Proceedings of The Thirteenth (2003) International Offshore and Polar Engineering Conference
Honolulu, Hawaii, USA, May 25−30, 2003

ISBN 1−880653-60−5 (Set); ISSN 1098−6189 (Set)

Pressure Characteristics of Hydrocyclones with Gas Injection

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ABSTRACT

Focus on a solid-liquid hydrocyclone, effects of both geometric parameters and operating parameters on pressure characteristics are studied. Results of pressure when with free gas injection are obtained, and at last the energy dissipation is analyzed. The results show that with gas injection, the pressure drop values of both overflow and underflow increase simultaneously. Pressure drop ratio (*PDR*) decreases with the rise of flowrate when without gas, but keeps nearly constant when with gas injection. With the rise of swirl number, pressure drop increases, while *PDR* declines. With the rise of gas-liquid ratio, pressure drop increases basically, while *PDR* remains nearly constant when with gas injection.

KEY WORDS: Hydrocyclone; experimental research; pressure; separation; gas

INTRODUCTION

Application and research of solid-liquid hydrocyclones can be traced back to several decades ago (Bradley, 1965; Svarovsky, 1984), but have rarely discussed about the effect of the existence of gas on pressure characteristics and separation efficiency of hydrocyclones. The pressure characteristics and separation performance would be different with those of without gas injection.

Hydrocyclones perform the separation function by taking advantage of the density difference among different immiscible phases (Jiang, Zhao and Wang, 2002). Under the action of centrifugal force, the solid particles will be moved to near the wall of hydrocyclone, and then be separated. During this process, pressure energy will be lost, which is indicated by pressure characteristics of hydrocyclones.

For a solid-liquid hydrocyclone, there are two outlets, one is underflow outlet, which is mainly for particles; the other is overflow outlet, mainly for water (as shown is Fig. 1). Most of the gas that mixed inside the hydrocyclone will be ejected with overflow together with water and a little part of fine particles (Jiang, Zhao, Li and Wang, 2000), and a strong vortex field exists (Zhao, Jiang and Wang, 2002), so it produces the pressure drop. Actually, hydrocyclones accomplish effective separation function just by taking advantage of a part of the pressure loss.

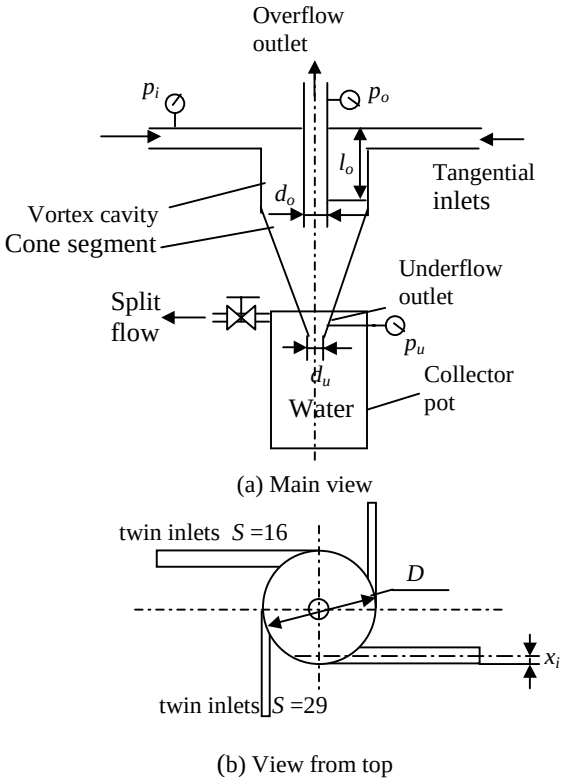

Fig. 1 Structural sketch of tested hydrocyclone

During the process of experimental research, it was found that when with gas injection, the central gas core diameter of hydrocyclone increased (as shown in Fig. 2), which inevitably affected the pressure characteristics of the hydrocyclone.

The objective of this research is to find out when with gas injection the