ENGINEERING MAINTENANCE BRANCH BULLETIN

Issue # 006 **October 2005**

THIS MONTH'S BULLETIN CONTAINS:

- *SAMM/Maintenance Tips*
- *MSC Oil Analysis Program – What Is It & How's It Work?*
- *Question of the Month – Receiving Data from shore?*
- *CMEO Training – What Are You Waiting For?*
- *Open up and say… Ahhh, some Feedback!*
- *Accelerometer Overload*

This is the monthly bulletin to MSC ships and shoreside personnel. The purpose of the bulletin is to inform all concerned of current COMSC Preventive Maintenance management practices associated with any new or revised policy and procedures, along with helpful tips & tricks for improved maintenance. The bulletin will also discuss and present any upcoming initiatives in the various programs.

Some may remember "*The Vibe Monitor*", a newsletter that was run up until 2000 by DLI Engineering. To continue our efforts to bring you useful information, we've added a new page to the newsletter, completely dedicated to the Vibration Monitoring System (VMS). This will have useful tips as well as past case histories.

WANTED… MORE PICTURES!!

It is said, "If you send it, we'll print it!" Let's prove it right. If you have pictures of Shipboard Maintenance (Vibration Monitoring, Oil Sampling, machinery upkeep, etc.) being performed, or a visit from a SAMM or VMS Tech Rep, please send them (along with a *brief* narrative as to what the picture is) to Norm Wolf (e-mail: Norman.wolf@navy.mil). In the meantime, here's the first of a 'double dose'. Check out the other picture later in this issue.

This picture was taken during the USNS Lewis & Clark (T-AKE 1) initial SAMM Development visit. The Lube Oil Testing representative overlooks the "web" of cabling still above the Main Diesel Engines.

SAMM/Maintenance Tips

Coupling Versus Equipment Tolerances in Shaft Alignment: When determining what tolerances to use for shaft alignment, make sure to take into account information provided by both the coupling manufacturer and equipment manufacturer. The coupling manufacturer may state that the coupling can withstand far more misalignment than what the equipment manufacturer suggests for their machines. However, when shafts are not properly aligned, vibration that is sustainable by the coupling will pass directly into the machines' bearings and mechanical seals. These components may not be able to withstand the same forces that the coupling can, and therefore deteriorate or fail prematurely.

-Tip provided by LUDECA, INC, www.ludeca.com

Lube Oil and Feedback: Received new SHELL products? Are you tired of handwriting the correct LO product on your SAMM LO labels? LO measuring point description doesn't match equipment on label? Please let us know! Submit a SAMM Feedback or send us a quick email with the correct product type, or correct sample point description-This will allow us to correct these issues in a timely fashion and it will prevent you from performing unnecessary work. In addition to correcting the LO label data, these changes will also update your LO product Chart found in the SAMM CMS32 module."

-Tip provided by Seaworthy Systems Inc.

MSC Oil Analysis Program – What Is It & How's It Work?

(By Andrew Shaw, Mechanical Engineer)

Introduction

SAMM provides maintenance management features including automated maintenance scheduling, unscheduled repair tracking and comprehensive history reviews. Integrated condition-based diagnostic technologies include vibration analysis, used oil analysis, combustion analysis, and insulation resistance monitoring.

With regard to used oil analysis, ship engineers need two questions answered when maintaining machinery: "Is the oil in the machine still useable?" and "Is the machine mechanically sound?" To help answer these questions the MSC has developed an extensive used oil analysis component within SAMM program. The oil analysis program allows experts to provide prompt and accurate feedback to ship engineers on thousands of oil samples taken each year.

Basic Outline of MSC Model

General: This section provides a summary of the oil analysis program developed by MSC. MSC tracks an oil sample from the time it is taken to the time the engineer gets test results on the equipment item. We'll focus on the handling of data associated with the oil sample both measured and assessed.

