

# BOB (Blending On Board)

KM Ocean Care

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회사명

KM OceanCare / (주)광문오션케어

대표자

배한경 (裵漢經)

설립년월일

2015년 7월 17일

업종

Ship Energy Saving Solution 외...

ESD (ESF:Energy Saving Fins)



Blending on board



ROV Hull cleaning service





## Licensee Certificate

July 2018

This is to certify, that the company;

- Marine Fluid Technology A/S
  - CVR No.: 39732610

Has been granted a license by A.P. Møller-Maersk (SEA-Mate Blending-on-Board systems) as per the SEA-Mate industry.

Marine Fluid Technology A/S has also been granted a license by A.P. Møller-Maersk (SEA-Mate Blending-on-Board systems) as per the SEA-Mate industry.

Marine Fluid Technology A/S have been authorized to sell and servicing the SEA-Mate Blending-on-Board system.

A.P. Møller-Maersk undertake no responsibility for the actions of Marine Fluid Technology A/S.

On behalf of

HT

Niels

Yours sincerely,

Jens Byrgesen

Managing Director

E-mail: [jens.byrgesen@marinefluid.dk](mailto:jens.byrgesen@marinefluid.dk)

Phone: +45 2476 9512

A.P. Møller-Maersk A/S  
59 Esplanaden, 1398 Copenhagen K, Denmark.  
Telephone: \* Direct: + 45 3363 3363

To whom it may concern,

November 15<sup>th</sup>, 2018

### Appointment of Distributorship

With this letter, MARINE FLUID TECHNOLOGY A/S, 24 Teglgårdsvej, DK-2920 Charlottenlund, Denmark, hereby confirm that,

### Norvel Marine Engineering Company Ltd.

Company Registration No.: 91310115MA1H7QDT3F/1500000

Address:

Room 307, Block 16, Lane 218 No. 6 Haiji Road, Nanhui New

Are officially authorized to act as distributor for MARINE FLUID TECHNOLOGY A/S in selling and servicing the SEA-Mate Blending-on-Board system.

Norvel Marine Engineering Company Ltd. will cover following

China  
Hong Kong  
Taiwan  
South Korea

This certificate has been issued for official purposes.

For and on behalf of

MARINE FLUID TECHNOLOGY A/S

Authorized Signature

Managing Director

E-mail: [jens.byrgesen@marinefluid.dk](mailto:jens.byrgesen@marinefluid.dk)

Phone: +45 2476 9512

## 공식 판매처

## 太仓中石油润滑油添加剂有限公司 经销商授权书



授权: 上海纳威船舶工程有限公司 为我公司昆仑牌  
“专用复合剂RHY3532” 全国经销商, 负责  
的产品推广销售、市场维护及打假工作。

为壹年。

6月25日起至2019年6月24日止。

授权单位: 太仓中石油润滑油添加剂有限公司

授权日期: 2018年6月25日

1. 涂改无效。  
2. 作废。  
3. 转让和买卖。



## SUPPLIER APPROVAL

For Lubrication Oil Blending Solutions

This is to certify that  
**Maersk Fluid Technology A/S**

50 Esplanaden  
1098 Copenhagen  
Denmark

is an approved supplier to manufacture and sell

**Cylinder lubrication Oil Blending-on-Board units  
(SEA-Mate) and Oil XRF-Analyzer**

for all WinGD 2-stroke engine types.

This certificate is valid until December 31<sup>st</sup> 2020.

Winterthur, January 10<sup>th</sup> 2017

Andrew Stump  
VIP Operations  
Winterthur Gas & Diesel Ltd.

Dr. Monika Damani  
General Manager ME  
Winterthur Gas & Diesel Ltd.



## BOB (SEA-Mate)는 기존 선박 엔진 윤활 방식과 비교하여 혁신적인 Concept의 제품

### ❖ System Oil을 Cyl. Oil로 또는 고BN Cyl. Oil과 Sys.Oil 혼합 사용

- System Oil 폐유 처리 ?
- System Oil의 장기 사용으로 인한 오염 ?
- System Oil과 Cyl. Oil 가격 차이 Benefit

### ❖ System Oil을 BN 첨가제 또는 기존 BN의 Cyl. Oil을 Blending 사용으로 연소실 내 최적의 중화 성능을 유지

- 고유황 연료유에 낮은 BN Cyl. Oil 투입, Feed rate 대응 현황 ?
- 연료유 황함량에 따른 다양한 BN Cyl. Oil 구매/보유 또는 유동적 대응 불가 ?
- Cyl. Liner에 Black mark, Scuffing 및 과도한 Wear down ?
- Engine Maker의 Cyl. Oil 관리 지침 ?

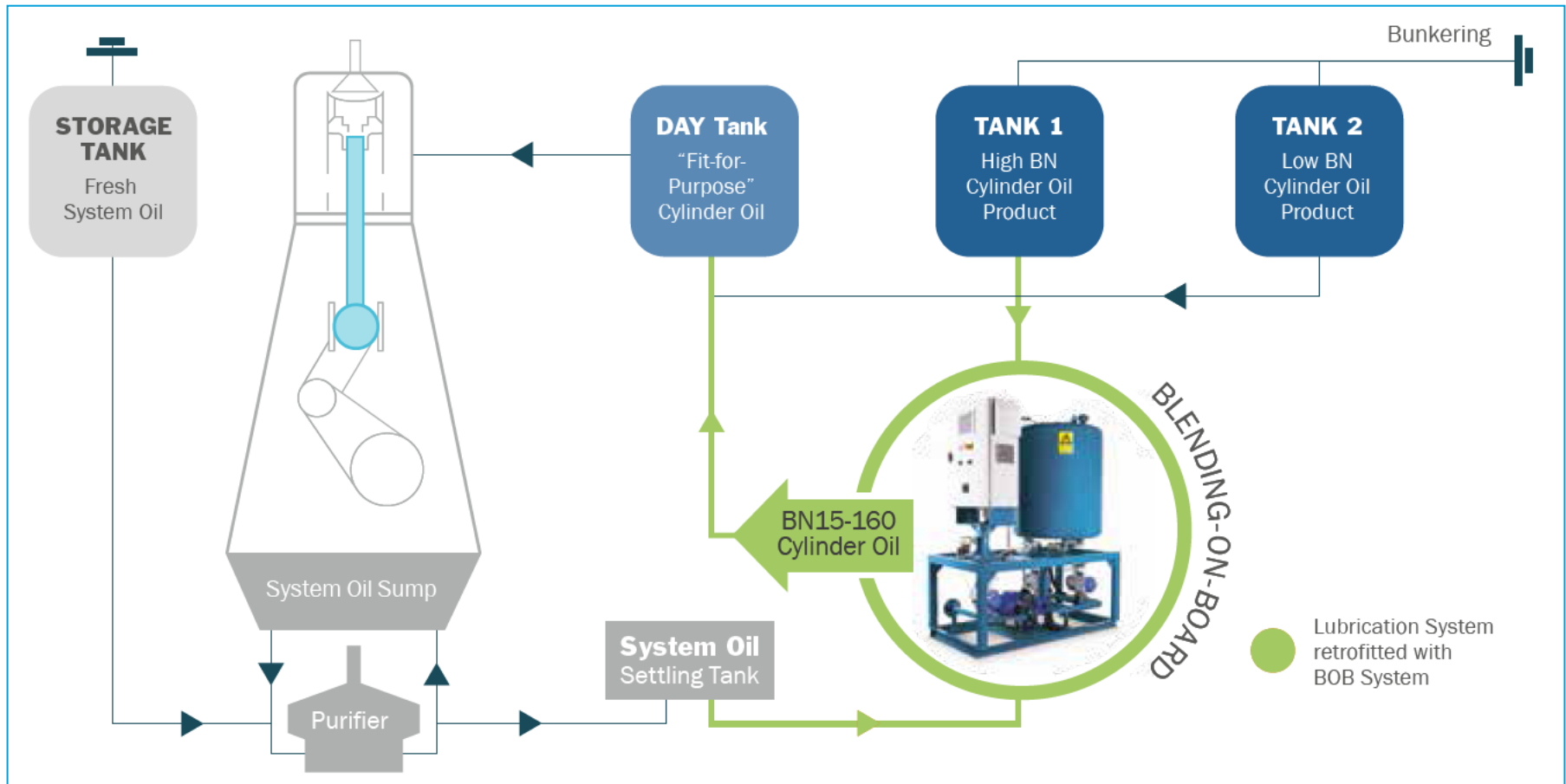
### ❖ 사용 System Oil : M/E System Oil , G/E System Oil



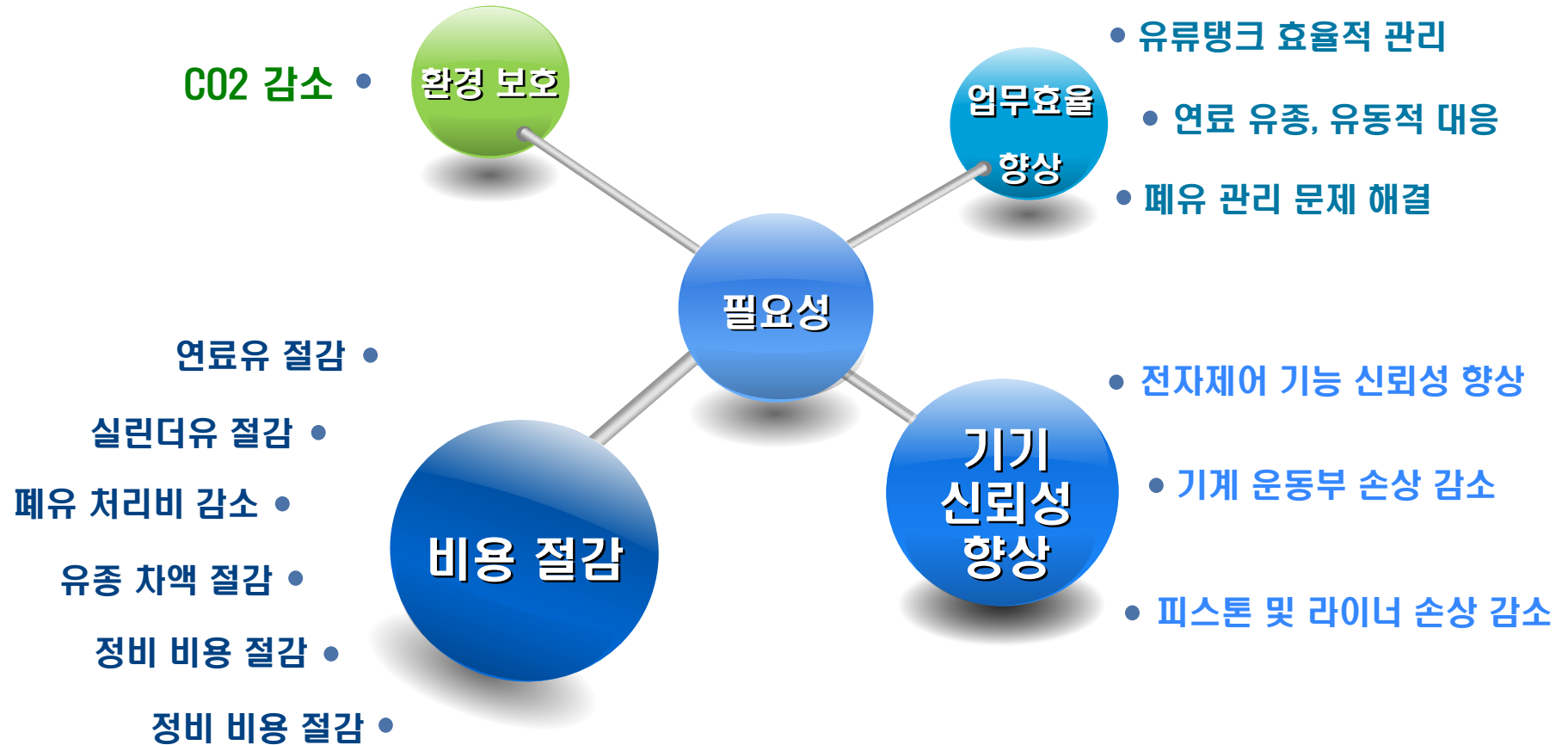
# 1. BOB 장비 개요 – 시스템 개략도

Best solution, your partner

- ❖ 사용 방법 – System Oil (M/E, G/E) + BN 첨가제
- ❖ System Oil + High BN Cyl. Oil
- ❖ Low BN Cyl. Oil + High BN Cyl. Oil
- ❖ Low BN Cyl. Oil + BN 첨가제



**비용 절감 뿐만 아니라 기기 신뢰성 향상에 큰 도움을 준다.**



### A. 비용 절감 / 효율 향상 / 에너지 절감 / 대기 환경 보호

- ☞ **연료 절감 : 0.5 ~ 1.5 %**
  - Maersk line 1.5%, 발전소 검증 0.5%
  
- ☞ **윤활유 소모량 40% 이상 절감**
  - 많은 선사가 BN의 유동적 대응이 어려워 Feed rate 증가로 대응 (Maker 권고운전가능)
  - Feed rate control 에서 BN contro로 Cyl. Oil 관리를 통한 절감
  
- ☞ **Spare part & Maintenance cost 절감**
  - 신유수준의 에 유막 유지 및 오염물질 감소에 따른 기계고장을 감소 및 수명연장
  - “M” 사 검증 결과 2 배이상 연장 확인함.
  
