



Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil - GulfSea Cylcare XP 5040

Author: Obydur Rahman, MLE, CLS

[Published in July 2024]

TB027

Abstract:

Gulf Marine achieved a significant milestone in August 2021 by securing a No Objection Letter from MAN ES for their Category II 40 BN cylinder oil, GulfSea Cylcare XP 5040. This innovative lubricant, with enhanced cleanliness and wear performance, has undergone extensive testing and demonstrated superior performance in maintaining cleanliness, reducing wear, and optimizing engine performance. It offers significant benefits in terms of reduced feed rates, extended maintenance intervals, and cost savings for vessel operators, while also supporting decarbonisation goals. GulfSea Cylcare XP 5040 sets new standards in cylinder oil technology, addressing the evolving needs of modern marine engines and emerging low-carbon fuels.

In August 2021, Gulf Marine became the first marine lubricant supplier to secure a No Objection Letter (NOL) by MAN ES for our Category II (CAT II) 40 BN cylinder oil (GulfSea Cylcare XP 5040).

The CAT II classification by MAN represents a significant advancement in cylinder oil technology, it requires the lubricant to have enhanced cleanliness, comparable with higher BN Cylinder Oils and wear performance, increasing protection for marine engines.

Our GulfSea Cylcare XP 5040 was tested on

MAN engines under quite severe operating conditions and has been in continuous use (with close monitoring) since its trial phase. As such, we now have the longest service experience with a CAT II 40 BN cylinder oil.

This document discusses our findings based on nearly 3 years of extensive field service experiences.

Our regular and continuous monitoring has reaffirmed the product's superior performance: it maintains cleanliness, enabling vessels to operate with reduced feed-rates, and has demonstrated improved

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

liner wear performance compared to non-CAT II 40 BN cylinder oils. Additionally, the product offers significant benefits in engine maintenance in cost saving and operational efficiency, particularly for newer engines and is suitable for most low-carbon emerging fuel types.

Operational Challenges and OEM requirements

Excessive deposition in the crown and ring pack areas, including the back of the piston ring and groove, is a primary cause of undue liner wear and premature failure. The development of GulfSea Cylcare XP 5040, with its enhanced

cleaning capabilities, directly addresses the excessive deposition issues prevalent in the industry following significant changes in bunker fuels post-IMO 2020.

As explained, the CAT II classification by MAN requires the lubricant to have enhanced cleanliness and wear performance, MAN's CAT II lubricants' cleanliness requirements are shown in the *Diagram 1*.

