



Action code: **WHEN CONVENIENT**

Low Load Operation

2011 Update

SL11-544/MTS

June 2011

Concerns

Owners and operators of MAN B&W two-stroke marine diesel engines.
Types: MC/MC-C and ME/ME-C/ME-B

Summary

Feedback on low-load operation from the operators has generally been positive. Only a few issues have emerged, but have been dealt with by few countermeasures.

Dear Sirs

In continuation of SL09-511, this service letter is issued to describe the service experience of MC/MC-C and ME/ME-C/ME-B engines, based on feedback from operators operating engines down to 10% engine load for longer periods.

Generally, the feedback has been very positive, with only a few necessary countermeasures to be handled.

Special attention has been directed to fouling of exhaust gas ways and turbocharger(s), but no major difficulties have been reported in this relation when following the guidelines from SL09-511.

Other issues have emerged, but they have been dealt with by means of a few countermeasures, as outlined in this service letter.

Yours faithfully

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CONTENTS:

Introduction	Page 2
Auxiliary blower	Page 2
T/C cut out	Page 2
Flap valves in scavenge air receiver	Page 2
Cylinder lubrication	Page 3
Turbocharger cleaning and engine load-up	Page 4
Wear on components	Page 4

Introduction

This service letter is a continuation of the service letters SL08-501 and SL09-511, and it is based on feedback from operators with engines operating continuously down to 10% engine load.

Auxiliary blowers

In connection with continuous low-load operation and, thereby, increased operation time of auxiliary blowers (A/B), we have experienced an increasing number of breakdowns of the A/B. An increased number of running hours will require increased maintenance, but still a number of breakdowns have occurred.

On some occasions, a contributing factor has been that the A/B flange venting hole for shaft sealing leakage has been plugged, thereby introducing a large risk on the bearing in case of a leaking shaft sealing.

If the shaft seal is leaking, and the venting hole is plugged, the scavenge air pressure will push air, sludge and impurities from the scavenge air through the bearing and, thereby, remove the lubricant from the bearing.

It is recommended to check the venting hole on all auxiliary blowers, and remove the plug if installed. A drain from the venting hole to the frame box drain should be arranged in order to avoid oil spills below the blowers. Change the shaft sealing if an excessive air amount is experienced from the drain.

During extended periods of low-load operation, we recommend to increase the attention and maintenance level for the A/B.

It is a general recommendation to carry a complete spare blower on board the vessel if low-load operation is employed for longer periods.

SL09-511 recommends operating the A/B in 'Manual on', operating the engine at A/B switch on/off point, so as to avoid frequent start/stop of the A/B. Operating the engine in this condition will result in the necessity of a manned engine room due to the engine control system (ECS).

For the ME engines, the ECS will handle the control of the A/B's and prevent a main engine start from the bridge if the A/B's are in 'manual on'. For the MC engine, the BMS (bridge manoeuvring system) will not block the engine from being started from the bridge if start blocking "Auxiliary blowers not in auto" is not implemented in the BMS software, and it will therefore be possible to start the engine with insufficient blower capacity, which could lead to engine damage.

During un-manned engine room, we therefore recommend operating the A/B's in auto, in order to ensure safe operation of the engine and auxiliary blowers under all running conditions.

T/C cut-out

Service experience with turbocharger cut-out has generally been positive. A high number of T/C cut-out installations with blind plates has been in trouble-free operation for several years. Installations with flexible cut-out (swing gates) has also shown good performance.

Flap valves – scavenge air receiver

There have been several reports of broken flap valves in connection with low-load operation.

