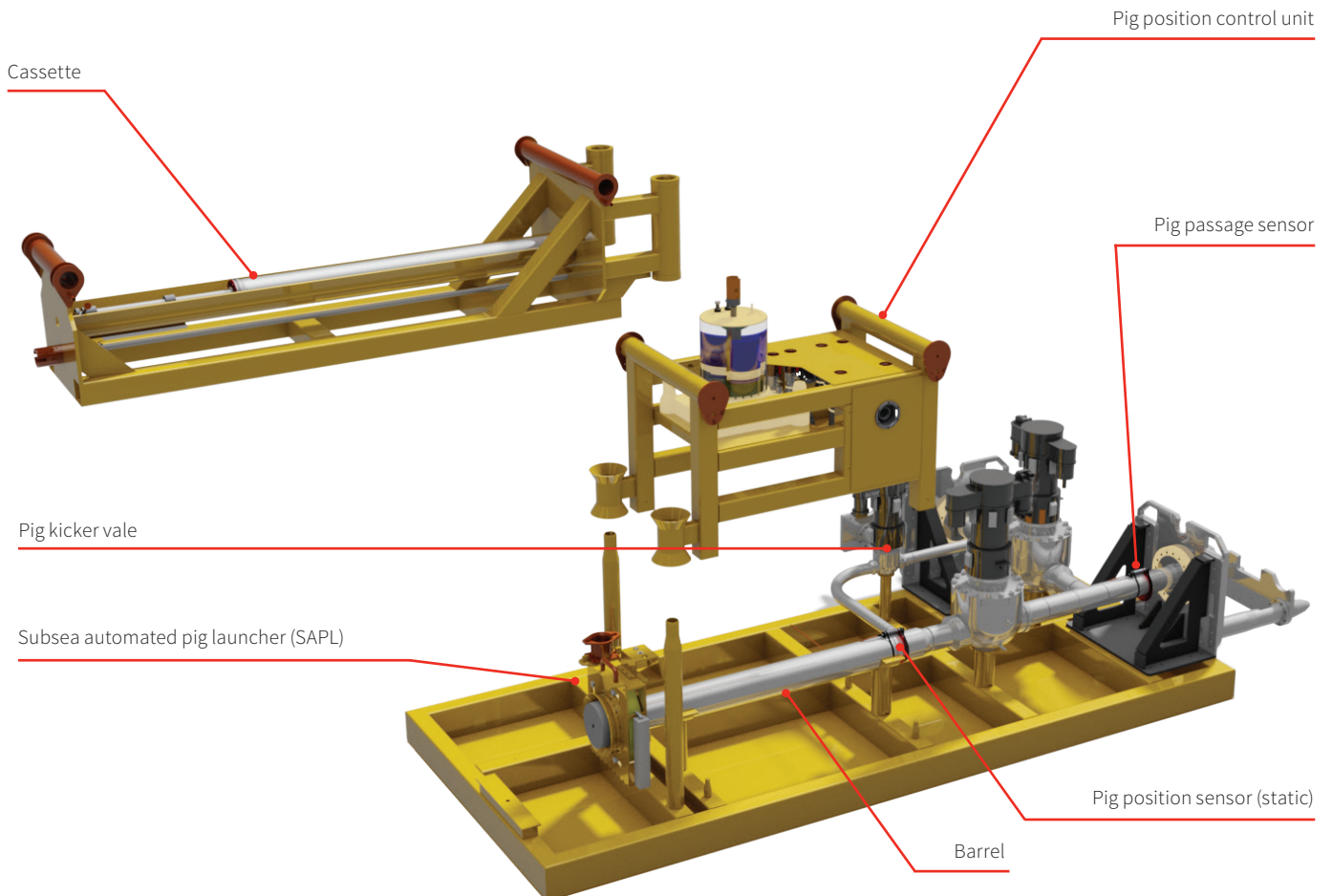
Internal pig cassette

The internal pig cassette, which holds several pigs and enables easy replacement, can be designed to handle:

- Pre-commissioning and commissioning pigs.
- Wax removal pigs.
- Inspection pigs.

FEATURES

- Subsea launching (no platform required)
- Remote launching (no vessel or ROV required)
- Multiple-pig cassettes reduces the number of trips by service vessel
- No round trip pigging required i.e. improved production uptime, no need for dual pipelines
- Inspection pigging from the same unit
- Pre-commissioning operations possible with ROV support/control only
- Additional sensors may be incorporated for redundancy
- The SAPL include dual barriers to sea, ensuring a robust and sustainable system with an ROV operated ball valve incorporated to allow safe replacement of pig cassette during production



Subsea automatic pig launcher - SAPL

Key elements

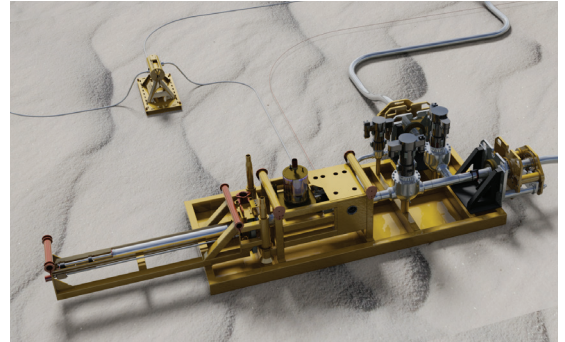
The SAPL comprises the following key elements:

