MITSUI E&S
Mitsui E&S Machinery Co., Ltd.

SERVICE NOTE

for MITSUI－MAN B&W engines,		No. 183	
Guidance for Cylinder oil consumption, in case if Alpha ACC is not applied		APPROVED	N. Osako
		CHECKED	
		PREPARED	M. Kotake
ENGINE TYPE	MC/MC-C Mark 7 and previous types. (Including mark 8 equipped with mechanical lubricator)	DATE	15th Feb. 2013

Rev.4: Engine type is changed, cylinder oil list is removed (2020.07.22)

Based on the recent service experience, we have revised the guidance for cylinder oil consumption and running–in schedule. This service note revises the reduction steps up to BASIC SETTING during the running–in period. The reduction steps before and after revising are shown in Table 1.

We would recommend to adjust the cylinder oil consumption in accordance with this service note. Beside, we would remove old Service Note No.163.

The guidance described in this service note is applied for engine equipped with the mechanical lubricator and/or Alpha ACC (Alpha Adaptive Cylinder oil Control) lubrication principle is not applied on MC/MC-C engines. (※1).

If you select Alpha ACC lubrication principle on MC/MC-C engines and ME/ME-C/ME-B engines, see Service Note No. 188 (for Mark 7 and previous) or Service Note No.189 (for S60ME Mark7.1 and all mark8 and newer engines)

Adaptive Cylinder oil Control (Alpha ACC) (※1):
The cylinder oil control principle that cylinder oil consumption can be decided by Sulphur content value (S %) and stated value (Feed Rate Factor). ME/ME-C engine decrease the cylinder oil dosage at part load by LOAD dependent regulation mode.（MC/-C engine with not Alpha ACC decrease the cylinder oil dosage at part load by MEP dependent regulation mode.）
It is so-called "Adaptive Cylinder oil Control (Alpha ACC)".

PRIORITY							
IMMEDIATELY	☐	AT FIRST OPPORTUNITY	■	WHEN CONVENIENT	☐	OTHERS	☐

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1. Cylinder oil consumption during running–in period（until 500 service hours）

The BASIC SETTING and Minimum Feed Rate（Min. Feed Rate）are shown in Table 2-1, Table 2-2 and Table 2-3. The guidance of the cylinder oil consumption and running–in schedule are shown in Fig.1, Fig.2, Fig.3 and to Fig.4. As the figure of the guidance is only guidance, the actual reduction schedule and cylinder oil feed rate should be adjusted based on actual cylinder condition.

ⅰ） Setting of cylinder oil consumption

Until 500 service hours is running-in period. We would recommend to adjust cylinder oil feed rate according to Guidance schedule of cylinder oil consumption adjustment as shown in Fig.1, Fig.2, Fig.3 and Fig.4.

Note：

- If abnormal cylinder condition such as cylinder liner scuffing, micro seizure of piston ring and so on is found, the cylinder oil feed rate must not be reduced and be increased to + 50% of previous cylinder oil feed rate and maximum 1.7 g/kWh on to the corresponding cylinder, until the cause of the problem has been eliminated and scavenging port inspections proved that a safe condition ha been re-established.

- In case of Mechanical lubricator, when staring or maneuvering in port, we would recommend to increase cylinder oil consumption manually. In case of LCD (Load Change Dependent) lubricators are installed, the cylinder oil feed rate is increased automatically, so that Operation is not required.

ⅱ）Choice of cylinder lubrication oil

Cylinder oil should be of the SAE50 viscosity grade.

Generally, cylinder oil with BN15~40 is used for low sulphur fuel (Sulphur ≤1.5wt %), and cylinder oil with BN70~100 is used for high sulphur fuel (Sulphur =1.5~3.5 wt %).

Regarding the choice of cylinder oil, please refer to Service Note No.194.

ⅲ）Running–in after maintenance

After maintenance for new piston ring or new cylinder liner, cylinder oil feed rate during running –in should be follow as shown in Fig.1, Fig.2, Fig.3 and Fig.4. The load on during breaking –in period should be increased carefully as shown in Fig. 5.

However, when assembling new piston rings in already run-in cylinder liner, if the special piston ring package for running-in (Alu-coat) is used, the running-in period can be shortened.

In case if the Alu-coat ring package is used in already run-in liner, the Basic Feed Rate shall be increased to 0.9g/kWh and keep at 0.9g/kWh for 24 hours only. If the Basic Feed Rate which is calculated by "ACC factor x S%" is higher than 0.9g/kWh, no extra lubrication is needed.

For any inquiries and questions regarding the Alu-coat piston ring, please refer to Techno News No.083.

2. Cylinder oil consumption after running–in period（after 500hours）

After running–in period, we would recommend to adjust properly in avoid to prevent the excessive cylinder oil dosage.