Sampling: The sample's life begins with a scheduled maintenance task. The SAMM system provides the ship engineers with a list of sampling points and guidelines on how to sample properly. SAMM also provides a tool for printing bottle labels to help guide the sampler to the correct sampling locations. Each sample label has sample point identification number, sample point description, lubricant type, and blanks for entry of sample date, engine hours, oil hours, and important comments. Each sample is drawn into the labeled bottle and packaged with dozens of other samples taken during the sampling period. As soon as ship operations allow, the packaged samples are sent to a designated laboratory.

Laboratory Processing and Equipment Registration: When the laboratory receives the labeled bottles, it records the label number, and assigns a lube oil sample identification number. The data written on the label is recorded to computer-generated forms. Laboratory technicians determine which slate of properties to measure from equipment registration lists received from the MSC. The registration lists provide the exact slate of measurements required for any sample point in the system, keyed by sample point identification number. Other information provided in advance by the equipment registration lists includes sample point description, MSC determined alarm levels for test results, and assigned lubricant information. Enough information is provided to the laboratory for them to make a preliminary assessment of the quality of the used oil being tested.

Laboratory technicians measure the physical and chemical properties of the sample required by the corresponding slate. The data are entered into the laboratory's database. Elsewhere at the laboratory, an STLE certified lubricant specialist (CLE) reviews the test results for each sample and makes a summary statement of his/her findings. If a ferrographic analysis is needed, the CLE notes this in his findings. At the end of each working day, the laboratory creates a single data file for the day's activity. The file includes sample tracking data, test results, and CLE comments on each sample. The sample file is posted an FTP delivery site for daily pickup. Ferrography reports are also posted to the site as they become available. Incidentally, the same FTP delivery site is used to automatically transfer equipment registration files from the MSC to the laboratory.

MSC Oil Analysis: MSC analysts use Oil Analysis Software (OAS) to reviews the new samples delivered by the laboratory. The sample listing is color coded to reflect the laboratories initial assessment of the oil and equipment condition. Samples are grouped by ship for reporting purposes. OAS allows the analyst to review the test results, laboratory comments and ferrographic reports for each sample. Alarm levels and trend graphs are used as required by the analyst. Final comments are made on the sample and when all samples for a vessel have been analyzed, the analyst prepares a message to the ship's chief engineer listing the assessments and recommendations in order of severity. The analyst sends the message by e-mail it to the ship's chief engineer and other interested parties. All data are archived after analysis to provide a sample population for calculation of statistical alarms based an equipment groups.

Onboard Applications

Condition Monitoring Software: Oil analysis data, vibration data, and other test result data are viewable by ship engineers using Condition Monitoring Software (CMS). CMS displays a group of test results determined by user selections of test type and equipment. Additional selections provide filtering by severity and sampling date and sorting of test results by many sample attributes. CMS presents test details when the ship engineer selects a specific test result.

Engineers can view of the test results in three different ways: tabular, bar charts and line charts. Comments and recommendations provided by the analyst on each data set are displayed at the bottom of the form.

If you have any questions or comments, please contact the author at andrew.shaw@navy.mil or 202-685-5721.

Question of the Month: How does the vessel receive data from shore?

(By Andrew Shaw, Mechanical Engineer)

All test results, analyst comments, feedback results, and updated ship information are entered into the shore-based database, and are made available to ship engineers through a process called database synchronization. Database synchronization means that the shore-based databases and the onboard databases communicate with each other so they will contain the same information as soon as is possible. Data entered into one database are replicated to the other database during the next connection cycle. Replication is accomplished by satellite, ground line, or direct file transfer and goes in both directions. Ideally, only data that pertains to an individual ship is sent to that ship's database. On the other hand, data from all ships is sent to the shore-based "consolidated" databases.

Once the data has reached the ship, it is available for viewing by interested ship engineers using the SAMM (Shipboard Automated Maintenance Management) modules. The SAMM modules allow the shipboard engineers to view the updated data. Shipboard engineers can communicate any data discrepancies through the feedback module to update changes. Feedback is a valuable tool for the database synchronization process to be successful.