- Insert cassette for storing pigs to be launched. It is inserted into the SAPL in a pipe-in-pipe arrangement, having a pressure retaining connector in its rear end and a hydraulic stab for fluids to the drive pig
- A drive pig (or piston) arranged at the rear end of the cassette, pushing pigs to be launched stepwise forward
- A displacement cylinder feeding a predefined volume to the drive pig
- Piping, valves and actuators
- Magnetic Pig Position Detector, one off to verify that the first pig is in a launch position. A second to verify that the pig has passed the production Tee and is in the well stream
- Subsea Control Module
- Electrical and hydraulic flying leads with associated connectors and MQC plates
- PLEM, Spool and Umbilical with SUTA (if required)

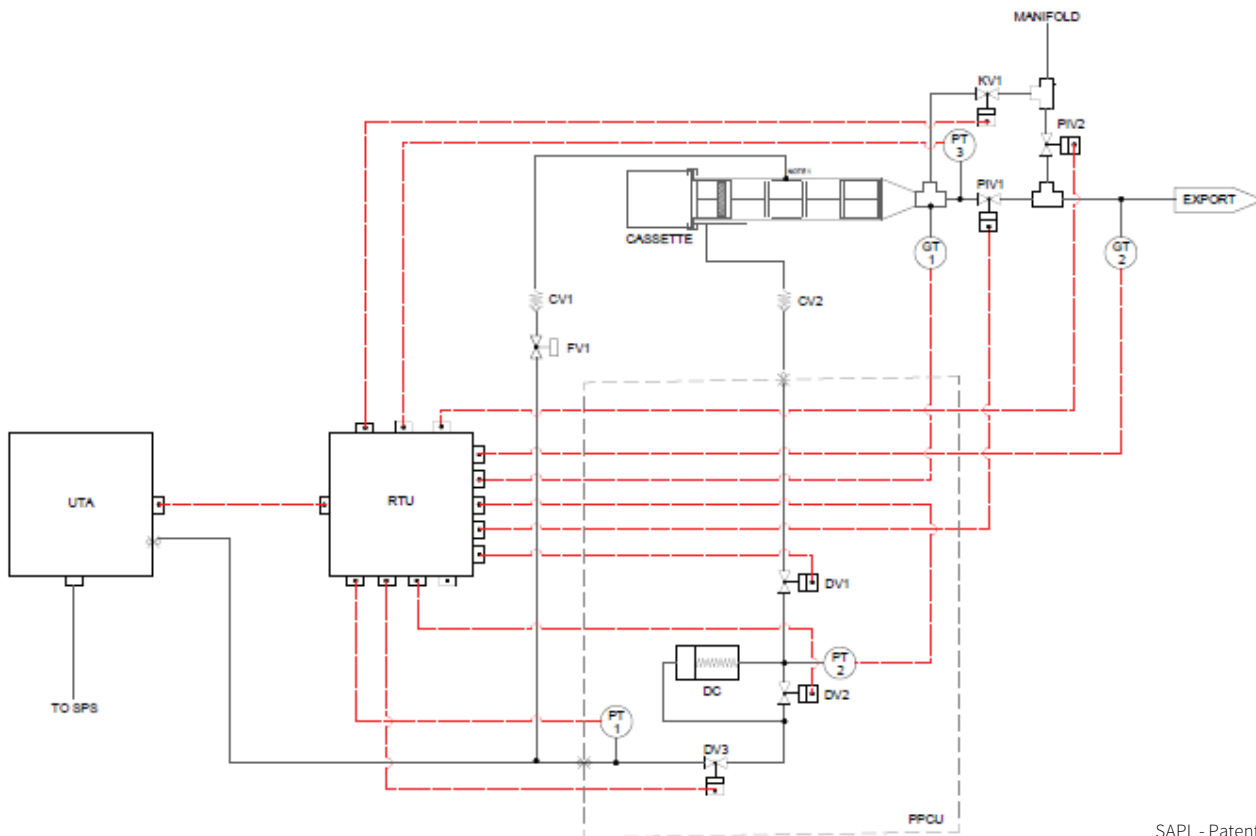
TECHNICAL SPECIFICATIONS

DESIGN LIFE:	25 years
PIG KICKER MEDIUM:	Well Stream/MEG
PIPELINE OD:	6" - 42"
NUMBER OF PIGS PER CASSETTE:	2 - 10

*Specification will be adapted to customer needs



Subsea Automatic Pig Launcher (SAPL)



SAPL - Patented Technology

Subsea Production Systems develops, produces and markets some of the strongest and most advanced subsea systems. Subsea Production Systems is a Business Unit in National Oilwell Varco (NYSE:NOV) which supplies customer-focused solutions that best meet the quality, productivity, and environmental requirements of the energy industry.

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