ⅰ） Cylinder oil consumption setting

Cylinder oil feed rate can be adjusted in steps at intervals of 600 hours as shown in Fig.1, Fig.2, Fig.3 and Fig.4.

Note:

- Basic Feed Rate Factor can be reduce gradually as shown in Fig.1, Fig.2, Fig.3 and Fig.4. However, before and after adjusting the Basic Feed Rate, the scavenge port inspection should be carried out and the cylinder condition should be proved satisfactory.

- Minimum cylinder oil feed rate (Min. Feed Rate (g/kWh)) is 0.8 g/kWh. The lower than the 0.8 g/kWh must not be set.

- If abnormal cylinder condition is found, the cylinder oil feed rate should be increased to + 50% of previous cylinder oil feed rate and maximum 1.7 g/kWh on to the corresponding cylinder.

ⅱ）Cylinder oil feed rate reduction

When cylinder oil feed rate become near to Min. Feed Rate, there is the possibility that the wear of cylinder parts such piston rings and cylinder liners might increase largely. If you have the plan to operate with the level, we would recommend you to carry out periodical scavenging port inspection, at least once a month, to keep monitoring the cylinder condition.

Regarding the guidelines for cylinder oil lubrication when operating with ≤ 0.5% sulphur fuel, please refer to Service Note No.202.

For questions regarding feed rate adjustments, please contact our Technoservice Division at tech_de@mes.co.jp. (For contact address, please refer to Service Note No.111)

iii） Cylinder oil consumption at part load

Mechanical lubricator:

The cylinder oil dosage at part load is decreased in proportion to the ratio between engine speed at part load and MCO. It is SPEED dependent regulation.
The cylinder oil feed rate (Feed rate [g/kWh]) at MCO with the SPEED dependent regulation is calculated by formula in shown in Material 1.

Alpha lubricator:

On most MC/-C engines, the cylinder oil dosage at part load is decreased in proportion to the ratio between mean effective pressure at part load and MCO. It is MEP dependent regulation.

The cylinder oil feed rate (Feed rate [g/kWh]) at MCO with the MEP dependent regulation is calculated by formula in shown in Material 1 and automatically taken over to SPEED dependent regulation of approximately 25% load on nominal propeller curve.

On some MC/-C engines, the cylinder oil dosage at part load is decreased in proportion to the ratio between engine output at part load and MCO. It is LOAD dependent regulation.

It is recommended to apply the Alpha ACC lubrication principle on MC/-C engines if LOAD dependent regulation is applied.

If you select Alpha ACC lubrication principle, see Service Note No. 188 or Service Note No.189.

For questions regarding regulation of cylinder oil consumption at part load on your vessel, please contact our Technoservice Division at tech_de@mes.co.jp. (For contact address, please refer to Service Note No.111)

Fig. 6 shows the ratio of cylinder oil consumption (%) at part load.

With regard to cylinder oil feed rate setting of Alpha lubricator, see related description of instruction book and Material 2. (With regard to setting of Mechanical lubricator, see related description of instruction book.)

Table 1: Cylinder oil consumption before and after revising

Lubricator/ Engine	Service hours	Before	After
Mechanical lubricator S-MC/ S-MC-C	0~	3.0 g/kW-h	2.7 g/kW-h
	15 ~	2.3 g/kW-h (Not revised)	
	250 ~	1.9 g/kW-h (Not revised)	
	BASIC SETTING	1.5 g/kW-h (Not revised)	
Mechanical lubricator L-MC/ L-MC-C K-MC/ K-MC-C	0~	2.4 g/kW-h	2.2 g/kW-h
	15 ~	1.8 g/kW-h (Not revised)	
	250 ~	1.5 g/kW-h (Not revised)	
	BASIC SETTING	1.2 g/kW-h (Not revised)	
Alpha lubricator system Cylinder bore 650mm and larger S-MC/ S-MC-C	0~	2.8 g/kW-h	1.7 g/kW-h
	15 ~	2.1 g/kW-h	1.6 g/kW-h
	250 ~	1.8 g/kW-h	1.5 g/kW-h
	BASIC SETTING	1.4 g/kW-h (Not revised)	
Alpha lubricator system L-MC/L-MC-C, K-MC/K-MC-C Cylinder bore 600mm and smaller S-MC/ S-MC-C	0~	2.2 g/kW-h	1.7 g/kW-h
	15 ~	1.8 g/kW-h	1.5 g/kW-h
	250 ~	1.4 g/kW-h	1.3 g/kW-h
	BASIC SETTING	1.1 g/kW-h (Not revised)	

Table2-1: Cylinder oil consumption with Mechanical lubricator

	S-MC / S-MC-C engines	L-MC / L-MC-C engines K-MC / K-MC-C engines
BASIC SETTING	1.50 g/kW-h (1.1 g/BHP-h)	1.2 g/kW-h (0.9 g/BHP-h)
Min. Feed Rate	0.95 g/kW-h (0.7 g/BHP-h)	0.8g/kW-h (0.6 g/BHP-h)

