

Accepted Manuscript

A new method for scour monitoring based on fiber Bragg grating

Yong Ding, Qingxiong Yao, Zhendong Zhang, Xin Wang, Tengting Yan, Ye Yang

PII: S0263-2241(18)30238-0
DOI: <https://doi.org/10.1016/j.measurement.2018.03.053>
Reference: MEASUR 5372

To appear in: *Measurement*

Received Date: 5 October 2015
Revised Date: 18 May 2017
Accepted Date: 20 March 2018



Please cite this article as: Y. Ding, Q. Yao, Z. Zhang, X. Wang, T. Yan, Y. Yang, A new method for scour monitoring based on fiber Bragg grating, *Measurement* (2018), doi: <https://doi.org/10.1016/j.measurement.2018.03.053>

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 proof before it is published in its final 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.

A new method for scour monitoring based on fiber Bragg grating

Yong Ding¹, Qingxiong Yao^{1,2}, Zhendong Zhang³, Xin Wang¹, Tengpeng Yan¹,
Ye Yang¹, Hui Lv^{1,4}

¹Department of Civil Engineering, Nanjing University of Science and Technology, Nanjing 210094, China

²Office of Capital Construction, Fuzhou Branch, Xiamen Airlines, Fuzhou 350014, China

³School of Civil Engineering, Huaihai Institute of Technology, Lianyungang 222005, China

⁴Fuzhou Water Investment & Development Co., Ltd., Fuzhou 350001, China

Corresponding author: Yong Ding, Department of Civil Engineering, Nanjing University of Science and Technology, Nanjing 210094, China. (njstding@163.com)

Abstract. This paper introduces feasibility study of scour depth determination based on lateral soil pressure measurement. The method is used for sensors which are made of fiber Bragg grating (FBG) as the sensing element, where the front side is under soil pressure, and the back is under the water pressure. It can accurately monitor the lateral earth pressure by measuring the front and back of the pressure difference. The pressure in the horizontal direction is only water pressure in water, while it consists of lateral earth pressure and pore water pressure in the soil. Therefore the depth of the mud surface can be calculated by a plurality of sensors at different depth. The method can feedback erosion and siltation of hydraulic structure in time, and provide reliable data support for the safe operation of the hydraulic structure.

Keywords. scour monitoring; lateral earth pressure; sensor; fiber Bragg grating (FBG); hydraulic

1. Introduction

In hydraulic structures like port, water conservancy, bridge and ocean engineering etc., it is common that the water scouring can cause damage to those structures [1-3]. The strength of the structure foundation often decreases due to water scouring which will cause the hidden danger to the structures. And the danger is usually hard to be discovered in time due to the underwater scouring [4-6]. Besides, the destruction of the structure due to erosion, with a sudden, often lead to such as collapse and other vicious accidents, endangering life and property safety [6-9].

So far, the traditional methods of scour and siltation monitoring include artificial depth gauge [10], sonar [11,12], radar [13] and time domain reflect meter (TDR) [14] etc. Those methods are of disadvantages such as easily off-line, low precision, high cost, poor stability and short durability of sensing elements. Therefore, they have great limitation in practical engineering application. While the methods of scour and siltation monitoring based on the sensing technology of fiber Bragg grating (FBG) are of high reliance and good durability [15]. For example, Lin *et al.* [16-18] developed an optical fiber sensor for

Download English Version:

<https://daneshyari.com/en/article/7120678>

Download Persian Version:

<https://daneshyari.com/article/7120678>

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