ANEXO B

Abstract aceptado en la conferencia SCACR

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A continuación se presenta un Abstract aceptado en la *SCACR2015 – International Short Course/Conference on Applied Coastal Research,28th September – 1st October 2015 – Florence, Italy. Sobre el estudio del flujo de velocidades que generan dos hélices.*

Este abstract se ha llevado a cabo a partir de los mismos datos obtenidos en el laboratorio que los que se han usado en la tesina anteriormente presentada.

STUDY OF THE EFFLUX VELOCITY USING TWO HELICES

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Paper topic: T2 : Numerical, Laboratory and Field Methods; T3 : Ports, Harbours and Waterways

1. Introduction

The characteristic velocity behind propeller jets is studied using a two propeller physical model to compare the results obtained in the present research with the already known efflux velocity equations. Two 25.4cm diameter helices are placed close to the bottom at a 12x4.6x2.5 (length, width and height) m tank, Figure **1** (D_p is the helix diameter and n is the speed rotation), and three different rotation speed are used (@300rpm, @350rpm, @400rpm).

Velocities are measured using ADVs located at several positions in order to have the magnitude of the velocity decay along the three axis.

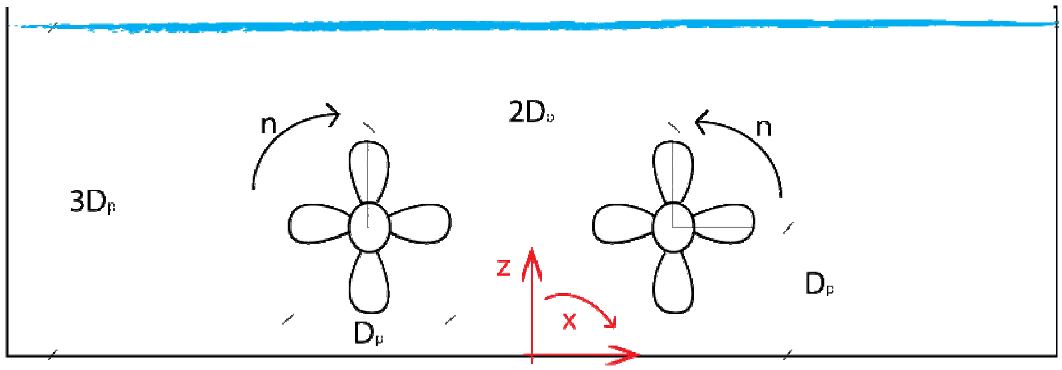

Figure 1. Sketch of the physical model.

2. Results

Experiments with two propellers were performed previously by Bergh and Magnusson (1987) using field data recorded in a Swedish harbour, computing the efflux velocity using the axial momentum theory equation,

$$V_0 = 1.6 n D_0 \sqrt{K_t}, \quad (1)$$

with K_t being the thrust coefficient of the helix. Later, Hamill and McGarvey (1996) performed laboratory experiments to validate Eq. (1) and proposed a new equation

$$V_0 = \left(\frac{D_p}{D_h}\right)^{-0.403} K_t^{-1.79} \beta^{0.744}, \quad (2)$$

with D_h the diameter of the hub and β the projected area of the helix.

Results show how both equations are far from the helix location when velocities are measured at a distance of $2.5D_p$, Figure **2**. Moreover, there is a few difference between both equations.

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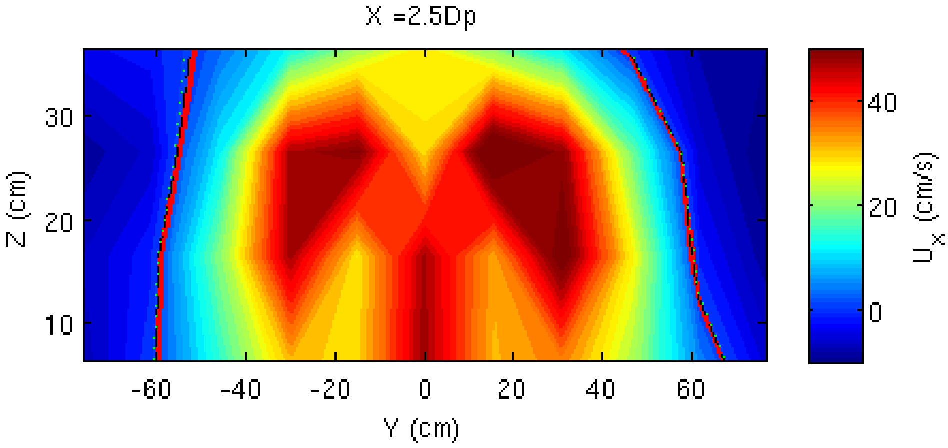

Figure 2. Axial velocity in cm/s at a distance equal to 2.5Dp from the helix plane, when the speed rotation is 400rpm. Red line: Eq. (1); dashed black line: Eq. (2)

¡Error! No se encuentra el origen de la referencia. shows how peak velocities decrease and move towards the bottom of the tank when we move far from the helix plane. In **¡Error! No se encuentra el origen de la referencia.**a, equations shown above are not even present, meaning that the efflux velocities are measured at a distance lower than 5Dp. **¡Error! No se encuentra el origen de la referencia.**d also shows how the helix jets are almost dissipated and few influence of the helices is present.

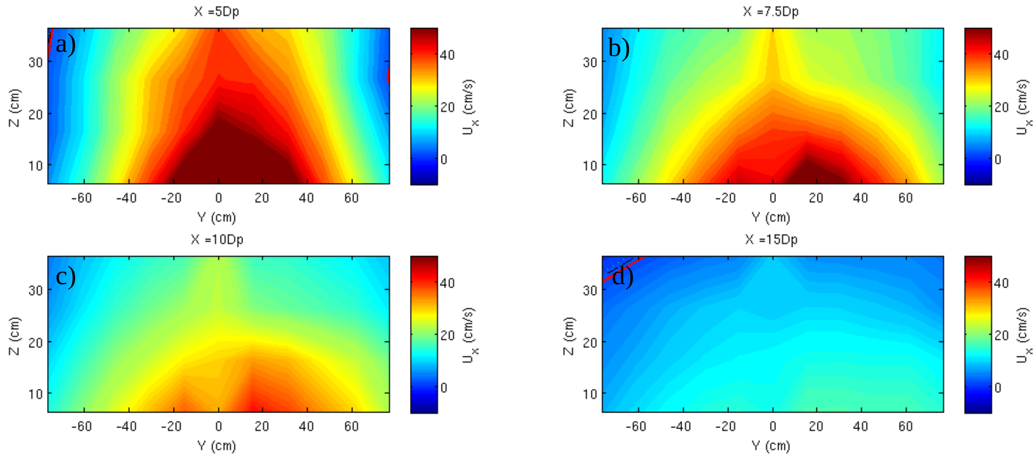

Figure 3. Axial velocity in cm/s at different distances from the helix plane. Speed rotation at 400rpm

The final paper will present results of different experiments and an accurate data analysis of the three velocity components evolution along the tank.

References

Bergh, H., Magnusson, N., 1987. Propeller erosion and protection methods used in ferry terminals in the port of Stockholm. *PIANC Bulletin*, no. 58.

Hamill, G., McGarvey J. A.1996. Designing for propeller action in harbours. *25th International Conference on Coastal engineering*, ASCE, Orlando.