

PIGWaves - In-line service for internal inspection of unpiggable buried oil pipelines using long range ultrasound guided waves in fifty metre segments

Around 0.5 million kilometres of buried oil pipelines in Europe carry hazardous fluids often at high pressure and temperature. In Europe alone, up to 4 million gallons of oil are leaked into the environment per year due to corrosion and mechanical damage. To stem this pollution, pressure is being put on the pipeline operators to find new inspection technology which provides an early warning about pipes in danger of failure.

Internal in-line inspection vehicles (Smart pigs) are available to detect and determine corrosion, cracks and dents in a pipeline's internal diameter, typically using conventional ultrasound or magnetic flux leakage probes. The pigs occupy the entire cross section of a pipe due to the size of the sensor collar assembly needed to provide 100% volume coverage. They can cope with moderate changes in diameter and moderate bends in the pipeline. However, there is a large variation in pipe sizes e.g. standard welded steel pipelines for gas/crude/oil-product have internal diameter between 150mm to 350 mm while larger pipes have internal diameter 500-1,380 mm. Therefore, a matching pig is required for each pipe size and for the larger diameters the pigs tend to be very large in bulk.

Project objective

The goal is to provide a single internal in-service pipe inspection tool capable of inspecting both piggable and currently unpiggable oil pipelines of steel construction and internal diameter 150-350mm, which will provide 100% volume inspection. The project aims to:

- develop a long range ultrasonic Guided Wave (LRUG) system capable of total volume inspection of the walls of oil and gas transmission pipes.
- demonstrate the operation of the robotic inspection systems on currently unpiggable pipelines.
- reduce 'false-calls' from pigging the line by using LRUG NDT to assess indications.

This project addresses the need to develop inspection tools for in-service NDT inspection of unpiggable pipelines while at the same time replacing existing methods of inspection for piggable

pipes with (i) orders of magnitude less data storage time with consequent (ii) greater (robot) inspection speed and (iii) far quicker availability of the inspection results after robot recovery.



The project aim is to perform total volume inspection far more rapidly and accurately than current methods of ultrasonic NDT inspection. In the field of pipeline inspection LRUG presents the benefit that the probes would only need to be adjusted every 50m, the typical attainable propagation range of LRUG in pipelines, thus making the adaptation more feasible. Key features of the system will be:

- A neutrally buoyant robot floats along pipeline flow performing a total volume inspection far more rapidly and cheaply.
- Enable pipelines with diameter reductions caused by obstacles, sharp bends, and little or no flow to be inspected.
- The collar locks every 50 metres and is loaded with LRUT probes that send ultrasound guided waves down the walls of a pipe.
- Retrieval: The LRUT collar is designed to collapse if robot becomes stuck so that it can be retrieved.
- Wireless in-pipe communication: Robot communicates with base station at entry point to send NDT data and locate position of robot.

For further information, please visit the project website at www.pigwaves.eu.

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