Table 2-2: Cylinder oil consumption with Alpha lubricator system（S-MC / S-MC-C engines）

	Cylinder bore 65cm and larger engines	Cylinder bore 65cm and smaller engines
BASIC SETTING	1.4 g/kW-h (1.0 g/BHP-h)	1.1 g/kW-h (0.8 g/BHP-h)
Min. Feed Rate	0.8 g/kW-h (0.6 g/BHP-h)	0.8 g/kW-h (0.6 g/BHP-h)

Table 2-3: Cylinder oil consumption with Alpha lubricator system （L-MC / L-MC-C, K-MC / K-MC-C engines）

	L-MC/L-MC-C, K-MC/K-MC-C engines
BASIC SETTING	1.1 g/kW-h (0.8 g/BHP-h)
Min. Feed Rate	0.8 g/kW-h (0.6 g/BHP-h)

Fig 1: Guidance schedule of cylinder oil consumption adjustment

for S-MC/ S-MC-C type engines with the mechanical type lubricator

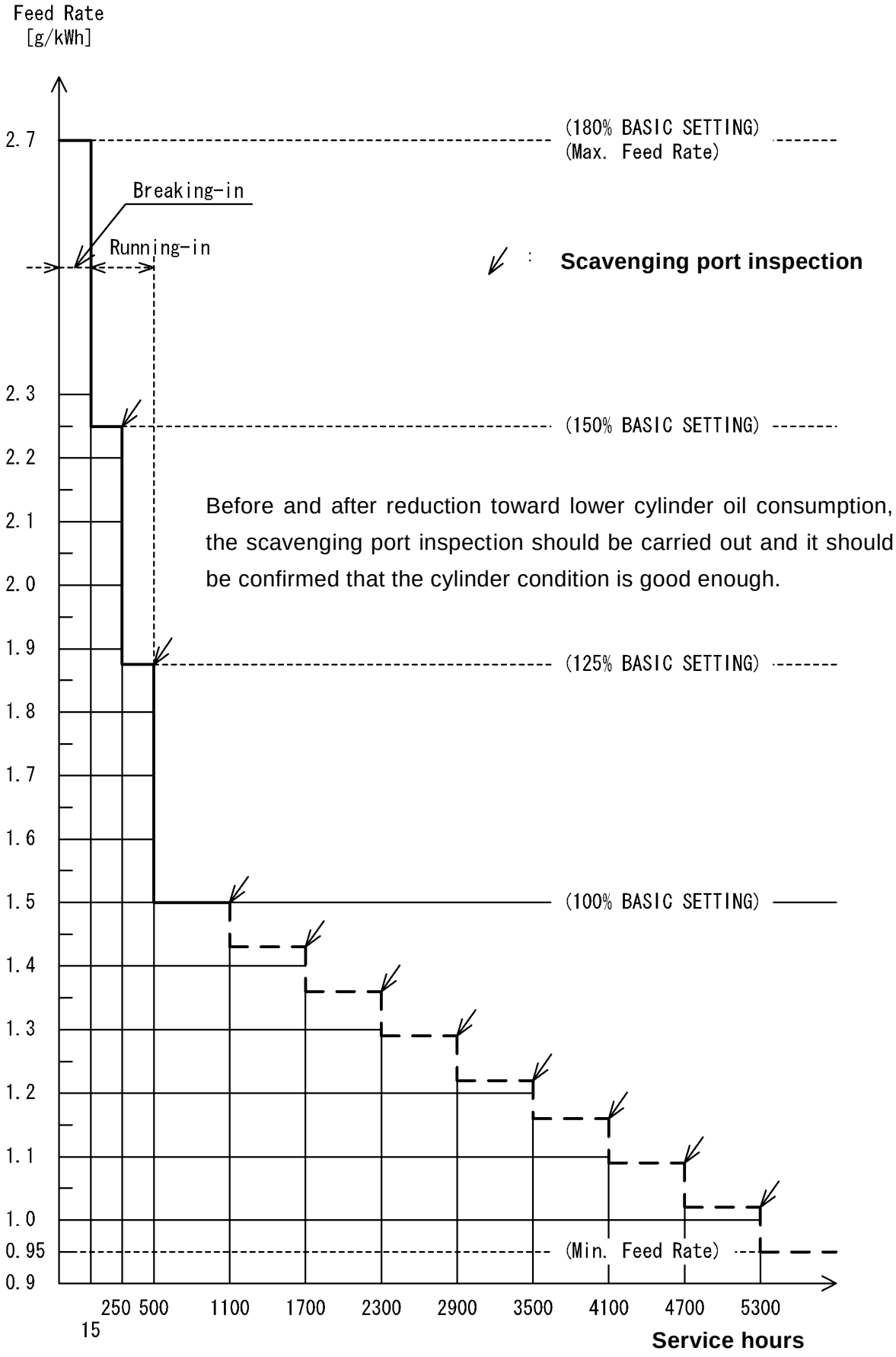
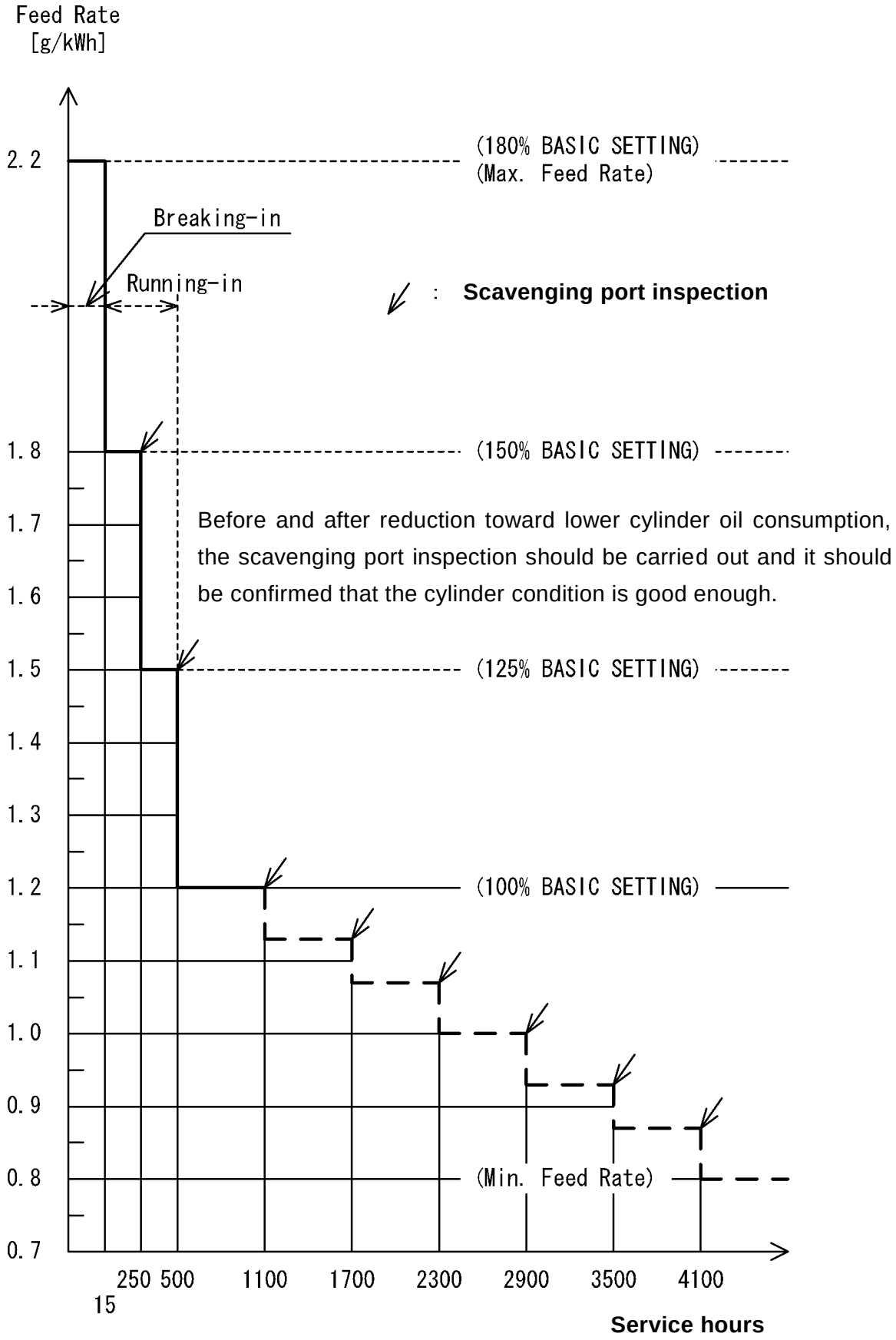


Fig 2: Guidance schedule of cylinder oil consumption adjustment

for L-MC/ L-MC-C, K-MC/ K-MC-C type engines with the mechanical type lubricator



Before and after reduction toward lower cylinder oil consumption, the scavenging port inspection should be carried out and it should be confirmed that the cylinder condition is good enough.

Fig 3: Guidance schedule of cylinder oil consumption adjustment
for S-MC/ S-MC-C type (cylinder bore 650mm and lager engines)
with the Alpha lubricator system

Before and after reduction toward lower cylinder oil consumption, the scavenging port inspection should be carried out and it should be confirmed that the cylinder condition is good enough.

