

TECHNICAL CIRCULAR

DOC No.: HHI-TEC-0382-R1

Date : OCT 14, 2022

SUBJECT: EEC SYSTEM APPLICATION FOR MAN B&W ENGINES

TYPE: ALL HYUNDAI-MAN B&W 2-STROKE ENGINES

DISTRIBUTION

<input checked="" type="checkbox"/> Ship yard	<input checked="" type="checkbox"/> Ship owner
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Date	TEC No.	Design	Check	Approve	Change	R
190719	HHI-TI-0382	DKH	SSH	PJK	First issue.	0
221014	HHI-TEC-0382-R1	LSH	OSH	SSH	EEC application chart was updated.	1
						2
						3
						4
						5

TECHNICAL CIRCULAR

DOC No.: HHI-TEC-0382-R1

We have issued technical information HHI-TI-0331(2017-11-27) and HHI-TI-0382(2019-07-19) for the combination of EEC (Economizer Energy Control) with Tier III technology, SOx scrubber EPT. We issue this technical information again to inform updated latest EEC application.

[Updated EEC application]

- EEC for ME-GA is newly added.
- EEC for sequential TC tuning is newly added.
- TierII LL tuning 10.6 engine is newly added.
- EEC for EGRTC tuning can be available.

The various EEC system bypass rates in Tier II and Tier III mode are given in the attachment.

We hope the information will do you a valuable service.

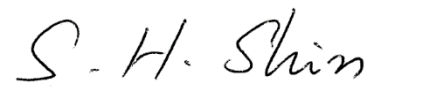
Encl. 1. Options for Economizer Energy Control (EEC)

Encl. 2. HHI-TI-0382 The Update of EEC system for IMO NOx Technology and,or SOx scrubber

Encl. 3. HHI-TI-0331 EEC system for Tier III Technology and/or SOx scrubber

[The end]

Yours sincerely,



S. H. SHIN / Senior Engineer

Head of Engine System Technical Sales Dep't

Options for Economizer Energy Control (EEC)

Conventional efficiency turbocharger matching:

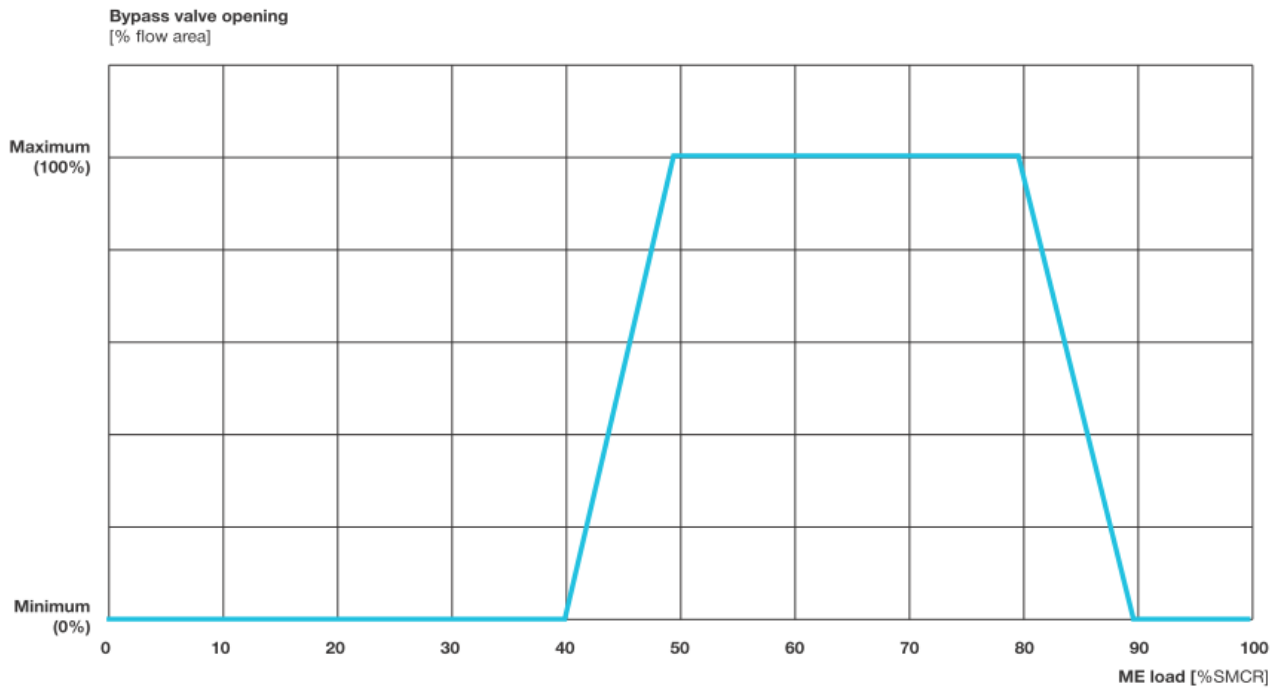
- No option for EEC system

High efficiency turbocharger matching:

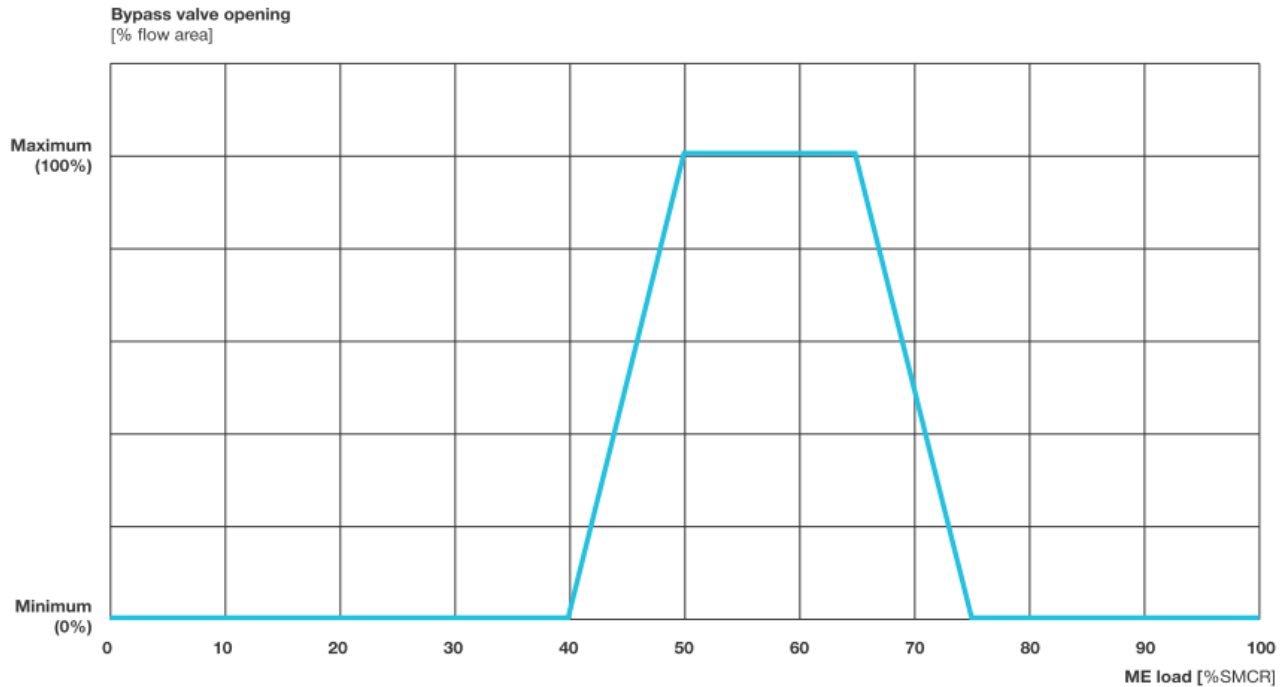
Engine and TierIII technology	Mode	Installed EGB rate	Allowable EEC bypass rate	Allowable EGB opening for EEC
Tier II (sequential TC-tuning)	Tier II	3.0%	3.0%	100%
Tier II (10.6 LL tuning)	Tier II	6.0%	3.0%	50%
Tier II (LL/PL EGB tuning)	Tier II	3.0%	3.0%	100%
EGRBP	Tier II	9.0%	0.0%	0%
EGRBP	Tier III	9.0%	0.0%	0%
EGRTC	Tier II	3.0%	3.0%	100%
EGRTC	Tier II (TCCO)	3.0%	0.0%	0%
EGRTC	Tier III	3.0%	0.0%	0%
LPSCR	Tier II	6.0%	3.0%	50%
LPSCR	Tier III	6.0%	0.0%	0%
HPSCR	Tier II	3.0%	3.0%	100%
HPSCR	Tier III	3.0%	3.0%	100%
EPT tuning	Tier II	3.0%	3.0%	100%
EcoEGR	Tier II	9.0%	3.0%	33%
EcoEGR	Tier III	9.0%	0.0%	0%
ME-GA EGR	Gas-TierII	6.0%	0.0%	0%
ME-GA EGR	Diesel-TierII	6.0%	3.0%	50%
ME-GA EGR	Diesel-TierIII	6.0%	0.0%	0%
Tier II (sequential TC-tuning) + SOx scrubber	Tier II	1.5%	1.5%	100%
Tier II (10.6 LL tuning) + SOx scrubber	Tier II	6.0%	1.5%	25%
Tier II (LL/PL-EGB tuning) + SOx scrubber	Tier II	3.0%	1.5%	50%
EGRBP + SOx scrubber	Tier II	9.0%	0.0%	0.0%
EGRBP + SOx scrubber	Tier III	9.0%	0.0%	0.0%
EGRTC + SOx scrubber	Tier II	1.5%	1.5%	100%
EGRTC + SOx scrubber	Tier II (TCCO)	1.5%	0.0%	0%
EGRTC + SOx scrubber	Tier III	1.5%	0.0%	0%
LPSCR + SOx scrubber:				
In parallel (SOx scrubber)	Tier II	6.0%	1.5%	25%
In parallel (LPSCR)	Tier III	6.0%	0.0%	0%
Inline (SOx scrubber)	Tier II	6.0%	1.5%	25%
Inline (SOx scrubber + LPSCR)	Tier III	6.0%	0.0%	0%
HPSCR + SOx scrubber	Tier II	3.0%	1.5%	50%
HPSCR + SOx scrubber	Tier III	3.0%	1.5%	50%
EPT tuning + SOx scrubber	Tier II	1.5%	1.5%	100.0%
EcoEGR + SOx scrubber	Tier II	9.0%	1.5%	16%
EcoEGR + SOx scrubber	Tier III	9.0%	0.0%	0%
ME-GA EGR + SOx scrubber	Gas-TierII	6.0%	0.0%	0%
ME-GA EGR + SOx scrubber	Diesel-TierII	6.0%	1.5%	25%
ME-GA EGR + SOx scrubber	Diesel-TierIII	6.0%	0.0%	0%

