



Grindrod Ship Management, a division of Grindrod Shipping Pte. Ltd.

To : As per distribution list

Our Ref : HSEQ

From : Technical

Date : 20 October 2020

UEC Diesel Engines

Main Engine Cylinder Oil Feed rate setting, Calibrations, Inspections, Oil Sampling

Dear Chief Engineer

In light of the recent engine component failures, we have enhanced our approach to meet the challenges faced by the varying quality of VLSFO supplied around the world.

To mitigate the problem of premature wear on liners, pistons and ring packs caused by the lack of lubricity and the corrosive tendency of these fuels, and the abrasiveness of Cat fines, we have reviewed various service bulletins from the engine maker and collated this information to help make informed decisions based on in service condition and trends that we observe from the fleet, to prevent premature failures.

All matters pertaining to Main Engine liner wear, running in, piston ring gap wear, fuel issues, cylinder lubricating issues and related matters are to be addressed to Rennie Govender - Projects Manager email: rennieg@grindrodshipping.com and copied to the SM and Grindrod Ship Management - technical@grindrodshipman.com . Rennie or the SM can be called on their mobile numbers at any time for emergency assistance. (+27 83 701 4567)

Please be informed, for all the UEC engines, that the following guidance was recently release in Service Bulletins USI-10022E Rev.2 & USI-10004E Rev 7 about cylinder oil selection and temperature adjustment of jacket cooling water for compliant fuel oils. Considering the current service results with compliant fuel oils, for fuels having sulfur content of 0.1% or below and 0.1%~0.5%, the engine makers have recommended to switch back to BN70 cylinder oils with ample service experiences and higher detergency / dispersant factors designed to reduce scuffing,



Sulfur content of fuel oil	Recommended cylinder oil BN (mgKOH/g)	
	Category II (UEC-LSE, LSH or later)	Category I (UEC-LA, LS, LSII or older models)
Sulfur \leq 0.1%	BN70	(BN40~ ^{※2})BN70
0.1% \leq Sulfur \leq 0.5%		
0.5% \leq Sulfur \leq 1.5%	BN70 (~100 ^{※1})	BN70 (~100 ^{※1})
1.5% \leq Sulfur	BN100	BN70~100

※1) When excessive residues on piston top lands are observed, adjust the cylinder oil feed rate and/or select cylinder BN.

※2) In case no trouble with BN40 cylinder oil, the BN40 cylinder oil can be used as it is.

Example of the detergency of higher BN Oils

(7/9)





After review of the various Service Bulletins we have decided to follow the company recommended set points as listed in the table below.

Note for the vessel fitted with the Hans Jensen Mechtronic Lubricators Grindrod Shipping will treat these system as a conventional lubrication system, as the maker does not provide any advice for lubrication setpoints within their manuals/service bulletins for HJL. Therefore, until further notice, we follow the Engine Makers recommended lubrication set point rather than the Hans Jensen guidance

Name of Vessel	Maker/Type of M/E	Lubricator & Type	Recommended Feed rate BN 70 (BN 40* Only if no 70 on board, BN 70 to be ordered)	Company Recommended Set Point
IVS KESTREL	mitsubishi 6UEC45LSE-1	HJL Mechtronic Type 95	1,36~1,5 Conventional	1,36 g/kwhr
IVS KINGBIRD	mitsubishi 6UEC52LA	Rational Lubricator/TLDCN 10L-24335-2L	1,35~1,5 (1.1 min depending on liner/ring condition)	1,36 g/kwhr
IVS KINGLET	mitsubishi 6UEC45LSE	HJL Mechtronic (Type: 95)	1,36~1,5 Conventional	1,36 g/kwhr
IVS KNOT	mitsubishi 6UEC45LSE	HJL Mechtronic Type 95	1,36~1,5 Conventional	1,36 g/kwhr
IVS Phinda	mitsubishi 6UEC45LSE-B2	HJL Mechtronic Type 95B	1,24~1,5 Conventional	1,24 g/kwhr
IVS Sparrowhawk	mitsubishi 6UEC45LSE-B2	HJL Mechtronic Type 95B	1,24~1,5 Conventional	1,24 g/kwhr
IVS Sunbird	mitsubishi 6UEC45LSE-B2			g/kwhr
IVS Tembe	mitsubishi 6UEC45LSE-ECO-B2	A-ECL system	0,6~1,1	1,1 g/kwhr
IVS Thanda	mitsubishi 6UEC45LSE-B2	HJL Mechtronic Type 95	1,24~1,5 Conventional	1,24 g/kwhr

