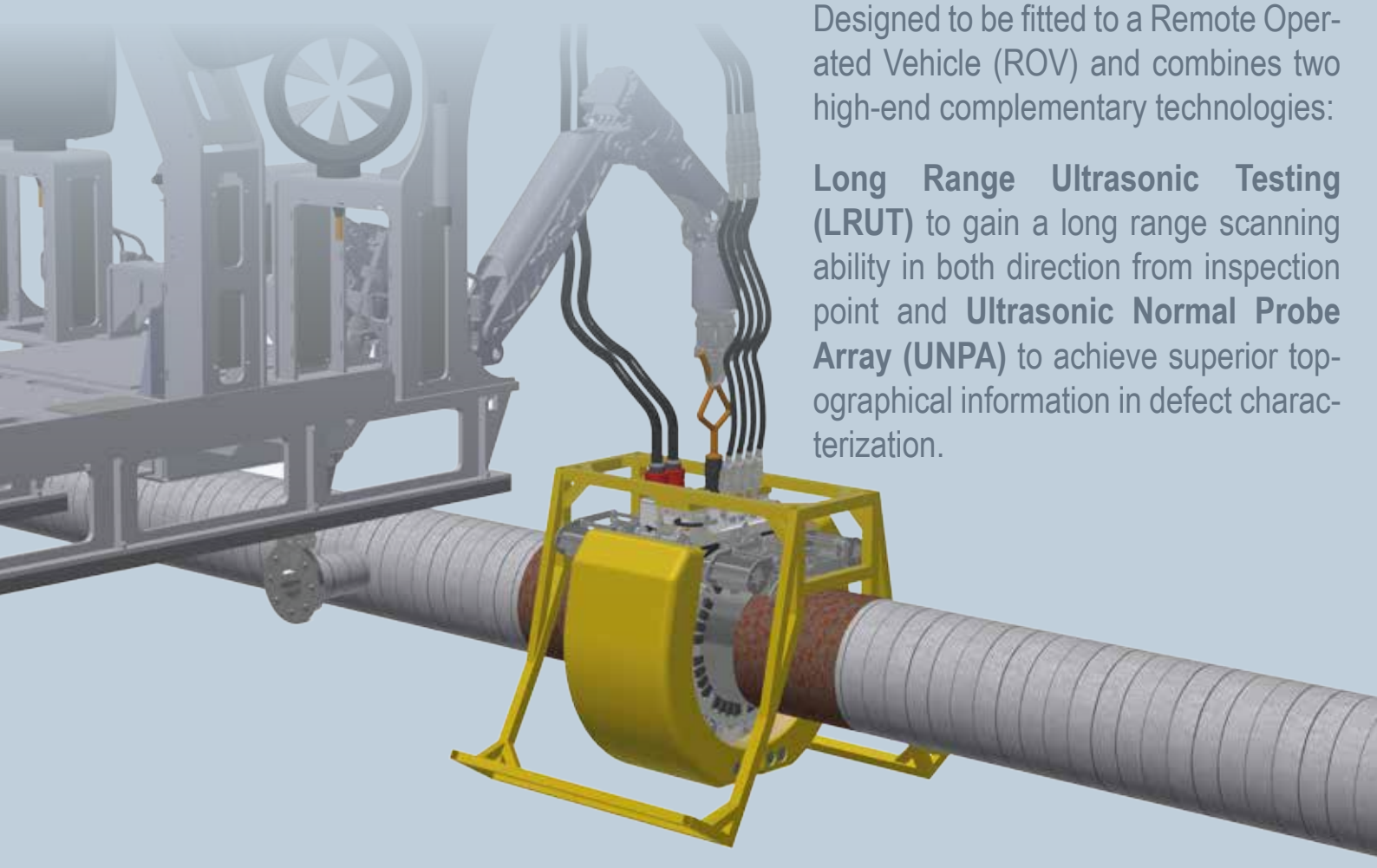
Ole Jørgen Bratland

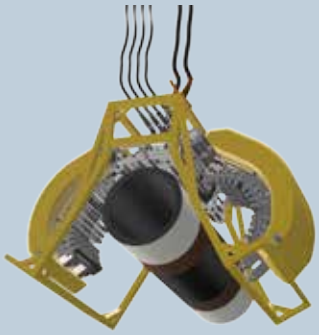
VERNE

subsea pipeline and structural integrity assessment tool



Designed to be fitted to a Remote Operated Vehicle (ROV) and combines two high-end complementary technologies:

Long Range Ultrasonic Testing (LRUT) to gain a long range scanning ability in both direction from inspection point and **Ultrasonic Normal Probe Array (UNPA)** to achieve superior topographical information in defect characterization.



