

SOME CAUSES AND EFFECTS OF PRESSURE PULSATION IN A HYDRAULIC SYSTEM INCLUDING THE IMPACT ON THE ENVIRONMENT

Michał Stosiak¹, Mykola Karpenko², Adam Deptuła³, Paulius Skackauskas⁴

¹*Faculty of Mechanical Engineering, Wrocław University of Science and Technology
50-371 Wrocław, Łukasiewicza 7/9 st., Poland
michal.stosiak@pwr.edu.pl*

²*Faculty of Transport Engineering, Vilnius Gediminas Technical University
Vilnius, LT-10223, Plytinės g. 27
mykola.karpenko@vilniustech.lt*

³*Faculty of Production Engineering and Logistics, Opole University of Technology
Prószkowska 76 st, 45-758 Opole, Poland
a.deptula@po.edu.pl*

⁴*Vilnius Gediminas Technical University, Faculty of Transport Engineering
Plytinės g. 27, LT-10105, Vilnius, Lithuania
paulius.skackauskas@vilniustech.lt*

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Positive displacement pumps are components in the hydraulic systems of many machines used in transportation systems. Hydraulic systems are commonly found in mobile machinery, military vehicles, aircraft and marine vessels. They perform the most responsible functions there, and the demands placed on them are constantly increasing. The paper points out that the positive displacement pump is an important source of pressure pulsation in the hydraulic system (Wengang *et al.*, 2023). A theoretical analysis of displacement pump capacity pulsation was carried out. In a hydraulic system, capacity pulsation contributes to pressure pulsation. The spectrum of pressure pulsations also includes components at lower frequencies. In some cases, these components are the result of mechanical vibrations acting on hydraulic valves (Stosiak *et al.*, 2023). It has been noted that hydraulic resonance phenomena can occur in a hydraulic line in certain situations. A complex univariate was used to determine the frequency characteristics of the system with a hydraulic long line by subsequently determining the transmittance of the system. Analysis of the change in the transmittance value of the system as a function of the length of the hydraulic line at a fixed pressure pulsation frequency makes it possible to determine the lengths of the hydraulic line at which amplification of the pressure pulsation amplitudes occurs. This can then form the basis for the design of the hydraulic system by selecting such pipe lengths and arrangement of system components to avoid hydraulic resonance. It has been pointed out that increased pressure pulsation affects the surroundings, including human beings, causing an increase in the noise generated into the surroundings and increasing vibration levels. The effect of vibrations on humans is unfavourable and particularly dangerous when the frequency of the vibrations acting on humans is close to the resonance of the human internal organs. At the same time, usually the smaller the human body organ, the higher its natural frequency. In order to minimise pressure pulsations in the higher frequency range, passive pressure pulsation dampers have been proposed. An active pressure pulsation damper was proposed to reduce pressure pulsations in the low frequency range (<100 Hz).

References

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