UE SERVICE INFORMATION

Confidential

JAPAN ENGINE CORPORATION
SERVICE ENGINEERING DEPARTMENT, SERVICE ENGINEERING SECTION
1, MINAMIFUTAMI, FUTAMI-CHO, AKASHI-CITY 674-0093, JAPAN
TEL. +81-78-949-0804 (direct), e-mail: sales2@j-eng.co.jp (parts & engineer order), service@j-eng.co.jp (technical inquiry)

Subject :	Application	UEC Diesel Engine
Recommendable cylinder oil BN and the guidance of cylinder oil feed rate	Type	All UEC
	No.	USI-10002E Rev.1
	At early opportunity	

Today, high base number (BN) cylinder oil against cold corrosion of cylinder liner and low BN cylinder oil adapted to low Sulphur fuel oil applying to IMO SOx emission control is used.
This service information informs users that recommendable BN cylinder oil and appropriate cylinder oil feed rate.
In this service information it shows that the recommendable BN and guidance of cylinder oil feed rate corresponding to engine type for UEC- LA/LS, LSII, LSE, LSH and each cylinder lubricating systems.
Up to this day, on the instruction book of UEC engine, cylinder oil feed rate was shown as the value of P1 rating engine (P1 converted cylinder oil feed rate). However from hereafter, please read the P1 converted cylinder oil feed rate equal to MCR feed rate of each engine.
For the details of the above, please refer to the service information USI-10006 (Abolition of cylinder oil feed rate at P1 point) additionally.
Additionally, about the condition judgement of piston ring and cylinder liner analyzing drain from piston under side is shown on section 3. (Analysis of drain from piston under side) and please refer this section also.
For actual operation, please refer to appropriate guidance from this information corresponding to the engine type, cylinder lubricating system, and cylinder oil BN.
About the detail of cylinder oil feed rate setting change procedure, etc. please refer to the instruction book.

【Related service information】

USI-10001 Instructions for Continuous Slow-Speed Operation
USI-10003 Notice for Using Low Sulfur / Low Viscosity Fuel Oil
USI-10004 Lubricating oil list for UEC engine
USI-10006 Abolition of cylinder oil feed rate at P1 point
USI-10008 Application proposal for low temperature corrosion on piston ring and cylinder liner for UEC-LSE type main engine
USI-10009 Procedure for setting and decreasing of cylinder lubricating oil feed rate after renewing of a cylinder liner and piston rings

Plan record
Newly issued 13th Dec. 2017 (T.Y, N.N, T.F)
No.MSI-1555 (14th Jul.2015)
Rev.1 Recommended BN revised 30th Aug. 2019

Approved	T.Yamamoto	SERVICE ENGINEERING DEPARTMENT
Checked	N. Nakashima	ENGINEERING DEPARTMENT
Designed	T. Fujimoto	DATE OF RIVISD: 30th Aug. 2019

1. UEC-LA / LS /LSII type engine

BN of cylinder lubricating oil corresponding to each type of fuel oil used (Informative)

Cylinder oil is sold the different BN which is corresponded to the sulfur content of used fuel oil. In the UE diesel engine, it is recommended to apply the suitable cylinder oil against the sulphur content of used fuel oil as following table.

Sulfur content of fuel oil	Recommended cylinder lubricating oil BN
Sulfur content ≦ 0.1%	BN 15～25mgKOH/g
0.1% ≦ Sulfur content ≦ 0.5%	BN 40 (～70*) mgKOH/g
0.5% ≦ Sulfur content ≦ 1.5%	BN 40～70mgKOH/g
1.5% ≦ Sulfur content	BN 70～100mgKOH/g

(*) Can be applied when piston crown cleanness is required (in case combustion sludges, usually blacky, are noticed in piston ring grooves and piston lands) carefully monitoring the amount of white sludges on the piston top combustion surface and piston top land.

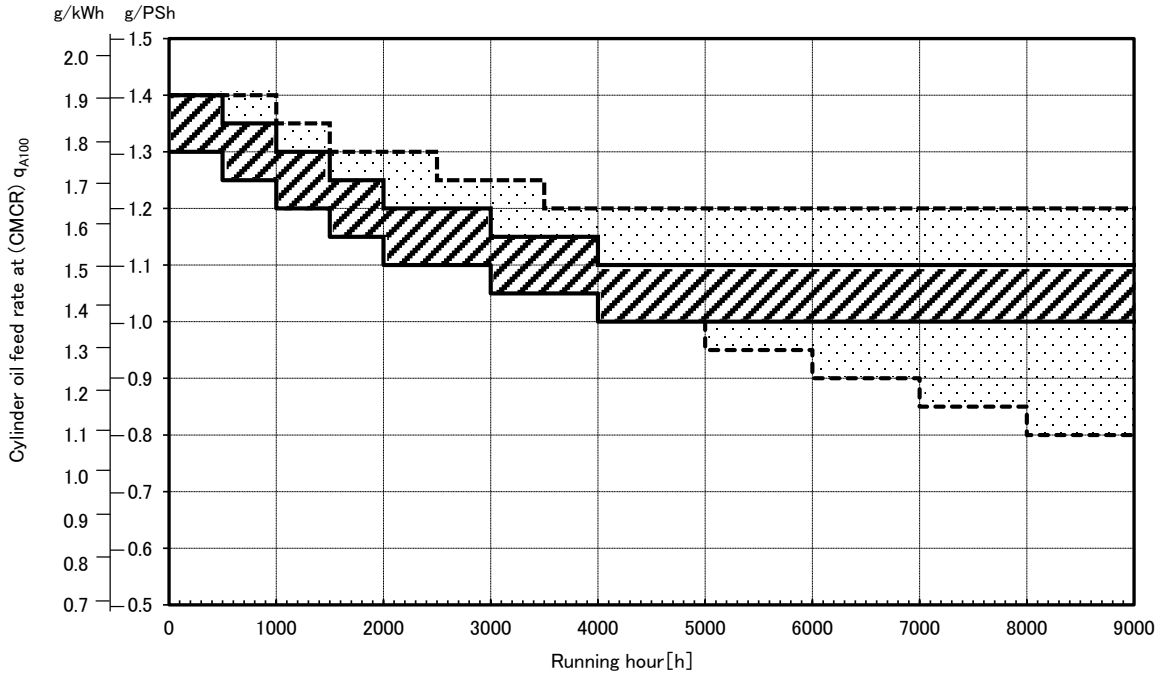
- Cylinder oil drain analysis is an effective way to judge the wear condition of piston rings and cylinder liner. It is recommended that cylinder oil drain analysis is carried out periodically. Refer to 3 item “Analysis of drain from piston under side” about the cylinder oil drain analysis.
- It is possible to operate with more than BN25 cylinder lubricating oil against less than 0.1% sulfur content fuel or more than BN40 cylinder lubricating oil against less than 0.5% sulfur content fuel in a short period (one or two weeks). And in case of using high BN cylinder lubricating oil, it is necessary to care the sludge accumulation (generating from additives in cylinder lubricating oil) on the piston top land and combustion surface, especially. If the excessive sludge accumulation was found, it is necessary to reconsider the feed rate and BN level.
- It is not recommended to adjust the BN level by mixing cylinder lubricating oil of different BN because performance of cylinder lubricating oil may decrease. If cylinder lubricating oil mixed that of different BN oil is forced to be used, contact the oil maker and confirm that stability after mixing, neutralization performance and lubrication performance etc. are no problem.
- Refer to service information USI-10004.

