

# INTEGRATED ACOUSTIC UNIT (IAU)

NON-INTRUSIVE, REMOTE OFFSHORE  
PIPELINE INTEGRITY MONITORING DURING  
LAYING ACTIVITIES



# WHO WE ARE

We are a global leader in the engineering and construction of major projects for the energy and infrastructure sectors, both offshore and onshore. We are a “one company” with distinctive competences, technological innovation capabilities and high-tech assets, able of identifying and developing multiple solutions to meet our clients’ needs for a sustainable business.

## THE INTEGRATED ACOUSTIC UNIT (IAU)

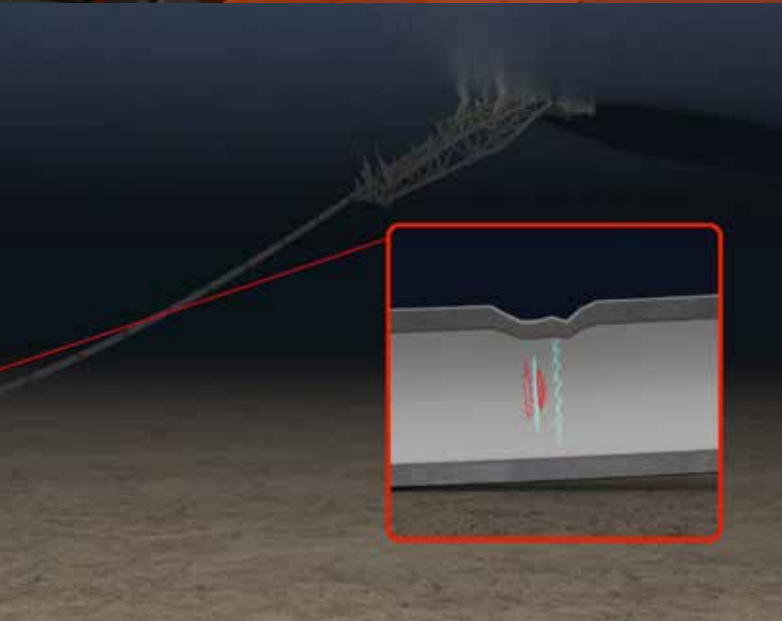
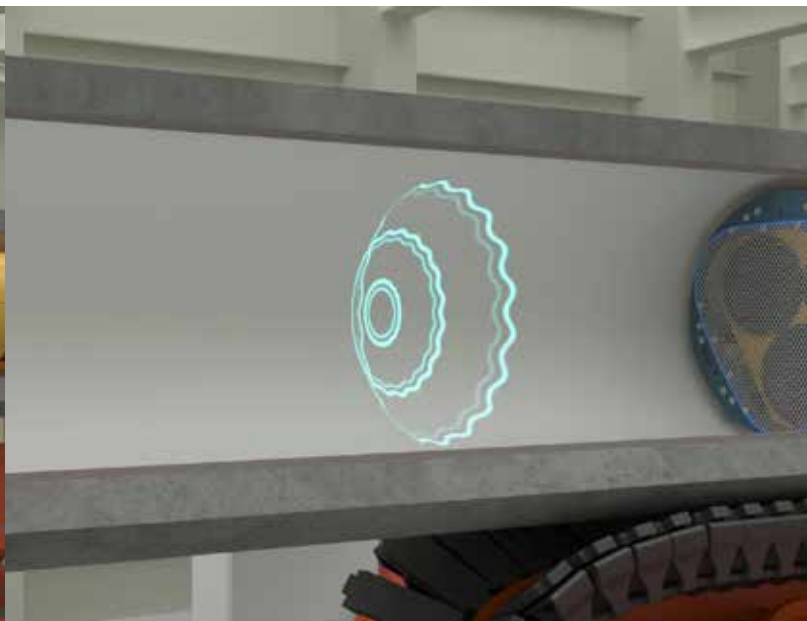
Saipem has developed a novel tool, the Integrated Acoustic Unit (IAU), based on a non-invasive acoustic technology, for the integrity monitoring of offshore pipeline. This solution addresses one of the main concerns of the offshore pipeline industry, which is how to preserve the pipes internal geometry, monitor potential buckles and the flooding of the line.



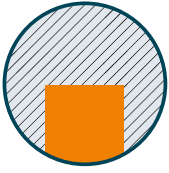
# WORKING PRINCIPLE

The IAU is able to localize obstacles (i.e. pigs, inline item), pipeline deformations (buckles) or detecting and tracking water level inside the pipe, through acoustic reflectometry technique. Endowed with loudspeakers, microphones and dedicated acquisition and control units, the IAU can remotely investigate up to some kilometers of the line, classifying and quantifying the measured anomalies.

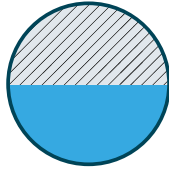
The shape and the arrival time of the reflected signal can be analysed to localize the anomalies and quantify them.