NB Adjustment of the cylinder oil feed rate must be based on the inspection results of piston ring/cylinder liner running behavior and piston underside drain analysis. Keep monitoring the piston top land condition of combustion residues while applying BN70 cylinder oil, though sound running is to be expected based on the past experiences.

Conventional lubricating system allow for a higher feed rate than the other lubricating system, however close inspection is a required.

If unsure of the evaluation, taking the below guidance's in to account, please contact Rennie Govender/ Ship Manager with any evidence, such as photographs of piston ring/cylinder liner (as shown below) and analysis records of piston underside drain(Fe content and residual BN) . He and the Ship Manager will offer further guidance.

Equipment provided to Monitor the performance of each unit

These are to be supplied as standard testing equipment to all our vessels. Please ensure you always have sufficient sample bottles and reagents to be able to test on board/land



samples for shore analysis. If not raise a requisition in BASSNet:

1. Tribolron Fe test kit – these kits produce an instant result of iron levels in the scavenge drainage, in addition to our CSA samples being landed for testing.
2. Tribomar BN test kit – these do on board tests for BN, water etc.
3. Tribomar CSA kit – under piston scavenge drain samples for analysis ashore



UE SERVICE INFORMATION

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Inspection sample photos of piston rings/cylinder liner.

(4-stage rings, Top, 2nd: Cr-coating ring)

Piston rings



Top/2nd rings (enlarged)



Piston skirt



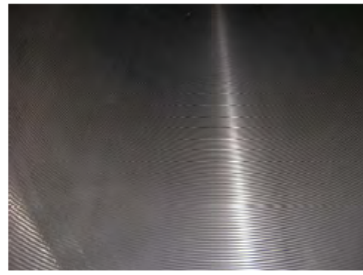
3rd/4th rings (enlarged)



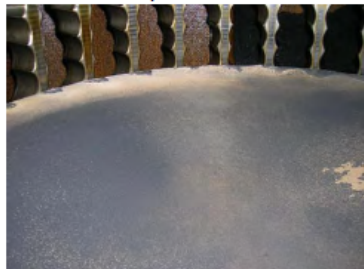
Piston top land



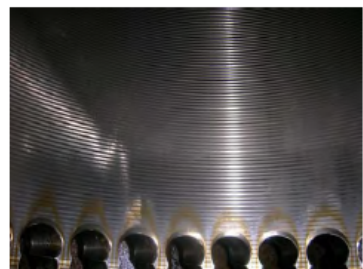
Cylinder liner upper area



Combustion side of piston


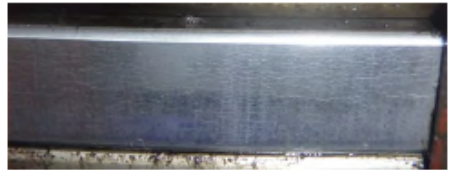




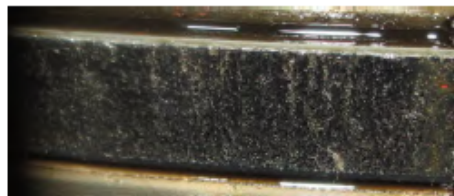


Cylinder liner lower area





Evaluation of piston ring condition and action to be take (Photos show Cr-Ceramic ring's cases.)