The VERNE® system

VERNE® is an Non-Destructive Test (NDT) measurement tool designed to be fitted to a range of underwater Remote Operated Vehicles (ROVs) and combines two high-end complementary technologies: Long Range Ultrasonic Testing (LRUT) to gain a long range scanning ability in both direction from the inspection point and Ultrasonic Normal Probe Array (UNPA) to achieve superior topographical information in defect characterization.

The purpose of LRUT is screening of pipelines or tubular structures in order to establish the presence or absence of defects. If LRUT proves that there are defects present at a given location, then the ROV will move the inspection unit to that specific location for detailed characterisation and sizing of the defect via UNPA.

The compact light-weight NDT measurement tool is a modular system, combining a Clamp, a Hydraulic system and a Canister with electronics. With easy connection to the ROV by an ethernet cable and a standard fish-tail handle mounted on top of the VERNE® Clamp that fits to the ROV manipulator arm, and the VERNE® system is ready for use.

VERNE®, through rapid, automated, accurate, and cost-effective NDT, will be instrumental in addressing the urgent need for extending offshore asset lifetimes and postponing their costly decommissioning while eliminating the risk of catastrophic failures.

The VERNE® Innovation

The project VERNE® originated as an European Commission FP6 project primarly for LRUT inspection of Risers (2006-2008).

The following SubCTest FP7 project aimed to use Alternating Current Field Measurement (ACFM) and Long Range Ultrasonic Testing (LRUT) sensors to inspect underwater pipelines and tubular structures. This project was finalized in a laboratory tank of the effectiveness of both types of sensors.

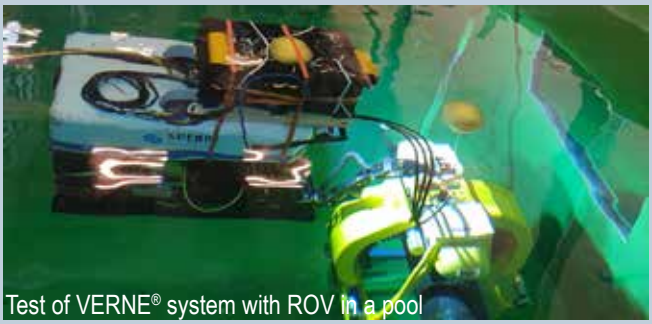
Subsequently, the project was offered a grant from the European Commission to validate the technology at Technology Readiness TRL7 and the follow-on project was entitled SubCTestDEMO. This project resulted in a prototype validated at TRL7 in a subsea environment using a work class ROV to test a subsea pipeline.

Following this successful outcome, in 2017, the two remaining SMEs Dacon AS and I&T Nardoni Instititute SRL were awarded a Horizon 2020 development project by the European Commission. The mandate of this project was to commercialize an NDT measurement instrument capable of screening tubular structures for loss of wall thickness in a subsea environment.

Based upon an extensive test program of both laboratory pool and open water tests, and in cooperation with an independent ROV manufacturer the VERNE® system has proven to be robust and reliable. Through close cooperation with TWI Ltd the VERNE® system has been validated to TRL9.