At some point in the load area around the switch point of the A/B, the flap valves (non-return valves) in the scavenge air receiver will be continuously opening and closing due to the pressure pulsations in the scavenge air receiver. This load area can be recognised by a distinct hammering noise

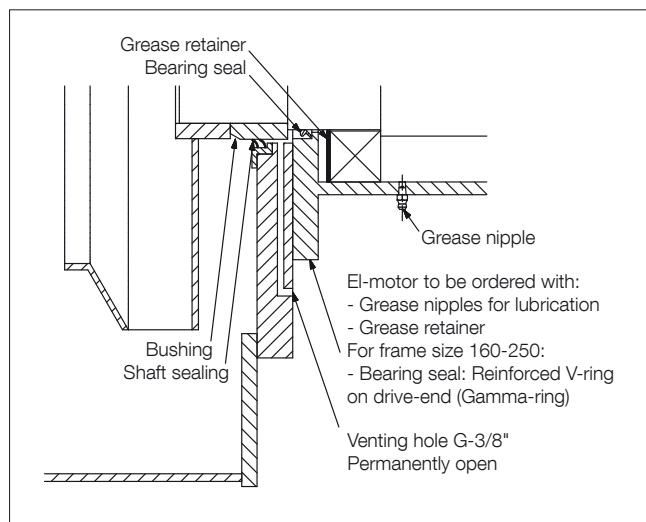


Fig. 1: Cut out of A/B wheel/shaft/flange



from the flap valves. The hammering of the valves will damage and/or break the valves after a short period.

Operating the engine continuously in this load area must be avoided, and the load area should be passed as fast as possible.

Broken and damaged valves must be changed at first opportunity, and valve pieces should be removed from the scavenge air space to prevent them from causing damage downstream.



Fig. 2: Broken flap valves

Broken and missing valves will have a negative impact on the engine performance when the auxiliary blowers are running.

Cylinder lubrication

Lower-load operation will result in an increase in the specific cylinder oil dosage (g/kWh).

The intention is to switch from load-proportional control to rpm- or mep-proportional control below 25% engine load. However, on mechanically controlled MC/MC-C engines, the Alpha Lubricator system has a limit of max. 15 rev. between injections in order to avoid too long intervals between lube injections. In most cases, this means that rpm-proportional lube oil control will start already at 35-40 % load. This may result in excessive lubrication at very low loads (10% load), which could lead to deposit build-up on the piston top lands.

Deposit build-up of unused lube oil and additives may be harmful to the cylinder condition, especially in connection with subsequent loading up to higher engine loads. However, we have not received any reports of damage in relation with overlubrication at low loads.

As illustrated in Fig. 3, the specific feed rate could, potentially, be reduced significantly if the 15 rev./inj. limit is reached too early. The feed rate could easily be halved if a constant specific feed rate, following the power algorithm, down to 10% engine load is applied.

To reduce the breakpoint load, smaller Alpha Lubricator pumps can be retrofitted whereby the load proportional