	Piston ring running state	Recommended Actions
Case.1 Normal & Good		Reduce the cylinder oil feed rate according to guidance.
Case.2 Minor micro cracks		
Case.3 Extended micro crack		<Engines with A-ECL, ECL-T and SIP lubricating system> Increase by 0.20g/kWh and keep monitoring
Case.4 Peeling off of coating		<Engines with conventional lubricating system> Increase by 0.30g/kWh and keep monitoring.
Case.5 Local hard contact		※If peeling-off penetrates vertically or peeling-off area exceeds half the circle, replace the piston ring with a new one. (Refer USI-24505)
Case.6 Early stage of adhesive wear (remaining of coating)		<Engines with A-ECL, ECL-T and SIP lubricating system> • Increase up to 1.70g/kWh <Engines with conventional lubricating system> • Increase up to 2.30g/kWh.
Case.7 Adhesive wear		<Common notice> • Replace piston ring(s) at early opportunity. • Replace cylinder liner according to liner actual conditions.

If evaluation is hesitated onboard, please contact J-ENG with evidences, such as photos of piston ring/cylinder liner and analysis records of piston underside drain(Fe content and residual BN) for further guidance



Adjustment of cylinder cooling water temperature

In the past Cylinder cooling water outlet temperature had been adjusted targeting at the upper limit of 90°C in the normal range of 80°C~90°C to avoid low temperature corrosion. When using 2020 SOx compliant fuel oils with low sulfur content (max. 0.5%), possible risk of low temperature corrosion is reduced and jacket cooling water outlet temperature must be adjusted **targeting the lower limit of 80°C**.

If it is difficult to adjust the temperature at 80degC considering heat balance of other onboard equipment, such as fresh water generator, adjust the temperature as close as possible to 80°C.

Ceramic Piston Rings

J-ENG is investigating higher durability piston ring too cope with various properties of 2020 compliant fuel oils, following candidate piston rings are being studied. Please make a note when ordering pistons rings that the maker must be consulted prior to purchasing new rings.

Take note these rings are not applicable to all models

Higher durability piston rings under study

Target engines are equipped with Cr-coating and/or bare cast iron rings

		Original	Higher durability	
Top	Coating	Cr Straight or Angle-cut	Cr-Ceramic Gas tight	Cr-Ceramic Straight
2 nd		Cr or bare cast iron Straight or Angle-cut	Cr-Ceramic Straight	
3 rd	Butt shape	Bare cast iron Straight or Angle-cut	Cr-Ceramic Straight	
4 th		Cr or bare cast iron Straight or Angle-cut	Cr-Ceramic Straight	
Target engine models			UEC60LS/LA UEC50LSII UEC60LSII UEC45LSE-1 UEC52LSE UEC60LSE-1 UEC68LSE	UEC45LA [®] UEC52LA UEC52LS

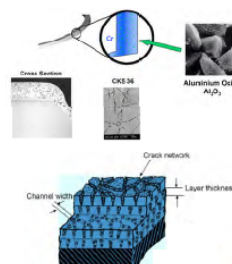
For UEC45LA, the butt shape of higher durability spec. is angle-cut

Butt shape : Gas tight



In case that wear of piston ring / cylinder liner progresses, gas sealing performance can be kept good.

Coating : Cr-Ceramic



Origin: Material introduced by ENGINEERING DEPT., FEDERAL MOGUL

Al₂O₃ is included in the channel crack of multi-layer chrome plating, which has higher wear & scuff resistance compared to Cr plating.



UNDER PISTON INSPECTIONS

This is to be done monthly as a planned routine.

They will also be done as per below running in procedures if major work has been performed on the engine.

The under piston inspection is to be recorded on Form 6.6.6.2, with clear close up pictures. The monthly routine has been added to BASSNet as a monthly scheduled job.

The 3 Monthly routine also includes entering the air side of the scavenge to conduct the same inspection as carried out monthly from the fuel side and has now also been included into BASSNet.