- ☞ **폐유 처리 비용 절감**
  - MSO, GSO 버려지는 윤활유 없음
  
- ☞ **연료 및 윤활유 소모 감소에 따른 대기 배출물 감소**

### B. 엔진 신뢰성 향상

- ☞ System Oil 의 신유 운전에 따른 기계효율향상
- ☞ 전자제어 기능의 신뢰성 향상
  - 전자 제어에 사용되는 System oil의 오염으로 인한 고장율이 80~90% 됨.
- ☞ 최적 저온부식 예방을 통해 라이너 과대 마모 및 피스톤 이상 손상 감소
  - 낮은 엔진부하 운전에 따른 저온부식 예방  
(최근 과대/이상 마모의 주원인은 윤활성능보다 저온부식에 기인한 문제가 다수임)



# 3. 제품 신뢰성-Additive approval form Engine Maker

Best solution, your partner

MAN Diesel



PetroChina Lubricant Company  
Beijing International Convention Center, 8<sup>th</sup> Floor,  
No. 8 Beichendong Road, Chaoyang District  
Beijing 100101 China

Att: Mr Zhai Yue Kui  
Head of Dalian Lube Oil R&D Institute

LDF4/DOJA/CEN/2122-2010

6 January 2010

**No Objection Letter for cylinder oil: Blending onboard additive package  
PetroChina: RHY3532 and ExxonMobil Mobilgard 300 (system oil)**

Dear Mr Zhai Yue Kui,

The PetroChina additive RHY3532 has been tested in combination with ExxonMobil system oil Mobilgard 300 for the Blending On-Board concept. The tested blend had a BN value of 70.

The field test of the combination RHY3532/Mobilgard 300 has been carried out in a MAN B&W Diesel 12K90MC engine with supervision of MAN Diesel and inspection of engine condition at the start and end of tests in accordance with the guidelines stated in the MAN Diesel document "Cylinder & System Lubricating Oil Properties and Engine Development".

The 4000 hrs end test inspection, conducted by MAN Diesel personnel, demonstrated acceptable performance, and therefore, MAN Diesel is granting a No Objection Letter for on-board blending of RHY3532/Mobilgard 300 at BN70 on MAN B&W two-stroke engines.

Additive and system lube oil different from the PetroChina additive (RHY3532) and ExxonMobil system oil (Mobilgard 300) may result in different performance in the engine and it is therefore mandatory for the safety and reliability of the engine operation that the different combinations of additive/system oil are individually tested as well as blend ratios resulting in products with lower than BN70.

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Fax: +45 33 85 10 30  
e-mail: info@mandiesel.com  
www.mandiesel.com

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Denmark  
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MAN Diesel  
Branch of MAN Diesel SE, Germany  
Dürk No.: 31611752  
Head office: Tagholmvej 41  
2450 Copenhagen SV, Denmark  
German Reg. No.: HRB 22006  
AN/101673 Augsburg

MAN Diesel - a member of the MAN Group

## 엔진 메이커로 부터 첨가제 승인 취득

Wärtsilä Switzerland Ltd



Mr Zhang Jie  
PETROCHINA Lubricant company  
Dalian Lube Oil R&D Institute  
No. 1 Shanzhong St., Ganzingzi  
District  
Dalian, China 116031

CC: Mr Tony Ng

Your Reference / Date  
Ihr Zeichen / Datum

Our Reference  
Unser Zeichen  
MOL 808 RH3532/2

Direct Dialing  
Durchwahl  
Tel: +41 52 282 2534  
Fax: +41 52 282 0390

Date  
Page /  
Document: PC BOB additive 40-1208M  
MOL

**No Objection Letter: Cylinder oil blended on board with Petrochina additive  
RHY3532. (BN 40 to BN120)**

Dear Sir / Madam,

The cylinder lubricating oil blended on board with Petrochina additive RHY3532 and used system oil in the SEA-Mate® Blender has satisfactorily completed 4000-hour validation tests in a Wärtsilä® 12 RTA96C engine as well as 2000 hours test in a Wärtsilä® 12 RT-flex96C-B. Based on the results of the engine inspection and lubricating oil analyses, Wärtsilä has no objection to the use of the blended on board cylinder lubricating oil with the Petrochina additive RHY3532 in Wärtsilä RTA, RT-flex and W-X as well as Sulzer 2-stroke engines operating on fuel with sulphur content in the range 0.5<S<3.5 mass % on a continuous basis.

Petrochina assumes all responsibility for the performance of the lubricating oils in service of the above mentioned engine types to the exclusion of any liability of any Wärtsilä company belonging to the Wärtsilä group. Petrochina along with other possible manufacturers and distributors of the products in question shall indemnify, compensate and hold harmless Wärtsilä and companies belonging to the Wärtsilä group from and against any claims, damages and losses caused by the lubricating oils in question. The application must comply with Wärtsilä's lubricating oil requirements and recommendations. The lubricants should be used as recommended in the Wärtsilä Service Bulletin RT-18.4, RT-113 and other manuals.

Petrochina undertakes to inform the undersigned Wärtsilä representatives of any subsequent changes in the formulation of the additive package in question.

Yours faithfully,  
Wärtsilä Switzerland Ltd.

Markus Wengle  
General Manager DMTS 2-Stroke

Shamba Jumaibe  
Expert Lubricant and Tribology

Wärtsilä Switzerland Ltd  
Wärtsilä Schweiz AG  
Wärtsilä Suisse SA

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CH-8401 Winterthur  
Switzerland

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Wärtsilä Switzerland Ltd



Mr Zhang Jie  
PETROCHINA Lubricant company  
Dalian Lube Oil R&D Institute  
No. 1 Shanzhong St., Ganzingzi  
District  
Dalian, China 116031

CC: Mr Tony Ng

Your Reference / Date  
Ihr Zeichen / Datum

Our Reference  
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MOL 808 RH3532/2

Direct Dialing  
Durchwahl  
Tel: +41 52 282 2534  
Fax: +41 52 282 0390

Date  
Page /  
Document: PC BOB additive 50-1208M  
MOL

**No Objection Letter: Cylinder oil blended on board with Petrochina additive  
RHY3532. (BN 50 to BN120)**

Dear Sir / Madam,

The cylinder lubricating oil blended on board with Petrochina additive RHY3532 and used system oil in the SEA-Mate® Blender has satisfactorily completed 4000-hour validation tests in the Wärtsilä® 12 RTA96C engine. Based on the results of the engine inspection and lubricating oil analyses, Wärtsilä has no objection to the use of the blended on board cylinder lubricating oil with the Petrochina additive RHY3532 in Wärtsilä RTA, RT-flex and W-X as well as Sulzer 2-stroke engines operating on fuel with sulphur content in the range 1.5<S<3.5 mass % on a continuous basis.

Petrochina assumes all responsibility for the performance of the lubricating oils in service of the above mentioned engine types to the exclusion of any liability of any Wärtsilä company belonging to the Wärtsilä group. Petrochina along with other possible manufacturers and distributors of the products in question shall indemnify, compensate and hold harmless Wärtsilä and companies belonging to the Wärtsilä group from and against any claims, damages and losses caused by the lubricating oils in question. The application must comply with Wärtsilä's lubricating oil requirements and recommendations. The lubricants should be used as recommended in the Wärtsilä Service Bulletin RT-18.4, RT-113 and other manuals.

Petrochina undertakes to inform the undersigned Wärtsilä representatives of any subsequent changes in the formulation of the additive package in question.

Yours faithfully,  
Wärtsilä Switzerland Ltd.

Markus Wengle  
General Manager DMTS 2-Stroke

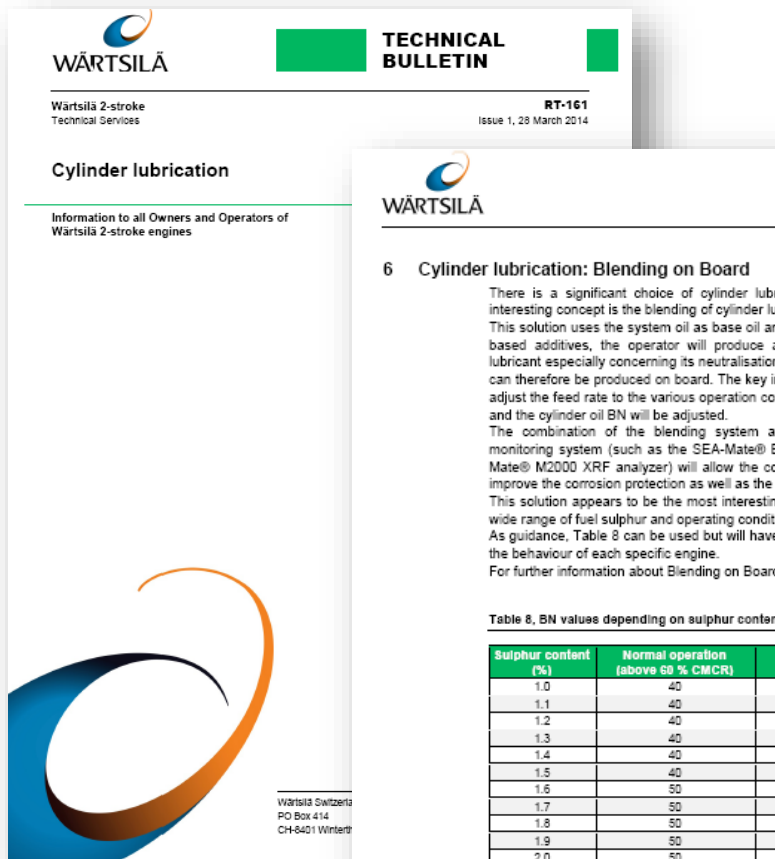
Shamba Jumaibe  
Expert Lubricant and Tribology

Wärtsilä Switzerland Ltd  
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Wärtsilä Suisse SA

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## A. 엔진 메이커 공식적 성능 인정 (Wartsila)



TECHNICAL BULLETIN

**RT-161**, Issue 1, Page 18 / 20

### 6 Cylinder lubrication: Blending on Board

There is a significant choice of cylinder lubricants on the market. A growing and interesting concept is the blending of cylinder lubricant onboard. This solution uses the system oil as base oil and by adding the correct quantity of over based additives, the operator will produce a fit for purpose and tailored cylinder lubricant especially concerning its neutralisation and detergency ability. Various BN oils can therefore be produced on board. The key interest is that there will not be a need to adjust the feed rate to the various operation conditions. The base feed rate will be kept and the cylinder oil BN will be adjusted. The combination of the blending system and of an onboard PUS oil condition monitoring system (such as the SEA-Mate® B2000 blender combined with the SEA-Mate® M2000 XRF analyzer) will allow the correct BN to be produced and therefore improve the corrosion protection as well as the detergency. This solution appears to be the most interesting technically for vessels operating on a wide range of fuel sulphur and operating conditions. As guidance, Table 8 can be used but will have to be further optimised as a function of the behaviour of each specific engine. For further information about Blending on Board see Chapter 7 "Appendix", Item 4.


❖ Engine 메이커에서도 BN Control 권고

## B. 엔진 메이커 공식적 성능 인정 (MAN Diesel & Turbo)

**Market Update Note**

**ACOM – Automated Cylinder Oil Mixing**

The automated cylinder oil mixing (ACOM) system is a newly developed cylinder oil delivery system which automatically mixes two fuels to the optimum base number (BN) depending on the sulfur content of the fuel in use, see Fig. 1.



The ACOM system will facilitate the lowest possible cylinder oil feed rate and thereby reduce costs, and still ensure safe lubrication and optimized tribology of the piston rings and liners.

The benefit of the ACOM system lies in its ability to ensure that the cylinder oil is mixed to match the sulfur content of the fuel in use, i.e. from 0.1% to 3.5%. The limit for when the ACOM is active depends on the adaptive cylinder oil control factor (ACC factor) for the engine, see 02018-663/JUSV. The ACC factor is also known as the feed rate factor.

In addition to facilitate a cylinder oil with a BN matched to the fuel, and thereby ensuring an optimized cylinder condition, long times between overhaul are achieved.

The ACOM system also measures the cylinder oil consumption in real time, and is fitted with the features to read out the

MAN Diesel & Turbo

**Market Update Note**

Since 1 January 2017, ACOM has been included as standard in all new quotations for ME-GIECE/MALDIP engines specified for running on specified dual fuel mode (DF). ACOM will be optional for all other engine types: ME-C/ME-B.

SDF means that the ratio of injected gas or liquid gas fuel and (dual) fuel oil is flexible, for example when the available fuel oil gas is limited in the SDF operation mode, the BN will be automatically adjusted to optimal feed rate independent of the ratio of gas or liquid gas fuel and dual fuel oil with varying sulfur content.

ACOM can be ordered and supplied for the MAN B&W two-stroke engine listed below. At the time of writing, the following latest engine types and configurations can be fitted with ACOM functionality in the MCP:

- ME-C
- All dual fuel type engines
- All Tier II type engines

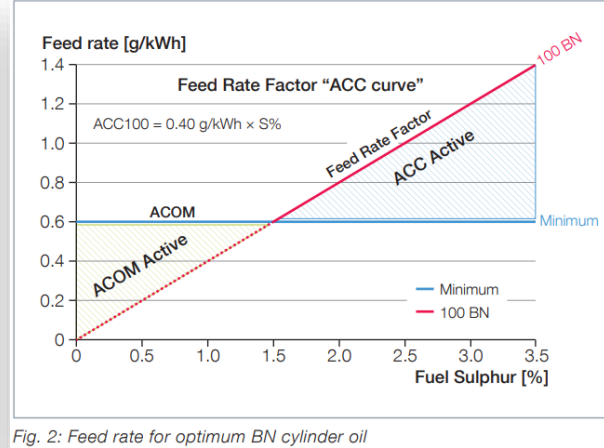
On ME-B engines, the ACOM is a stand-alone unit on which the BN values can be entered manually.

The ACOM can also be retrofitted on the above-listed engine types. For retrofit of ACOM on other engine types, please contact our Proposals & Customer Support department at [help@manenergy.com](mailto:help@manenergy.com).



Height: 2,190 mm  
Width: 780 mm  
Depth: 640 mm

MAN Diesel & Turbo



see Fig. 2. This enables the operator to use a low Cyl. Oil feed rate, thereby **saving costs**, and, at the same time, **keeping the Cyl. Oil BN at the optimum for the engine.**

MUN2017-06-28

Service Letter SL2018-663/JUSV

MAN Energy Solutions

**Cylinder oils and system oils**

Tables 3, 4 and 5 list major international cylinder oil and system oil brands tested in service with acceptable results, and which have passed the No Objection Letter (NOL) testing procedure with acceptable results. Do not consider these lists to be complete, as other cylinder and system oils, with NOLs from MAN Energy Solutions, can be equally suitable. Further information can be obtained by contacting MAN Energy Solutions in Copenhagen.