⚠ CAUTION

- If different brand cylinder lubricating oil needs to be used such as changing of the cylinder lubricating oil which is currently used for that of different brand, it is recommended to adjust the mixing ratio to 10% or less because the anti-seizing (extreme pressure property) of mixed cylinder lubricating oil could be lower than that of single brand cylinder lubricating oil.
- In case where the piston ring or cylinder liner are renewed, a somewhat excess amount of lubricating oil is to be supplied. (Refer to service information USI-10009.)
- Adjust the feed rate when running the engine at slow speed operation. (Refer to service information USI-10001.)

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

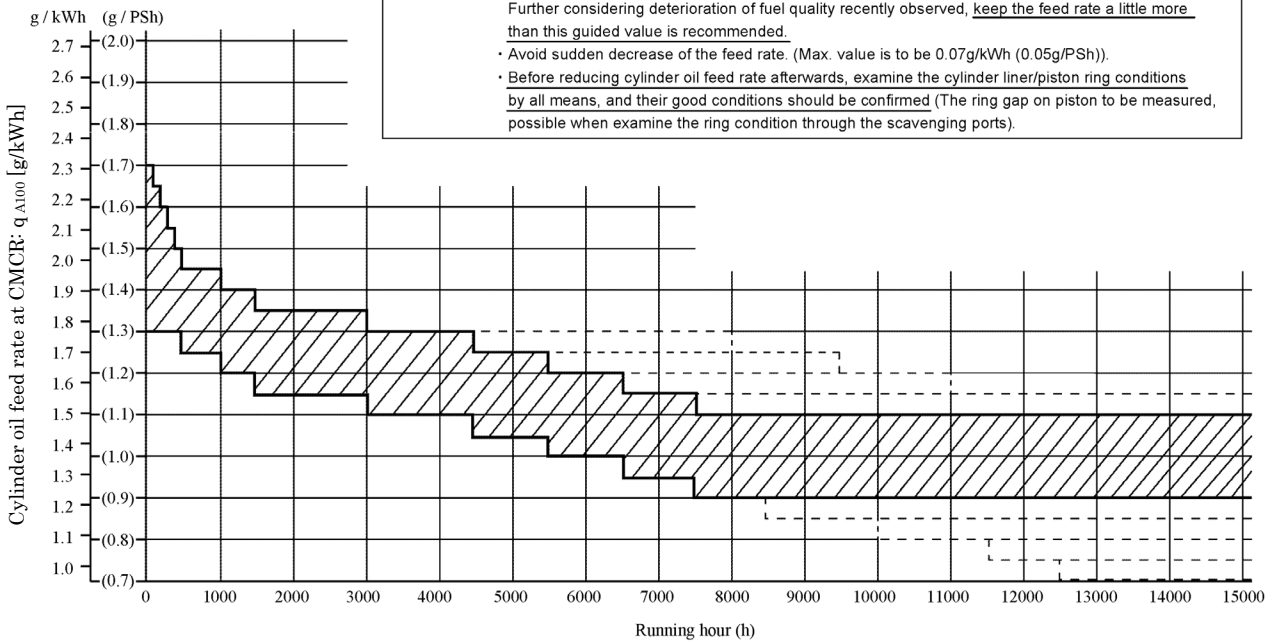
: Standard zone
: Feed rate shall be adjusted by taking account of kinds of cylinder lubricating oil and fuel oil and conditions of rings and liners.



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

⚠ CAUTION

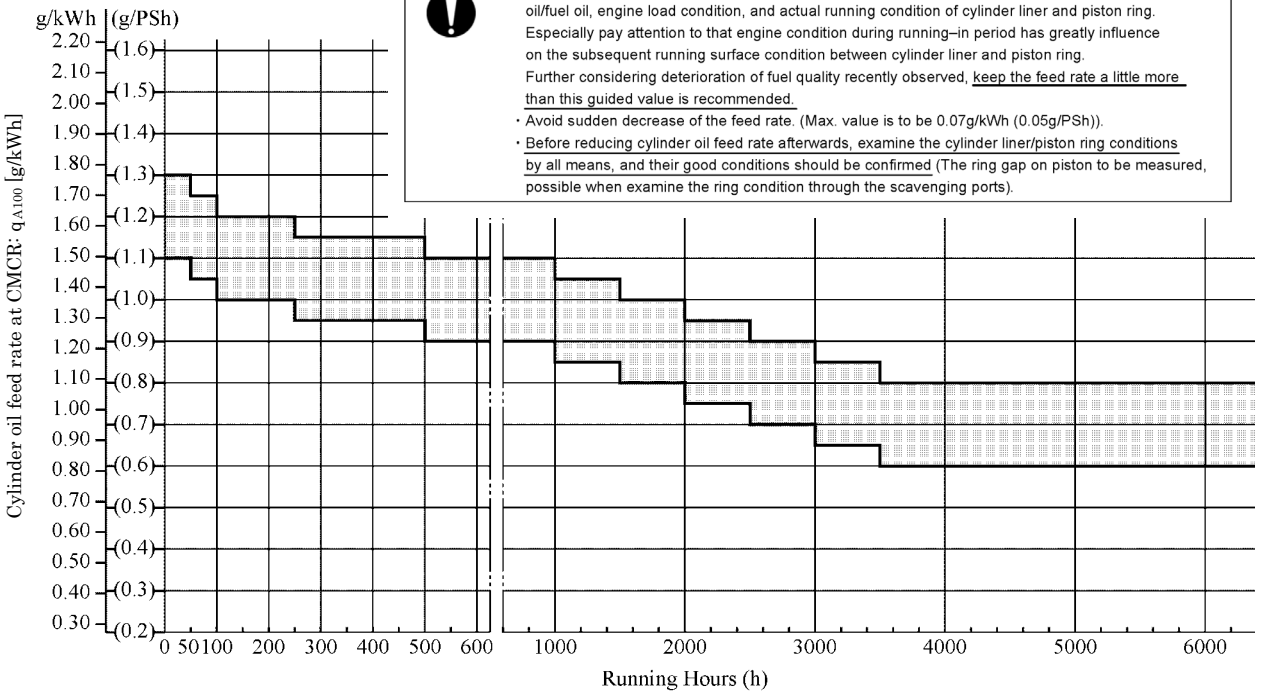
- Thereby, the practical cylinder oil feed rate should be adjusted depending on character of cylinder oil/fuel oil, engine load condition, and actual running condition of cylinder liner and piston ring. Especially pay attention to that engine condition during running–in period has greatly influence on 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 0.07g/kWh (0.05g/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).



