VIBRATION ANALYSIS AND DIAGNOSTIC IN A CATAMARAN VESSEL

E. Egusquiza, X. Escaler, C. Valero, M. Coussirat

Center for Industrial Diagnostics (CDIF)-UPC; Av Diagonal, 647; 08028 Barcelona (Spain).
Phone +34-93-4016714; Fax +34-93-4015812; email: egusquiza@mf.upc.edu

KeyWords – Vibration, cracks, diagnostics, Catamaran vessel

1. Introduction
In this paper the measurement and analysis of vibrations in a catamaran vessel is presented. The analysis was aimed to detect the cause of the structural damage that appears in the vessel during its operation. Cracks appeared in stern tube next to inlet duct and in hull next to sea water discharge pipe.

The vessel had four water jet pumps, two on each side, powered by variable speed internal combustion engines. The impeller takes sea water through an inlet duct in the bottom of the vessel and creates a output water jet that propels the unit [1][2]. A deflector behind each jet serves to control the vessel operation.

This analysis was used in the litigation that the owner of the vessel put against the constructor [3].

2. Experimental measurement
A series of vibration and pressure measurements on the vessel were carried out. The goal of the measurements was to determine possible harmful levels that could be the origin for the appearance of cracks and failures in the mechanical parts of the propulsion system. Vibration and pressure measurements were carried with the vessel standing still and sailing at different operating speeds with sea in calm conditions. The vessel was operated with the clutch off at an engine rotating speed of 500 rpm and with the clutch on at the same speed. Then, engine speed was increased and readings were taken at around 1000, 1200, 1500 and 2000 rpm's. Start-up and coast down transients were also recorded.

The overall vibration levels and vibration signatures were calculated.

3. Results and Discussion
The vibration signals were analysed using several methods from spectral analysis to transfer functions between structure and fluid-flow (Fig. 3).

The different phenomena that could produce excitation forces on the structure were identified and studied [4]. The most important were the rotor-stator interaction, the cavitation and the turbulence generated by the operation of the pump [5][6]. The structural response was also analysed.

The origin of vibrations was determined. Vibrations in water jet room were due to the centrifugal pump internal combustion engine IC.
MARINE OIL MONITORIZATION BY MEANS OF ON-LINE SENSORS
E. Gorritxategi (1), A. Arnaiz (1), J. Bellew (2)
Fundación TEKNIKER – Avda. Otaola 20 – 20600 Eibar (Spain)
(+34)943206744 egorritxategi@tekniker.es
Martechnic GmbH- Adlerhorst 4 - 22459 Hamburg (Germany)

1. Introduction
The degradation and contamination of lubricating oil is the root cause of many severe machine failures. It also reduces equipment service life and frequently leads to unnecessary maintenance expense. This is true in all situations where machinery is deployed however, in the maritime environment the situation is exacerbated for all the reasons we know so well. Lube oil is a critical fluid onboard ship. It is the lifeblood of propulsion and power generating engines and any quality failure leaves the vessel, its cargo, the community onboard and even the environment at the mercy of the most hostile operating condition on earth. Precise analysis of engine lube oil can only be performed in shore-based laboratories and the logistics of the maritime industry leaves operators with unreasonable extended periods between analyses. Over the intervening years field tests for basic lube oil parameters have been developed in an attempt to bridge this vulnerability gap.

This problem has been recognised as a critical area of vulnerability by operating engineers, engine manufacturers and standard setting bodies for around 20 years. Unfortunately, no adequate solutions were available and existing technology was unable to respond to the challenge. In recent times the increasing demand for machine lifetime reliability and unmanned classification exposed this deficiency and the rising cost of lubrication and environment sensitivity regarding spent lube oil disposal exacerbated the situation. In spite of this...