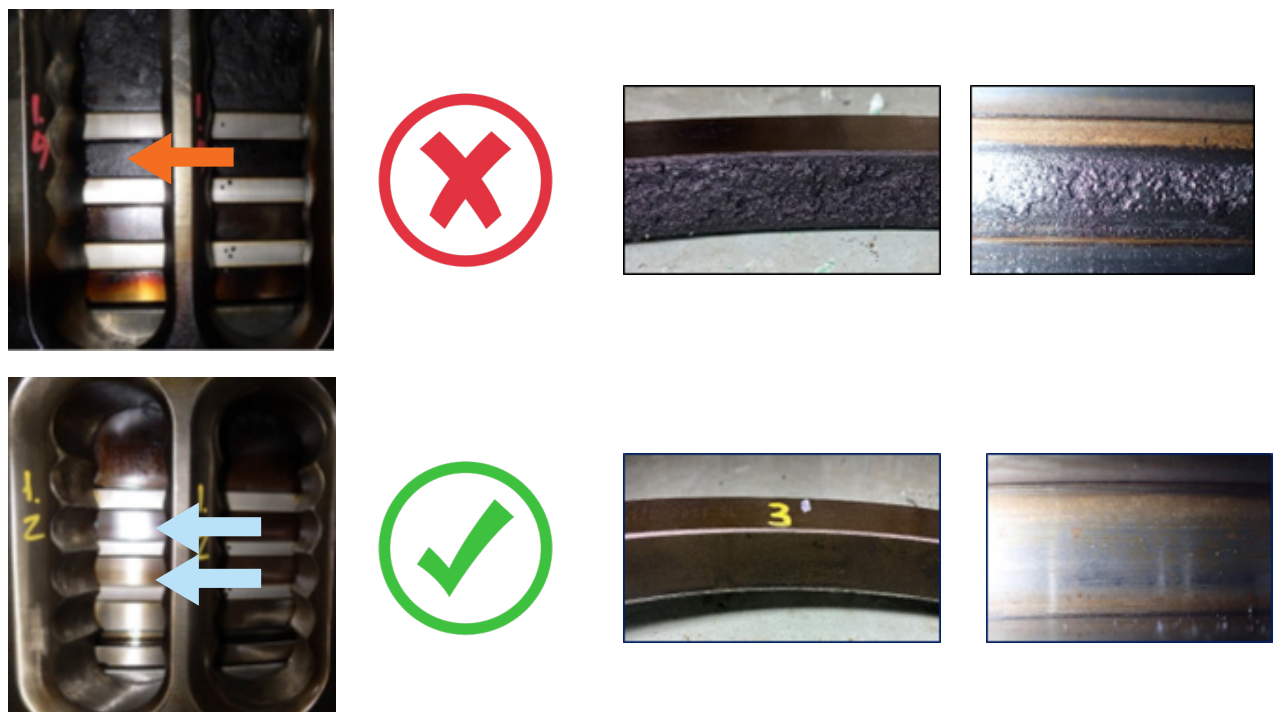


Diagram 1 MAN's CAT II lubricants' cleanliness requirements
Image source: MAN ES Service Letter MAN ES SL2023-737/NHN

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

Cleanliness Performance of GulfSea Cylcare XP 5040

GulfSea Cylcare XP 5040, formulated with advanced deposit control technology, has demonstrated exceptional cleanliness across critical engine components, including piston crowns, ring pack areas, the back of the piston ring grooves, and cylinder liners.

