

## Piezoelectric ultrasonic transducer for operation in pressurized gases

CSIC have developed a Piezoelectric Ultrasonic Transducer for operation in pressurized gases and adaptive to the level of external pressure capable of operating in pulse-echo mode with high sensitivity and high axial resolution to detect echoes generated by a solid body (such as echo of the first surface - front wall -, or echoes of internal discontinuities, or the echo of the rear wall).

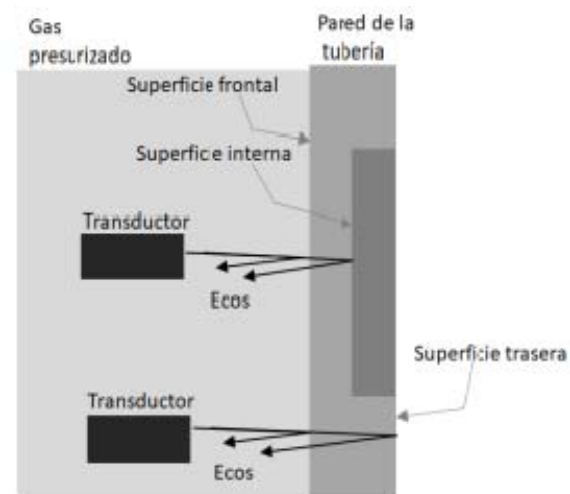
Industrial partners from refinery, chemical plant and pipeline operators are being sought to collaborate through a patent licence agreement.

### Pulse-echo piezoelectric transducer with high sensitivity and high axial resolution

The transducer resolves the detection of echoes coming from the front surface of a solid, such as a pipe, internal discontinuities or the rear surface using a single transducer in pulse-echo mode.

The reason that these echoes are difficult to detect lies in the strong decoupling of impedances at the transducer-gas and gas-solid interfaces. This causes that: i) the sensitivity of the transducer is very poor, ii) the signal amplitude reflected in the first interface is very high, while that of the internal echoes is very weak.

The presented design solves this problem by combining a high center frequency, high sensitivity and bandwidth that is achieved through an appropriate selection of piezoelectric material, damping block and stack of adaptation layers optimized to maximize bandwidth and sensitivity, where the Impedance of the outer layer has an adaptive character to the gas pressure.



Outline of the problem to solve

### Main innovations and advantages

Inspection of tanks and pipes that contain or transport gases (> 200 psi):

- Profilometry of the internal Surface
- Measurement of the thickness of the wall.
- Detection of corrosion by reduction of thickness.
- Detection of cracks or other defects.

### Patent Status

Priority patent application filed suitable for international extension

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