Cyl. Oils and system Oils Tables 3, 4 and 5 list major international Cyl. Oil and system Oil brands tested in service with acceptable results, and which have passed the No Objection Letter (NOL) testing procedure with acceptable results. Do not consider these lists to be complete, as other Cyl. and system Oils, with NOLs from MAN Energy Solutions, can be equally suitable. Further information can be obtained by contacting MAN Energy Solutions in Copenhagen.

Service Letter SL2018-663/JUSV

MAN Energy Solutions

Action code: WHEN CONVENIENT

**Cylinder and System Oils**  
MAN B&W Low-Speed Two-Stroke Engines  
SL2018-663/JUSV  
August 2018

**Concerns**  
Owners and operators of MAN B&W two-stroke marine diesel engines. Type: M/C/MC-C, ME/ME-C, G3 and G33

**Summary**  
Lubrication strategy:  

- Use low-BN cylinder oils for ultra-low-sulfur fuels
- Use high-BN cylinder oils for high-sulfur fuels

For questions or inquiries regarding the content in this service letter, contact our Operation Department at [ops@manenergy.com](mailto:ops@manenergy.com)

Yours faithfully

Mikael C. Jensen  
Vice President,  
Engineering

Sig B. Jakobsen  
Senior Manager,  
Operation

MAN Energy Solutions  
15-25 BN  
100 BN  
140 BN 70 BN  
ACOM  
40 BN

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shipping@manenergy.com

## C. 선급 공식 인정 (Class Certificate)

Document no: M/1095912  
Issue number: 0  
Page 1 of 3



### Marine Design Appraisal Document

Lloyd's Register EMEA  
Copenhagen Design Support Centre  
Strandvejen 104A  
DK-2900 Hellerup  
Denmark  
copenhagen-design-support@lr.org

Date  
23 March 2011

Quote this reference on all future communications  
M/1095912/1100249/PMU/pmj



### Marine Design Appraisal Document

Lloyd's Register EMEA  
Copenhagen Technical Support Office  
Strandvejen 104A, 2  
DK-2900 Hellerup  
Denmark  
copenhagen-technical-support@lr.org

Date  
14 July 2015

Please quote this reference number on all future communications  
M1110488/1500788/LL/tpz

Document no: CTS-M1110488  
Issue number: 0  
Page 1 of 3

#### Machinery General Design Appraisal

Client: CC Jensen A/S, Svendborg, Denmark  
Manufacturer: CC Jensen A/S, Svendborg, Denmark  
Subject: "SEA Mate Blender", Cylinder Oil Batch Blender

This Machinery General Design Appraisal is valid for a period of 5 years from the date of issue or until a change of the Rules, whichever comes first.

- The Document listed in paragraph 1 of the appendix have been examined for compliance with:  
LR Rules and Regulations for the Classification of Ships July 2010, Part 5, Chapter 12 and 14 and Part 6, Chapter 2  
as well as for compliance with  
LR Rules for the Manufacture, Testing and Certification of Machinery (Rules for Machinery) 2010

#### Machinery General Design Appraisal

Client : Blosteel A/S (Denmark)  
Manufacturer : Blosteel Poland (Poland)  
Subject : Sea-Mate Blender B3000

This Machinery General Design Appraisal is valid for a period of 5 years from the date of issue or until a change of the Rules, whichever comes first.

- The Documents listed in paragraph 1 of the appendix have been examined for compliance with LR Rules and Regulations for the Classification of Ships July 2014, Part 5, Chapter 12, 13 and 14 as applicable and have been assigned an appraisal status as indicated subject to the following:
- Product Description
 

Makers Designation	: Sea-Mate Blender B3000
Media	: Lubricating Oil
Class	: III (piping)
Design Pressure	: ≤ 6 bar
Design Temperature	: ≤ 50 °C
Purpose	: Blending lubrication oil to obtain MECO
- Comments
  - Note that lubrication Oil is a flammable liquid and so in according with Part 5, Chapter 14, 1.1.3 the system must also comply with Part 5, Chapter 14, sections 2 and 4.

FINAL ACCEPTANCE OF ACTUAL ITEM(S) DEPENDS ON SATISFACTORY SURVEY AND TESTING

Lloyd's Register EMEA  
is a member of Lloyd's Register group

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Form 6438MARREF (2014.12)



(19)



(11) EP 1 640 442 B1

(12)

## EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention  
of the grant of the patent:  
**26.08.2009 Bulletin 2009/35**

(51) Int Cl.:  
**C10M 171/00<sup>(2006.01)</sup> C10M 175/00<sup>(2006.01)</sup>**

(21) Application number: **04388064.0**

(22) Date of filing: **24.09.2004**

(54) **Method and system for modifying a used hydrocarbon fluid to create a cylinder oil**

Methode und System für die Modifizierung eines gebrauchten Kohlenwasserstoff-Fluids zur Herstellung eines Zylinderöls

Méthode et système permettant la modification d'un liquide hydrocarboné usé afin de créer une huile pour cylindre



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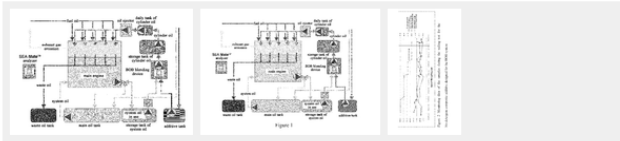


## Marine cylinder oil composite additive

### Abstract

The present invention relates to a marine cylinder oil composite additive. Based on the total weight of the composite additive, said marine cylinder oil composite additive comprises: 15-25% sulfonate detergent with superhigh base number, 35-45% phenolate detergent with superhigh base number, 20-30% naphthenate detergent with superhigh base number, 0-8% dispersing agent, 0-4% antiwear agent, and 10-20% Group I base oil with high viscosity index which is selected from the group consisting of 400SN, 500SN and 650SN. The benefit of the present invention lies in the fact that the composite additive can satisfy the requirement of BOB system about the viscosity and base number, and can be blended with many system oils under a number of domestic and foreign brands so as to provide cylinder lubricating oils with different base numbers. The composite additive according to the present invention has good adaptability and excellent performances in terms of antiwear, antioxidization and high temperature detergency, which meet the requirement of marine engines about the performance of cylinder oils. Moreover, the composite additive according to the present invention is able to maintain good stability in the base oil of the system oil as well as good compatibility, and thus the lubricating performance of the cylinder oil will not be adversely affected.

### Images (3)



### Classifications

■ **C10M161/00** Lubricating compositions characterised by the additive being a mixture of a macromolecular compound and a non-macromolecular compound, each of these compounds being essential

[View 15 more classifications](#)

US20150144430A1

United States

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Inventor: Yuekui Zhai, Jie Zhang, Gongde Liu, Yuli Ma

Current Assignee: PetroChina Co Ltd

### Worldwide applications

2011 · CN WO 2012 · EP 45 2014 · 55

### Application US14/550,626 events

- 2011-03-10 · Priority to CN201110058054.X
  - 2011-03-10 · Priority to CN201110058054XA
  - 2012-03-09 · Priority to US13/416,079
  - 2014-11-21 · Application filed by PetroChina Co Ltd
  - 2014-11-21 · Priority to US14/550,626
  - 2014-12-03 · Assigned to PETROCHINA COMPANY
  - 2015-05-28 · Publication of US20150144430A1
- Status · Abandoned

Info: [Patent citations \(15\)](#), [Cited by \(6\)](#), [Legal events, documents, Priority and Related Applications](#)

External links: [USPTO](#), [USPTO Assignment](#), [Espacene Dossier](#), [Discuss](#)

보급되는 Additive는 메이저 윤활유 회사의 제품과 잘 호환 됨을 확인하였습니다.

[0039] The composite additive designed for the BOB system using triple detergents provided by the present invention is well compatible with system oil products under typical domestic and foreign brands, for example Exxon-Mobile Company, BP Company and PetroChina. The performances of the formulated cylinder oils with different base numbers are individually studied by simulated experiments, and the results demonstrate that the cylinder oils with different base numbers maintain good combination property as for lubricating oil, for example the antioxidization, antiwear, detergency and water resisting performances and etc.

[0040] Herein, the antioxidization performance of the cylinder oil is evaluated according to the oxidative induction time which is measured by differential scanning calorimetry (PDSC). The antiwear performance is evaluated by the Pb value and the long wear extent which are obtained by four-ball test. The coking tests are carried out in order to test the detergency performance of the cylinder oil, while the gel tests are carried out so as to test the storage stability.

[0041] The tri-detergent composite additive designed for the BOB system formulated according to the formulation of Example 6 is blended with Exxon-Mobile system oil Mobilgard M300, BP system oil Energol OE-HT30 and Kunlun system oil DCC3008, respectively, so as to provide cylinder oils with the base numbers of 70 mgKOH/g, 60 mgKOH/g, 50 mgKOH/g and 40 mgKOH/g as shown in Tables 2, 3, 4 and 5.

TABLE 2 Physical and chemical properties of the cylinder oil with the base number of 70 mgKOH/g and the simulated performance thereof Mobilgard Energol KUNLUN Item Unit M300 OE-HT30 DCC3008 Method Dosage of

On Board Blender

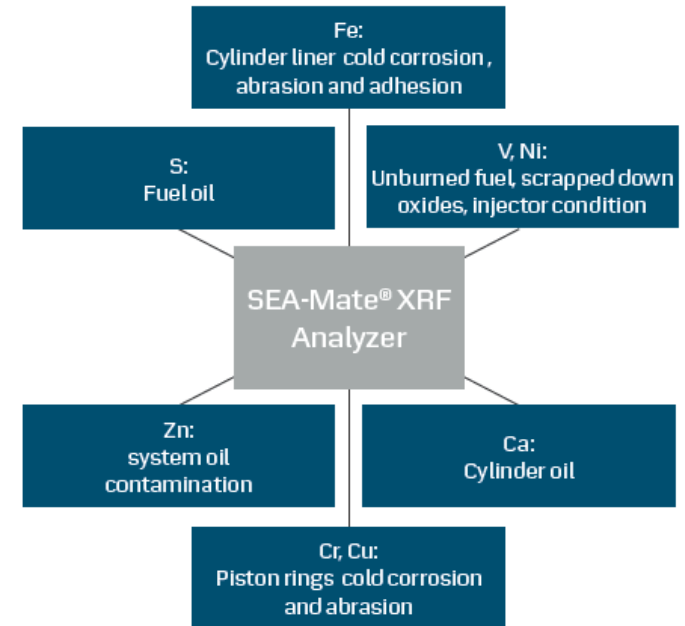


(Option) On Board Analyzer



본선 사용자는 다음의 간단한 값을 장비 Control Panel Screen에 입력하여 사용합니다.

- ① 사용 중 System Oil의 BN 값 (On board Analyzer)
- ② 첨가제 BN 값 : 상이한 첨가제를 사용하지 않는다면, 운전 초기 일회 입력함
- ③ Blended Cyl. Oil 의 Target BN 값
- ④ Blended Cyl. Oil의 총량 (Amount in tonne)



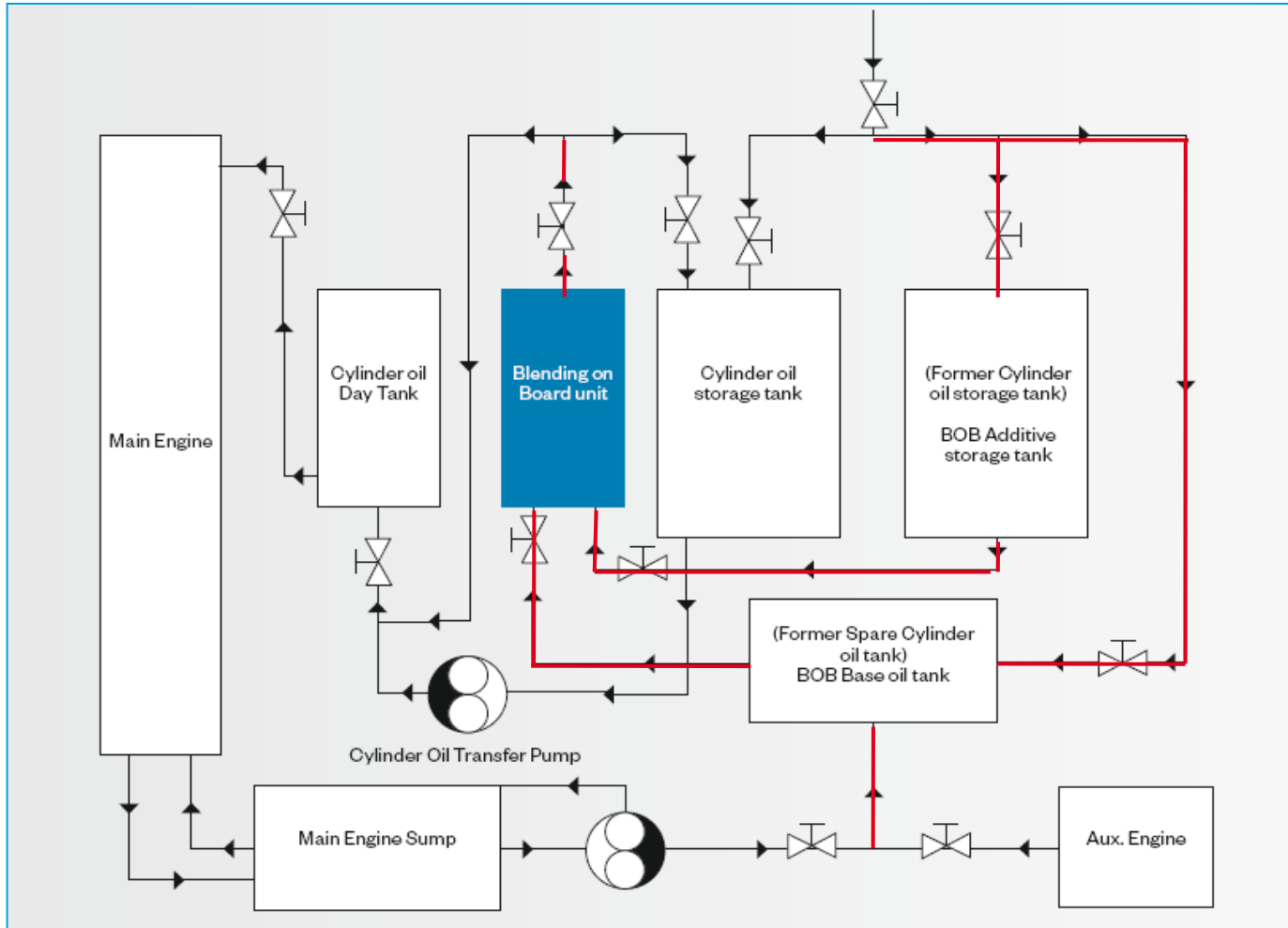
## 5. 제품 종류 사양

Best solution, your partner

Performance	SEA-Mate B500	SEA-Mate B1000	SEA-Mate B3000
사용 Cyl. Oil BN 값	15-325		
Blending Cyl. Oil BN값	15-160		
Standard deviation range (BN)	+/- 2		
Blending capacity (Ltr/working day)	0-300	0-300	0-2000
Streams that can be blended	3	4+	4+
Operation	Semi-automatic	Semi-automatic or automatic with multiple options for signal input	
Dimension L x W x H (cm)	110 x 60 x 85	110 x 60 x 85	130 x 70 x 170
Weight (Kg)	170	170	350



- ❖ BOB System은 현존 운항선 조건에 적합한 Compact Module로 설계 제작
- ❖ 작업 공기 약 2일 소요 (기존 Piping 수정 포함 : Blending machinery 병렬 연결)
- ❖ Tank Allocation, 장비 설치, 시운전 등 작업 (새로운 Tank 설치 불필요)



감사 합니다.....