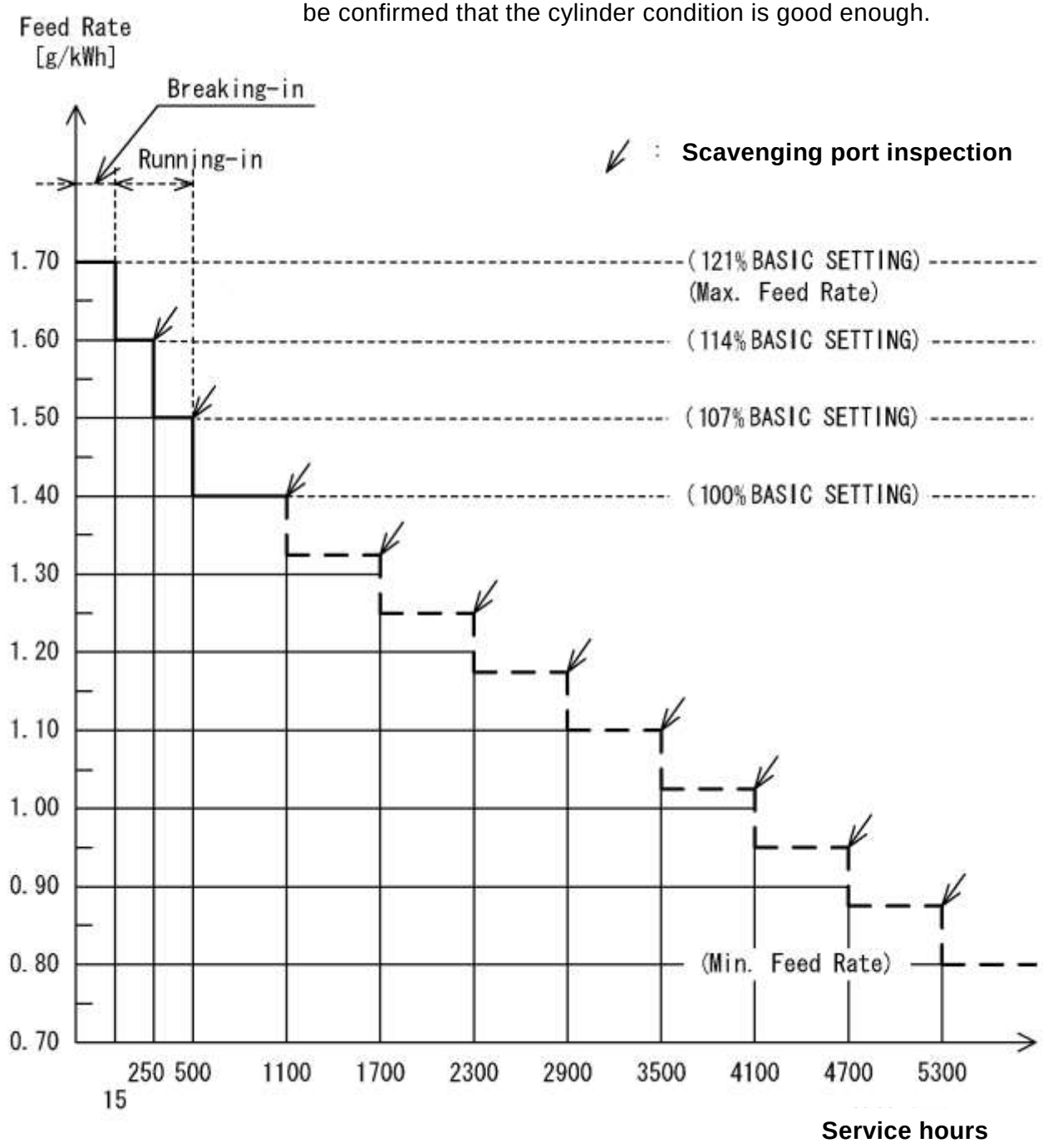
