15th INTERNATIONAL CONFERENCE
Dynamical Systems — Theory and Applications
December 2-5, 2019. Lodz, POLAND.

DSTA 2019

paper id: EXP94

Experimental investigation of Helmholtz resonator due to various temperature and mass flow conditions

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Abstract: There is considerable need to control and reduce pressure pulsation in pipelines supplied with pulsating flows. The use of a Helmholtz resonator introduces an additional degree of freedom to the analyzed dynamic system. Tube resonators Helmholtz type are often used in pipelines to minimize the resonances air flow excited by parameters like equivalent pipeline length, medium frequency but also medium temperature and intensity of flow defined as mass flow rate. This research considered presents influence of medium temperature (from 317 K to 377 K) and their mass flow rate (0.02 to 0.15 kg/s) into amplitude frequency characteristics. There were adjusted: air temperature and various mass flow rate from. There was also assumed experimental results as three dimensional maps which presents dynamic properties examined systems (resonance frequency, resonance frequency under conditions of forced oscillations, relative damping coefficient). This enable to present new analytical tool help in gaining new understanding of presented phenomenon. There are provided theoretically empirical contribution in control resonant systems applied to pipelines with tube resonators. The results are significant for identifying the nonlinear properties of transient stages in pulsating flows along pipelines with sweep-type excitation, and have possible industrial applications including in process plants, the power and chemical industries, in compressed air systems and in automobiles

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