이하 참조 자료입니다.

당사 현황에 최적화 Solution 제공에 노력하겠습니다.

## 70 BN, Feed rate 증가 와 100 BN, Feed rate 감소 에 따른 C.LINER Wear down 영향

The two different lube oils were used two different feed rates:

- 70 BN oil: High feed rate:  $FR = \text{Fuel Sulphur\%} * ACC_{70}$ .  $ACC_{70} = 0.45$
- 100 BN oil: Low feed rate:  $FR = \text{Fuel Sulphur\%} * ACC_{100}$ .  $ACC_{100} = 0.30$

The test showed that the 100 BN oil can be used at 33 % lower feed rate than the 70 BN oil, and produce lower wear rates. See Figure 17. This led to the successful introduction of the 100 BN cylinder lube oils.

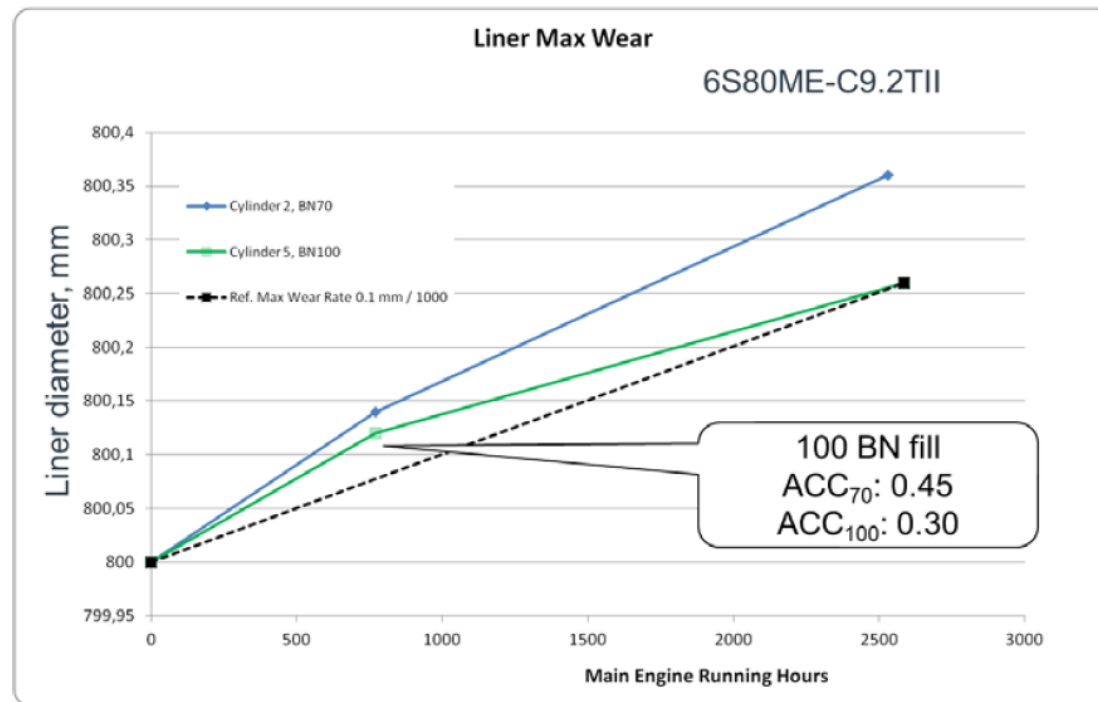


Figure 17: Wear data from new engine. Engine type: MAN B&W 6S80ME-C9.2.

Note: The 100 BN oil can be used at lower feed rate than the 70 BN oil, and produce lower wear rates.



**A sample test result showed a 0,5% increase in fuel efficiency, which translates to a fuel saving of BD\$18,000/month.**

The Barbados Light & Power Company Limited feels confident that this installation will help us to achieve our overall goal and we are of the belief that other 2-stroke engine power plants can secure similar technical and financial benefits.



**Service report**      **Heat Rate Test**  
**Project No.:**      **60095**

### 1. Basic data

Plant:	Barbados Light and Power	
Customer:	Maersk Fluid Technology A/S	
Period:	7-15 April 2013	
Participants:	Maersk Fluid Technology A/S: BWSC A/S:	Henrik Bak Weimar Carsten Otte Finn Hansson

### Maersk Fluid Technology A/S

Technical & Operational Manager: Henrik B Weimar

### BWSC A/S

Test Engineer:	Carsten Otte
Manager Field Service:	Finn Hansson
Project Manager:	Jeanett Grandjean

### 2. Technical systems

Diesel engine  
 Maker: MAN  
 Type: 9K80MC-S  
 Engine No.: D14  
 Running hours: 59915

#### Other equipment

##### Power Meter:

Maker: Zimmer Electronic System  
 Type: LMG450

##### Flowmeter:

Maker: KRAL  
 Type: OMG

### 3. Scope of work

In connection with a SEA-Mate® Blending on Board, tests were performed to check for any differences in the mechanical properties/efficiency related to friction in the bearings when operating an engine on "used, but useable" lubricating oil, e.g. lube oil which has been in operation for a long time, only replenished due to leakage or sweetened, when the BN (Base Number) are found to high compared to fresh new oil.

### 4. Executive summary

This heat rate test was performed to evaluate the differences in SFOC (Specific Fuel Oil Consumption) when operating a diesel engine on used/useable lubricating oil compared to new/fresh lubricating oil. A fuel saving of 0.86g/kWh or 0.44% was noted as well as a lube oil temperature reduction of 0.7 °C in the temperature increase between inlet and outlet.

❖ 전자 제어 기능 불량량의 약 80~90% 가 System 에의 오염으로 기인함

## Components problem

Fliter element fouling

FIVA valve worn

Propotional valve

Hydraulic pump

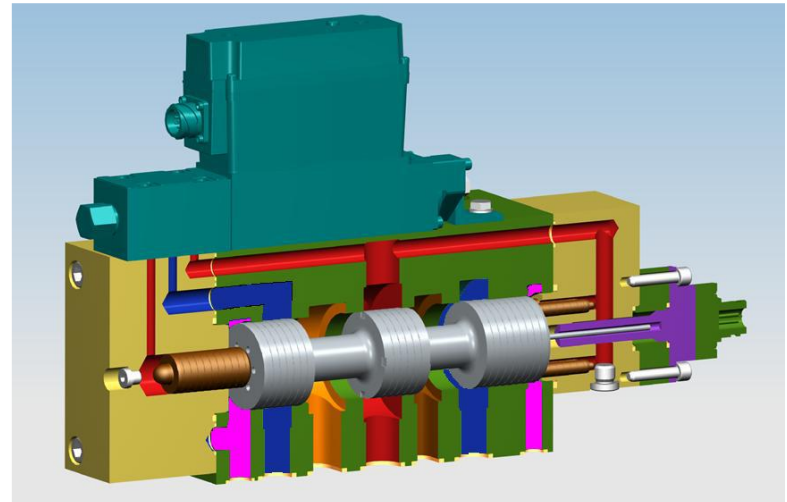


Breakdowns

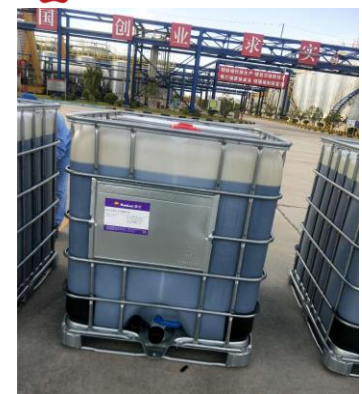


80-90 %

Hydraulic system breakdowns  
caused by  
Contaminants in Hydraulic fluid



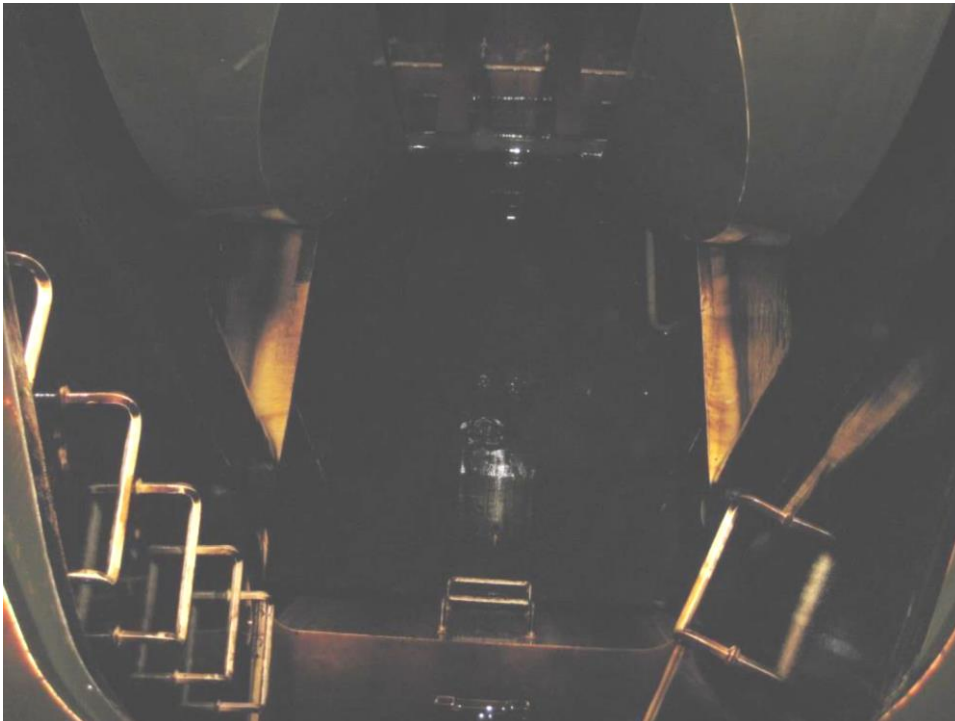
Real Case on COSCO Vessel : LAN HUA HAI with 6RT-Flex58 engine