Under piston drain oil will be sampled and sent for analysis as Tribomar CSA samples. This sample is tested for Fe, water and BN levels by our contracted testing company Maritec.

These inspections are to be carried out at times when a new batch of fuel is bunkered, and the inspection is to be done at least 48hrs after commencing use this fuel. The Chief Engineer is to discuss the plan with the Ship Manager who will notify IVS Operations.

If any of these inspections are not able to be performed on planned schedules, the SM must be contacted for advice.

RUNNING IN PROCEDURES

This to be discussed with all the engineers on board and your Ship Manager. The ER to be manned at all times during running in.

Note guidance from Engine Manual Group 053 / Item 02

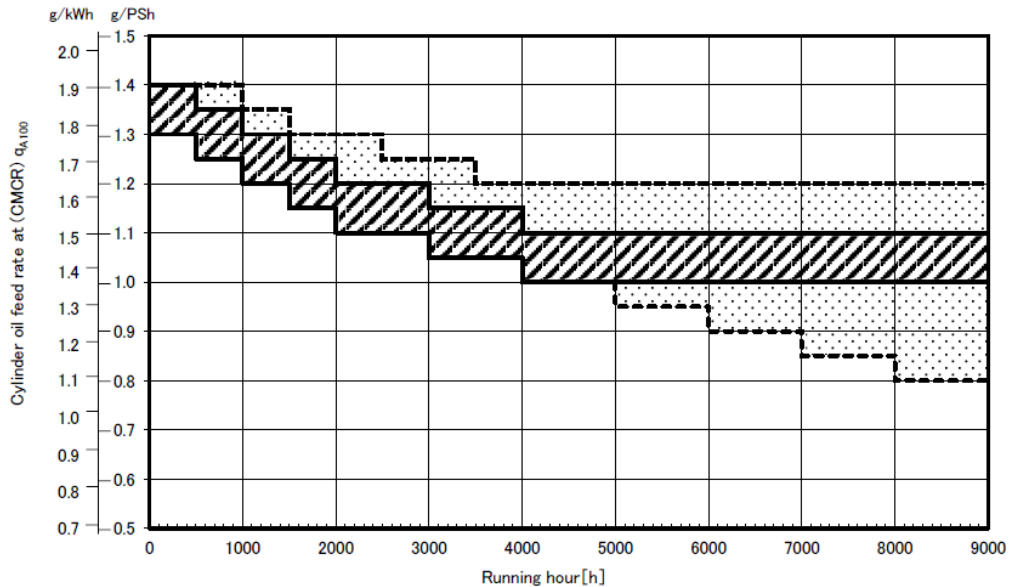
Guidance for cylinder oil feed rate when replacing both cylinder liner and piston rings for Conventional and A-ECL and the HJL Mechtronic Lubricator retrofit (HJL to be treated as Conventional systems). The feed rate is to be increased to the rate as stipulated at 0 Running hours. It is to be decreased in accordance to the below guidance.

1. For the conventional & HJ Mechtronic Lubricators, the CEO to verify the current feed rate for the respective unit and increase the lubrication by +30%. Max allowable is 2.3g/kwhr. The feed rate is to be decreased at not more than 0.07g/kwh every 200~300 hrs, until you reach the feed rate prior to replacing the rings.



UEC-LA/LS guidance of cylinder oil feed rate (conventional system)

- : Standard zone
- : Feed rate shall be adjusted by taking account of kinds of cylinder lubricating oil and fuel oil and conditions of rings and liners.