UEC-LSII type guidance of cylinder oil feed rate（SIP、ECL-T system）

⚠ CAUTION

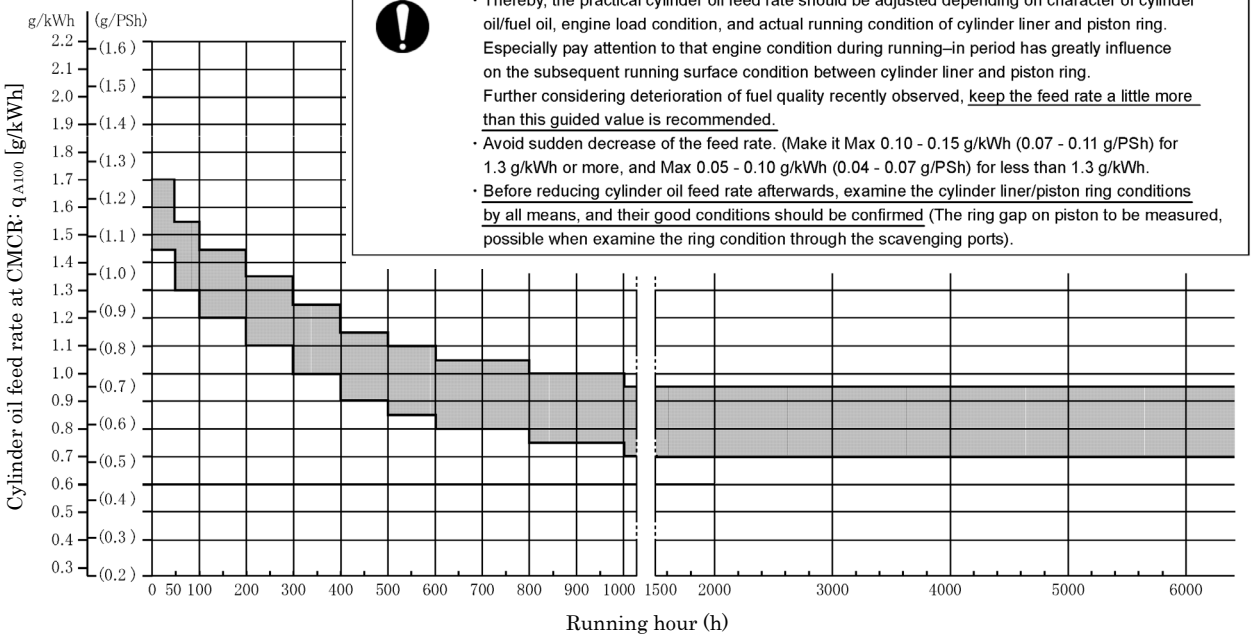
- Thereby, the practical cylinder oil feed rate should be adjusted depending on character of cylinder oil/fuel oil, engine load condition, and actual running condition of cylinder liner and piston ring. Especially pay attention to that engine condition during running–in period has greatly influence on 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 0.07g/kWh (0.05g/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).



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

⚠ CAUTION

- 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. (Make it Max 0.10 - 0.15 g/kWh (0.07 - 0.11 g/PSh) for 1.3 g/kWh or more, and Max 0.05 - 0.10 g/kWh (0.04 - 0.07 g/PSh) for less than 1.3 g/kWh.
- 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. UEC-LSE / LSH type engine

BN of cylinder lubricating oil corresponding to each type of fuel oil used (Informative)

Cylinder oil is sold the different BN which is corresponded to the sulfur content of used fuel oil. In the UE diesel engine, it is recommended to apply the suitable cylinder oil against the sulphur content of used fuel oil as following table.

Refer to Fig.A, B and C (053-02) of Guidance of the cylinder oil feed rate for reduction in cylinder oil feed rate.

Sulfur content of fuel oil	Recommended cylinder lubricating oil BN	Guidance of the cylinder oil feed rate
Sulfur content ≦ 0.1%	BN 15～25mgKOH/g	Fig.A
0.1% ≦ Sulfur content ≦ 0.5%	BN 40 (～70*) mgKOH/g	Fig.B
0.5% ≦ Sulfur content ≦ 1.5%	BN 40～70mgKOH/g	Fig.B
1.5% ≦ Sulfur content	BN 100mgKOH/g	Fig.C

(*) Can be applied when piston crown cleanness is required (in case combustion sludges, usually blacky, are noticed in piston ring grooves and piston lands) carefully monitoring the amount of white sludges on the piston top combustion surface and piston top land.