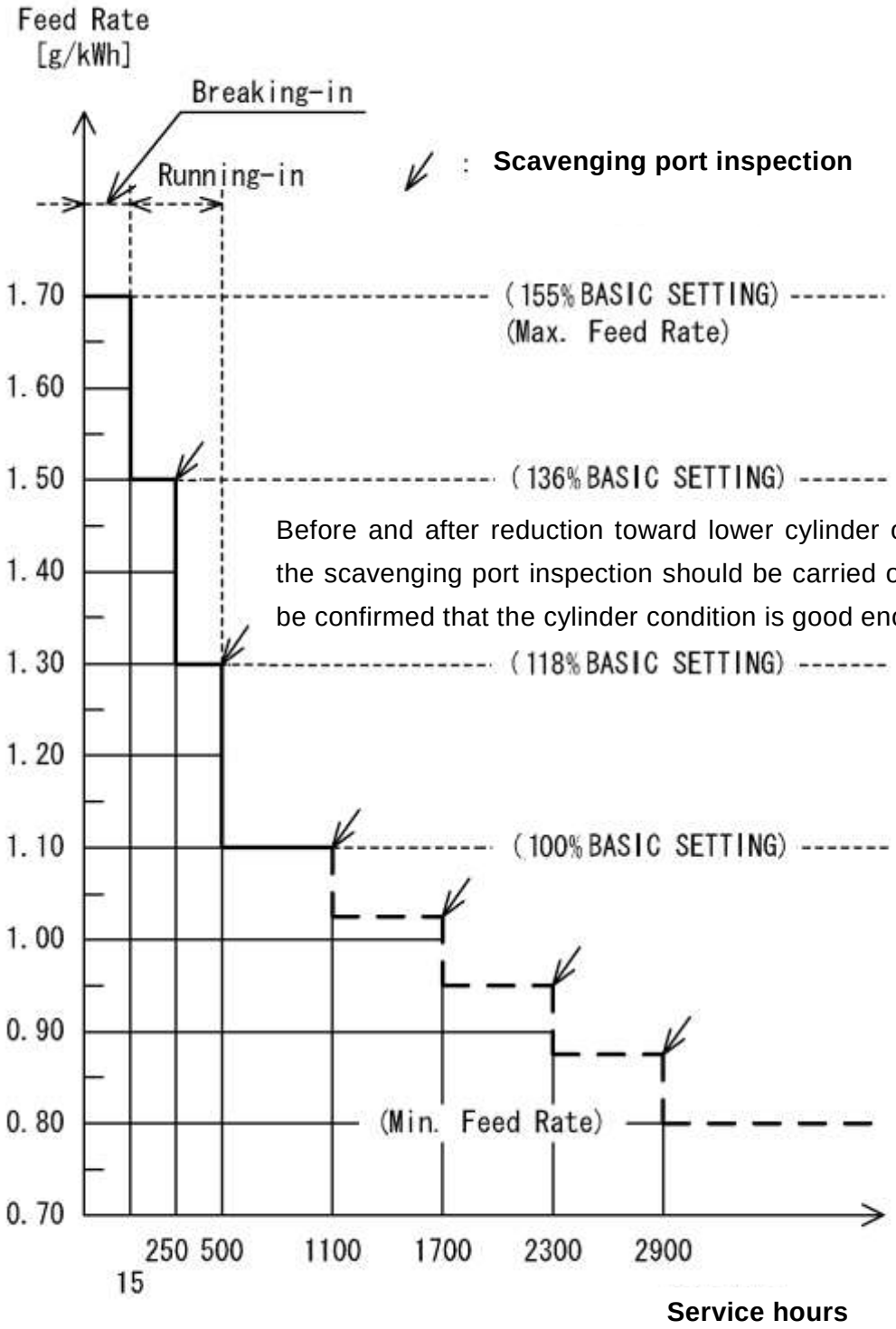