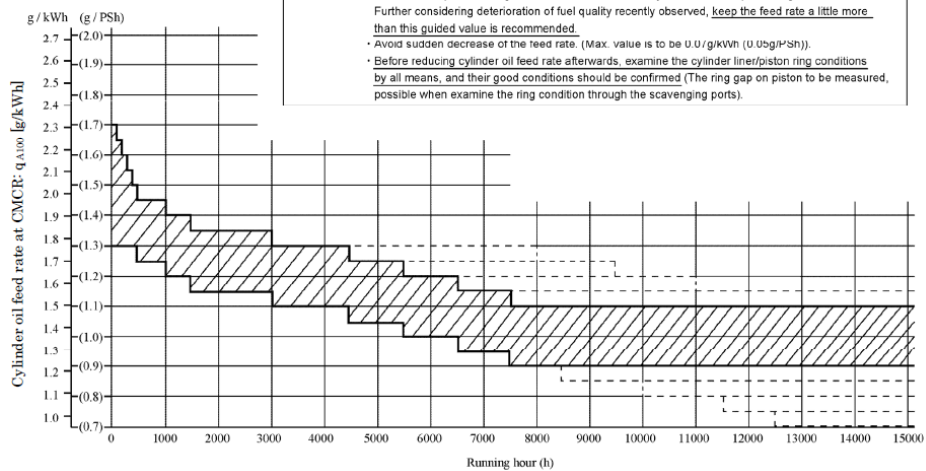


UEC-LSII guidance of cylinder oil feed rate (conventional system)

CAUTION

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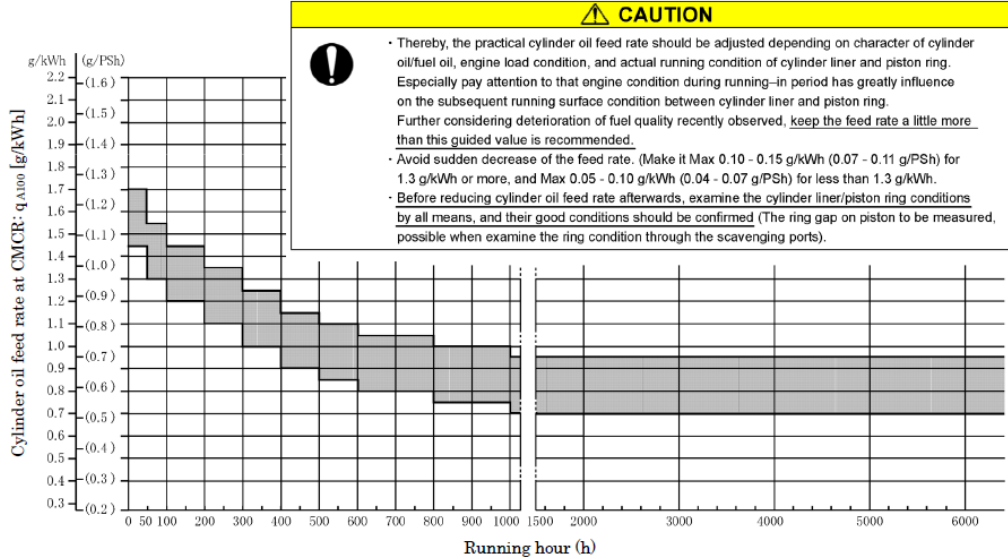
- Thereby, the practical cylinder oil feed rate should be adjusted depending on character of cylinder oil/fuel oil, engine load condition, and actual running condition of cylinder liner and piston ring. Especially pay attention to that engine condition during running-in period has greatly influence on the subsequent running surface condition between cylinder liner and piston ring. Further considering deterioration of fuel quality recently observed, keep the feed rate a little more than this guided value is recommended.
- Avoid sudden decrease of the feed rate. (Max. value is to be 0.0/g/kWh (0.0g/PSH)).
- Before reducing cylinder oil feed rate afterwards, examine the cylinder liner/piston ring conditions by all means, and their good conditions should be confirmed (The ring gap on piston to be measured, possible when examine the ring condition through the scavenging ports).



2. For vessels fitted with the A-ECL Lubricator CEO to verify the current feed rate for the respective unit and increase the lubrication by +0.27g/kwhr. Max allowable is 1.7g/kwhr. The feed rate is to be decreased at not more than 0.07g/kwh every 200~300 hrs, until you reach the feed rate prior to replacing the rings.



