

We also presented **other examples** e.g. a tanker owner, who anticipates annual savings of up to USD 7 million per year

from only conducting condition based overhauls of main engine bearings and turbochargers on their Very Large Crude Carriers.

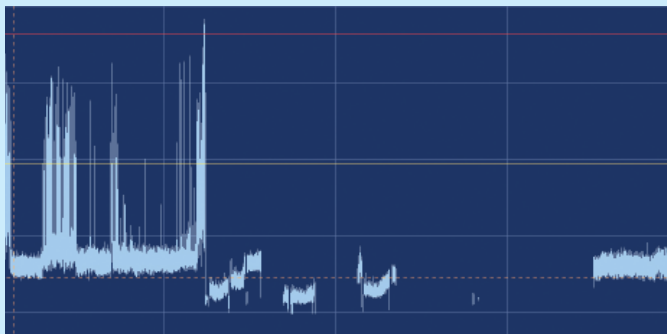
PREVENTED TURBOCHARGER DAMAGE SAVED HAPAG-LLOYD CONSIDERABLE COSTS

In October 2007 the German shipping company Hapag-Lloyd installed an advanced OPENpredictor™ condition monitoring solution on three 4,000 teu containerships in service since 2002: Dublin Express, Glasgow Express and Liverpool Express. The systems monitor both the vessels 9-cylinder Wärtsilä engines and their Napier turbochargers.

Within 6 months this investment paid off, when OPENpredictor™ detected increased vibration level of one of the turbochargers at Glasgow Express. The warning was fortunately given in due time for the crew to replace the

turbocharger's turbine rotor. Thereby they avoided the risk of significant consequential damage, which could have resulted in significant repair or turbocharger exchange costs.

Following the successful field test on the three vessels in service, Hapag-Lloyd decided to also equip their six new 8,750 teu containerships under construction with an OPENpredictor™ online condition monitoring solution for the 12-cylinder MAN B&W main engines. Read more in our press release and Dynamic News July 2008.



The OPENpredictor™ graph shows how the turbocharger's vibration level increased beyond both the yellow alert level and the red alarm level

THE ENGINE DESIGNER'S VIEW Why omit open-up inspections?

Torben Wiik and Niels Nøjgaard from **MAN Diesel** explained why they now recommend ship

owners to omit regular open-up inspections of the crank-train bearings of certain engine types and only conduct Condition Based Maintenance supported by various types of monitoring. The overall aim is to increase



Courtesy: Lloyd's Register

vessel reliability and reduce operational costs.

The human factor is the main reason why the engine designer advice against open-ups, which are said to only identify <1% of the problems, while generating >2% of the damages. Grave examples of open-up induced engine damages e.g. due to forgotten tools inside the engine were presented along with other cases. Only one hour into her maiden voyage, a brand new vessel suffered severe engine damage and 3 ½ months repair due to wrong assembly of a main bearing after inspection.

Other damages are: Lube oil contaminated with water, white metal or other foreign particles, thin/thick shell fatigue and steel-to-steel contact.

According to MAN Diesel's statistics, bearing damages registered over the last 7 years have had huge consequences:

- Repair costs of \$ 40 million
- 4.3 years off-hire resulting in losses of \$ 25-50 million

In many cases traditional systems like oil temperature measurement and oil mist detection warned far too late - when bearing damage had occurred - or not at all.

Tests and experience since 2003 has convinced the company that **Bearing Wear Monitoring is a far more dependable solution**, which fulfil their key requirements:

- No false alarms
- Reliable detection of wear of <50% of the bearing lining ~0.5 - 0.7mm
- Integration with vessel alarm & slow-down system

Therefore, MAN Diesel now support omission of open-up bearing inspections for engines with monitoring of

- Bearing Wear
 - Water in Oil
 - Bearing Temperature
 - Shaft Line Earthing Device effectiveness
- as the ideal basis for carrying out Condition Based Maintenance.

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