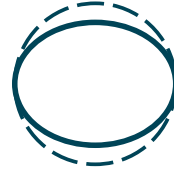
## ANOMALY QUANTIFICATION (OBSTACLE, WATER, BUCKLE)



**OBSTACLE**  
EAR Function



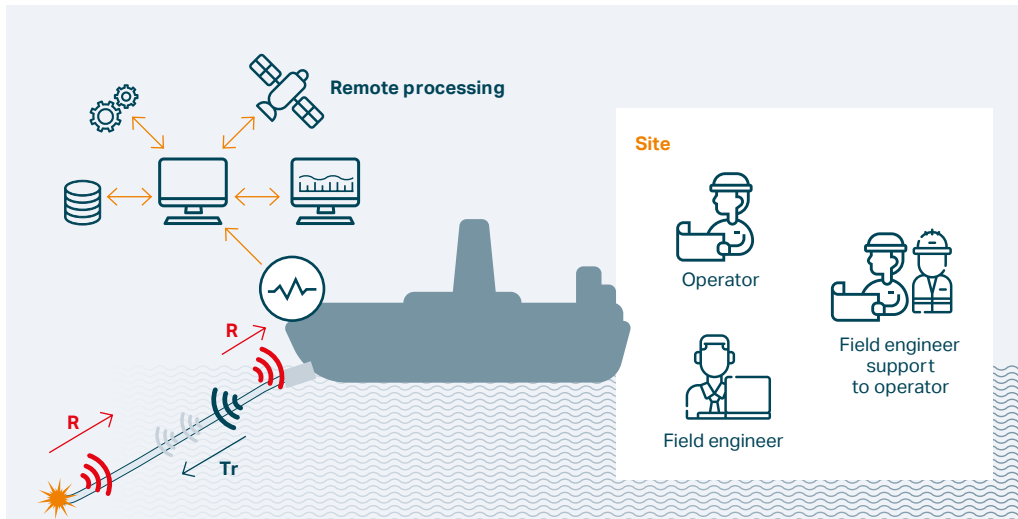
**WATER**  
WaLeM Function



**BUCKLE**  
ABcD Function

## PRINCIPLE OF OPERATION

- Acoustic wavelet emission
- Signal acquisition
- Signal post-processing
- Onboard/online response
- Remote online/offline data advanced processing



# TECHNICAL DATA

- THE IAU CAN BE USED IN PIPELINE WITH A DIAMETER BETWEEN 10" AND 60"
- THE SIZE AND PERFORMANCES ARE PIPE DIAMETER DEPENDENT
- SOME IAU SIZES ARE ALREADY BUILT, OTHER ONES CAN BE BUILT ON PURPOSE
- THE IAU ENABLES TO DETECT VARIOUS ANOMALIES (BUCKLES, OBJECTS, WATER) BY USING ONLY ONE MODULE

## TECHNICAL SPECIFICATIONS

**DIMENSIONS/WEIGHT:**  
( $\Phi$  900 x 850) mm/ab. 270 kg (42" pipe)

**POWER CONSUMPTION:**  
10-1000 W pneumatic – electric

**SAIPEM**  
**IAU**  
INTEGRATED ACOUSTIC UNIT

# OPERATIONAL APPLICATIONS

During a pipelaying operation, the Integrated Acoustic Unit (IAU) can perform, almost in real time, the following functions:

- Water Level Monitoring Mode to identify the presence, position and velocity of a water front inside the pipe (i.e. the monitoring of the laying catenary flooding after an accidental wet buckle)
- Extended Acoustic Radar Mode to identify and localize obstacle inside the pipe (i.e. to localize the position within the pipeline of an item accidentally lost during laying operations)
- Acoustic Buckle Detection Mode to identify and localize buckles within the laying catenary, to support the assessment of the pipeline pigability

**DNV QUALIFIED DNVGL-RP-A203**



## OPERATIONAL APPLICATIONS & TECHNOLOGY STATUS

<b>2010</b>	LNG Livorno	(EAR function) Successful localization of a lost buckle detector@ 3km
<b>2014</b>	Italy Test field	(ABcD function) Full scale testing for internal validation process
<b>2014</b>	Singapore shallow wate sea trial	(ABcD function) Prototype on Castorone
<b>2015</b>	South Sream Project	(ABcD function) Successful integration test for S7000 vessel
<b>2015</b>	Ichthys Project	(ABcD function) Operational test on board Castorone in standard laying operation
<b>2017</b>	DNV Technology Qualification Plan	(ABcD function) Statement of Feasibility & Endorsement of Qualification Plan Certificates
<b>2022</b>	Statement of Qualified Technology	IAU for 42" - 48" pipelines
<b>2022</b>	Statement of Qualified Technology	IAU for 30" - 36" pipelines
<b>2023</b>	IAU for 30" - 36" pipelines, in operation onboard Saipem	
<b>2024</b>	IAU for 30" - 36" pipelines, in operation onboard Saipem	



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**LET'S KEEP IN TOUCH**