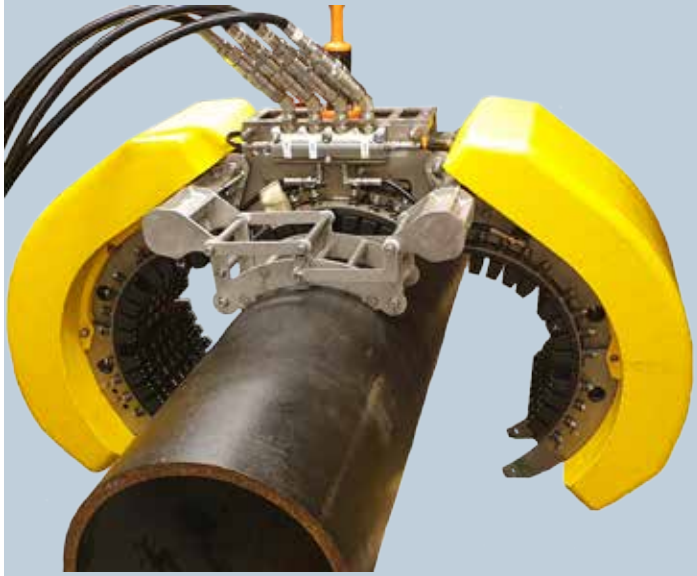
Part of Technical Team

Robust and handyness transportbox for the Clamp



Test of VERNE® system with ROV in a pool

Test of VERNE® system with ROV in water



The VERNE® Technology

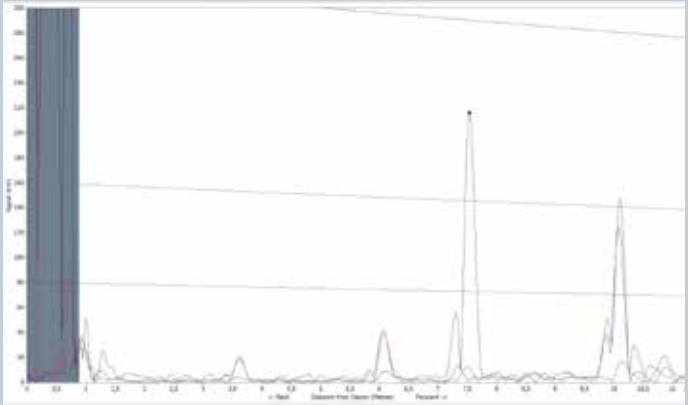
LRUT is an established rapid and productive screening NDT method for detecting corrosion in tubular structures. It is a pulse-echo ultrasonic method, using Guided Ultrasonic Waves (GUW) which are propagated along the axial length pipe and are reflected by areas of corrosion. LRUT covers the complete circumference of the pipe at distances up to 100 m either side of the device.

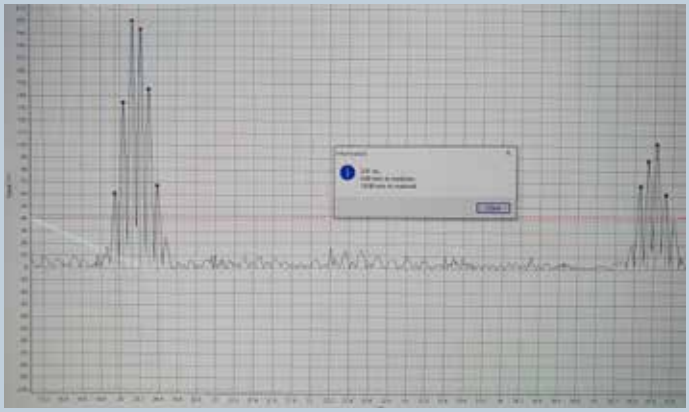
The software streamlines collection and interpretation of data with many features automated for speed and ease of use. For example, the test data collected over a range of ultrasound frequencies, so that frequency can be optimized for the specific test pipe geometry. In addition, the software allows focusing of the GUW energy on the corrosion for improved sensitivity and C-scan functions to give images of corrosion around the pipe.

The software also sets the Distance Amplitude Correction (DAC) curves automatically, which are an essential part of GUW NDT. The DAC is set from the pulse echo-reflections from circumferential butt welds in the pipe. The software can switch between different A-scan and C-scan displays and there is an automated reporting facility, using Microsoft Word for improved productivity.

Location measuring accuracy to whitin 50 mm and thickness measuring accuracy to with 10% of wall thickness is achievable. Greater accuracy leads to more efficient inspections and more accurate information for Engineering Critical Assessment (ECA) of corrosion.