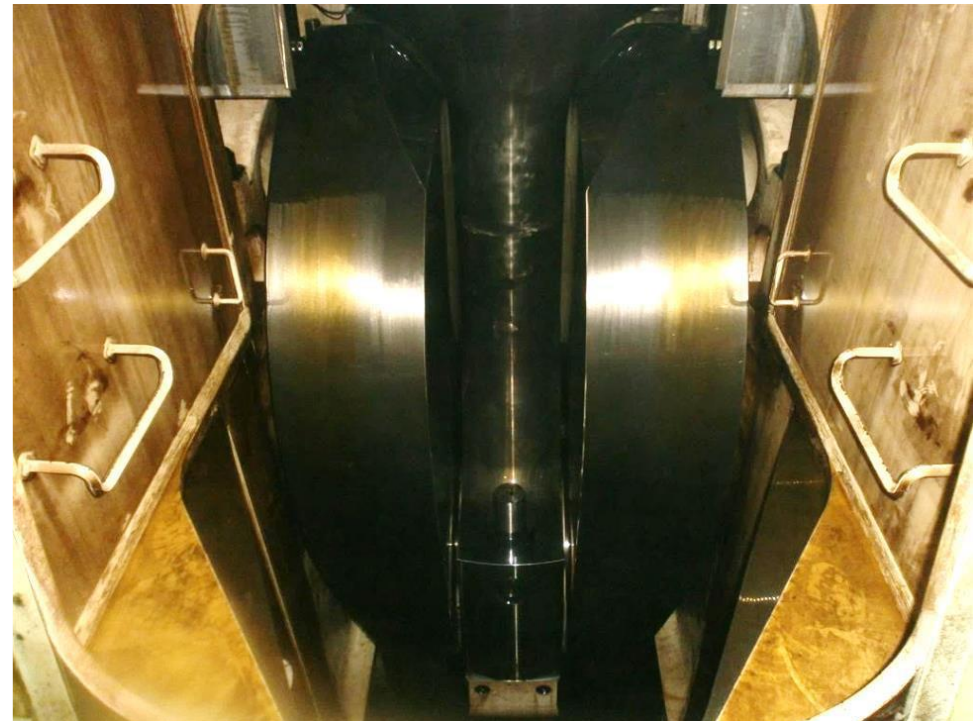
# Clean of system Oil

*Example: Crank Case @ Maersk Antares (12RT-Flex96)*

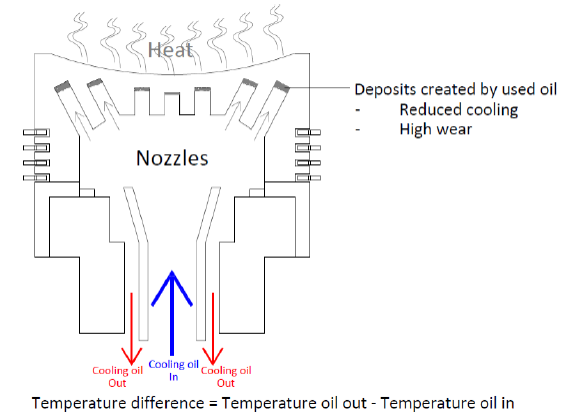
**Before BOB**



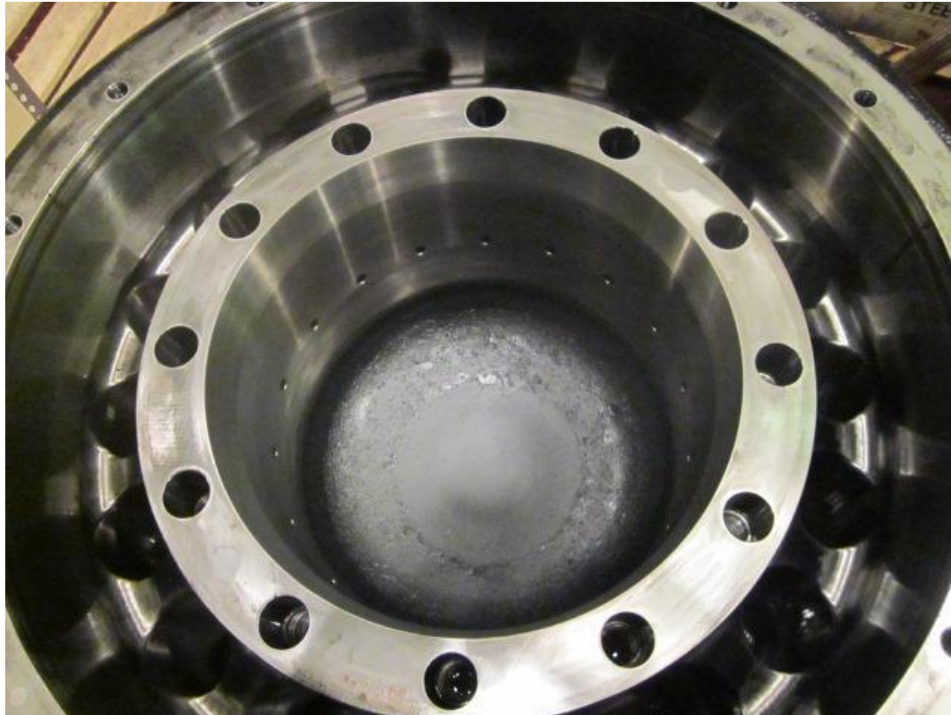
**After 8,000 hours BOB**



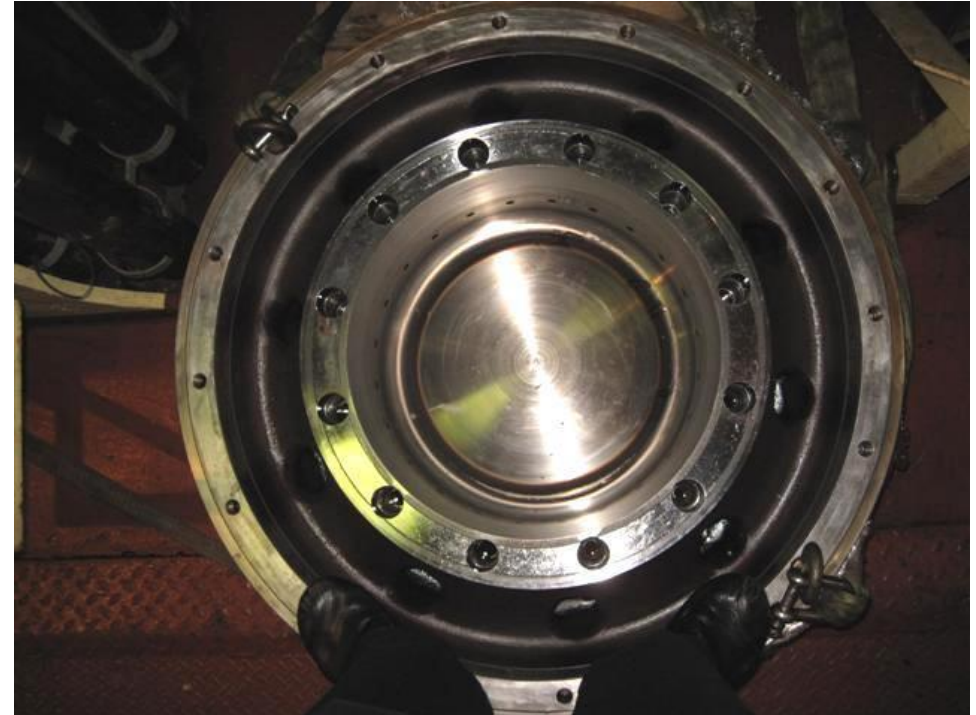
Benefit: Clean the Piston inside Service  
Experience about



Normal 18.000H



BOB For 27.000H





## Feed rate 변화 – 70 BN, Drain 분석과 100 BN, Drain 분석에 따른 Fe / BN 함량의 변화

As for the case story 2 above, 70 BN and 100 BN cylinder oil were tested on an engine with split lubrication system: Half the engine was lubricated with 70 BN oil and half was lubricated with 100 BN oil. A cylinder lube sweep test was performed, and the drain oil was analysed for iron and remaining BN. See also Section 10. The data show that the remaining BN is approximately 30 BN higher for the 100 BN than for 70 BN at equal feed rate, and that the iron in the drain increases to unacceptable level at up to 40% higher feed rate for the 70 BN oil. The conclusion is, that the 100 BN oil is able to protect the engine against cold corrosion at much lower feed rate than the 70 BN oil. See Figure 19.

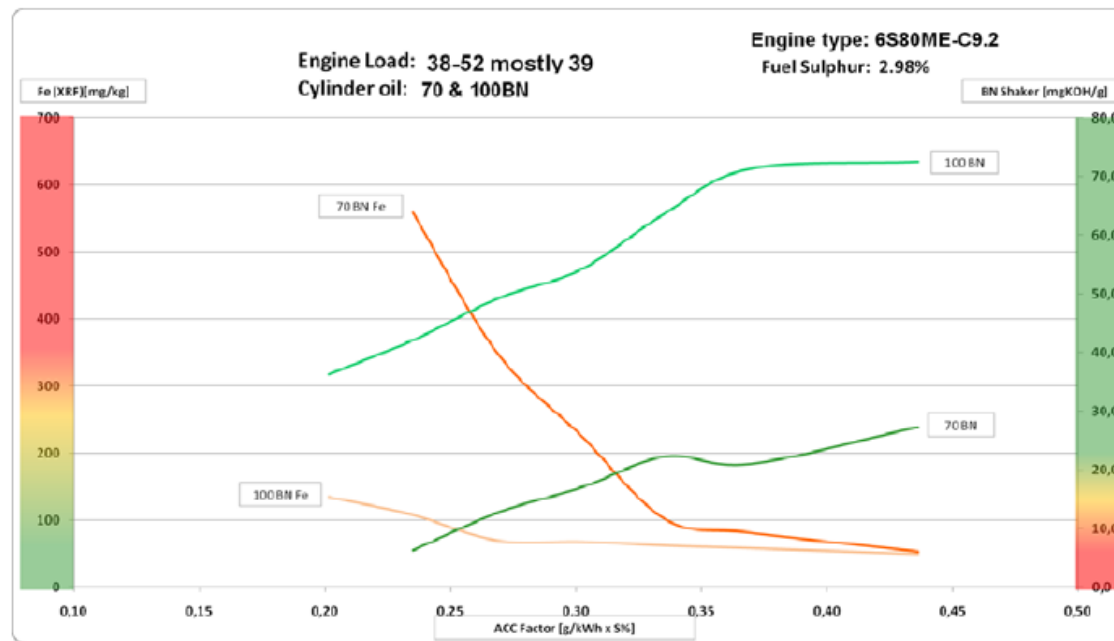


Figure 19: Drain oil data from engine with split lubrication system: Half of engine is lubricated with 70 BN oil and other half is lubricated with 100 BN oil. Engine type: MAN B&W 6S80ME-C9.2. Feed rate = ACC factor \* Fuel Sulphur.

*Note: When the BN in the cylinder lube is higher, the feed rate can be lower and still protect the engine.*



## Feed rate 변화 – 70 BN, Drain 분석과 100 BN, Drain 분석에 따른 Fe / BN 함량의 변화

It shows that under the same operating conditions, the BN100 CLO has performed in a better way than the regular BN 70 CLO. However it must be pointed out that the wear measured with the BN70 CLO is much lower than the limits set by the engine manufacturer. In other words the BN 100 CLO brings here additional operating safety margin and allows possible lower lube oil feed rate than the BN 70 regular CLO.

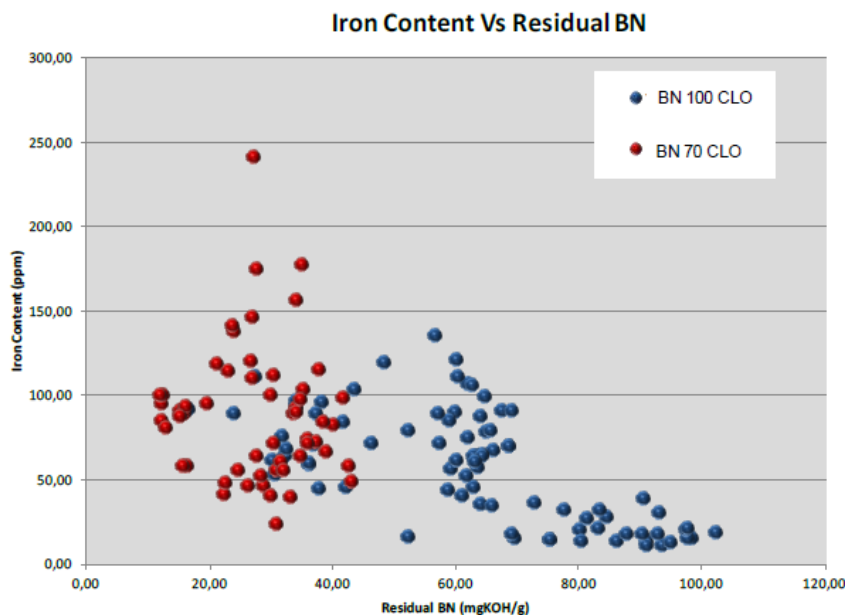


Figure 24: Iron content versus Residual BN for BN 70 and 100 CLO

The graph above shows the iron content and residual BN measured from the drain oil samples taken along the test. It can be seen clearly that the residual BN is higher when using the BN 100 CLO, also the BN reserve is higher and the risk of corrosion is lower. In the meantime, the trend to have a lower level of iron is in favour of the BN 100 CLO. The set of blue dots concentrated in the area 80-100 mg KOH/g corresponds to the period of time during which the ship was sailing in ECA, where also the iron content was also the lowest.

The following table summarizes the various values measured. The chromium content gives a view on the ring coating wear behaviour. All the items are in line with engine manufacturer recommendations.

## Feed rate 변화 – 70 BN, Drain 분석과 100 BN, Drain 분석에 따른 Fe / BN 함량의 변화

For the ship operator, the biggest advantage of switching to a higher BN lubricant is the associated cost savings. Higher BN lubricants can deliver the same amount of protective alkalinity in the cylinder at a lower cost. The included graphs show the results of a field test executed by Chevron.