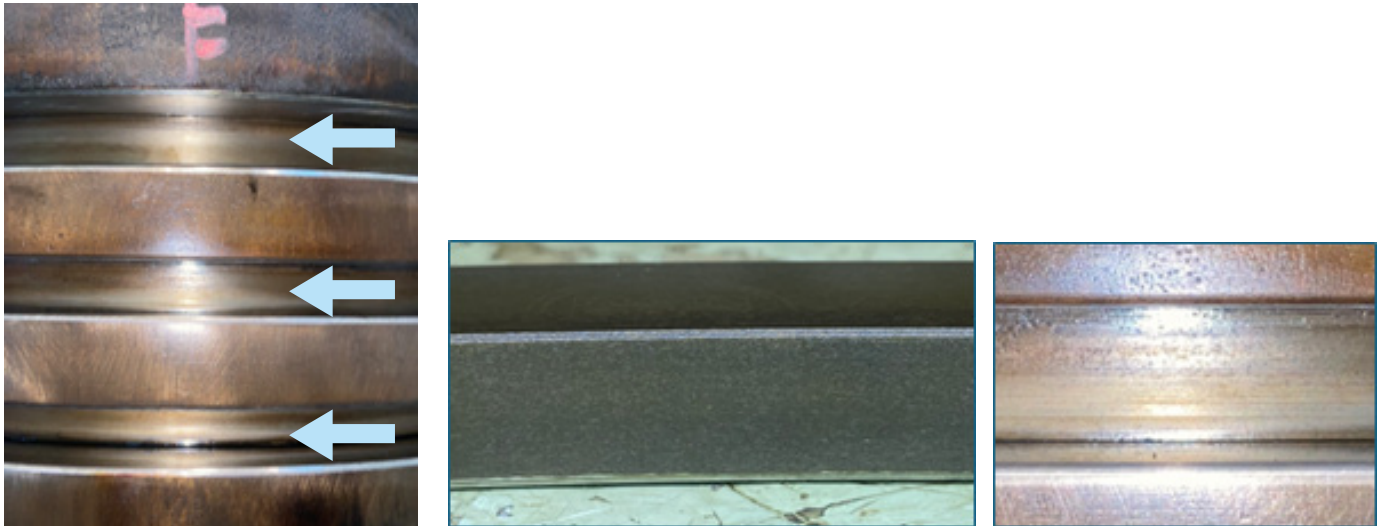


Diagram 2. MAN G60ME-C9.5: 2700 Hours of operation with VLSFO

Extensive field tests with various engines have further substantiated the superior performance of GulfSea Cylcare XP 5040 in maintaining cleanliness, highlighting its excellent deposit control capabilities. (See below images in *Diagram 3* which were captured on a different engine.)

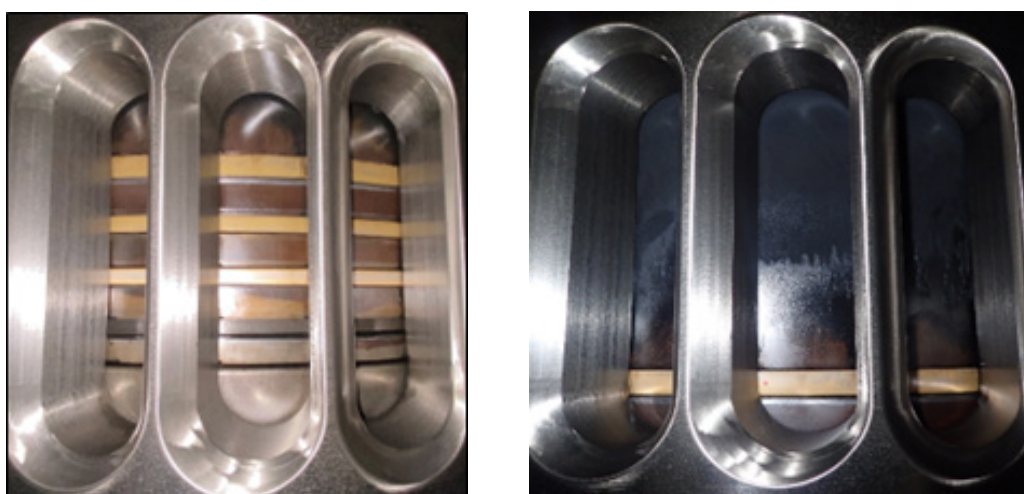


Diagram 3. MAN G80ME-C9.2: 2700 Hours of operation with VLSFO

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

Reduced Wear Rate

Our performance evaluation of GulfSea Cylcare XP 5040 has been extended to understand liner wear behaviour. Using in-situ LDM tools, regular liner measurements were conducted periodically over 21,000 engine running hours while operating on VLSFO and our CAT II 40BN cylinder oil. "The results demonstrated exceptionally low wear rates of 0.02 mm per 1,000 hours; one unit had a wear rate of 0.03 mm per 1,000 hours. These wear rates are significantly below the industry and OEMs' acceptable wear rate limit of 0.1 mm per 1,000 hours.