UEC-LSII type guidance of cylinder oil feed rate (A-ECL system)

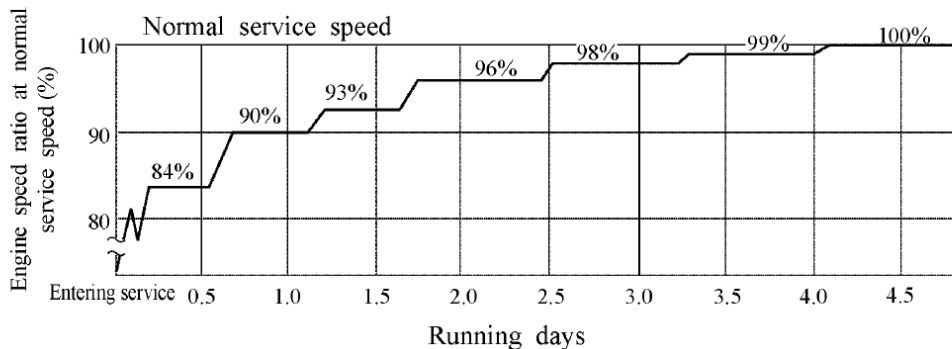


NB: - Before decreasing the cylinder oil feed rate and under piston inspection must be carried out for the respective units.

Procedure for running in the unit after replacing the piston rings or the liner must be followed refer to the instruction manual

Procedure for increasing speed :

The procedure is in the same way as a ship is entering maiden voyage (refer to 025-01). Keep paying attention to heat generation, noise, pressure, and temperature of engine various parts while the engine speed is on the increase.



- This chart will serve as reference for a procedure for increasing speed after renewing the piston ring or the cylinder liner. Therefore, in case of an actual voyage, a decision is to be made in accordance with the conditions of various parts of the engine.
- The range of critical speed due to torsional vibration shall be passed through as soon as possible.



The Master is to inform the pilot aboard that the main engine was worked on and running in, and hard movements are to be avoided.

- Step 1 - 50% Normal Service Speed load for first 2 hours
- Step 2 – 50-84% Increase load 2% every 15 min for the next 4 hours until the vessel reaches 84% Normal Service Speed. Stop and inspect the under-piston spaces as per agreed reporting form 6.6.6.2. If any problems noticed, call SM to discuss. If all is in good condition, take a set of close up pictures of the components, box up the covers, restart the engine and go back to last speed and oil feed before you stopped for the inspection. Send photos and the report to the SM and call him to discuss your findings. In collaboration with the SM and designated Projects Manager, the vessel will receive an email to advise what to action, if any is required.
- Step 3 – Maintain 84% for the next 8 Hours. After running for 8 hrs, stop the engine and inspect the under pistons of all six units. If all is in good condition, take a set of close up pictures of the components, box up the covers, restart the engine and go back to last speed and oil feed before you stopped for the inspection. Send photos and the report to the SM and call him to discuss your findings. In collaboration with the SM and designated Projects Manager, the vessel will receive an email to advise what to action, if any is required.
- Step 4 - 84% - 90% Increase load 1.5% every hour over 4 hours.
- Step 5 - Maintain 90% for the next 10 hrs. After running for 8 hrs, stop the engine and inspect the under pistons of all six units. If all is in good condition, take a set of close up pictures of the components, box up the covers, restart the engine and go back to last speed and oil feed before you stopped for the inspection. Send photos and the report to the SM and call him to discuss your findings. In collaboration with the SM and designated Projects Manager, the vessel will receive an email to advise what to action, if any is required.
- Step 6 - 90% - 93% Increase load 1% every hour.
- Step 7 - Maintain 93% for the next 10 hrs.
- Step 8 - 93% - 96% Increase load 1% every hour.
- Step 9 - Maintain 96% for the next 16 hrs.
- Step 10 - 96% - 98% Increase load 1% every hour. For engines fitted with the A-ECL Lubricator the lubrication can be reduced as per chart however only after carrying out and underpiston inspection and on consultation with your ship manager after you have sent through photos of all 6 units. For conventional systems/HJL the lubrication set point remains the same.