Allowable opening of EEC as a function of engine load:

Standard EEC opening for all engines except sequential turbocharging.



Allowable EEC opening in case of sequential turbocharging tuning.



TECHNICAL INFORMATION

DOC No.: HHI-TI-0382

Date : July 19, 2019

**SUBJECT: THE UPDATE OF EEC SYSTEM FOR IMO NO_x
TIER III TECHNOLOGY AND/OR SO_x SCRUBBER.**

TYPE: ALL HYUNDAI-MAN B&W 2-STROKE ENGINES

Date	TEC No.	Write	Checked	Approve	Change	R
190719	HHI-TI-0382	DKH	SSH	PJK	First issue.	0
						1
						2
						3
						4
						5

TECHNICAL INFORMATION

DOC No.: HHI-TI-0382

We have issued technical information HHI-TI-0331(2017-11-27) for the combination of EEC (Economizer Energy Control) with Tier III technology and/or SOx scrubber.

We issue this technical information again since the EEC for EPT (Engine Process Tuning) was newly introduced.

EPT is applied for G95ME-C10.5, G80ME-C10.5 and G60ME-C10.5 engine types and because the EPT tuning does not include an EGB (Exhaust Gas Bypass), EEC application has to be selected during technical agreement.

In addition, EEC for Eco-EGR is also newly added in this attachment.

Therefore, this technical information replaces the previous technical information HHI-TI-0331.

The various combinations of Tier III technology, SOx scrubber and allowable EEC system bypass rates in Tier II and Tier III mode are given in the attachment.

We hope the information will do you a valuable service.