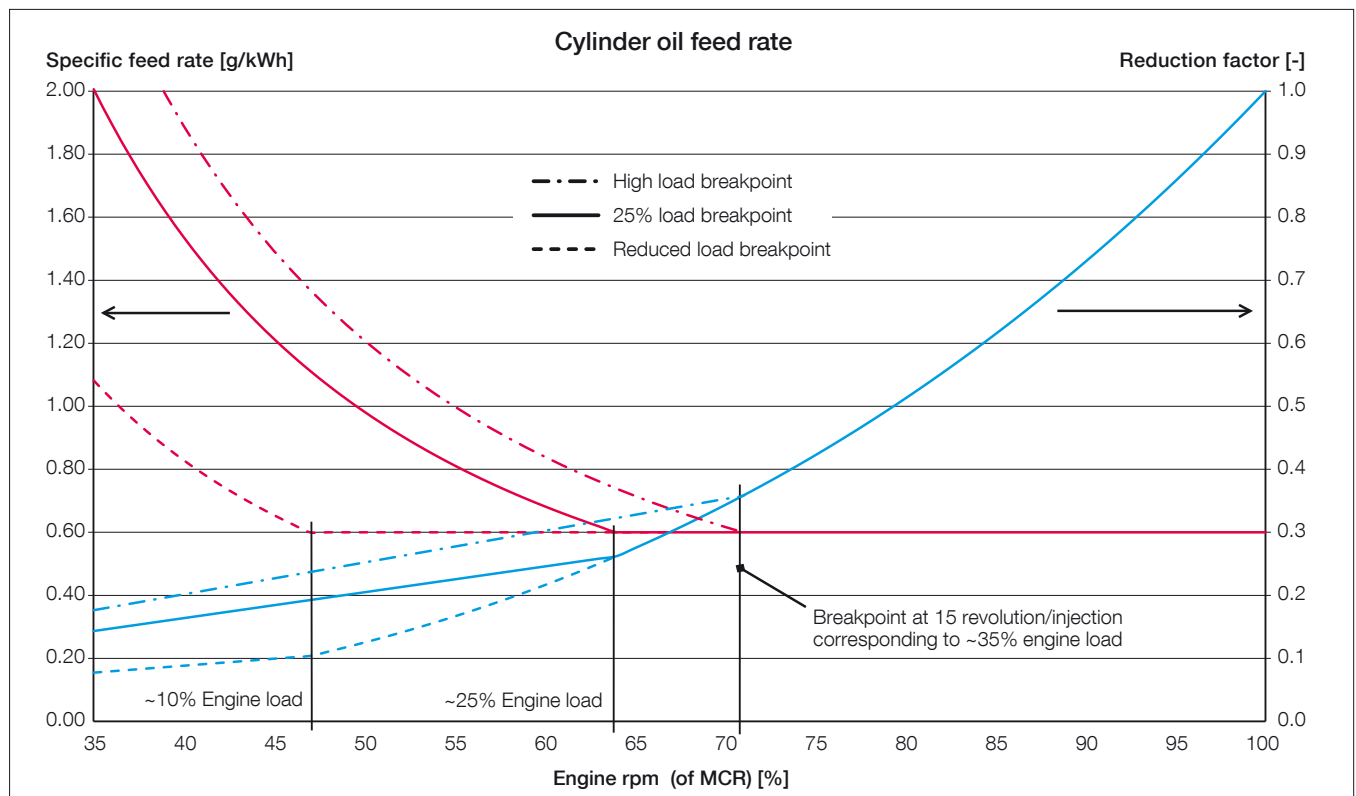


Fig. 3: Alpha Lubricator feed rate algorithm



breakpoint can be moved down to a lower engine load. Depending on the load pattern of the engine, this modification could show profitable, and it would reduce the fouling of the scavenge air space with excessive lube oil.

If mechanical lubricators are installed, it is highly recommended to retrofit the Alpha Lubricator. Especially during low-load operation, the mechanical lubricator will have a very high feed rate compared to the specified need.

The lubrication systems applied on the electronically controlled engines (ME/-C/-B) fully comply with the specified feed rate due to the layout philosophy for these lubricators.

Turbocharger cleaning and engine load-up

The necessity of turbocharger cleaning will highly depend on the maintenance condition of fuel injection equipment, fuel cleaning equipment, and the quality of the fuel used. The cleaning interval must be based on experience from the specific plant, and it will vary from ship to ship.

Engine load-up level (% engine load), and the frequency of engine load-up, should be reduced as much as possible in order not to compromise the cylinder condition.

Engine load-up to approximately 50% engine load every second day could be used as a reference starting point.

The necessary cleaning intervals of the turbocharger are specified by the turbocharger designer, and the latest recommendation should be followed.

The recommended cleaning intervals from the three T/C designers are outlined below:

- ABB: increase load to >50% engine load
 - minimum once every 24-100 hours.
- MAN: to be effected during normal service load, i.e. not necessary to increase engine load
 - minimum once every 24 hours.
- Mitsubishi: load to be between a minimum and a maximum T/C speed depending on T/C type
 - minimum once every 100 hours.

Wear on components

A reduction in engine load will generally reduce the load on engine components, both in relation to temperature and load.

We have seen indications that the piston ring wear and liner wear will be reduced with a reduced engine load, but due to the limited running hours, no clear conclusion has been achieved so far.

In addition, wear on some components will be directly related to the number of revolutions for the engine. Running hours for these components could be extended to the same proportion, depending on the low-load profile for the engine compared with a 'normal' load profile.

Questions regarding this service letter should be directed at our Operation department in Copenhagen (email: operation-cph@mandieselturbo.com).

Please contact PrimeServ-cph@mandiesel.com for further information and a quotation for specific applications.