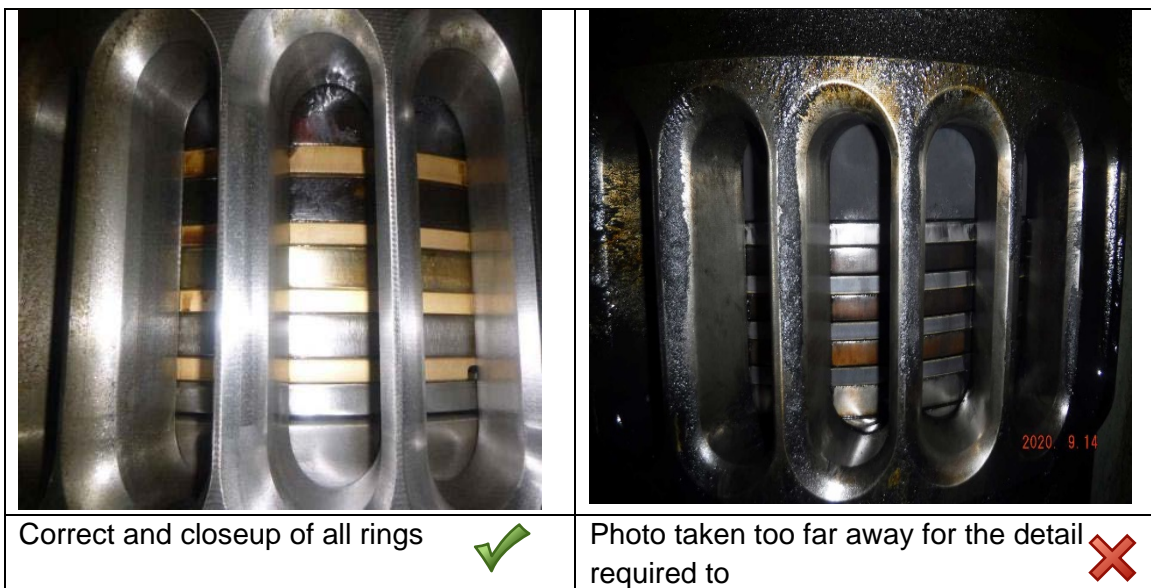
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- Step 11 - Maintain 98% for the next 16 hrs.
- Step 12 - 98% - 99% Increase load 0.5% every hour.
- Step 13 - Maintain 99% for the next 16 hrs.
- Step 14 - 98% - 99% Increase load 0.5% every hour.

Running in time approximately 100-112 Hrs to Nominal Service Speed. At this stage vessels fitted with A-ECL lubricator or the LSE II engines can reduce the feed rate as per chart only after carrying out an under-piston inspection and on consultation with your ship Manager. For the older engines the first lubrication adjustment can only be done at 500hrs after carrying out an under-piston inspection.

Additional Guidance

1. Running in should not be suspended. In case of emergency, you must of course choose vessels safety first, but this might have negative effect on the end result in setting up the proper cylinder liner/piston ring symbiotics. The running in must/should be followed to archive best result.
2. Please see Form 6.6.6.2 guidelines that you need to assess the photos you will be taking at each step. Please find examples on the left of good quality reports and on the right a report that the Office would not be able to interpret.





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<p>Correct magnification to establish ring's performance </p>	<p>Nothing can be made of the ring's performance – no magnification. </p>

Regards

Rennie Govender
Project Manager

p.p.

DISTRIBUTION

- All Masters
- Ship Managers
- Marine Superintendent
- Marine Manager SHEQ Manager
- Crewing Manager