

## How the Programme Works

• **A Vessel Monitoring Programme is defined to cover :-**  
Used Oil Analysis and Vibration Monitoring of critical machinery, jointly identified with Shell's Technical Services team.

Lubricant samples sent to Shell's Laboratory will be analysed in under 24 hours from receipt.

If corrective Action is required, the owner's Technical Department, or ship, will be contacted immediately.

Results are despatched via the Shell Marine Technical Service team, who assisted by the Shell RLA OPICA and Vibration Monitoring databases :-

- **Diagnose Potential Equipment Problems.**
- **Identify Solutions and Offer Advice on Effective Courses of Action.**

The Test Results, Diagnosis and Advice are sent to the customer's head office or vessel, electronically or in traditional report form.

Vibration data collection is carried out by ship's staff, following suitable training provided by Shell :-

The collected data is then transmitted to Shell's office for analysis and diagnosis. Previous data trends and supplementary information are used extensively by the Shell team, who assisted by the Shell RLA Opica and Vibration Monitoring databases will :-

- **Identify Machinery Faults.**
- **Give Reliable Assessment of general Machine Health and Bearing Deterioration before any Costly Failures Occur.**

The recommendations are given in the form of a user friendly vibration monitoring report, although the customer will receive a quick response if corrective action is required.

Shell's Technical Services team offer :-

- **Post Analysis Support and Advice on the Used Oil and Vibration Monitoring programme**
- **Continuous personal contact with the Chief Engineer or Superintendent, concerning all recommended Remedial Action.**

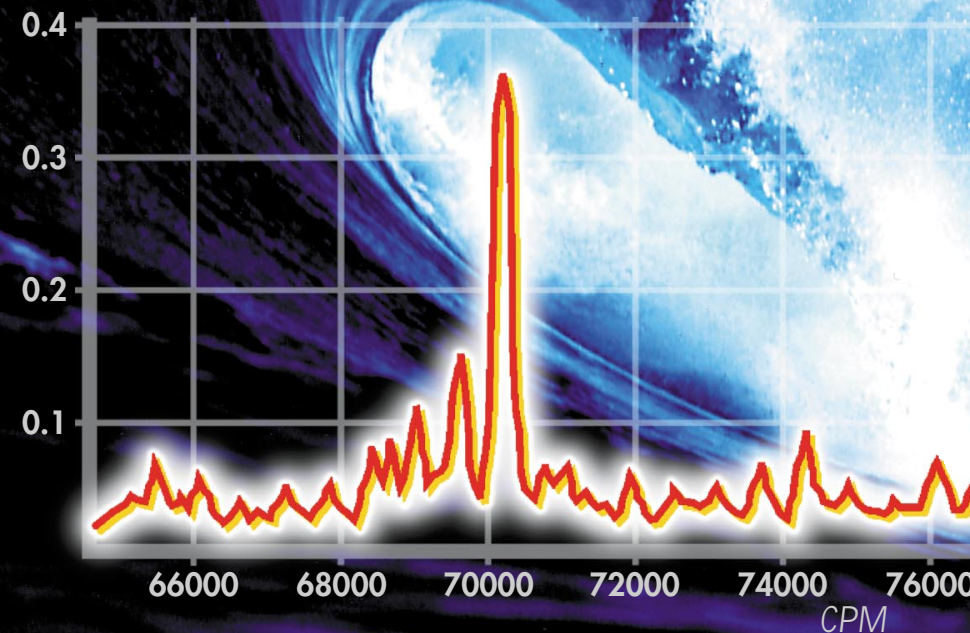


For more information on Shell's

### **INTEGRATED MACHINERY CONDITION MONITORING SERVICE**

Contact your  
Shell Marine Area Manager,  
or Phone 0171 - 257 3424

**SHELL**  
**INTEGRATED**  
**MACHINERY**  
**CONDITION**  
**MONITORING**  
**SERVICE**



**A SERVICE  
That Saves You Money  
Wear It Counts !...**

## Shell's Machinery Condition Monitoring Service

An Oil Analysis & Vibration Monitoring Programme, that Integrates the following Services :-

- **Shell RLA OPICA,**

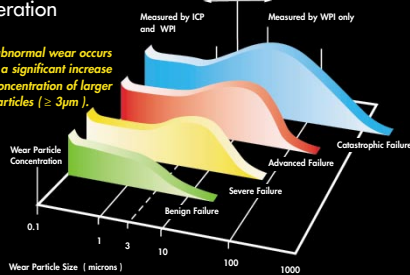
Shell RLA OPICA is a highly customised lubricants analysis package, with data comparison and trending facilities, which along with the RLA electronic mailing facilities, enable the transmission of lubricant analysis results from Shell via a satellite to the vessel and / or its' owners within hours.