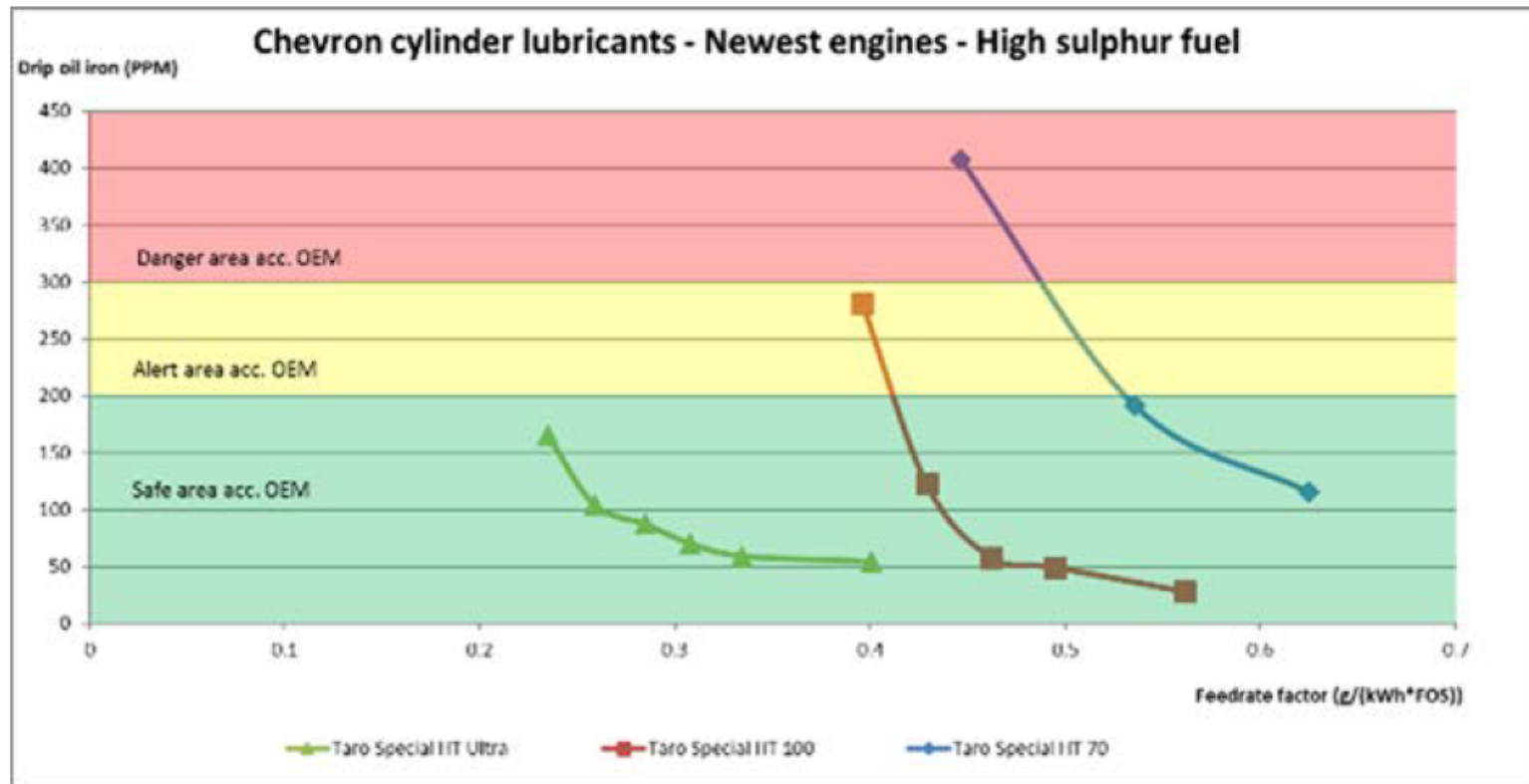


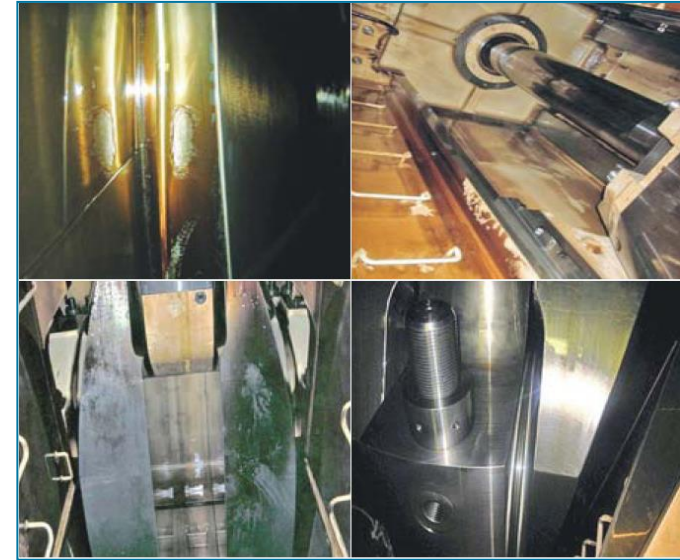
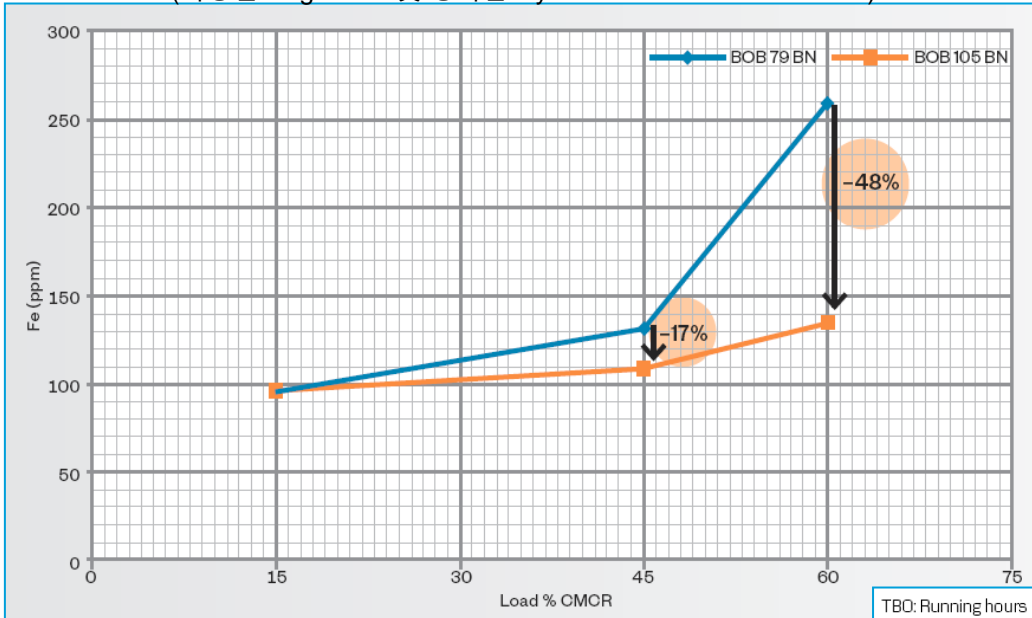
Figure 25: Comparison of drip oil analysis results of a 70BN, 100BN & 140BN cylinder oils show feed rates being reduced during field testing. Changing from 70BN to 100BN oil brings feed rates to manageable levels. Using Chevron Taro Special HT Ultra (140BN), wear metals stay below OEM limits while operated at historical minimum feed rates.



# BN 관리를 통한 엔진 관리 필요성-4

Best solution, your partner

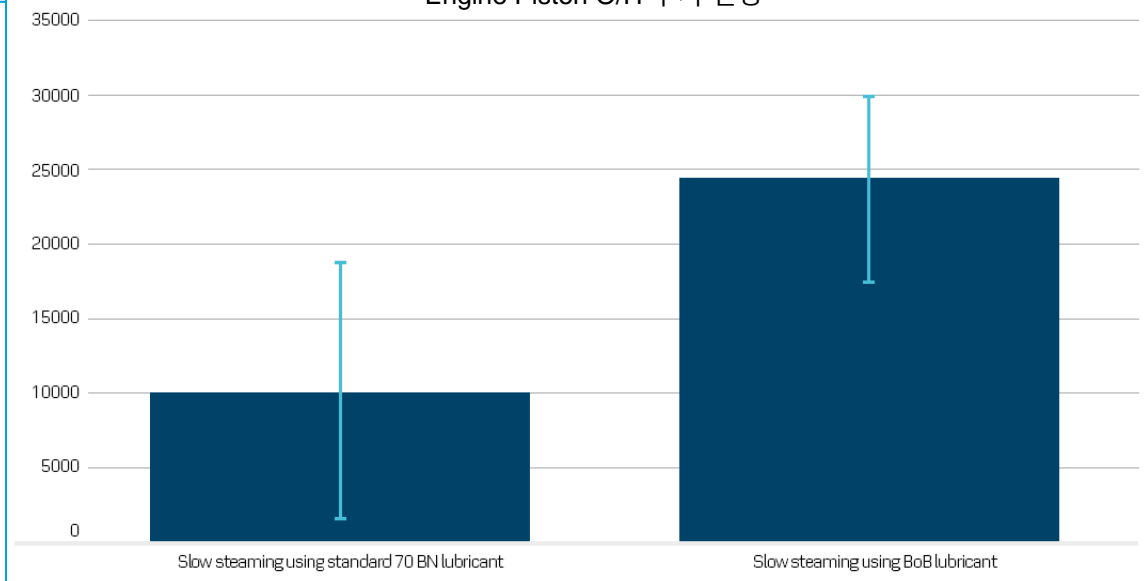
Total Iron content of piston underside drain Oil during operation with BOB  
 12Cyl' Wartsila RTA96C Engine test report  
 (다양한 Eng. Load 및 정확한 Cyl' Oil Feed-rate & BN Value)



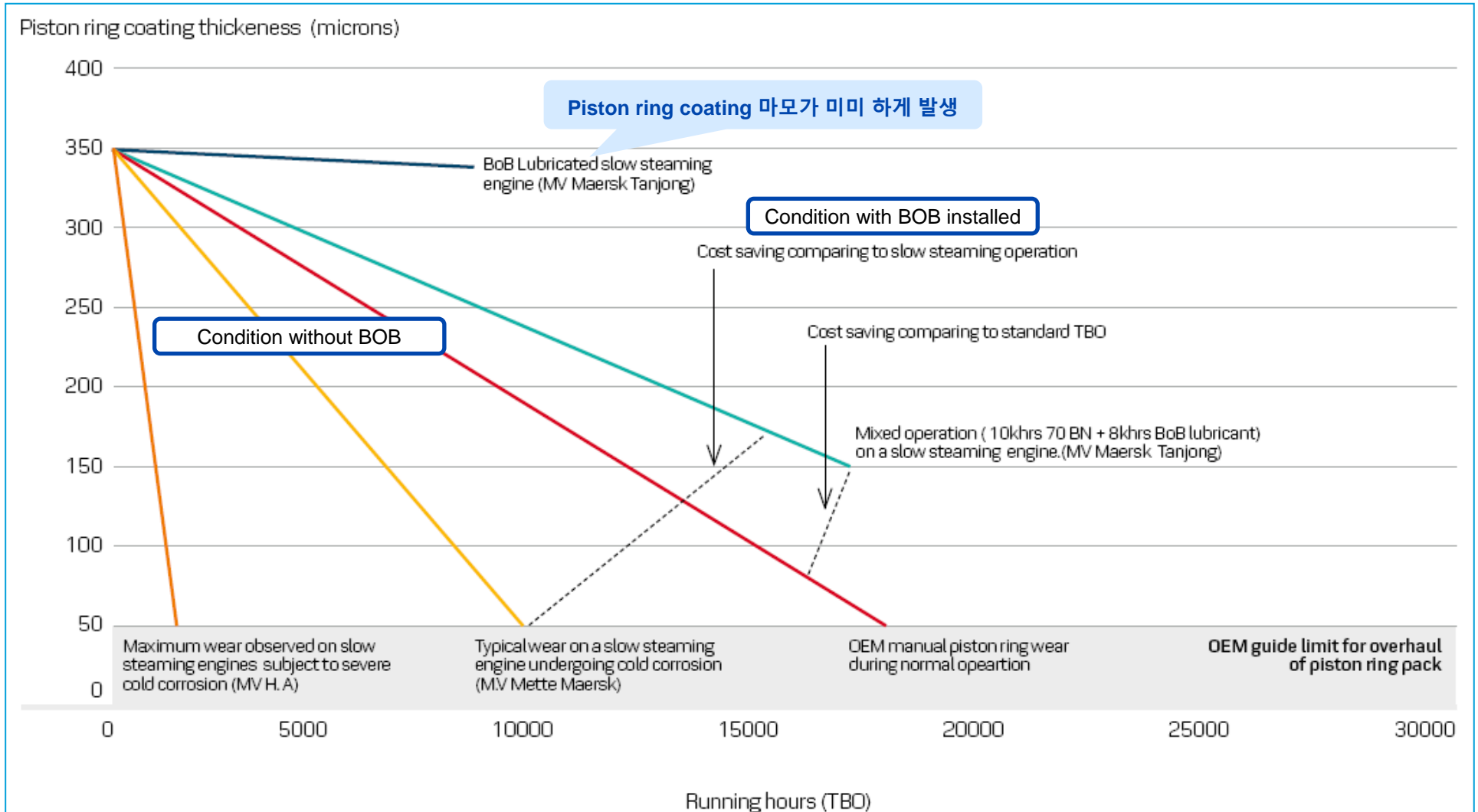
❖ High BN 사용으로 Fe (기기마모율 척도)  
 함량이 낮아 집을 검증함

TBD: Running hours

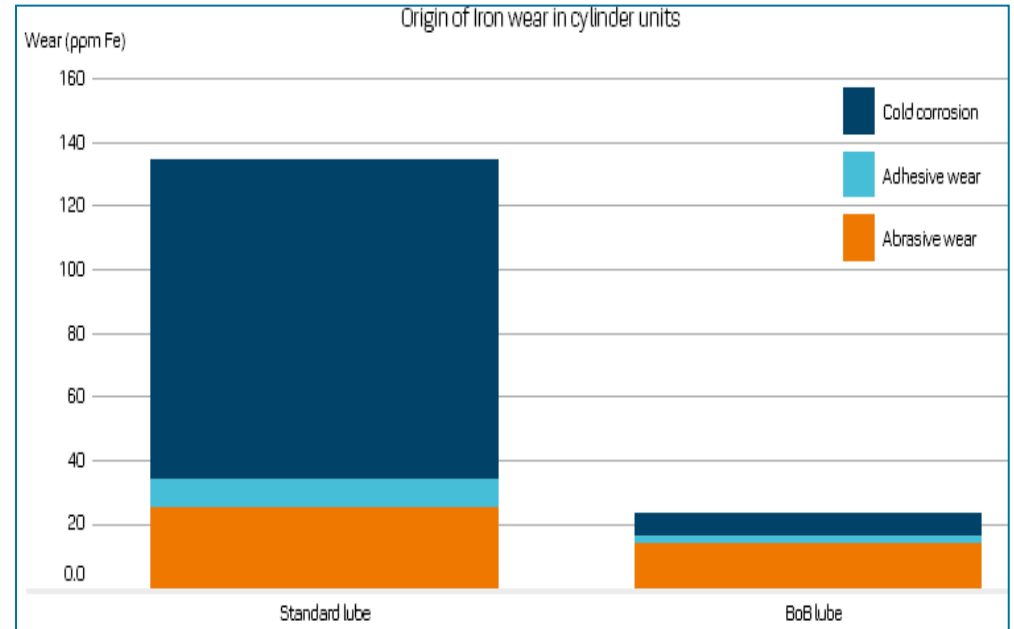
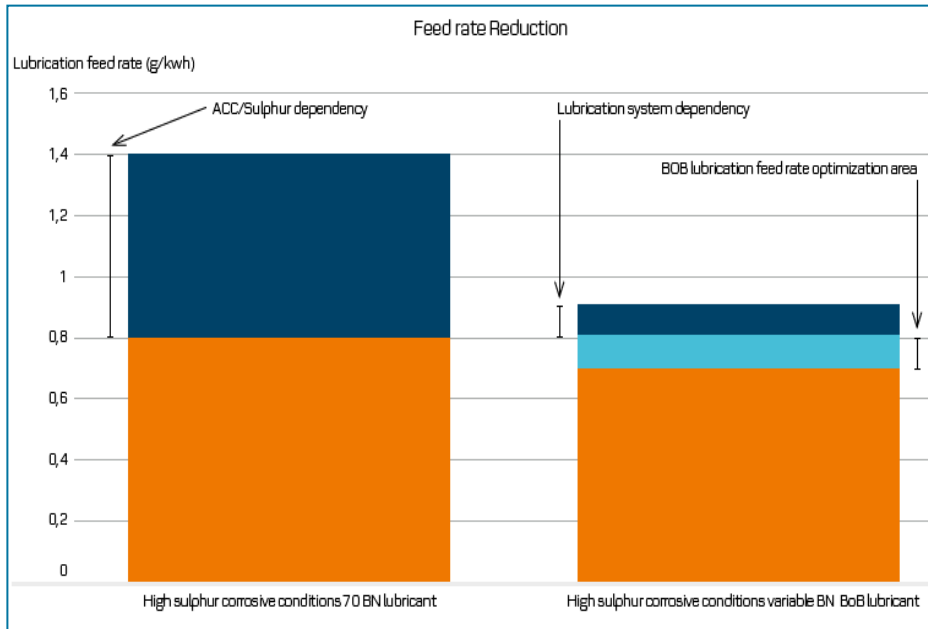
Engine Piston O/H 주기 연장



❖ BOB 운용에 따른 Piston coating 두께 마모율을 측정하였고 정비 주기 연장을 확인함.