Encl. 1. Options for Economizer Energy Control (EEC) on Tier III engines

Encl. 2. HHI-TI-0331 EEC system for Tier III Technology and/or SOx scrubber

[The end]

Yours sincerely,



J. K. PARK / Senior Engineer

Head of Marine Engine & Machinery Technical Sales Dep't

Options for Economizer Energy Control (EEC) on Tier III engines

Conventional efficiency turbocharger matching:

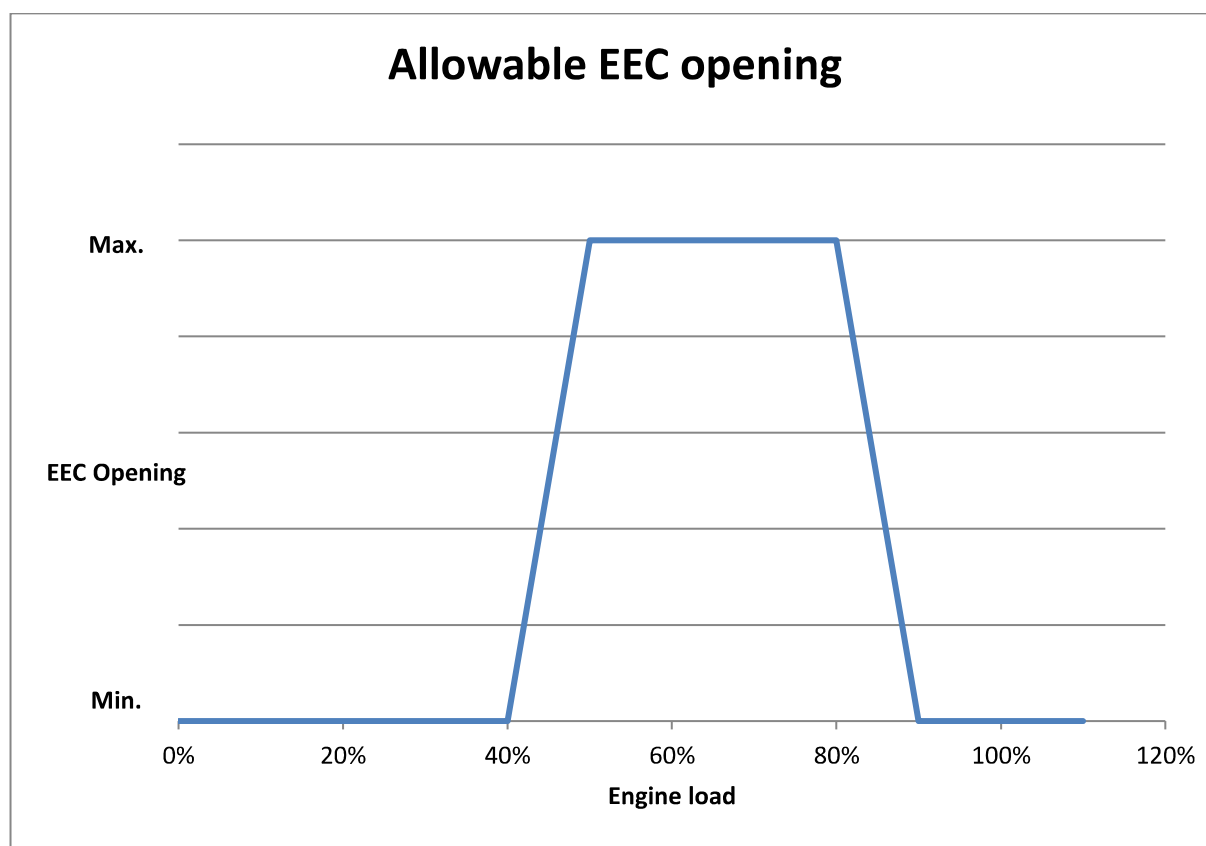
- No option for EEC system

High efficiency turbocharger matching:

Tier III technology	Mode	Installed EGB rate	Allowable EEC by-pass rate	Allowable EGB opening for EEC
EGRBP	Tier II	9%	-	0%
	Tier III		-	0%
EGRTC	Tier II	Non	-	N/A
	Tier II (TCCO)		-	N/A
	Tier III		-	N/A
LP SCR	Tier II	6%	3.0%	50%
	Tier III		-	0%
HP SCR	Tier II	3%	3.0%	100%
	Tier III		3.0%	100%
Tier II (LL/PL-EGB tuning) + SO _x Scrubber	Tier II	3%	1.5%	50%
EGRBP + SO _x Scrubber	Tier II	9%	-	0%
	Tier III		-	0%
EGRTC + SO _x Scrubber	Tier II	Non	-	N/A
	Tier II (TCCO)		-	N/A
	Tier III		-	N/A
LP SCR + SO _x Scrubber				
In-parallel (SO _x Scrubber)	Tier II	6%	1.5%	25%
In-parallel (LP SCR)	Tier III		-	0%
In-line (SO _x Scrubber)	Tier II	6%	1.5%	25%
In-line (SO _x Scrubber + LP SCR)	Tier III		-	0%
HP SCR + SO _x Scrubber	Tier II	3%	1.5%	50%
	Tier III		1.5%	50%
EPT tuning	Tier II	3%**	3.0%	100%
EPT tuning + SO _x Scrubber	Tier II	1.5%**	1.5%	100%
Eco-EGR	Tier II	9%	3.0%	33%
	Tier III		-	0%
Eco-EGR+ SO _x Scrubber	Tier II	9%	1.5%	16%
	Tier III		-	0%

