

Hapag-Lloyd measures up bearing wear solutions

To save time, cost and manpower by avoiding open-up inspections, Hapag-Lloyd has opted – after exhaustive trials on three in-service vessels – for a bearing wear monitoring system from Roving Dynamics for six new very large containerships

As one of the world's top five shipping companies Hapag-Lloyd has long realised the potential that condition monitoring holds for reducing both the costs and time taken by open-up inspections, as well as the damage risk that such checks can induce and has sought a solution that fulfils these requirements.

Six months ago Roving Dynamics installed an advanced OPENpredictor solution on three 4,000 TEU Hapag-Lloyd containerships in service since 2002: *Dublin Express*, *Glasgow Express* and *Liverpool Express*. Besides online monitoring of the 9-cylinder Wärtsilä engines, the system also monitors each vessel's Napier turbochargers. It detects signs of bearing wear and other machinery faults at an early stage and, thanks to the AutoDiagnosis software, issues warnings with automatic fault identification and prediction of lead time to inspection.

Roving Dynamics says that Hapag-Lloyd was enthusiastic about its bearing wear monitoring solution because it enables the crew to plan corrective actions in due time, and because it offers more flexibility than competing solutions. For example, it offers several expansion options for monitoring other onboard machinery and the predictive maintenance information can be integrated with other maintenance systems.

Following the field tests, Hapag-Lloyd decided to equip the 12-cylinder MAN B&W main engines on six new 8,750 TEU containerships currently under construction with the OPENpredictor bearing wear monitoring system.

Hapag-Lloyd first begun to consider bearing wear monitoring several years ago, following discussions initiated by MAN Diesel, with whom the company undertook many projects. To gather as much experience as possible, various types of bearing wear alarm systems were installed on different engine types and on containerships in service as well as newbuildings – all supervised by different classification societies.

“Our target is to obtain approval to avoid open-



Warnings from the bearing monitoring system can be integrated into a ship's alarm system and potentially be configured to raise alerts on the bridge

up inspections from all five classification societies that we use, so we are flexible in making decisions independent of engine maker and classification society,” Hapag-Lloyd explains. “We tried installing temperature monitoring, but by the time we received a warning, the bearing has already suffered significant damage. Online bearing wear monitoring has a clear advantage in that it is much more precise, and provides much earlier warning plus trending. Electronically supported systems such as OPENpredictor are also useful for superintendents since the predictive maintenance information enables them to decide required actions in due time, significantly reducing the risk of bearing damage occurring while underway.”

OPENpredictor is intended for the online monitoring of wear in the crosshead, crank and main bearings on two-stroke diesel engines. These bearings are especially sensitive to wear which, if undetected, can lead to critical and very expensive damage to the crankshaft and bearings. Roving Dynamics' solutions are based on a method, tested and approved by several engine designers – namely, using the engine's crosshead location in relation to the engine frame at bottom dead centre as an indicator of bearing wear.

Prediction of bearing wear at sea is complex process since measurements are results of both bearing wear and numerous other parameters, including crankshaft speed and power. OPENpredictor, however, takes this into account by: classifying measurements according to a vessel's operating state; compensating for temperature related structural changes in an engine's A-frame; and eliminating background interference such as vibrations from waves and/or

neighbouring equipment.

Hapag-Lloyd continues to gather experience with online monitoring of critical machinery. A next step is to integrate bearing wear warnings into each vessel's alarm system. Hapag-Lloyd states that, “if online bearing wear monitoring turns out to be a success, we will consider making it company policy to have it as a standard tool on all newbuildings.” This would be in line with a decision by at least one major engine builder to make online bearing wear monitoring mandatory for certain engine types.

In close cooperation with Roving Dynamics and class society Germanischer Lloyd, Hapag-Lloyd is streamlining its implementation of condition monitoring. The predictive maintenance information will not only be used by superintendents to avoid bearing damages and to plan and prioritise maintenance, but in the future bearing condition data will be utilised by class surveyors as an alternative to open-up inspections.

The six new vessels to be equipped with Roving's system will be identical to the recently named 8,750 TEU *Kuala Lumpur Express*, which also holds Germanischer Lloyd's Environmental Passport, a commendation issued to newbuildings designed to be particularly environment friendly. Hapag-Lloyd is also understood to be one of the first liner shipping company to recently reduce the speed of its vessels in order to reduce both their fuel consumption and environmental impact. It is also the first to earn the classification society's newly introduced “GL Excellence – 5 Stars Award” for high standards of safety, security, and quality. **MEC**