- **Wear Particle Index ( WPI ),**

WPI was developed specifically to meet the unique conditions encountered in the marine environment. It compliments Spectrographic determination of iron content in a sample, and provides critical additional information on the iron content of an oil sample relating to particle size and hence the type of wear taking place.

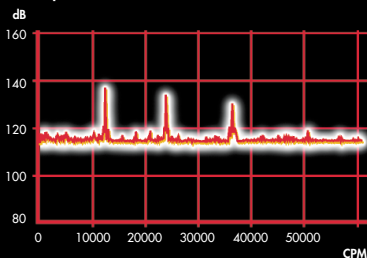
### Wear Particle Generation

When abnormal wear occurs there is a significant increase in the concentration of larger wear particles ( $\geq 3\mu\text{m}$ ).



- **Vibration Monitoring of Critical Equipment**

Using Shell supplied data collecting instruments, vibration readings of critical equipment are taken. Interpretation of data and trending information over a period of time will provide reliable assessments of machinery health and bearing condition, thus avoiding costly failures and unplanned downtime.



The data was taken from Aft Fire Pump bearing, and highlights the high level of the main peak, and the presence of 2x and 3x harmonics of this frequency.

The Recommendation was that this bearing was damaged and required replacement during refit.



## Reduce Maintenance Costs...



## The Value of Condition Monitoring

Machinery maintenance accounts for a large proportion of the operating costs of a vessel. Recent CIMAC Conference identified Reliability, Operating Economy and Minimum Maintenance as the main focus of Shipowners' efforts to reduce costs.

Predictive maintenance is acknowledged as top priority, with predictive measures gaining in importance as crew manning levels fall to minimum levels.

Indeed, many shipowners are seeing maintenance intervals based on a rigid calendar basis, as a potential cost saving

area, if it can be replaced by a Predictive Condition Monitoring system. This avoids the stripdown of a perfectly healthy machine, which means that the shipowner will benefit from extending machine and component life, and allowing better utilisation of maintenance resources.

### "Trends are of the Utmost Importance" Lloyd's Register - July 1995

Classification Societies, including Lloyd's Register, recognise the benefits of Trend Analysis in establishing the health and condition of plant and machinery, and consequently the benefits of not removing / inspecting machinery which is in good condition.

The use of Shell's Integrated Machinery Condition Monitoring Service will help to :-

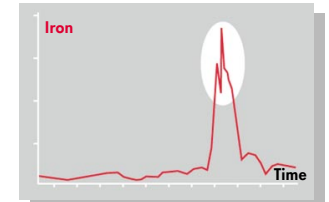
- Reduce the statutory requirements for periodic stripdown and internal inspection.
- Agree extensions to Classification Survey intervals.

## Let Shell Manage Your Machinery Condition Monitoring

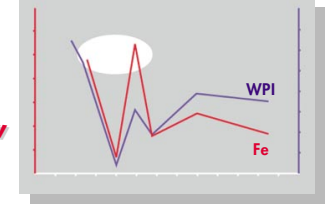
An experienced team of engineers will use information taken from the ship's machinery, either through oil analysis or vibration monitoring, to offer advice about the condition of the machinery, identifying possible areas of concern, and focusing the Chief Engineer's attention on machines with potential problems. Machinery failure may often lead to disruption of the ship's schedule and delays. Early warning and avoidance of failures has obvious cost savings and benefits for the shipowner. Shell's recommendations - in report form - would be particularly useful as a pre-dry dock survey, enabling the vessel's technical staff to focus on machines with potential problems.

Shell's Integrated Oil Analysis and Vibration Monitoring Programme will :-

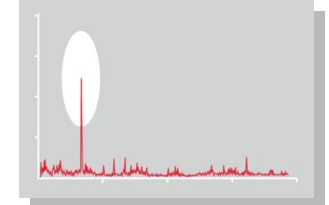
- Focus Attention on Machines with Potential Problems.
- Enable Extension of Maintenance Intervals.
- Reduce Costly Stripdowns of Healthy Machinery.
- Provide Prior Warning about Impending Machinery Failures.
- Make Substantial Cost Savings.



Keyway Wear in Reduction Gears Identified with Trend Analysis of Iron Content over Time. Following Shell's recommendation for early inspection, the problem was identified and remedied. Gearbox Failure could have resulted in Total Loss of Power.



Abnormal Wear identified in Reduction Gearbox. Wear Particle Index ( WPI ) indicated a significant increase in the concentration of larger wear particles ( $\geq 3\mu$  ). Shell's recommendation for inspection helped remedy the problem.



Vibration Analysis indicates that Diesel Alternator Turbocharger exhibits vital characteristics of imbalance at Running Speed of 33,600 rpm. Shell recommends inspection for Bearing Failure.