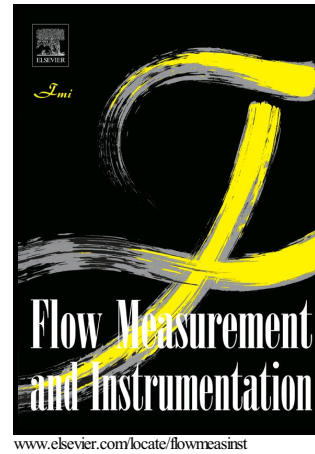


Author's Accepted Manuscript

Experimental study on the confined flow over a circular cylinder with a splitter plate

Kai Liu, Jianqiang Deng, Mei Mei



PII: S0955-5986(16)30139-X
DOI: <http://dx.doi.org/10.1016/j.flowmeasinst.2016.09.002>
Reference: JFMI1251

To appear in: *Flow Measurement and Instrumentation*

Received date: 21 March 2016
Revised date: 1 August 2016
Accepted date: 11 September 2016

Cite this article as: Kai Liu, Jianqiang Deng and Mei Mei, Experimental study on the confined flow over a circular cylinder with a splitter plate, *Flow Measurement and Instrumentation*, <http://dx.doi.org/10.1016/j.flowmeasinst.2016.09.002>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Experimental study on the confined flow over a circular cylinder with a splitter plate

Kai Liu, Jianqiang Deng*, Mei Mei

School of Chemical Engineering and Technology, Xi'an Jiaotong University, Xi'an 710049, China

*Corresponding author. Tel: +86 29 82663413, Fax: +86 29 82663413, dengjq@mail.xjtu.edu.cn

Abstract

An experimental study was carried out to investigate the effect of a splitter plate on wake flows downstream of a circular cylinder symmetrically placed in a confined channel. A particle image velocimetry (PIV) measurement was applied to visualize the flow structure and analyze changes in the vortex shedding process. The control elements of the splitter plate length, L/D (D is the cylinder diameter) was varied from 0 to 1.5 and Reynolds number, Re_D was considered at 2400 and 3000. The experimental results showed that the splitter plate had an influence on stabilization of wake turbulences in a confined channel. For shorter splitter plate length of $L/D = 0.5$ and 0.75 cases, flow structures were significantly modified and the vortex shedding frequency decreased as compared with bare cylinder cases. For longer splitter plate length of $L/D = 1, 1.25$ and 1.5 cases, the generation of a secondary vortex was observed based on the snapshot proper orthogonal decomposition (snapshot POD) analysis. In addition, turbulent characteristics corresponding to turbulent kinetic energy (TKE) and Reynolds shear stress correlations took the lowest values and the dominant vortex shedding frequency disappeared. There was an optimal value of the splitter plate length at $L/D = 1$ on suppression of velocity fluctuations. Moreover, the stabilizing effect of a splitter plate was more obvious at Reynolds number of $Re_D = 3000$ than that at $Re_D = 2400$.

Keywords: Flow control; Splitter plate; Confined circular cylinder; Wake suppression; Instability; PIV

Nomenclature

D	Circular cylinder diameter
f_s	Vortex shedding frequency
G	Gap distance
L	Splitter plate length
L_s	Vortex formation length
Re_D	Reynolds number (DU_∞/ν)
St	Strouhal number ($f_s D / U_\infty$)

Download English Version:

<https://daneshyari.com/en/article/7114066>

Download Persian Version:

<https://daneshyari.com/article/7114066>

[Daneshyari.com](https://daneshyari.com)