Fig 4: Guidance schedule of cylinder oil consumption adjustment
for L-MC/ L-MC-C, K-MC/ K-MC-C, and
for S-MC/ S-MC-C type (cylinder bore 600mm and smaller engines)
with the Alpha lubricator system



Before and after reduction toward lower cylinder oil consumption, the scavenging port inspection should be carried out and it should be confirmed that the cylinder condition is good enough.

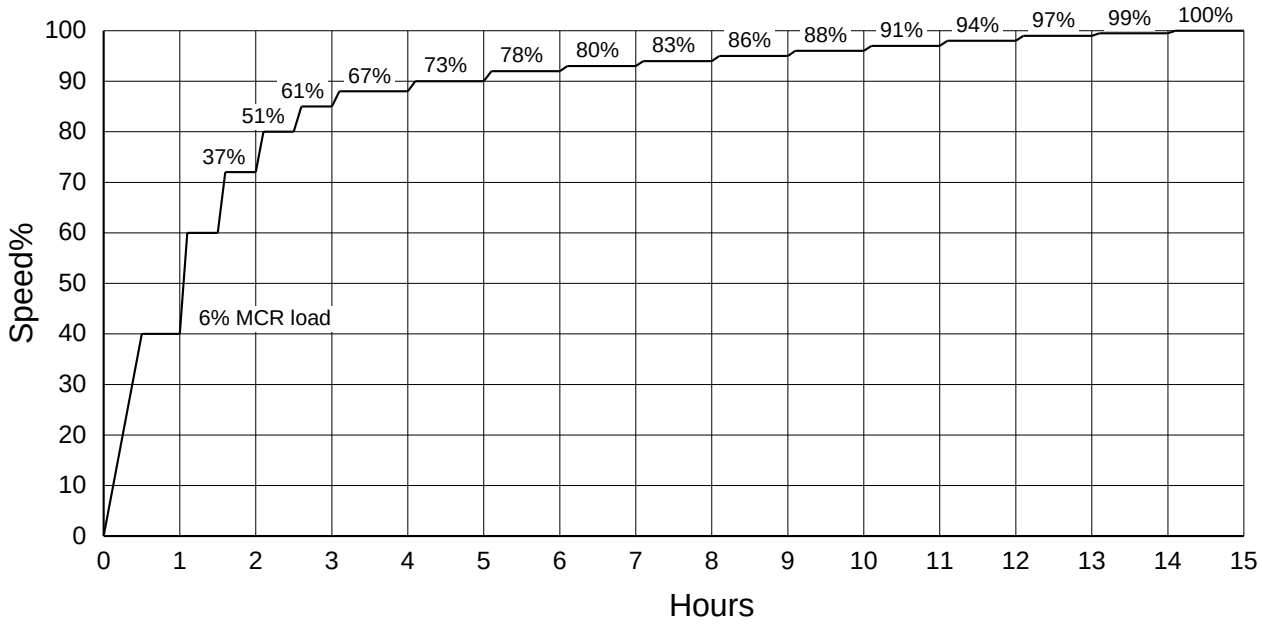


Fig 5: Breaking –in schedule recommendation

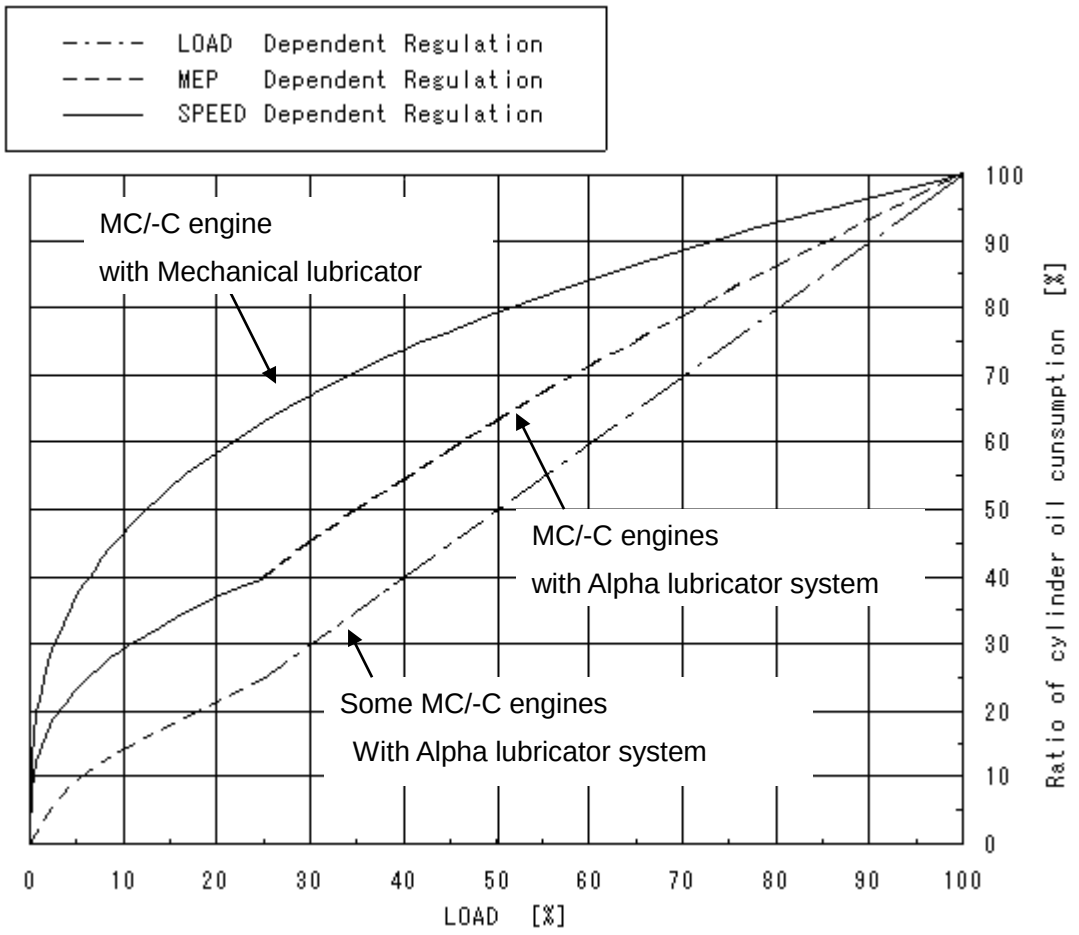


Fig 6: Cylinder oil consumption rate at partial load

Materila1：Formula of cylinder oil feed rate calculation

1) In case of SPEED dependent regulation:

(Cylinder oil feed rate（Feed rate [g/kWh]）

$= Q_{Measured} \times (SPEED_{MCO} / SPEED_{Measured}) \times (1 / OUTPUT_{MCO}) \times (\rho \times 1000 / 24)$

2) In case of MEP dependent regulation:

（Cylinder oil feed rate（Feed rate [g/kWh]）

$= Q_{Measured} \times (MEP_{MCO} / MEP_{Measured}) \times (1 / OUTPUT_{MCO}) \times (\rho \times 1000 / 24)$

$= Q_{Measured} \times (100 / MEP\ \%) \times (1 / OUTPUT_{MCO}) \times (\rho \times 1000 / 24)$

3) In case of LOAD dependent regulation:

（Cylinder oil feed rate（Feed rate [g/kWh]）

$= Q_{Measured} \times (LOAD_{MCO} / LOAD_{Measured}) \times (1 / OUTPUT_{MCO}) \times (\rho \times 1000 / 24)$

$= Q_{Measured} \times (100 / LOAD\ \%) \times (1 / OUTPUT_{MCO}) \times (\rho \times 1000 / 24)$

$Q_{Measured}$	:	Measured cylinder oil consumption per 24 hours [liter / day]
$SPEED_{Measured}$	:	Measured engine speed [rpm]
$SPEED_{MCO}$	:	Engine speed at specified MCO [rpm]
$OUTPUT_{MCO}$	:	Engine output at specified MCO [kW] = ($LOAD_{MCO}$)
ρ	:	Specified density [kg/liter] = 0.92 (guidance value)
$MEP_{Measured}$	:	Measured mean effective pressure [MPa]
MEP_{MCO}	:	Mean effective pressure at specified MCO [MPa]
MEP %	:	MEP ratio between part load and MCO [%]
		＝ displayed value in HMI panel [%]
$LOAD_{Measured}$	:	Measured engine output [kW]
$LOAD_{MCO}$	:	Engine output at specified MCO [kW]
LOAD %	:	LOAD ratio between part load and MCO [%]
		＝ displayed value in MOP panel [%]

Material 2: Operation method

1） MC/-C engines with Alpha lubricator system and its control unit (ALCU) is ALCU1 spec.

Breaking-in～Running-in period（until 500 service hours）:

Service hours [hours]	Bore 650mm and larger S-MC/-C engine F. ruinin [g/kWh]	L-MC/-C engine、K-MC/-C engine、Bore 600mm and smaller S-MC/ -C engine F. runin [g/kWh]
0 ～	1.70	1.70
15 ～	1.60	1.50
250 ～	1.50	1.30

Set the value in below Fields of HMI panel

“F.runi” : Set value of F.runin in the above table [g/kWh]

“S.FACt” : 0.34 [g/kWhS%]

“S-Pct” : 4.2 (independent of actual sulphur content) [wt%]

“F.Lo” : Min. Feed Rate = 0.80 [g/kWh]

“InJAL” : Set “nnep” （Choice to MEP dependent regulation）

After Running-in（After 500 service hours）:

	Bore 650mm and larger S-MC/-C engine F. ruinin [g/kWh]	L-MC/-C engine、K-MC/-C engine、Bore 600mm and smaller S-MC/ -C engine F. runin [g/kWh]
BASIC SETTING	1.40	1.10
Min. Feed Rate	0.80	0.80

Set the value in below Fields of HMI panel

“F.runi” : Set value of F.runin in the above table [g/kWh]

2） MC/-C engines with Alpha lubricator system and its control unit (ALCU) is ALCU0 spec.

Breaking-in～Running-in period（until 500 service hours）:

Service hours [hours]	Bore 650mm and larger S-MC/-C engine HMI setting [%]	L-MC/-C engine、K-MC/-C engine、Bore 600mm and smaller S-MC/ -C engine HMI setting [%]
0 ～	121	155
15 ～	114	136
250 ～	107	118

Set the value in below Fields of HMI panel

“FrAtEt” : Set value of HMI setting in the above table [%]

“F.Lo” : Set value of HMI setting in the Min. Feed Rate of the below table. [%]

（Min. Feed Rate = 0.80 [g/kWh] ）

“InJAL” : Set “nnep” （Choice to MEP dependent regulation）

After Running-in（After 500 service hours）:

	Bore 650mm and larger S-MC/-C engine HMI setting [%]	L-MC/-C engine、K-MC/-C engine、Bore 600mm and smaller S-MC/ -C engine HMI setting [%]
BASIC SETTING	100	100
Min. Feed Rate	57 (= 0.80 [g/kWh]）	73 (= 0.80 [g/kWh]）

Set the value in below Fields of HMI panel

“FrAtEt” : Set value of HMI setting in the above table [%]