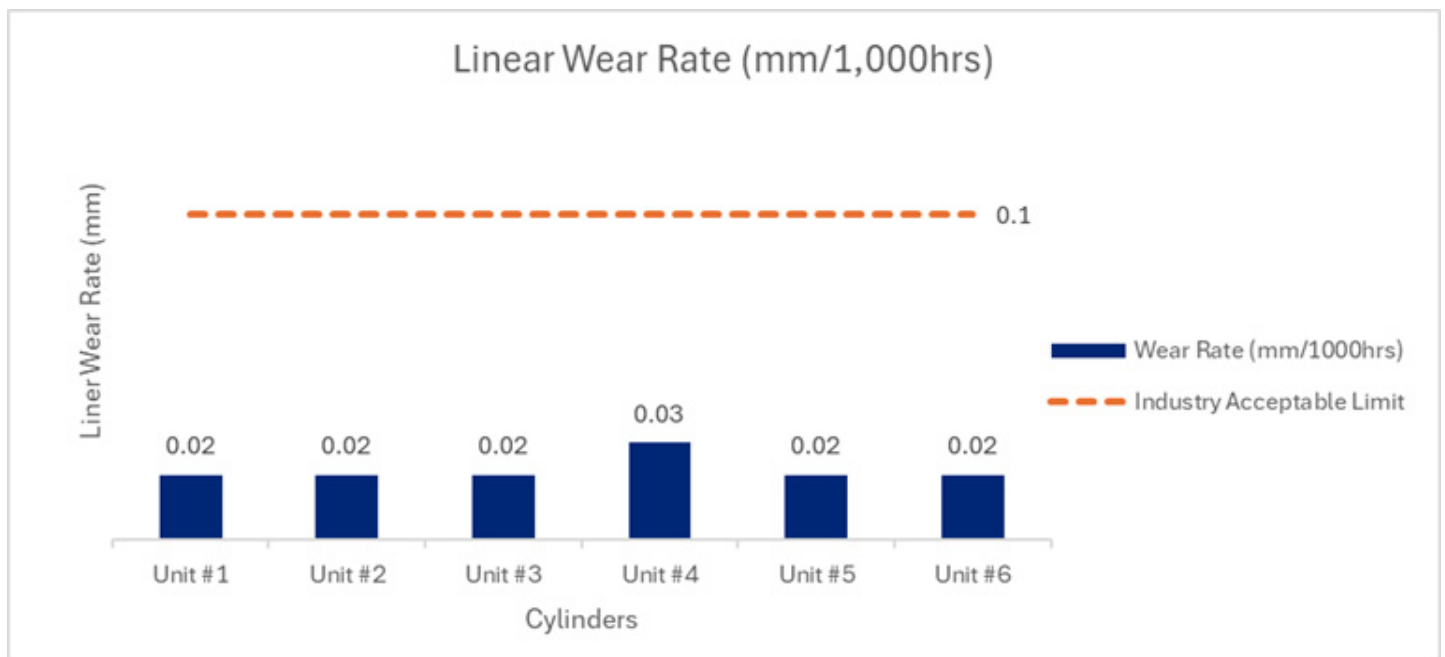


Diagram 4. Liner Wear Rate (mm/1000hrs)

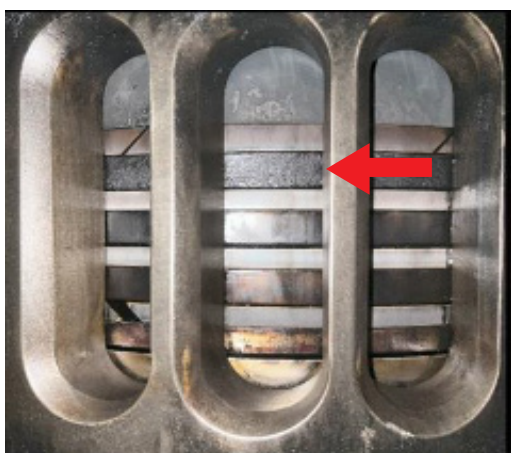
This substantial reduction in wear rate, along with a cleaner system, is expected to extend the time between overhauling, resulting in reduced maintenance costs and smoother operations with increased uptime. Additionally, the prolonged use of engine components is anticipated to contribute positively to vessel operators' decarbonisation goals.

