



# LEAK DETECTION SYSTEM



## Oil & Gas / Midstream

“Given the need to be able to use pigs to inspect the pipelines, we chose non-intrusive ultrasonic technology for flow measurements. After analysing the options available on the market, we decided on Flexim and the FLUXUS® H721 measuring system. A temperature sensor can be connected to this dedicated hydrocarbon measuring system, and it is able to output the density as well as the flow rate.”

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## Measuring Task

**Installation of a leak detection system using differential flow measurements on the liquid hydrocarbon lines between the tanker terminal in Lavéra and the SPSE tank farm in Fos-sur-Mer.**

The business purpose of Société du Pipeline Sud Européen (SPSE) is the supply and storage of crude oil and intermediate or refined products. The safety and protection of people, the environment and goods have the highest priority. The company values the satisfaction of its customers and listens to its stakeholders, the authorities and the neighbouring communities.

The pipelines and the facilities required for their operation (pumping stations, tank farms) are subject to maintenance and inspection plans that ensure, on the one hand, the reliability and safety of the processes and, on the other hand, the integrity of the facilities throughout their lifetime. These plans are regularly reviewed by the regional environmental authority.

In order to be able to identify an incident quickly, SPSE uses a leak detection system on its pipelines. These leak detection systems rely essentially on flow measurements at each end of the respective lines. The pipelines connecting the oil terminal at Lavéra to the tank farm at Fos-sur-Mer are used for

the two-way transport of crude oil. The flow measurement system must therefore be able to measure in both directions of flow, i.e. bidirectional. The lines are regularly checked with the pig for their physical integrity. Therefore, the engineers at SPSE specifically looked for non-intrusive measurement technology for flow monitoring.

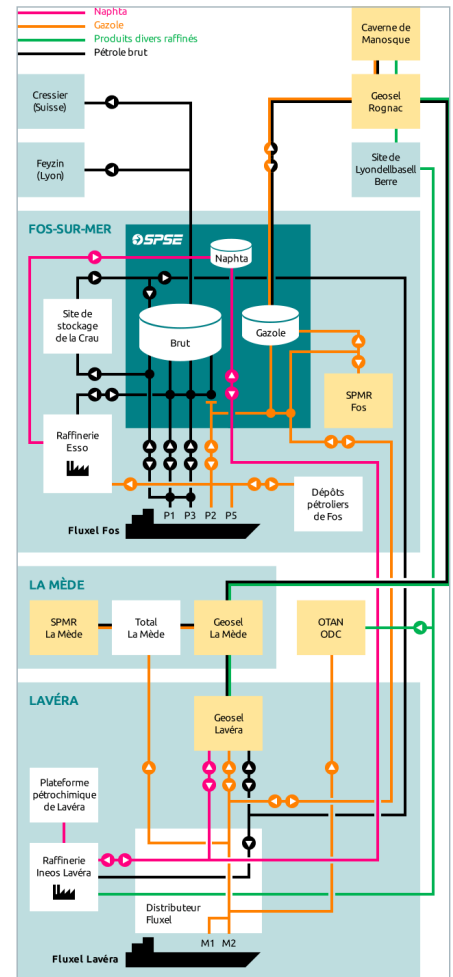
Leak detection systems require a high level of accuracy from the flowmeters used. A particular challenge lies in the topology of the pipe systems, in which the necessary undisturbed straight pipe lengths cannot be achieved. In addition, leak detection systems for hydrocarbons are not just about comparing volume flows, but about a mass balance.



## Solution

When it comes to simply retrofitting flow measurement points on existing piping systems, we know the best place to go: Flexim. The flow experts from Flexim France got an idea of the measurement on-site and developed the most suitable solution together with the production engineers from SPSE. It quickly became clear: The best measuring system for this task is FLUXUS® H. Flexim developed FLUXUS® H specifically for measuring liquid hydrocarbons. The ultrasonic system simultaneously measures the speed of sound of the medium flowing in the pipe using the same clamp-on ultrasonic transducers that are mounted on the pipe wall and determine the flow rate by measuring the transit-time difference. This correlates with the density. Together with an equally non-intrusive temperature measurement, this makes it possible to distinguish and identify the different crude oil qualities transported in the pipe and to determine their density and thus the mass flow.

Flexim prepared a study in which the measurement inaccuracies to be expected were considered in detail and recommendations for the best possible instrumentation were developed. On this basis, SPSE decided to implement all flow measurement points with two channels. The effects of disturbed flow profiles can be effectively compensated for by the double structure of flow measurements with transducer arrangements offset across the pipe cross-section. Low-frequency Lamb wave transducers, which reliably cover the wide range of possible flow velocities, were identified as the ideal transducer type. Data is transmitted to the leak detection system integrated in the process control system via Modbus RTU.



Crude oil, naphtha and diesel (SPSE and third parties) piping diagram to and from SPSE.



Measuring point with ultrasonic transducers installed in a Variotfix C transducer mounting device on the outside of a DN600 crude oil pipeline. Two measuring channels with two pairs of sensors allow effective compensation of the distorted flow profile.



The FLUXUS® H721 is used as the measuring transmitter. The stationary ultrasonic system was specially developed for the non-intrusive measurement of hydrocarbons and, in addition to the volume flow, also measures the density and thus the mass flow.

## Measuring Points and Instrumentation

<b>Pipelines</b>	32" and 24", steel
<b>Medium</b>	crude oil
<b>Measuring Devices</b>	6 non-intrusive ultrasonic FLUXUS® H721 measuring systems for hydrocarbons dual channel version, stainless steel housing) with 12 pairs of CRH ultrasonic transducers (Lamb wave, ATEX version) mounted in Variofix C and 6 clamp-on Pt100 temperature sensors (also ATEX version)

## Advantages

- Accurate non-intrusive measurement of volumetric flow, density and thus mass flow
- Measurement with clamp-on ultrasonic transducers mounted on the outside of the pipeline, no interference with the passage of pigs
- No need to empty the lines, no disruption to production for the commissioning of the flowmeters and for their regular calibration
- Measurement uncertainty meets the requirements of the leak detection system
- Bidirectional flow measurement with Lamb wave transducers which cover a wide range of flow velocities and sound velocities
- Data communication (fluid, density, flow, temperature, alarms ...) via Modbus RTU

## Customer

### Société du Pipeline Sud-Européen, Fos-sur-Mer, France

The Société du Pipeline Sud-Européen (SPSE) operates underground pipelines that transport liquid hydrocarbons from the port facilities at Fos-sur-Mer et de Lavéra (Bouches-du-Rhône).

It is also a storage company operating a depot in Fos-sur-Mer with a nominal storage capacity of 14.2 million barrels. Initially dedicated almost exclusively to crude oil, SPSE gradually expanded its logistical activities to include the storage of naphtha and diesel fuel.



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