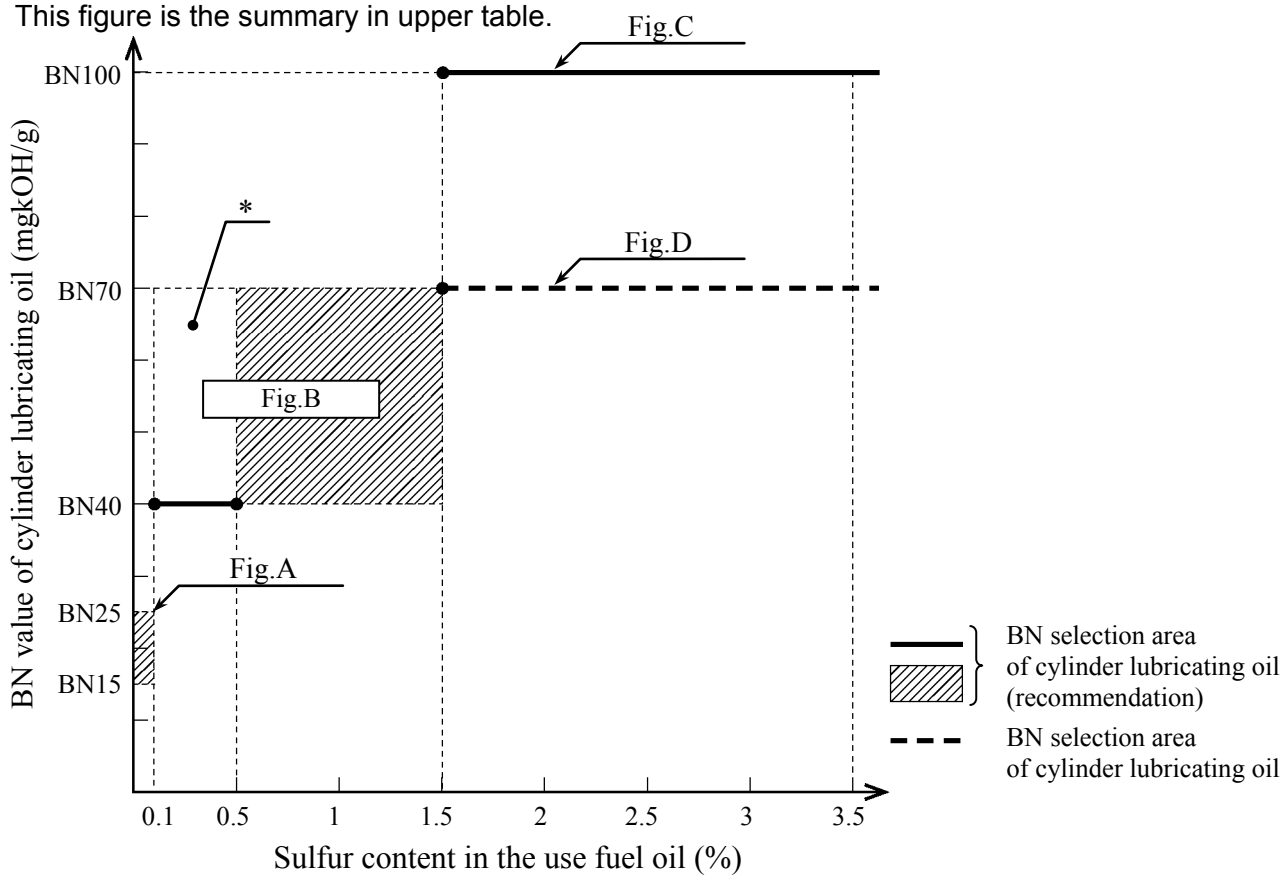
In the case of use the cylinder lubricating oil of BN70mgKOH/g and fuel oil contained more than 1.5% sulfur

When cylinder lubricating oil of BN70mgKOH/g is reluctantly used while the fuel oil contained more than 1.5% sulfur is used, adjust amount of cylinder lubricating oil according to Fig.D of Guidance of the cylinder oil feed rate.

Cylinder oil BN	Sulfur content of fuel oil	Guidance of the cylinder oil feed rate
BN 70	1.5% ≦Sulfur content	Fig.D

BN value selection figure of the cylinder lubricating oil :

This figure is the summary in upper table.



K

CAUTION

If different brand cylinder lubricating oil needs to be used such as changing of the cylinder lubricating oil which is currently used for that of different brand, it is recommended to adjust the mixing ratio to 10% or less because the anti-seizing (extreme pressure property) of mixed cylinder lubricating oil could be lower than that of single brand cylinder lubricating oil.

- Cylinder oil drain analysis is an effective way to judge the wear condition of piston rings and cylinder liner. It is recommended that cylinder oil drain analysis is carried out periodically. Refer to 3 item “Analysis of drain from piston under side” about the cylinder oil drain analysis.
- It is possible to operate with more than BN25 cylinder lubricating oil against less than 0.1% sulfur content fuel or more than BN40 cylinder lubricating oil against less than 0.5% sulfur content fuel in a short period (one or two weeks). And in case of using high BN cylinder lubricating oil, it is necessary to care the sludge accumulation (generating from additives in cylinder lubricating oil) on the piston top land and combustion surface, especially. If the excessive sludge accumulation was found, it is necessary to reconsider the feed rate and BN level.
- It is not recommended to adjust the BN level by mixing cylinder lubricating oil of different BN because performance of cylinder lubricating oil may decrease. If cylinder lubricating oil mixed that of different BN oil is forced to be used, contact the oil maker and confirm that stability after mixing, neutralization performance and lubrication performance etc. are no problem.
- Refer to service information USI-10004.

⚠ CAUTION

- The guidance of the feed rate on each BN is only a target. In case feed rate is to be reduced further below than that in the following table, it’s acceptable only if the cylinder liner and piston ring conditions are good and abnormalities like low temperature corrosion or scuffing are not observed.(The ring gap on piston to be measured, possible when examine the ring condition through the scavenging ports.)
- Avoid sudden decrease of the feed rate at a time.

[Reduction amount of the feed rate]

1.3g/kWh or more : Max 0.10～0.15g/kWh

Less than 1.3g/kWh : Max 0.05～0.10g/kWh

- In case where the piston ring or cylinder liner are renewed, a somewhat excess amount of lubricating oil is to be supplied.(Refer to service information USI-10009)
- Adjust the feed rate when running the engine at slow speed operation. (Refer to service information USI-10001)

UEC-LSE/LSH type guidance of cylinder oil feed rate（A-ECL system）

It is recommended to reduce the feed rate and adjust the feed rate to the range of finally according to the operating condition and the sliding surface condition of cylinder liners and piston rings based of the guidance of the cylinder oil feed rate. (Fig. A-1～D-1)

Sulfur content ≦0.1%

BN15～25

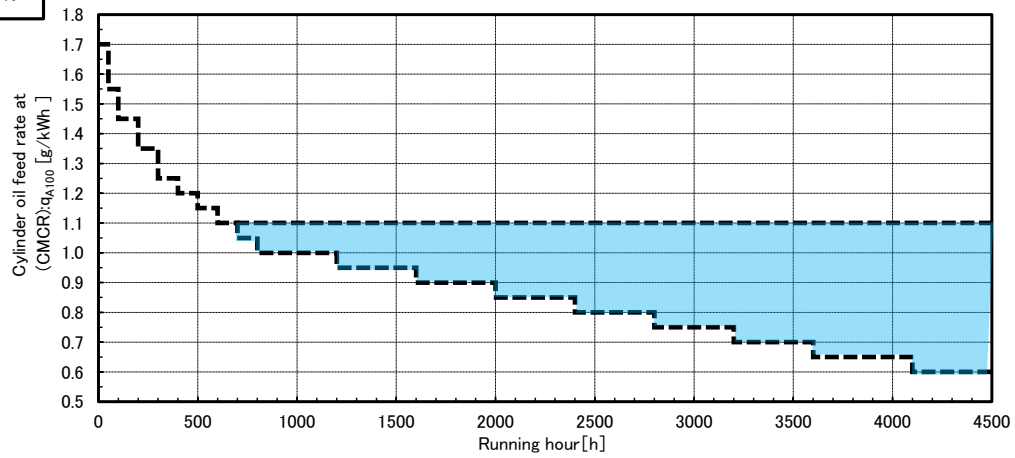


Fig.A-1 : “A-ECL system” guidance of cylinder oil feed rate(BN15～25)