UNPA has been included to achieve superior topographical information in defect characterisation. The UNPA is included within the LRUT clamp. The UNPA will take pipe-wall thickness measurements of the pipe-wall under the clamp position pre-LRUT. The UNPA will then be moved to the location along the pipe, identified by the LRUT, as containing corrosion. Here it will accurately measure the pipe-wall loss (±1mm) and map the extent of corrosion.



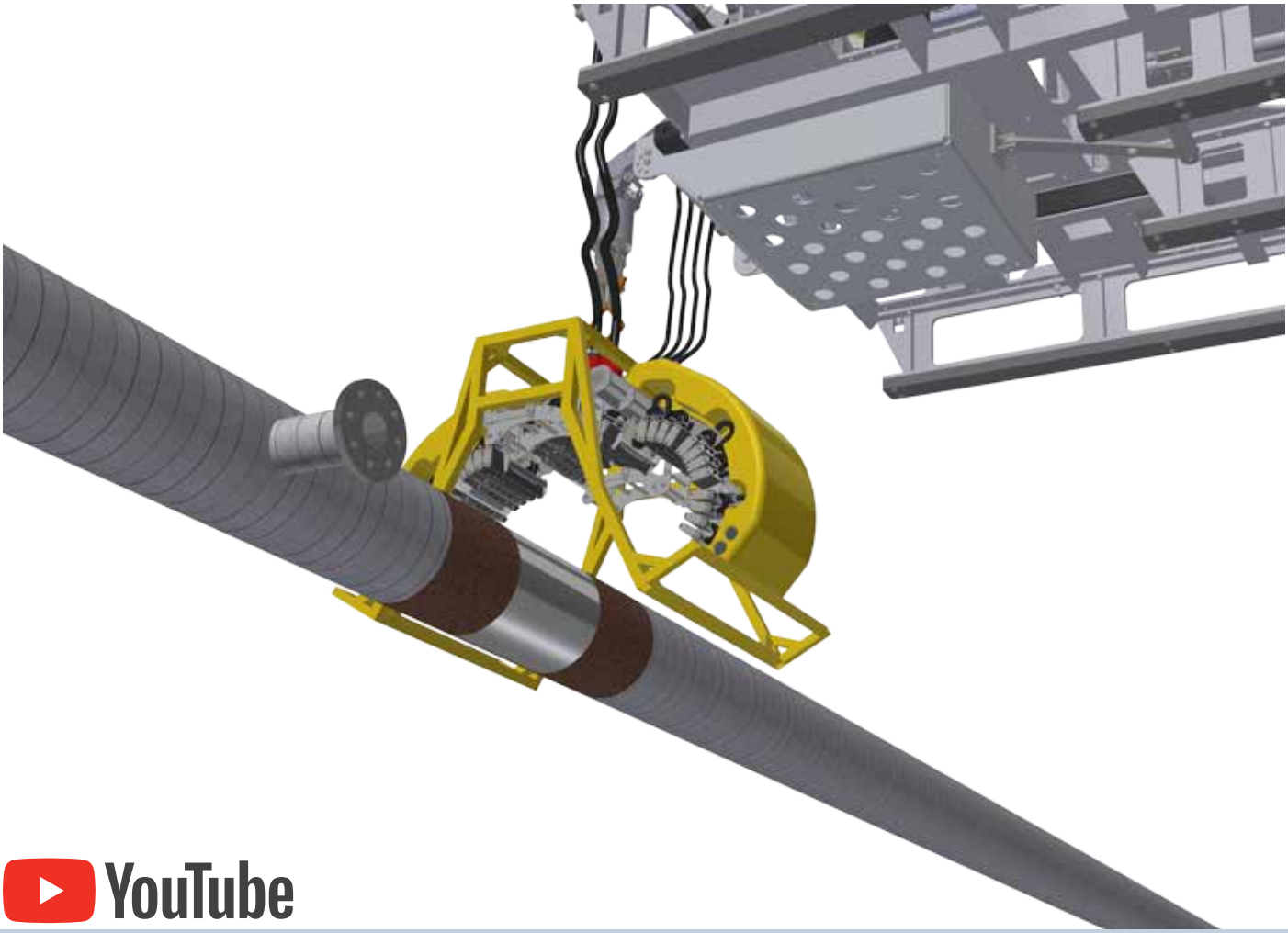


Specifications

12” Clamp	
Type	NDT measurement tool
Model	Clamp
Part Number	4VD12CL
Other pipe dimensions	Upon request
Dimensions, L x W x H [mm] Clamp closed incl. ROV handle Clamp closed excl.. ROV handle Clamp open incl. ROV handle Clamp open excl. ROV handle	 1001 x 272 x 998 1001 x 272 x 618 534 x 272 x 980 534 x 272 x 600
Weight in Air	99,3 kg
Weight in Water	0 kg
Working depth	500 m
Material	Titanium Gr.2
ROV handle	Fish tail
Hydraulic channels	4
Hydraulic functions	Open Clamp, Close Clamp, Lock/ Open Actuator, Inflate/ Deflate Bladders

Canister #1	
Type	NDT measurement tool
Model	Canister #1
Part Number	4VDCA
Description	Electronics
Dimensions, H x Ø [mm]	490 x 295
Supply Voltage, AC	110 - 230 V
Working depth	500 m

Hydraulics	
Type	NDT measurement tool
Model	1. Hydraulic Unit 2. Hydraulic Connection
Part Number	1. 4VDHU 2. 4VDHC
Description	1. A separate hydraulic system from the ROV 2. Hydraulic connection directly to the ROV system
Working depth	500 m



YouTube

SCREENING

MONITORING

LRUT

EASY MOBILISATION

EXTENDING OFFSHORE ASSET LIFETIME

CORROSION

LONG RANGE ULTRASONIC TESTING

ROV TOOL

UNPA

DEFECT CHARACTERISATION