- ❖ BOB 장비를 이용 최적 BN 관리 함으로써 Cylinder oil 소모량이 25~40% 감소
- ❖ BOB를 이용 BN 관리함으로써 Cylinder liner Wear down에 주 원인인 저온부식을 감소 시켰다.



본 Data 및 Graph들은 "M"사에서 Operating hour 1,000,000 hrs 운전 실적을 근거로 분석하였고, Wartsila 와 Man B&W 에서도 비슷한 결과와 선사의 Benefit을 검증 한 바 있다.

- ❖ 최근 낮은 연소실 온도 영향에 의한 저온부식은 엔진 Cyl' Liner 및 Piston Ring 부식, 마모를 증가함.
- ❖ 저온부식 발생은 Piston ring 표면 상태 불량과 Damage로 이어지고, 이에 따라 발생된 Particles은 Piston ring과 Liner에 심각한 마모의 결과를 가져옴. 결과적으로 Adhesive wear (scuffing)은 심각하게 증가 되고 있다.



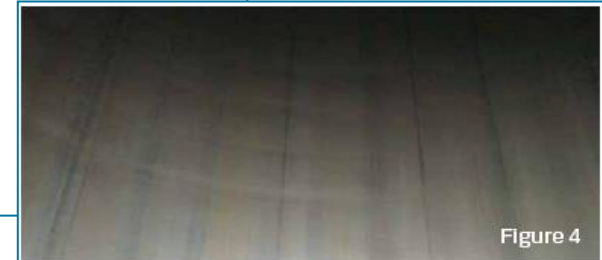
Vessel: M/V H/A  
 Ring pack: 8,429 hours  
 Engine: 8,429 hours  
 Cylinder oil feed rate 1.05g/kWh  
 70 BN standard cylinder oil  
 Fuel S = 2.9%  
 Average engine load = 35%



Vessel: M/V B.E  
 Ring pack 2,257 hours  
 Cylinder liner: 6,000 hours  
 Engine: 6,000 hours  
 Cylinder oil feed rate 1.05 g/kWh  
 70 BN standard cylinder oil  
 Fuel S = 3.1%  
 Average engine load = 35%



Vessel: M/V Maersk Tanjong  
 Ring pack: 15,329 hours  
 Engine: 40,455 hours  
 Cylinder oil feed rate 0.85g/kWh  
 95 BN Blending on Board cylinder oil  
 Fuel S = 3.26%  
 Average engine load = 26%



Vessel: M/V Maersk Tanjong  
 Ring pack 2,994 hours  
 Cylinder liner: 40,455 hours  
 Engine: 40,455 hours  
 Cylinder oil feed rate 0.85g/kWh  
 95 BN Blending on Board cylinder oil  
 Fuel S = 3.26%  
 Average engine load = 26%

- Fig. 1 - 황산 발생에 따른 Top Piston ring의 부식의 예
- Fig. 2 - 최저 Feed rate 조건에서 BOB 장비는 다양한 BN Cyl' Oil을 공급함으로써 Piston ring 저온 부식 방지 및 최적 상태 유지
- Fig.3과 같은 Black mark 가 나타나는 것은 Liner wall의 spongy 표면 저온 부식과 BN 결핍에 의해 발생한다.
- Fig.4 BOB 장비는 다양한 BN값 조정으로 전체 실린더 윤활 성능 저하를 방지함으로써 심각한 저온부식의 위험을 사전에 예방한다.

## BOB - Case Study (Wallem Group, Bulk Carrier)



Ralf Veigel  
Fleet Manager at Wallem Group

Today, the main engine of a vessel should have highly flexible operational capabilities, while, at the same time, maintaining high reliability. Versatility, in terms of the operational load and different fuel oil qualities of the engine, affects operational costs. Wärtsilä's Blending on Board (BOB) optimises the overall fuel performance of large bore engines.

— Wärtsilä gave us a solution that addressed adjust the lubrication of changing conditions, as Fleet Manager at Wallem

The Wallem Group delivers maritime solutions. It enhances and protects its clients' assets with its vast collective knowledge, experience and expertise. Established in Shanghai in 1903 by Haakon Wallem, the company today is one of the world's largest providers of maritime solutions, within the fields of Ship

often, operates with high sulphur fuel, under harsh conditions and different engine loads. The crew manages these conditions by regularly measuring the residual BN-value and adjusting the feed rate, according to the engine manufacturer's recommendation.

—As we were using the recommended

**"Wärtsilä gave us an attractive solution that addressed our need."**

### ADJUSTING THE CONCENTRATION OF ADDITIVES

The main purpose of cylinder lubrication is to build an optimal oil film for piston running, neutralising sulphuric acid from fuel combustion, and cleaning. A technically and commercially favourable alternative to the traditional measures is to maintain the cylinder oil feed rate at the most optimal level, under almost all operational conditions, while, simultaneously, adjusting the cylinder oil's properties to the actual conditions.

This is exactly what is achieved with the BOB concept. The concept is to keep the cylinder oil feed rate constantly low, while adjusting the concentration of the additives in the oil. This results in a wide base number range, from 40BN to 120BN.

— Wärtsilä's Blending on Board solution was attractive, as the system addresses the need to adjust the lubrication oil, according to the changing situation, including the engine load, fuel and environmental conditions, says Ralf Veigel.

Wärtsilä's scope of supply included the delivery and installation of the BOB system SEA-Mate® Blender, consisting of a blender with a blender control panel. Installation of the system is relatively simple and can be done without interrupting the vessel's commercial operations. The pre-inspection of the engine system took place in Singapore and the installation of the system was performed in South Korea in December 2013. The solution has been designed in a modular way, in order to allow easy installation, and is compact enough to be placed in the engine room.

— The time between pre-inspection and the installation was less than six weeks. The installation, including piping and necessary



Challenges	Solutions	Benefits
— Optimising lubrication by flexible adjustment of the BN-value for different engine running conditions.	— Installing Blending on Board (SEA-Mate®) blended, with system oil and additives, allowing a closed loop lubrication by measuring the residual BN-value of the piston underside oil.	— Reduced lubrication feed rate — Reduced costs for lubrication oil — Avoidance of cold corrosion — Less separator discharges, thus, additional savings.

tank adaptations, could be carried out during a port stay of the vessel, which is quite an achievement. Thanks to the close cooperation between Wallem and Wärtsilä, the challenges, such as the short time, the organisation and transportation of the goods, did not affect the installation work, states Ralf Veigel.

### REDUCED COSTS FOR LUBRICATION

With a BOB installation, the used system oil is transferred from the main engine, and, optionally, also the auxiliary engines, and is then blended with a specially formulated cylinder oil additive. The result is cylinder oil for the specific operating conditions of each vessel, thus reducing a vessel's lube oil consumption by 10%–50%, depending on the currently used feed rate.

To reduce corrosion, Wärtsilä and other engine designers recommend increasing the cylinder lubrication oil feed rate or the use of different lubrication oils. However, with the BOB equipment in use on a vessel, the reduction in corrosion can be achieved by adjusting the BN of the lubricant, and not by increasing the cylinder oil feed rate.

Wallem's experience with the BOB solution has been very positive, so far.

— We have been able to optimise the lubrication, reduce the feed rate and stabilise the piston running, says Ralf Veigel and continues to highlight the benefits that Wallem has gained through this installation.

— We have optimised the piston running, achieved flexibility and, most importantly, reduced the costs concerning lubrication.

### VALUABLE TECHNICAL SUPPORT

Mr. Veigel says that Wärtsilä has been supporting his team throughout the installation and also when using the system. He points out that there has been a mutual exchange of open and trustworthy information already before the installation, which supports Wallem's aim to reduce the lubrication costs.

— Part of this successful product is a close cooperation with Wärtsilä and having a fast and direct contact to their technical know-how. This is, especially, relevant for newly introduced products. If a ship operator requires flexibility and runs the engine at low loads with different fuel qualities, I would, without doubt, recommend installation of the Blend on Board system, concludes Ralf Veigel.



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WARTSILA.COM

### Challenges

다양한 엔진 운전 조건에서 신속성 있는 BN 값 조정에 의한 엔진 윤활 최적화

### Solution

엔진 System Oil과 첨가제 혼합 사용을 위한 BOB (SEA-Mate) 설치. Piston 하부 Drain Oil의 잔류 BN 값 측정을 통한 완벽한 Loop lubrication

### Benefit

- Cyl. Oil feed rate 조정
- 엔진 윤활유 비용 절감
- 엔진 구성품 저온 부식 방지
- 청정기 배출량 감소, 엔진 부품 사용 기간 연장 증 부가 비용 절감

**BOB 설치 선박 : M/V Belo Horizonte (81,681 DWT Bulk Carrier)**

**BOB 설치 Pre-inspection Place : 싱가포르**

**소요 시간 for Pre-inspection & 설치 작업 : 6주 이하**

**BOB 설치 Port & 기간 : South Korea & Regular Port Stay (2일)**

### 설치 검증 결과

- ▶ Cyl. Oil Feed Rate Low – Lub. Oil BN값 (40 ~ 120) 유지
- ▶ 선박 Lub. Oil 사용량 감소 : 10~50% (적용 Cyl' Oil Feed Rate)
- ▶ 엔진 부품 부식 : 기존 엔진 Maker Recommend – Cyl' Feed rate 증가 혹은 다른 윤활유 사용 권고 → BOB 설치 후 윤활유 BN값 조정 가능하여 MCO Feed Rate 증가 불필요 확인

### Mr. Ralf Veigel (Fleet Manager of Wallem Group) 인터뷰

최근의 선박 엔진은 큰 변동성의 운항 조건에 만족하며, 동시에 높은 신뢰성과 유동성을 유지할 수 있어야 한다. 직면한 저속 운항 등 다양한 엔진 부하 조건과 다른 연료유 사용은 선박 운항비용에 큰 영향을 끼침으로 본 BOB Solution의 주요 성능, 즉, 전체적인 윤활 성능 최적화 및 엔진 부품의 성능 개선은 매우 중요하고 성공적인 결과를 가져왔다.





Maersk Line Container (M/V Edith Maersk, 14 Cyl. Warsila Rt-Flex96C) – 2012년

고객 선박 운항 조건의 다양한 Parameter (연료유, 윤활유, Engine 부하, Cyl. Oil Feed Rate 등) 및 설치 조건을 고려하여 BOB 장비 설치 시 고객의 Benefit, Cost Saving, Pay back time 등 제안함

### Our Work & Supply Scope

- ◆ BOB 장비 공급 설치 전 Class Approval 및 Installation Drawing 제작 공급
- ◆ Pipe Line, Tank 변경 등 Steel Works 수행
- ◆ 장비 설치, 시운전, Commissioning 제공
- ◆ 본선 선원 운전 및 정비 교육
- ◆ Other Technical Assistance
- ◆ 설치 효과 및 비용 절감에 대한 Verification

### BOB 장비 Value Calculation (1. 적용 Data)

Main Engine Type	7 Cyl. RT-Flex 96C
M/E 연간 운전 시간	6000 Hrs
M/E Cyl. 윤활 시스템 (CLU3 or CLU4)	CLU3
평균 Engine 부하 (%)	50%
엔진 System Oil 금액 (USD/t)	1550
엔진 Cyl. Oil 금액 (USD/t)	2000
BN 첨가제 금액 (USD/t)	3600
연료유 금액 (USD/t)	600

### BOB 장비 Value Calculation (2. 예상 절감 Cost 및 Payback Time)

Item (Cost Saving)	Approx. saving in USD/year	Cumul. Savings in USD/year	Payback times in years
연간 Cost 절감액 (Standard Cylil Oil과 조정된 Fedd-rate에 따른 Blended Cyl' Oil – 0.1f/kWh 예상)	110,000	130,000	< 1.2
연간 Cost 절감액 (증가된 청정기 배출 주기에 따른 System Oil 손실, System Oil 개선에 따른 비용 절감)	20,000		
향상된 Engine 부속품 상태에 따른 정비 및 Spare Part 비용 절감	50,000	180,000	< 0.85
감소된 마찰, 점도 최적화 및 지속적인 System Oil 신유 공급, 엔진 청소 효과에 따른 연료 절감 효과 (0.5%)	60,000	240,000	< 0.65



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HOME » SHIPPING NEWS » MAERSK FLUID TECHNOLOGY EXAMINES BENEFITS OF BLENDING-ON-BOARD ON SYSTEM OIL

# Maersk Fluid Technology Examines Benefits Of Blending-On-Board On System Oil

By MI News Network | In: Shipping News | Last Updated on May 16, 2018

System Oil by Blending-on-Board' a whitepaper which explores the many benefits of system oil that are conferred by the company's SEA-Mate® Blending-on-Board (BOB) system. The paper details how BOB – developed in-house by the AP Møller subsidiary as a means of producing system oil suited to different fuel types and engine operation modes for crosshead and two-stroke engines – even more benefits for the engine's system oil. BOB significantly improves engine performance, making the engine more efficient and reducing fuel consumption. The consequent reduction in fuel consumption is also beneficial to the environment.

