

The XXXVI International School of Hydraulics, 23-26 May 2017, Jachranka, Poland

An Experimental Investigation of Pressure Wave Celerity during the Transient Slurries Flow

A. KODURA¹, M. KUBRAK¹, P. STEFANEK² and K. WEINEROWSKA-BORDS³

¹ Warsaw University of Technology, Building Services, Hydro and Environmental Engineering
Faculty

Nowowiejska 20, 00-653 Warsaw, Poland

e-mail: apoloniusz.kodura@pw.edu.pl

² KGHM Polska Miedź, Tailings Management Division
Polkowicka 52, 59-305 Rudna, Poland

³ Gdańsk University of Technology, Department of Civil and Environmental Engineering
G. Narutowicza 11/12, 80-233 Gdańsk, Poland

ABSTRACT

Transportation of slurries in the pressure pipelines is an example of a complex flow due to specific parameters of transported medium. For practitioners, the economy of designing and maintenance is usually the most important factor. For this reason, most of hydrotransport installations are fairly simple, however they become more vulnerable to negative effects of the transient flow which can occur in pressure pipelines. As the consequence, the phenomenon may cause major damage, and thus, it should be precisely described. A deep analysis of transients in slurries is crucial, both from theoretical and practical point of view. In this paper, the experimental investigation of pressure wave celerity during the transient flow of slurries in the HDPE pressure pipe was described. The value of this celerity has a significant influence on the pressure changes in the pipeline, and thus, its correct determination is crucial to calculate the actual maximal pressure increases or decreases. To achieve the aim, two sets of the physical tests were performed. The first series were carried out with use of a physical model, enabling the measurements of pressure characteristics caused by a rapid valve closure. The experiments were accomplished both for slurries of different densities and for water. The second series were carried out in a real hydrotransport installation. The analysis of the experimental data was compared with the theoretical equation for the wave celerity. Experimental data indicates a huge difference compared to the theoretical values of celerity. The results confirm the necessity for revision of the theoretical expression for the wave celerity.