

**COMPANY**

Microflow Technologies

**RESEARCH CENTRE**

ITMATI & Universidade da Coruña

**PRODUCTIVE SECTOR**

Mechanics and Mechatronics



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SS\_039\_2022

# ACOUSTIC

Windshield designs for acoustic devices.

Development and implementation of porous windshield designs for pressure-velocity sensors.



Pressure-velocity sensor produced by Microflow Technologies.

## PROBLEM DESCRIPTION

The company Microflow Technologies was interested in the prediction and mitigation of the effects of airflow in its pressure-velocity sensors, and also in the design of porous windshields to avoid undesirable airflow phenomena.

## CHALLENGES AND GOALS

- ✓ To guarantee the quality of the device measurements in the presence of wind.
- ✓ To increase the accuracy of measurements in windy outdoors.
- ✓ To identify accurately noise source locations under the presence of wind.

## MATHEMATICAL AND COMPUTATIONAL METHODS

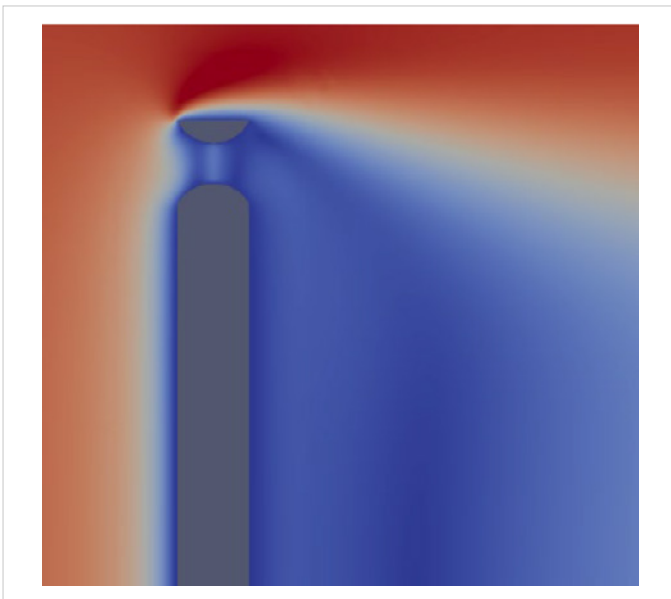
Firstly, the mathematical modeling of the pressure-velocity sensor and the windshield was written using a coupled problem which involve porous materials and a compressible fluid with an underlying flow. Second, a finite element analysis was performed to obtain an approximate solution of the particle velocity and the sound pressure. Both physical quantities were evaluated at the near and far field. All these information has been used to suggest and orientate the next-generation of pressure-velocity devices designed by the industrial partner

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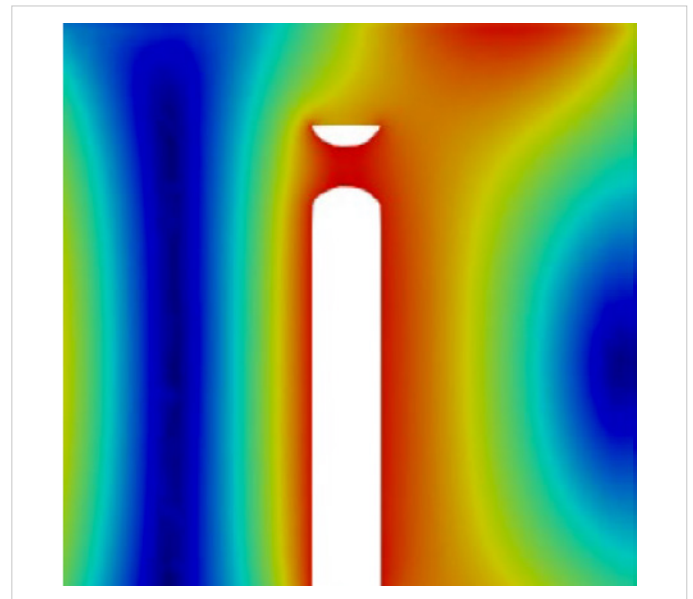
# ACOUSTIC

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Numerical simulation of the airflow around the pressure-velocity sensor.



Numerical simulation of the scattered pressure field at 2000 Hz.

## RESULTS AND BENEFITS

The development and deploy of a digital twin for the pressure-velocity sensor plays a key role of the design of the next-generation of acoustic devices. Thanks to this digital approach, the performance of different acoustic solutions based on porous windshields and micro-perforated steel meshes could be evaluated. Furthermore, the influence of the airflow on the device could be predicted at difference frequency ranges.

**The company has a computational methodology to predict, design and optimize the acoustic behavior of its acoustic devices under the presence of an underlying airflow.**