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

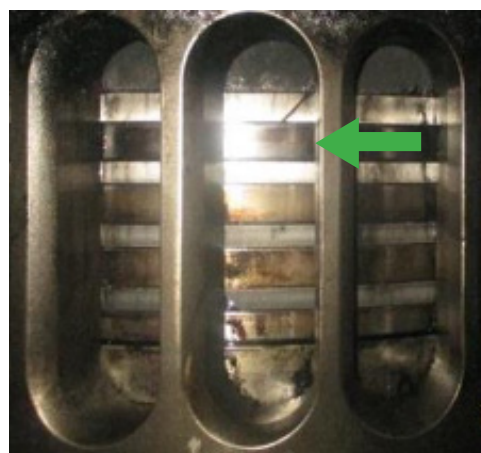
Cylinder Oil Feed Rate Reduction

It is typical that Gulf Marine works with vessel operators to implement our cylinder oil feed rate optimization process upon switching to CAT II 40BN cylinder oils.



**Classical 40BN
(CAT I 40BN)**

Feed Rate: 1.35 g/kWh



**GulfSea Cylcare XP 5040
(CAT II) 40BN**

Feed Rate: 1.20 g/kWh

Diagram 5

Comparative analyses between classical 40BN and Category II 40BN cylinder oils indicate that CAT II cylinder oil demonstrates higher performance than non-CAT II oils even at lower feed rates. (See *Diagram 5*)

The cylinder oil feed rate for the vessel above was reduced from 1.35 g/kWh to 1.20 g/kWh. Despite the 11% reduction, enhanced cleanliness of the piston ring pack area was achieved within just 720 hours, demonstrating the superior efficiency of GulfSea Cylcare XP 5040. Because of the superior performance, we are currently continuing to further reduce the feed-rate for this vessel.

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

In another tested vessel, we reduced the feed rate to 0.9 g/kWh and monitored it for 2,000 hours. Once again, we observed superior cleanliness (see image in *Diagram 6*).

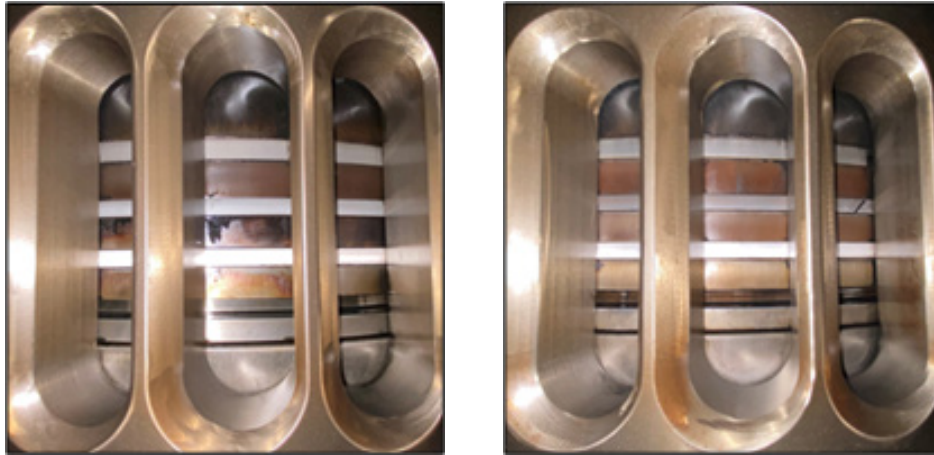


Diagram 6

We have observed feed-rate reductions exceeding 25% in specific vessels, with strong potential to push further to >30% reductions. As a general rule, there is increased potential for feed-rate reductions for vessels using non-CAT II cylinder oils with feed-rates in excess of 1.2 g/kWh.

While each engine behaves uniquely, but the process of determining the optimal feed-rate will be the same, i.e., through our feed-rate reduction programme.

In fact, continuous monitoring and optimization are expected to yield further reductions, enhancing long-term benefits. These can represent real economic savings for vessel operators, reinforcing the value of transitioning to GulfSea Cylcare XP 5040.

