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

DSTA 2019

paper id: EXP76

Influence of temperature conditions into dynamics of pipes with pulsating flows and sweep type frequency excitation

Tomasz Pałczyński

Abstract: The nonlinear dynamic properties of pipes with pulsating flows in transient states (sweeping up and sweeping down) are a still underinvestigated phenomenon in fluid transportation. The swept mode of pulsating flows can occur during start-stop procedures and due to sudden frequency changes related to the system operating conditions. In this study, a test rig was prepared to investigate the flow parameters of pipes with pulsating flows, with a wide range of changes in pulsation frequency (from 20 Hz to 180 Hz) and intensity (defined as the required time to switch from 20 Hz to 180 Hz), in two directions (up and down). The proposed procedure enables complex analysis of the transient states of pipes with pulsating flows. Three fields were measured: air temperature from 305 K to 343 K and various intensities of frequency changes, from 1 s to 9 s. The experimental results were analysed in the Matlab environment using the author's own version of the Short Time Fast Fourier Transform algorithm. Amplitude frequency characteristics under the influence of two dominant cases (sweeping up and down) were also estimated and compared using relative and absolute values. 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.

[1)] Tomasz Pałczyński, Ph.D.: LUT, Institute of Turbomachinery, 219/223 Wólczańska Str., 90-924 Łódź, Poland (PL), tomasz.palczynski@p.lodz.pl , the author presented this contribution at the conference in the special session: "Dynamics of parametric and self-excited systems: analysis and applications" organized by F. Dohnal and J. Warmiński.