

Mathematical Modeling of Mineral Concentration in a Hydrocyclone: Design of a novel geometry to minimize erosion

Peng Xu

*Minerals, Metals & Materials Technology Centre (M3TC), National University of Singapore
Department of Mechanical Engineering, National University of Singapore
School of Physics, Huazhong University of Science and Technology*

Synopsis

Most often raw mineral ores are crushed to a relatively fine size range and concentrated using wet processes. The hydrocyclone is one of the most popular and common device used for this purpose which also classifies the particles in a water-based slurry. Its operating principle is similar to that of a cyclone for gas-particle systems. A swirling motion is imparted to the slurry which passes through a cylinder-on-cone geometry. Design of such devices is currently empirical and based on decades of experience. Since mineral slurries are inherently abrasive they tend to erode the chamber walls requiring shut-down and replacement at frequent intervals, causing significant down time and additional maintenance and operating expenses. The objective of this study was to arrive at a hydrocyclone design that minimizes potential for wear by proper management of the flow pattern. Here we succeeded in arriving at a with a simple design based on fundamental hydrodynamic modeling of the complex two phase flow, which shows major reduction in wear and also marginally reduced pressure drop. This seminar will present the key results of this research following a capsule overview of prior work and applications of hydrocyclones in mineral processing as well as in waste management.

About the speaker (<http://sites.google.com/site/pengxuhust/>)

Peng Xu joined ME department at NUS under the supervision of Prof. Arun S. Mujumdar in September 2007. He is supported by the Chinese Government Scholars Program. He completed his PhD thesis while at NUS under the joint supervision of Prof. Boming Yu and Prof. Arun S. Mujumdar in November 2008. He will start his independent academic and research career at China Jiliang University in Hangzhou, China in September 2009. Peng has published over 20 journal papers along with 10 conference papers and one book chapter. He is co-editor of an e-book entitled with "Mathematical Modeling of Industrial Transport Processes", which can be freely downloaded from Prof. Mujumdar's website: http://serve.me.nus.edu.sg/arun/TPR_Ebook.htm.