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

Suitable for LNG Fuels

In addition to conventional fuels (such as, VLSFO), our monitoring has also been extended to vessels equipped with the MAN – 6G70ME-C10.5-GI, predominantly operating on LNG fuels.

We have a series of vessels that began using GulfSea Cylcare XP 5040 from the time of newbuilding. To date, after 5,500 hours of operation on LNG, the data we collected has provided good insights. Essentially, the results were remarkably similar to what we have achieved with the conventional fuels. (See cleanliness performance from images in *Diagram 7*.)

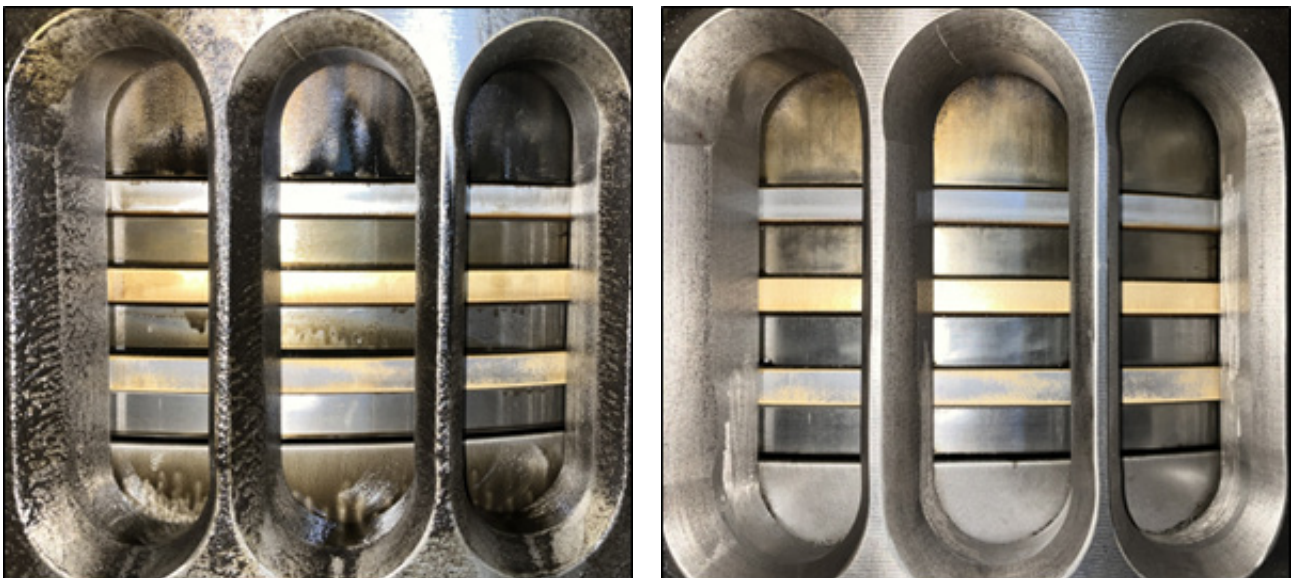


Diagram 7 MAN G70ME-C10.5-GI: 5500 Hours of operation with LNG

Technical Brief

Service Experience of Gulf Marine's CAT II 40BN Cylinder Oil

New Standards in Lubrication Performance

GulfSea Cylcare XP 5040 has set a new benchmark in cylinder oil lubrication with its advanced formulation that enhances cleanliness, reduces wear, and boosts overall engine performance. This innovation is a clear testimony to the ongoing advancements in lubrication technology, designed to meet the evolving demands of modern marine engines and emerging low-carbon fuels.

For vessel operators, its superior performance has enabled optimized feed rates and helps to extend intervals for liner and piston overhauls. These will potentially lower total vessel operating costs, enhance operational efficiency, and increase vessel uptime. In essence, GulfSea Cylcare XP 5040 not only offers considerable economic benefits but also supports decarbonisation goals.

- END -

Gulf Marine

e-mail : technical.engineer@gulf-marine.com
web: www.gulf-marine.com