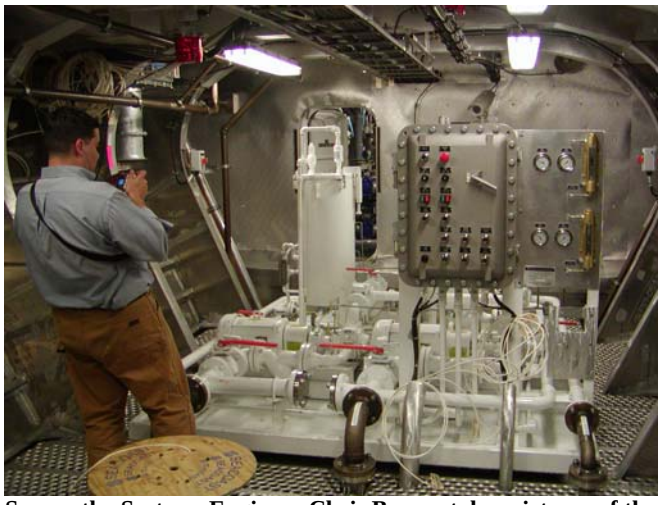
For more information, or if you have any questions/comments, contact Liem Nguyen (Liem.Nguyen@navy.mil) or Will Carroll (William.s.carroll@navy.mil).

Engineering Maintenance Branch Website – something old is new again!!

The Engineering Maintenance Branch web page has had a bit of a facelift; along with some helpful downloads (SAMM, PENG, EASy overviews, OAS Guide, past issues of our bulletin, etc.), the latest CMEO Class information and who to contact for questions or comments regarding Engineering. Maintenance. For helpful updates, keep checking it out!

http://www.msc.navy.mil/n7/engmgmt/engmgmt.htm

BONUS PICTURE OF THE MONTH!



Seaworthy Systems Engineer Chris Byrnes takes pictures of the JP-5 pump skid aboard the Sea Fighter, to confirm equipment configuration for maintenance.

ENGINEERING MAINTENANCE BRANCH BULLETIN

CMEO Training – What Are YOU Waiting For????

CMEO (**C**ivilian **M**arine **E**ngineering **O**fficer) is a two-week training course (held *quarterly*) at the Naval Supply Corps School in Athens, GA. It is for both shipboard and shoreside engineers. The Engineering Directorate (Code N7) of Military Sealift Command hosts the course and encourages ***ALL*** MSC Engineers (3rd A/Es through Chief Engineers, as well as Port Engineers and Project Engineers) to attend *(**Note:** MSC shipboard engineers are given priority when classes are full).*

CMEO provides training on an array of topics such as: SAMM (MALIN, Logbook, etc.), Vibration Monitoring, Lube Oil, Fuel Oil (NEURS), Chemicals (boiler treatment, sewage treatment, etc.), Supply (COSAL, ShipCLIP), Environmental, and Safety. SAMM is interactively taught using actual data and each module is discussed extensively.

Upcoming CY '05 class dates:

- December 05-16, 2005

Upcoming CY '06 class dates:

- Jan 23-Feb 3, 2006
- April 17-28, 2006
- July 10-21, 2006
- December 04-15, 2006

For further information and to sign up, please go to the CMEO website (http://63.219.124.12/cmeoclasssignup/cmeo.htm), or contact Dave Greer (david.greer1@navy.mil) with any questions.

Open up and say… Ahhh, some Feedback!

This is designed to help *YOU* by providing useful information. Feedback is *ESSENTIAL* to making this a helpful bulletin to all shipboard personnel in doing your job "smarter not harder". Please pass on any and all feedback from your Engine Department.

This is ***YOUR*** Maintenance Management Bulletin. What we don't want is to give you more junk mail. If there's a SAMM or Maintenance tip, topic, question, suggestion, or comment on how to make this useful, or something relating to Engineering Maintenance you think should get out to the ships, please pass it on. Send your submission to Randy Torfin (randel.torfin@navy.mil) *OR* Norm Wolf (norman.wolf@navy.mil).

COMING UP FOR NEXT MONTH!

New SAMM/Maintenance Tips!

Insulation Resistance Monitors in Lieu of Meggering

Another Question of the Month

New Pictures of the Month!

