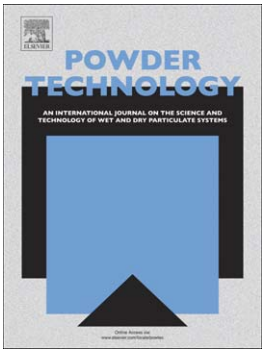


# An experimental investigation on hydrocyclone underflow pumping

Reza Sabbagh, Michael G. Lipsett, Charles R. Koch, David S. Nobes

PII: S0032-5910(16)30629-5
DOI: doi: 10.1016/j.powtec.2016.09.045
Reference: PTEC 11955

To appear in: *Powder Technology*

Received date: 30 December 2015
Revised date: 12 July 2016
Accepted date: 22 September 2016

Please cite this article as: Reza Sabbagh, Michael G. Lipsett, Charles R. Koch, David S. Nobes, An experimental investigation on hydrocyclone underflow pumping, *Powder Technology* (2016), doi: 10.1016/j.powtec.2016.09.045

# An experimental investigation on hydrocyclone underflow pumping

Reza Sabbagh[a], Michael G. Lipsett[a], Charles R. Koch[a], David S. Nobes[a,*]

[a] *The Department of Mechanical Engineering, University of Alberta, Edmonton, Alberta T6G 2G8, Canada*

**Abstract**

The efficiency of a hydrocyclone is highly affected by the inlet flow conditions. Any fluctuation in the feed flow rate or feed solid concentration directly changes the separation performance. The underflow is typically adjusted to overcome the variable conditions of the feed flow, thereby delivering desired performance. A pump in the underflow allows active control of the hydrocyclone separation performance through either providing back pressure or by pump suction.

The effects of underflow pumping at different inlet conditions are investigated experimentally. The ratio of the absolute underflow pressure to the overflow pressure is defined as pressure ratio $P^*$ and is used to compare the results. The pressure ratio resulting from underflow pumping has a similar effect in hydrocyclones as changing the underflow pipe size. For instance, increasing the pressure ratio (less pumping in the underflow) is similar to decreasing the underflow pipe diameter. The operating parameters of flow ratio $R_f$ and inlet solid volume concentration $c$ are found to have significant effect on pressure ratio. A nonlinear model for predicting pressure ratio is found to be $P^* = R_f^{-0.2689} \exp(-0.0267c)$ and has a maximum uncertainty of $\pm 13\%$ for the conditions tested. This prediction could be useful for controlling the underflow to maintain the desired hydrocyclone performance under varying inlet conditions.

*Keywords:* hydrocyclone; underflow pump; pressure ratio; model; correlation;

*Corresponding author: David S. Nobes, Mechanical Engineering Department, University of Alberta, Edmonton AB, CANADA
E-mail: david.nobes@ualberta.ca