0.1≦ Sulfur content ≦1.5%

BN40～70

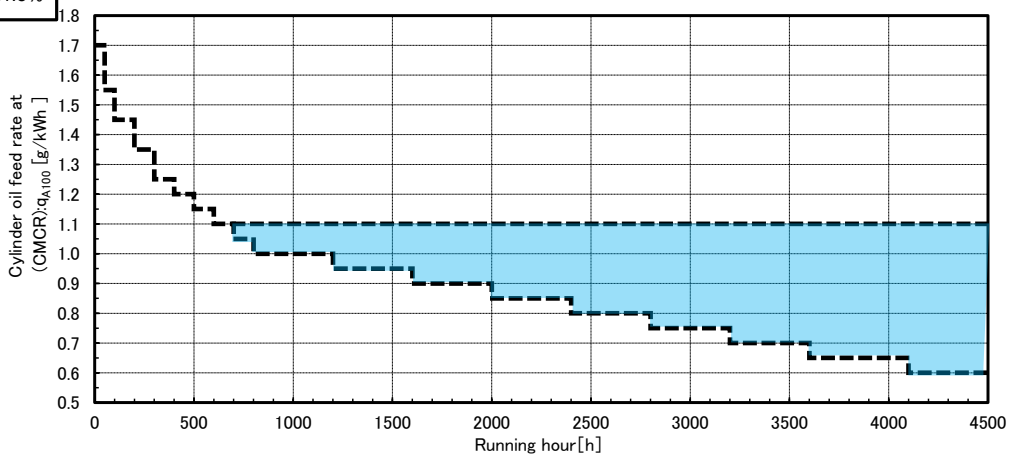


Fig.B-1 : “A-ECL system” guidance of cylinder oil feed rate (BN40～70)

1.5≦Sulfur content

BN100

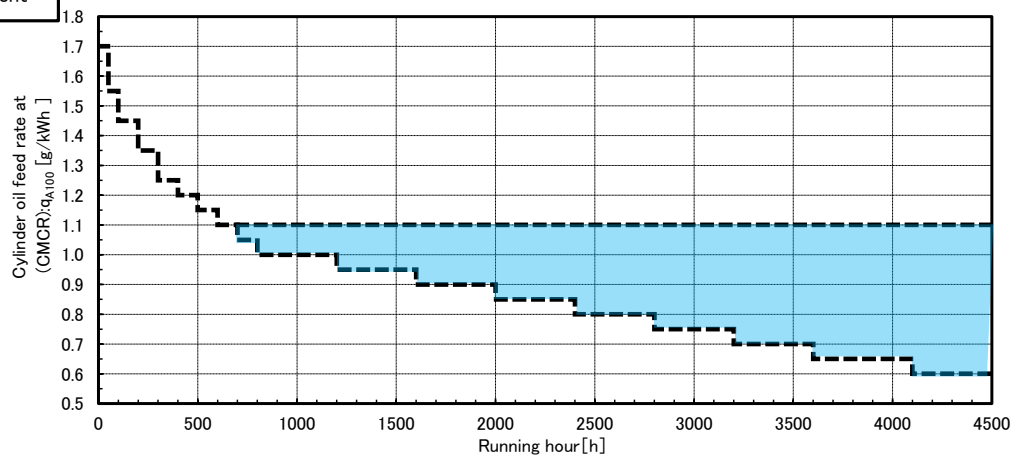


Fig.C-1 : “A-ECL system” guidance of cylinder oil feed rate (BN100)

UEC-LSE/LSH type guidance of cylinder oil feed rate（A-ECL system）

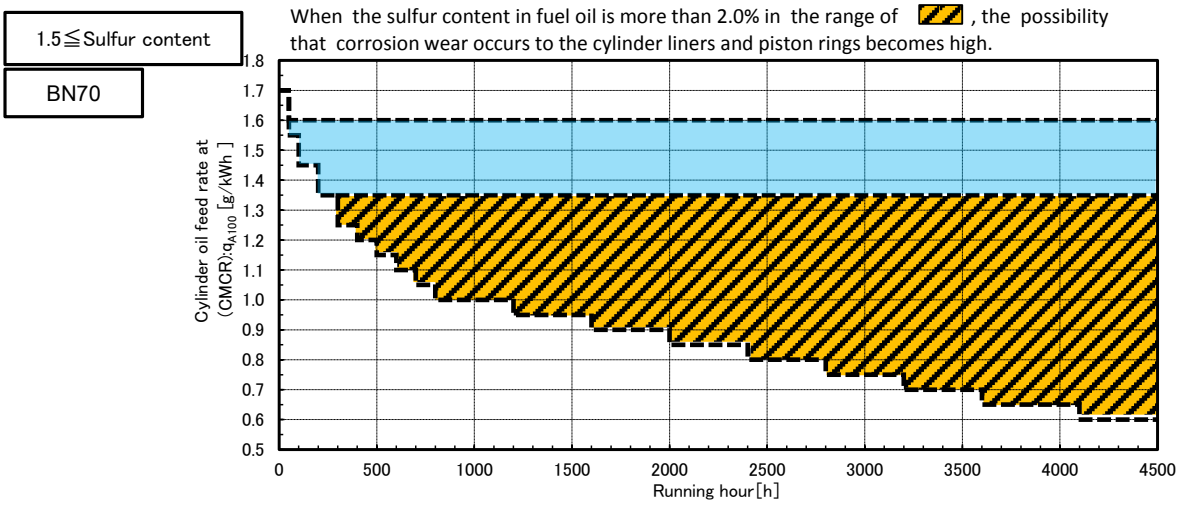


Fig.D-1 : “A-ECL system” guidance of cylinder oil feed rate (BN70)

⚠ CAUTION

- In the case of operation at the engine of of Fig. D-1, it is recommended to carry out the cylinder oil drain analysis (total iron and residual BN). When the using fuel oil, the brand of cylinder lubricating oil or the feed rate are changed, it is recommended to carry out the cylinder oil drain analysis as soon as possible.(within 100 hours) About the analysis of drain from piston underside, please refer to section 3.
  And it is recommended to investigate wear rate of the piston rings and cylinder liners by possible timing in order to understand the wear amount of the piston rings and cylinder liners.