Vibration Monitoring Tips & Information

N711 – Points of Contact:

Branch Chief – Randy Torfin, (202) 685-5744 (Randel.Torfin@navy.mil);

Sr. Mechanical Engineers – Will Carroll, (202) 685-5742 (William.S.Carroll@navy.mil) & Norm Wolf, (202) 685-5778 (norman.wolf@navy.mil);

Mechanical Engineers – Liem Nguyen, (202) 685-5969 (liem.nguyen@navy.mil) & Andrew Shaw, (202) 685-5721 (andrew.shaw@navy.mil);

Electrical Engineer – David Greer (202) 685-5738 (David.Greer1@navy.mil)

Accelerometer Overload

By K.C. Dahl, Engineer
*DLI Engineering (**www.DLIengineering.com**)*

A common diagnosis issued by the Expert system is "Accelerometer Overload" when a significant "Ski Slope" is present the spectral vibration data. A "Ski Slope" is an elevated noise floor that decreases with increasing frequency, often overwhelming the peaks at discrete frequencies that are present in normal measurements.

When the system indicates accelerometer overload, further investigation is usually required to determine the real cause of the bad data. Collecting time waveform data or increasing the analysis frequency range may help point to the problem. Intermittent glitches in the time record may be caused by physically driving the accelerometer into saturation, or by temporarily interrupting the power supply to the sensor.

True accelerometer overload is caused by exceeding the vibration limit of the transducer (typically 40 g's or greater), which saturates the internal amplifier. When this occurs, the electrical response of the transducer becomes distorted or temporarily unstable. Real physical vibration that causes this is usually high frequency, possibly exciting the natural frequency of the accelerometer or the sensor mount. Linear displacement of vibration decreases with increasing frequency, so high-amplitude, high frequency vibration may be present even if a machine seems like it is running fairly smooth.

This type of reading may also be caused by intermittent electrical faults such as broken wires or loose connections. If the power supply to the sensor is temporarily interrupted, then the signal will drift over a brief settling period. If this occurs while a measurement is taking place, then glitches will be observed in the time domain, and a ski slope will be present in the frequency domain data.

Temperature gradients, such as might occur when a cold accelerometer is attached to a hot machine, will also cause a ski slope in the frequency domain. This can be avoided by ensuring that temperature equilibrium between the machine and the sensor is reached before initiating a measurement.

Random or non-periodic motion that is within the measurement limit of the transducer will also result in a ski slope. This type of motion is usually caused by a source outside the machine, or by the operating conditions changing during the measurement period. A loosely mounted sensor may also produce this type of signal. Always ensure that the machine remains in a steady-state condition while vibration readings are being taken, and that external sources of motion are at a minimum.

Bad cables, faulty connections, and improper sensor mounting should be eliminated as a cause of the ski slope before investigating true accelerometer overload. Cable problems should always be suspected when a ski slope is seen in data from multiple machines collected with the same transducer/data collector, always on the same channel. For the cluster-type sensors used on aircraft carriers, which are not ground-isolated, a ski slope may be seen on all channels when the ground connection (brown wire) to the accelerometer block is broken. When a faulty cable or connector is suspected, the transducer should be sent to DLI for replacement. Be aware that the designations radial, axial, and tangential depend on the mounting pad orientation, and are not always mapped to the same channel of the sensor.

It is common for one particular machine location to consistently indicate accelerometer overload. When this occurs, the bronze attachment disk should be replaced. If overload is still indicated, it could mean that a component of vibration (usually high frequency) exceeds the valid range of the sensor. This vibration might be inherent to the machine, and does not necessarily indicate a problem. However, if previous measurements from the same location did not result in a ski slope, and hardware problems and transient motion have been eliminated as a cause, then it may be suspected that the accelerometer overload indicates the presence of a developing mechanical fault. This has been seen to be the case, for example, with the deterioration of ceramic bearings, which can generate significant high frequency vibration.

Machine locations that consistently produce indications of accelerometer overload, but for which no other problem can be diagnosed, might require that measurements be taken with a different type of sensor, or that data be analyzed with a technique other than frequency analysis. It is important to realize that measurements are generally not valid if physical or electrical sensor overload occurs. Information about the state of the machine can rarely be deduced from these data.