System oil cools and lubricates essential engine components. It is as well used for operating and controlling engine components and systems, fuel injection pumps and turbochargers. Under normal circumstances, the system oil degrades in the engine as the oil changes; becoming thicker, losing its detergent characteristics and becoming contaminated with wear particles and possibly by leakage from the upper cylinder through the

Small bore 2-stroke 엔진 : \$ 20,000 ~ 40,000

Medium : \$ 40,000 ~ 90,000

의 절감 효과

When BOB is employed to produce cylinder lubricating oil from the in-use system oil and an appropriate high BN oil product, the engine's system oil is constantly replenished with fresh clean oil and therefore the protection and efficient operating of the engine is continually maintained.

The whitepaper also details the considerable financial savings as a result of lower maintenance and less use of the system oil cleaning system and separator. With BOB, annual savings on a small bore two-stroke main engine is in the range of \$20-40,000 and for a medium to large bore engine as much as \$40,000 – 90,000. The reduction in cylinder lubrication and engine wear alone justifies the investment.

Since the concept was first developed in 2008, MFT initially supplied BOB systems to vessels in the Maersk fleets, it is now available to all shipowners.

Jens Byrgesen, Managing Director of MFT says; "Users of BOB have been impressed with the improved engine performance and maintenance that have resulted from the cleaner system oil and have welcomed the cost savings the improvements bring."

## SAFETY4SEA

200 대가 넘게 설치 되었으며 검증 결과 40% 이상 MCO 절감 효과와 더불어 연료 1.5% 이상 절감 효과를 검증 하였다.

The SEA-Mate® Blending-on-Board (BOB) system enables the crew on board the vessel to blend an engine-specific fit-for-purpose cylinder lubricant with the optimal neutralisation and detergent properties. The in-use 2-stroke engine system oil is blended with a high-BN cylinder oil. The resulting fit-for-purpose cylinder lubricant composition matches actual engine operating conditions and fuel sulphur levels, making it possible to reduce cylinder oil consumption and mitigate issues like cold corrosion and excessive cylinder wear.


Moreover, reports highlight potential cylinder oil savings, as well as energy and consumption savings related to having a continuous refreshment of the system oil. Calculations are on actual system and cylinder oil consumption & cost for both main engine and auxiliary engines. It also includes an estimate for expected reduction of maintenance cost – reduced cost for change of cylinder piston rings & liners, reduced cost for purifier maintenance and more. The resulting report is emailed to your inbox for further evaluation and support when building a business case.

Sune Lilbaek, Head of Sales at Maersk Fluid Technology, explains:

*“By using the value calculator it is easy to see the potential cost savings achievable with the introduction of a BOB system. With over 200 installations to date, we have proven it is possible to achieve lubrication at, or close to, the lowest allowed consumption of lubricant as specified by the engine manufacturer. This results in proven reductions of up to 40% in 2-stroke engine cylinder oil consumption, as well as significant fuel and maintenance savings”.*

And as the refreshment becomes a reoccurring event, system oil viscosity is returned to its original state, reducing friction in the engine and thereby providing proven fuel savings up to 1.5%.





### Up to 50% reduction in lube oil consumption

Next generation lube-oil Blending on Board systems for all 2-stroke engines – calculate your savings

Calculator

**Cylinder Oil - Input**

Manufacturer:

Type:

Blending system:

Minimum cylinder oil feed rate for engine:  g/kWh

Lube-oil supplier:

Current lube-oil BN used:

**actual data:**

Fuel sulphur % bunkering:  %

Engine load:  %

Cylinder oil feed rate:  g/kWh

Cylinder oil consumption annually:  L

Cylinder oil price:  USD/100 L

**Savings**

<b>Cylinder oil:</b>	
Current cost of operation per year, without BOB	60,000 USD
Cylinder oil per year with BOB	35,325 USD
<b>Annual cylinder oil saving</b>	<b>24,675 USD</b>

The SEA-Mate Blending-on-Board Value Calculator

**Maersk Fluid Technology updates blending calculator**  
 Maersk Fluid Technology has announced that it has upgraded the SEA-Mate® Blending-on-Board Value Calculator, to include a mobile optimised version that is used in calculating savings, based on a variety of real life scenarios.

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### Maersk Fluid Technology Updates Blending-on-Board System for Mobile Use

Calculations to date, we have been able to achieve lubrication at, or below, the allowed consumption of oil as defined by the engine. This results in proven reductions

of up to **40 percent** in 2-stroke engine cylinder oil consumption, as well as significant fuel and maintenance savings."

Reports also detail energy and consumption savings related to continuous refreshment of the system oil, with calculations based on actual system and cylinder oil consumption, as well as cost for main engine and auxiliary engines.

"It also includes an estimate for expected reduction of maintenance cost – reduced cost for change of cylinder piston rings and liners, reduced cost for purifier maintenance and more. The resulting report is emailed to your inbox for further evaluation and support when building a business case," explains the company.

In July, it was reported that [Maersk Fluid Technology SEA-Mate B1000](#) had received its first [commercial order](#), and was slated for installation on 12 [Maersk Tankers](#).

검증 결과 40% 이상 MCO 절감 효과와 더불어 연료 및 정비비 절감 실현함.

“

**The mobile-optimised BOB Value Calculator is noted to enable users to calculate savings based on a number of real life scenarios**

Posted by Eric Haun April 5, 2016

## Maersk to Address 'Blending-On-Board'



Maersk's SEA-Mate Blending-On-Board system (Photo: Maersk)

Visitors to the 2016 European Marine Engineering Conference in Amsterdam this year will be able to hear a keynote speech from Maersk Fluid Technology managing director Jens Byrgesen, who will talk about his company's success with "Blending-On-Board" lubrication technology.

Maersk' SEA-Mate Blending-On-Board concept is based on proprietary technology designed to enable the operator to custom blend a fit-for-purpose cylinder lubricant from recycled two-stroke system oil and a cylinder oil concentrate with a base-number up above 300 BN.

The SEA-Mate concept is designed to address the needs of today's operational challenges, such as slow-steaming, changes between different fuel types with different sulphur content, crankcase cleanliness issues and system oil performance concerns.

The topic of Blending-On-Board divides opinion within the industry, with many leading lube manufacturers advising caution, but with a number of shipowners apparently seeing benefits from employing the technology. Independent consulting company BWSC has documented that the system facilitates a fuel consumption reduction up to 1.5 percent, and owners find it is possible to reduce lube oil consumption by up to 50 percent.

The first Blending-On-Board systems were commissioned back in 2008 and today there are more than 200 systems in active operation. As an example, Blending-On-Board was installed on Emma Maersk in 2012. Back then, Maersk Line estimated cost savings from reduced lubricant and fuel consumption for Emma Maersk in excess of \$100,000 per year and the total operating savings from the Blending-On-Board technology installed on Maersk Line ships to be in excess of US\$17 million per year.

BOB 를 적용하여 1.5% 연료 소모량 절감과 50% 실린더유 절감을 예상한다.

2008년 처음 적용 후 200 척이상 적용

Emma Maersk 의 경우 연간 \$100,000 절감 예상하고 있다.

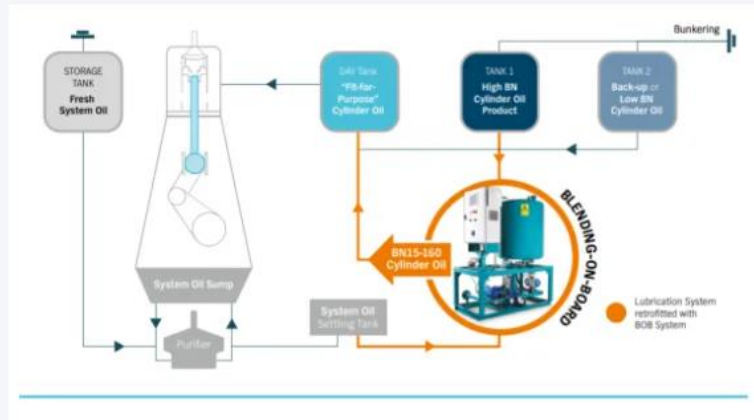


## Blending-on-board system-oil solution gives engine efficiency a boost

MAINTENANCE & CONTINUOUS IMPROVEMENT

OPERATIONS AND MANAGEMENT

MAY 15, 2018



MFT's Blending-on-Board concept

Engines can be made more efficient and fuel consumption can be reduced by using a Blending-on-Board (BOB) technique for system oil on board ships, claims Maersk Fluid Technology (MFT).

A white paper published by MFT shows how a consistent replenishment of system oil without oil losses can improve engine performance, lower maintenance intervals, and reduce a vessel's environmental impact, all of which lead to significant cost savings.



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## UPGRADE AUTOMATES MAERSK LUBE BLENDING TECHNOLOGY

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29 May 2018

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A software upgrade for Maersk Fluid Technology's (MFT) SEA-Mate blend-on-board cylinder lubrication system is set to make accurate blending faster and simpler.

The mid-sized B1000 model, with a blending capacity of 300 litres a day, will have the option to be automated. It will use output signals from the ship's engine control system and other sensors for engine condition to optimise cylinder oil properties.

Henrik Bak Weimar, technical and operational manager, Maersk Fluid Technology, said: "Our developments of the automated versions of the BOB system models are a result of extensive operational experience onboard vessels. The new generation of blenders meets expectation of modern engine operators."

MFT's technology blends in-use system oil with cylinder oil to produce optimised cylinder lubricant, with added benefits claimed from the replenishment of system oil in the engine sump.

The SEA-Mate line comprises three models with different blending capacity.



Automation comes to onboard cylinder lubricant blending

[« Insights & News](#)

## Evergas and Clipper to equip ships with lubricant blending-on-board system

Total number of SEA-Mate blending-on-board systems ordered is more than two hundred.



*Image credit:*

Updated on 09 May 2017 09:05 GMT

**Maersk Fluid Technology (MFT)** has signed contracts with both **Evergas** and the **Clipper Group** for the supply of the **SEA-Mate** blending-on-board (BOB) system. This recent order takes the total number of SEA-Mate BOB systems invested in by ship owners to more than two hundred units, representing millions of logged cylinder operation hours.

The **SEA-Mate B1000** unit - a system which is suitable for medium range engines with a bore size of 50 to 72 centimetres - will be installed on Evergas's vessels.

Clipper Group has taken delivery of its smaller **B500** unit, which is the system specifically designed for engines with a bore size of 26 to 48 centimetres, to be fitted on a vessel equipped with a MAN Diesel S42MC engine.

### **BOB for better cylinder lubrication and system oil quality**

Initially a tool for the reduction of lubrication issues on very large two-stroke engines, the concept is today available in three different sizes and said to be suitable for all modern two-stroke engines.

MFT's BOB technology is designed to facilitate blending of the in-use system oil, as a base oil, with a high-BN cylinder oil product to produce a fit-for-purpose cylinder lubricant matching the actual fuel composition. With BOB units on board, ship operators can blend cylinder lubricant compositions that match actual engine operating conditions and fuel sulphur levels.

MFT says the use of this technology can reduce cylinder oil consumption and alleviate issues such as cold corrosion, excessive cylinder wear. The system is also said to mitigate issues associated with worn system oil, causing problems for the hydraulic control system in modern electronic 2-stroke engines. Once oil is refreshed, significant energy savings in connection with purification and frictional losses can be realised, according to MFT.

### **Designed in cooperation with the large engine designers and Maersk Line**

The SEA-Mate BOB concept is designed with a shipowners needs in mind and has been developed together with major engine designers; it has received 'no objection' letters for MAN Diesel & Turbo and Winterthur Gas & Diesel (WinGD) engines.

The system can be installed on newbuilds or as a retrofit and does not require installation of additional cylinder oil tanks nor does installation result in offhire - it is fitted and commissioned during regular port stays.

"Maersk Fluid Technology welcomes the recent orders from Evergas and Clipper Group. The 200+ unit orders received to date represent systems installed across a wide range of vessels types, for retrofit and newbuild application. This is a technology that is supporting ship operators with both changing engine operating conditions and fuel sulphur levels, it is needed in the industry and we are pleased that our order book reflects that requirement," said **Sune Lilbaek**, Head of Sales at Maersk Fluid Technology.



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Views

## Maersk Fluid Technology Welcomes Growing Demand for SEA-Mate?



Engine room for Maersk Tankers vessel with a B1000 unit fitted by the crew during voyage and commissioned by Maersk Fluid Technology during a regular port stay.

BY THE MARITIME EXECUTIVE 05-17-2017 09:20:24

Maersk Fluid Technology (MFT) has built a reputation in the industry for their

### A future-ready system for cylinder oil blending with more than 200 installations in operation

Originally developed by Maersk for use on A.P. Moller-Maersk group's fleet of containerships, MFT has since welcomed investment in the technology for installations across a wide range of ship types. To date, over two hundred units have been installed and millions of cylinder operation hours have been logged.

The MFT Blending-on-Board product line comprises of three unit types; the B1000 for medium range engines with a bore size of 50 – 72 cm, the B3000 for larger engines with a bore size above 72 cm, and the new SEA-Mate B500 specifically designed for engines with a bore size of 26 – 48 cm.

The medium range unit was introduced in 2015 and the first volume order was placed by Maersk Tankers for the retrofit of the SEA-Mate® B1000 system for twelve tankers. In 2016, the units were installed on the tankers without the need to interrupt the vessels schedule.

Since the introduction, the SEA-Mate® B1000 system has also been adopted for vessels owned by Bertling, Masterbulk and Evergas. For the smaller B500 system, the Clipper group has in 2017 taken delivery of the first unit, to be fitted on a vessel equipped with an MAN Diesel S42MC engine.

"Our experiences with the current 200+ installations have proved that it will be possible to achieve continuous lubrication at, or close to, the lowest allowed consumption of lubricant as specified by the engine manufacturer, with the optimal amount of acid neutralization and cleaning properties – the cylinder lubricant from the SEA-Mate® BOB system always matching the fuel composition.

"The flexibility of the system allows blending of a cylinder oil with system oil or blending of two cylinder oils, and means it can easily be adapted for future needs through change of the incoming streams." says Sune Lilbaek, Head of Sales at Maersk Fluid Technology A/S.