UEC-LSE/LSH type guidance of cylinder oil feed rate（Conventional system）

It is recommended to reduce the feed rate and adjust the feed rate to the range of finally according to the operating condition and the sliding surface condition of cylinder liners and piston rings based of the guidance of the cylinder oil feed rate. (Fig. A-2～D-2)

Sulfur content ≦0.1%

BN15～25

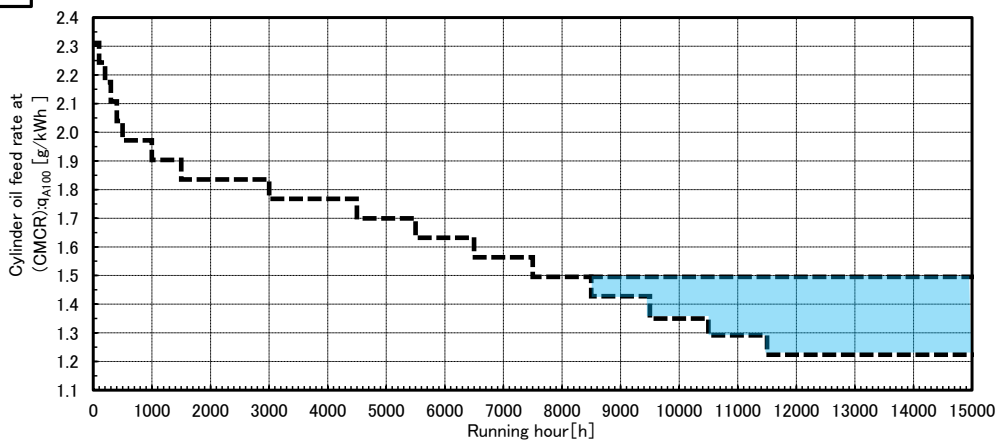


Fig.A-2 : “Conventional system” guidance of cylinder oil feed rate(BN15～25)

0.1≦ Sulfur content ≦1.5%

BN40～70

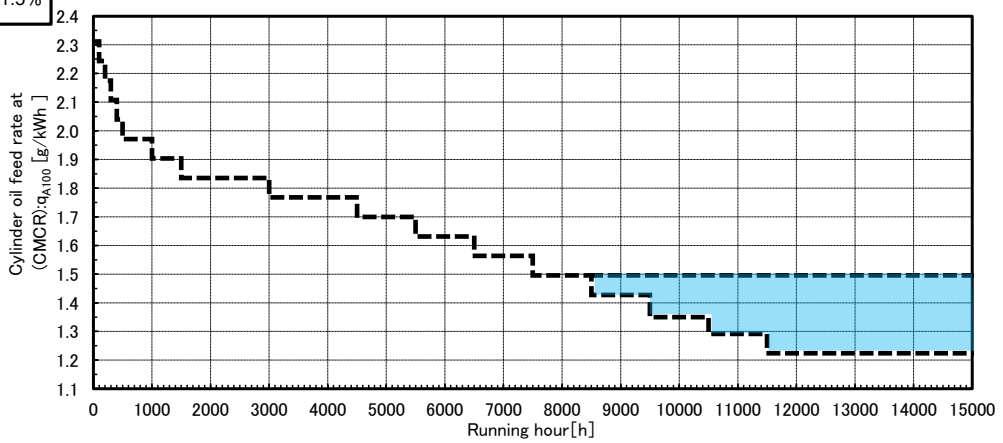


Fig.B-2 : “Conventional system” guidance of cylinder oil feed rate (BN40～70)

1.5≦Sulfur content

BN100

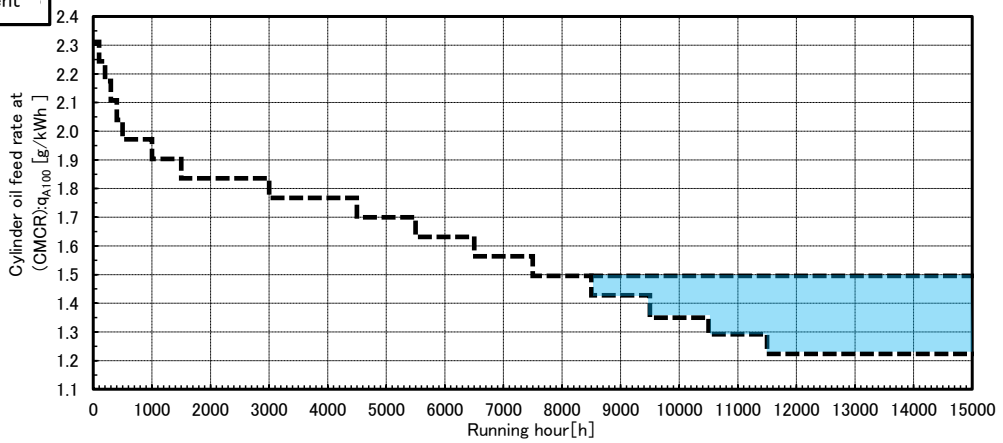


Fig.C-2 : “Conventional system” guidance of cylinder oil feed rate (BN100)

UEC-LSE/LSH type guidance of cylinder oil feed rate（Conventional system）

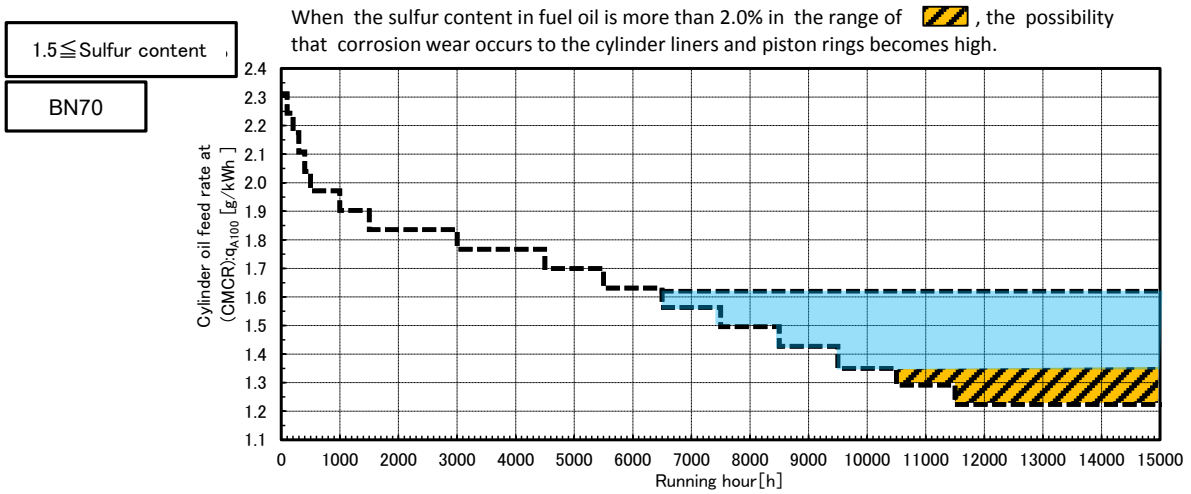


Fig.D-2 : “Conventional system” guidance of cylinder oil feed rate (BN70)

⚠ CAUTION

・In the case of operation at the engine of of Fig. D-2, it is recommended to carry out the cylinder oil drain analysis (total iron and residual BN). When the using fuel oil, the brand of cylinder lubricating oil or the cylinder oil feed rate are changed, it is recommended to carry out the cylinder oil drain analysis as soon as possible.(within 100 hours) About the analysis of drain from piston underside, please refer to section 3.

