Control of water air content during transient cavitation tests of inducers

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The control of water air content is often necessary during the following tests of hydraulic machines or other equipment in water supply installations:

- Cavitation tests
- Hydro acoustics studies
- Noise characterization

Tests standards (such as EN ISO 3822-1 for example, reference [1]) often give recommendations about that problem, but nether define or impose methods in order to control it quantitatively, especially during transient tests such as:

- Continuous decrease of available NPSH at pump inlet for cavitation tests
- Laboratory tests on noise emission from appliances and equipment used in water supply installations

The paper intends to show how a well-known in-duct intensimetry, using three pressure transducers (references [2] to [11]), can be used accurately for the instantaneous determination of waves celerity in ducts during such transient tests, with an appropriate treatment of the measured pressures. The instantaneous wave celerity can then be related to an instantaneous value of air content using a model (Jakobsen model for example, reference [11]).

An application to cavitation tests of an inducer at various speeds of rotation and a given non-dimensional flow rate is proposed, analyzed and discussed. Figure 1 illustrates waves celerity evolutions in the inlet pipe during tests of an inducer at three speeds of rotation and a continuously decreasing mean pressure (in abscissa). The overall duration of such tests is 4 min. Figure 2 shows an interpretation of these results regarding the evolution of water air content during the same tests.

References

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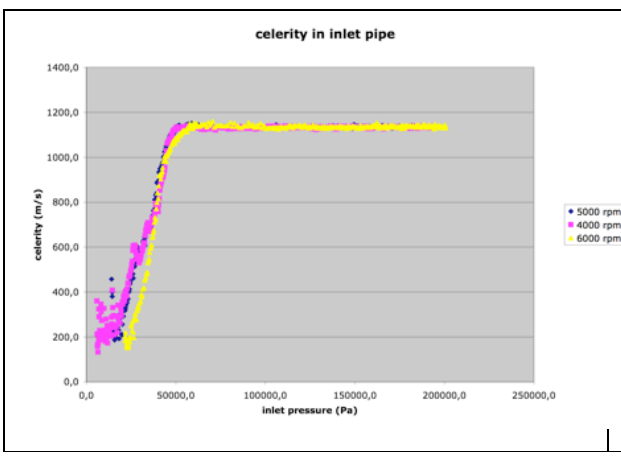

Figure 1 Waves celerity in inlet duct

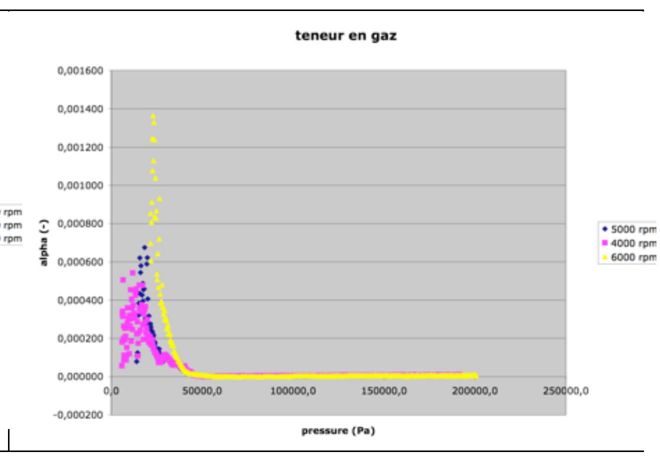

Figure 2 Water air content evolution