PIPELINE INSPECTION TOOL

DETECT FLAWS

ANALYSING

COST-EFFECTIVE NDT

SPLASH ZONE

BURIED PIPELINES

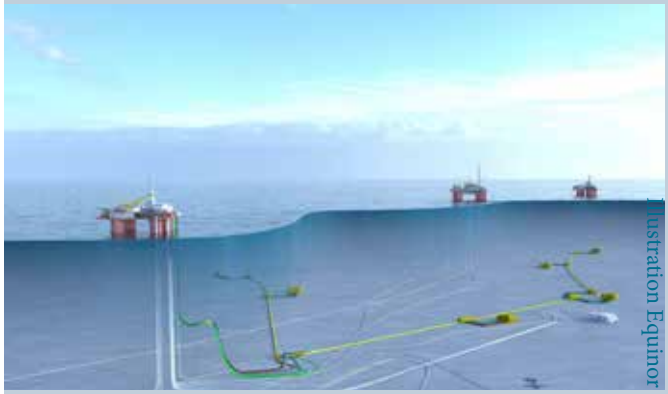
FAST DEPLOYMENT

Area of Application

Unlike onshore pipelines, subsea pipelines operate in a severe physically and technically demanding environment, where inspections and NDT are exposed to various hazards that undermine their safe operation. Damage from corrosion cannot be taken lightly as it can lead to catastrophic pipeline failure resulting in disastrous consequences, both economic and environmental. A staggering amount of different technologies are available for inspection and NDT of subsea pipelines. For subsea pipelines, sensors can be delivered by divers, but increasingly, due to personnel safetyconcerns, by ROV or Autonomous Underwater Vehicles (AUVs).

VERNE® is particularly beneficial in the subsea oil and gas market since it will reduce the need for divers, increase the speed of inspection and decrease the assosiated downtime. VERNE® inspects from the outside of the pipe, with no need for insertion of socalled inspection “pigs” from “pig-traps” resulting in reduced process downtime. Since VERNE® is linked directly to the ROV, this ensures safety of offshore platforms and the personnel.

Of particular importance is the fact that VERNE® will make an inspection of subsea pipelines or structures in the “splash zone” easier and more effective. In the problematic splash zone, the focus is on increasing periodic in-service and ad hoc inspection and VERNE® ensures fast deployment including assessment and detection in one operation.



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