And it is recommended to investigate wear rate of the piston rings and cylinder liners by possible timing in order to understand the wear amount of the piston rings and cylinder liners.

UEC-LSE/LSH type guidance of cylinder oil feed rate（SIP, ECL-T system）

It is recommended to reduce the feed rate and adjust the feed rate to the range of finally according to the operating condition and the sliding surface condition of cylinder liners and piston rings based of the guidance of the cylinder oil feed rate. (Fig. A-3～D-3)

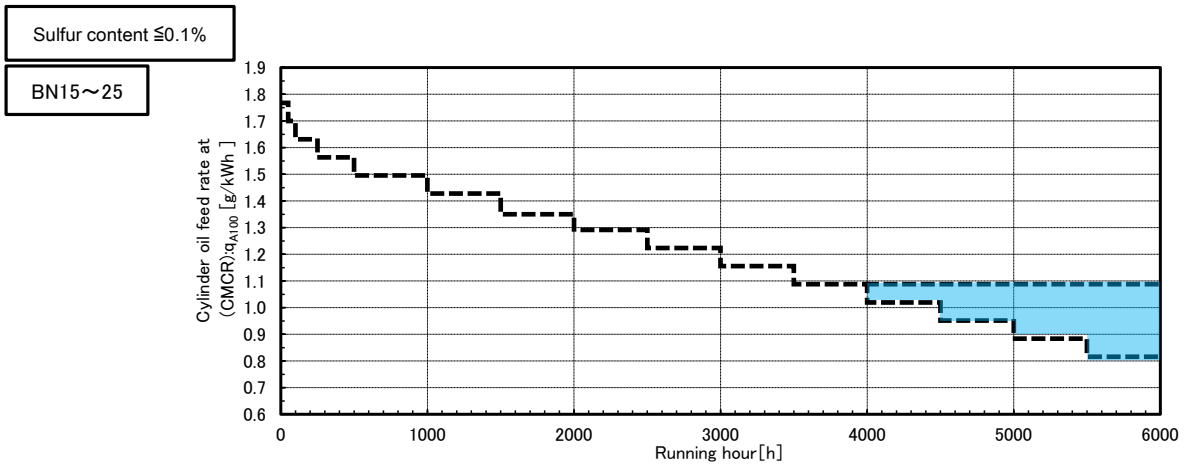


Fig.A-3 : “SIP, ECL-T system” guidance of cylinder oil feed rate(BN15～25)

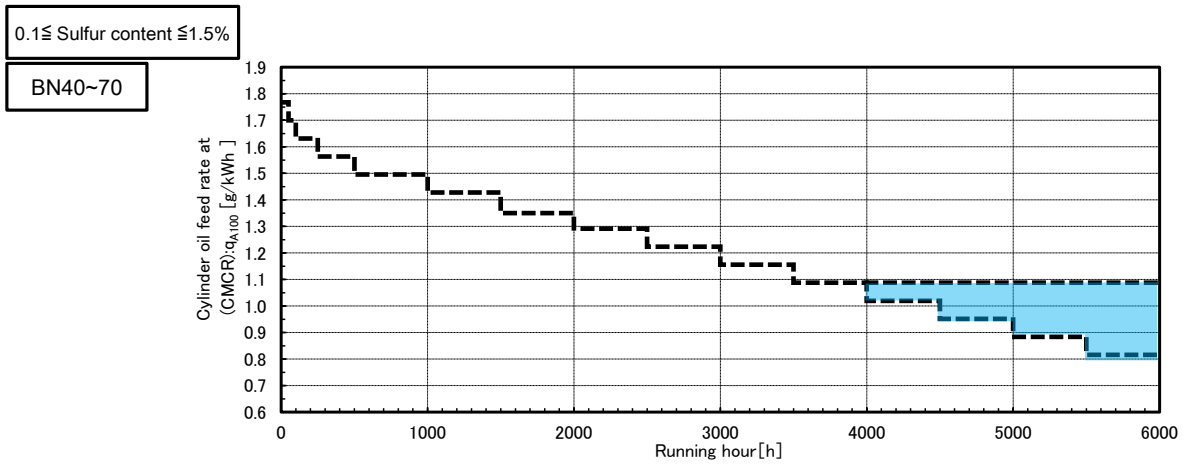


Fig.B-3 : “SIP, ECL-T system” guidance of cylinder oil feed rate (BN40～70)

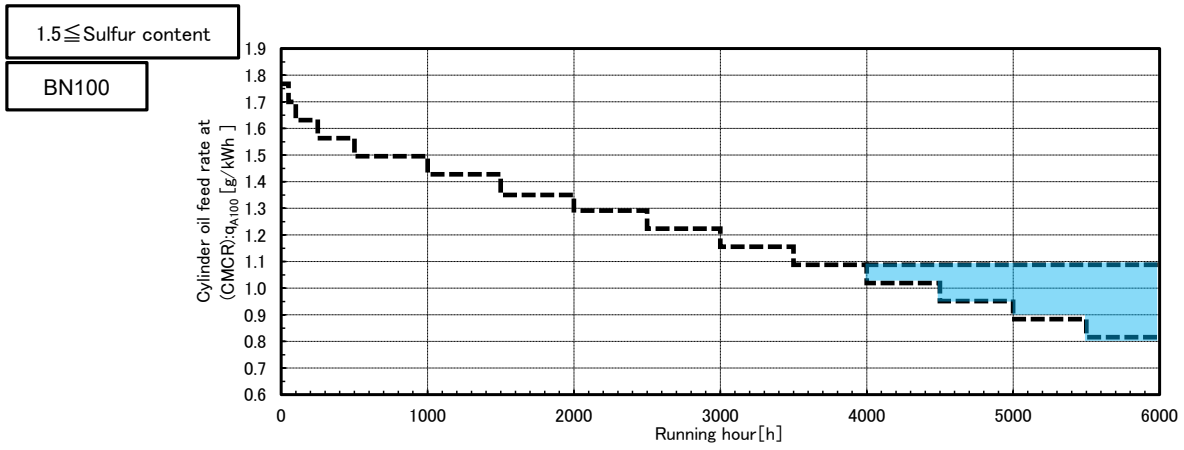


Fig.C-3 : “SIP, ECL-T system” guidance of cylinder oil feed rate (BN100)

