Modeling and Simulation of a Disposable Coriolis Flow-meter

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Abstract

The approach of this project is Modeling a Coriolis Mass Flow-meter (CMF) bases on a Fluid-Structure Interaction (FSI) device. The "Coriolis mass flow-meter sensor" is modeled using a COMSOL Multiphisics® simulation, specifically the Acoustic-Shell Interaction physics interface coupled with the FSI physics interface to drive and simulate the sensor. The modeling and simulation are provided into two different segments: First, Design a Conventional U-shaped tube CMF and obtain its Eigenfrequencies in the first 6 modes, while the tube is filled by air and then water; The second part is using the obtained eigen-frequency of a particular mode and the flow properties as boundary conditions while the tube conveys water. By defining all the correspond expressions to obtain Coriolis effect on the structure, a phase shift would be appeared on both sides of the U-shaped configuration and twists the structure.

Since the phase-shift is generated by the fluid flow and a constant vibration interaction, so it represents the flow-rate. All the results are compared between a proposed polymer and conventional materials, which replaced easily on the completed model, to find out the accuracy level. The new CMF's polymer tube, instead of conventional stainless steel material, can be recognized as disposable mass flow-meter.

Reference

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