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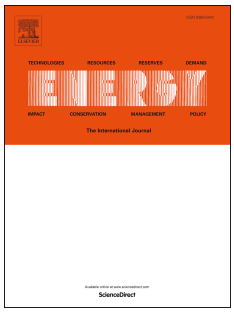

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Experimental investigation of cavity length pulsation characteristics of jet pumps during limited operation stage

Jiong Wang[a,b], Shuangjie Xu[a,b], Huaiyu Cheng[a,b], Bin Ji[a,b], Junqiang Zhang[c], Xinping Long[a,b,*]

[a] Hubei Key Laboratory of Waterjet Theory and New Technology, Hubei, 430072 China

[b] School of Power and Mechanical Engineering, Wuhan University, Hubei, 430072 China

[c] Wuhan Second Ship Design and Research Institute, Hubei, 430064 China

Nomenclature

A	cross-sectional area (mm^2)	e_s	image error
D	diameter (mm)	θ_{hs}	half angle of the camera view (°)
p_r	outlet pressure difference ratio	W_{hs}	width of the captured scope (mm)
h	total pressure difference ratio	L_{hs}	shooting distance (mm)
L	axial distance (mm)		
m	throat to the nozzle exit area ratio		
P	total pressure (kPa)	*Greek symbols*	
p	static pressure (kPa)	α	suction chamber angle (°)
z	elevation (m)	β	diffuser angle (°)
v	cross–sectional mean velocity (m/s)	ρ	density (kg/m^3)
Q	volumetric flow rate (L/s)	λ	radial section cavitation cloud
q	flow ratio		
D_{di}	inner diameter of inlet pipe (mm)	*Subscripts*	
D_{do}	outside diameter of inlet pipe (mm)	n	nozzle exit
D_s	inner diameter of suction chamber (mm)	l	liquid
L_s	suction chamber length (mm)	d	high pressure driving fluid
D_{th}	throat diameter (mm)	o	outlet fluid
D_o	diffuser outlet diameter (mm)	s	suction fluid
L_{th}	throat length (mm)	th	throat inlet

Abstract

Experiments were conducted to investigate the cavity length pulsation characteristics in jet pumps with different area ratios during limited operation stage. Images of various cavitating flows were captured and analyzed to study the cavity length pulsation characteristics by high speed camera technology. It was found that the development tendency of time-averaged cavity length can be divided into two sections with different pulsation intensity by throat length. Further analysis indicated that the time-averaged cavity length is a function of area ratio and outlet pressure ratio independent of the inlet pressure. And the time-averaged cavity length decreases slowly and then faster with the increase of comprehensive parameters. Meanwhile, the cavity length pulsation can be decomposed into low frequency component and high frequency component. The pulsation intensity of low frequency component is relatively high during unstable limited operation stage, while it is at a low level during stable limited operation stage. Besides, smaller area ratio and inlet pressure result in larger pulsation intensity of low frequency component during unstable limited operation stage. The experimental points of high frequency component pulsation intensity collapsed around a V-shaped curve and it reached the minimum value when time-averaged cavity length is approximate to the throat length.

* Corresponding author. Tel/Fax number: +86-27-68774906
E-mail address: xplong@whu.edu.cn (X.P. Long).