UEC-LSE/LSH type guidance of cylinder oil feed rate（SIP, ECL-T system）

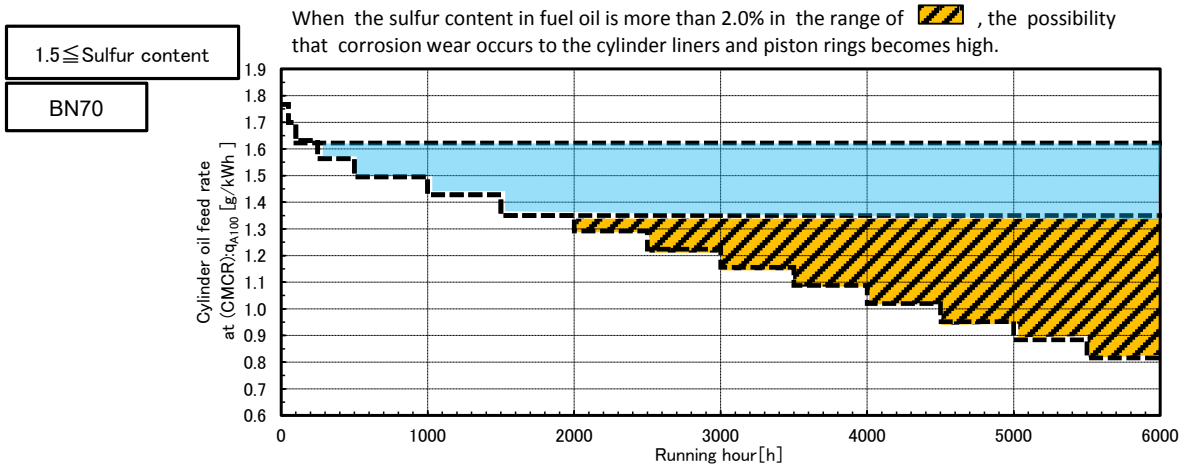


Fig.D-3 : “SIP, ECL-T system” guidance of cylinder oil feed rate (BN70)

⚠ CAUTION

・In the case of operation at the engine of of Fig. D-3, it is recommended to carry out the cylinder oil drain analysis (total iron and residual BN). When the using fuel oil, the brand of cylinder lubricating oil or the feed rate are changed, it is recommended to carry out the cylinder oil drain analysis as soon as possible.(within 100 hours) About the analysis of drain from piston underside, please refer to section 3.

And it is recommended to investigate wear rate of the piston rings and cylinder liners by possible timing in order to understand the wear amount of the piston rings and cylinder liners.

3. Analysis of drain from piston under side

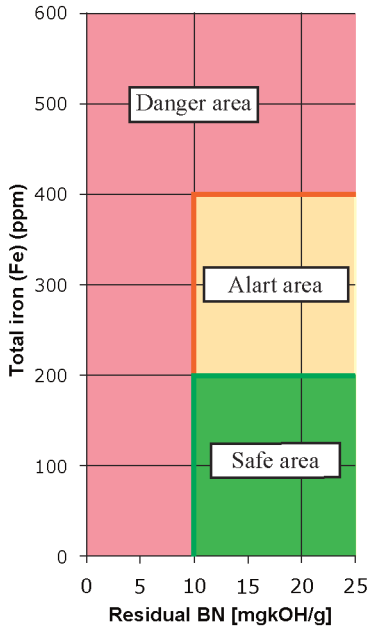
From the analysis of drain from piston under side, the condition of cylinder liner and piston ring can be estimated to some extent.

Drain analysis is judged with below chart dealing iron powder caused by cylinder liner and piston ring wear (Total iron (Fe) [ppm]), and alkalinity from cylinder oil does not be used to neutralization (residual BN [mgKOH/g])

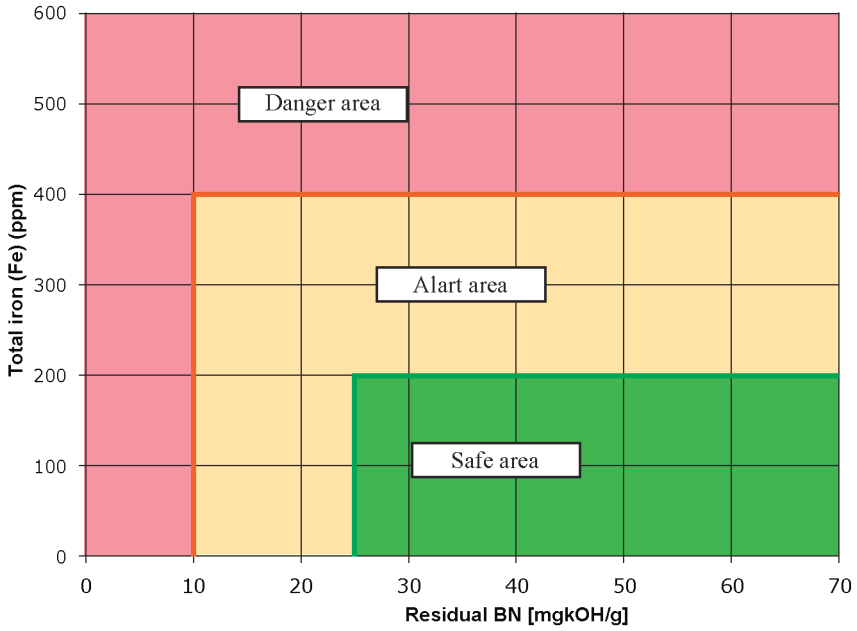
- In case that the mixing of system oil is rich, the measurement data likely to be lower than actual data, therefore the measured data of particular cylinder is lower than others, please check continuously because it caused by wear of grand packing ring, spring fatigue, uneven wear of piston rod.

- When the measured data is on danger zone, if the Fe has tendency of high, it indicates that caused by abrasive wear, or in case BN is lower, it indicates that caused by cold corrosion.
  In case that the result of drain analysis is not good area, please check piston and liner running condition, and liner wear amount as soon as possible.

- If your engine does not have sampling line of piston under side and the drain analysis is planned to done, please contact us.



For cylinder oils with BN15～25



For cylinder oils with BN40 or higher

Guideline of cylinder oil drain analysis evaluation