**) EGB is a new/additional part

Allowable opening of EEC as a function of engine load:



EEEDF2 - 2019-06-20

Vs. 5 EEC for EPT added.

Vs. 6 EEC for eco-EGR added



HEAD OFFICE: 1, CHEONHA-DONG, DONG-KU, ULSAN, KOREA /TEL:(82)(522)30-2114/FAX:(82)(522)30-3470/TLX:HHIEMD K53815, K52191/CABLE:HHIYARD DONG ULSAN
SEOUL OFFICE: 140-2, GYE-DONG, JONGRO-KU, SEOUL, KOREA /TEL:(82)(2)741-1201/TLX:K27496, K28361/CABLE:HDYARD SEOUL
LONDON TEL:01-741-1531 **NEW JERSEY** TEL:201-592-7766 **TOKYO** TEL:03-211-0851/0854

TECHNICAL INFORMATION

Date : 2017. 11. 27
Our Ref. : HHI-TI-0331
Tel. : +82 52 202-7327~9
Fax. : +82 52 202-7692

To whom it may concern.

Subject: EEC system for Tier III Technology and/or SOx Scrubber

(For all Hyundai-MAN B&W ME-C/B with Tier III Technology and/or SOx scrubber)

Dear Sirs,



We have a pleasure in sending Technical Information Letter, ref. HHI-TI-0331 attached herewith.

Questions or comments relating to this Technical Information Letter should be directed to our 2-Stroke Engine Design & Engineering Dep't.

Best regards,

B. G. Kim / Senior Engineer

Head of 2-Stroke Engine Design & Engineering Dep't

	Technical Information		
DOC. NO. : HHI-TI-0331	27th Nov. 2017	Engine Type :	All Hyundai-MAN B&W ME-C/B with Tier III Technology and/or SOx scrubber
<div>PAGE 1 OF 3</div>			
<p><u>SUBJECT: EEC system for Tier III Technology and/or SOx Scrubber</u></p> <p>We have issued Technical Information HHI-TI-0258(2014-04-21) that EEC “Economizer Egnery Control” can increase the exhaust gas temperature at engine part load on Hyundai-MAN B&W ME-C/B with PL-EGB or LL-EGB (High efficiency T/C) as optional.</p> <p>According to adopting applications for Tier III technology and/or SOx scrubber, we have received several customers’ questions about combination possibility of those applications with EEC. We would like to inform you of latest strategy for Tier III technology and/or SOx scrubber with EEC combination through this technical information.</p> <p>As mentioned on HHI-TI-0258(2014-04-21), basically the EEC system is offered for engines desinged with an exhaust gas bypass(EGB) valve and high efficiency turbocharger. The EEC system opens the EGB valve to increase the exhaust gas temperature when the demand for steam exceeds the production. If the normal operating condition is with closed EGB valve and a standard turbine back pressure, the maximum allowable bypass rate for the EGB valve is limited to 3% of the exhaust gas flow.</p> <p>On engines with SOx scrubber and EEC system, the maximum allowable bypass rate is limited to 1.5% of the exhaust gas flow because the increased back pressure will reduce the heat load margins.</p> <p>The various combinations of Tier III technologies, SOx scrubber and allowable EEC system opening in Tier II and Tier III running modes are given in the attachment. The EEC system is available for both fuel oil and low-flashpoint fuel (LFF) modes.</p> <p>We hope this information will do you a valuable service.</p> <p>※ Attached : Option for EEC on Tier III Technology and/or SOx Scrubber --- Total 2 pages</p>			
HEAD OF 2-STROKE ENGINE DESIGN & ENGINEERING DEP'T			
☎ +82 52 202-7327~9, FAX: +82 52 202-7692, E-mail: k210hhi@hhi.co.kr			

MAN Diesel & Turbo



Options for Economizer Energy Control (EEC) on Tier III Engines

Conventional efficiency turbocharger matching:

- No option for EEC system

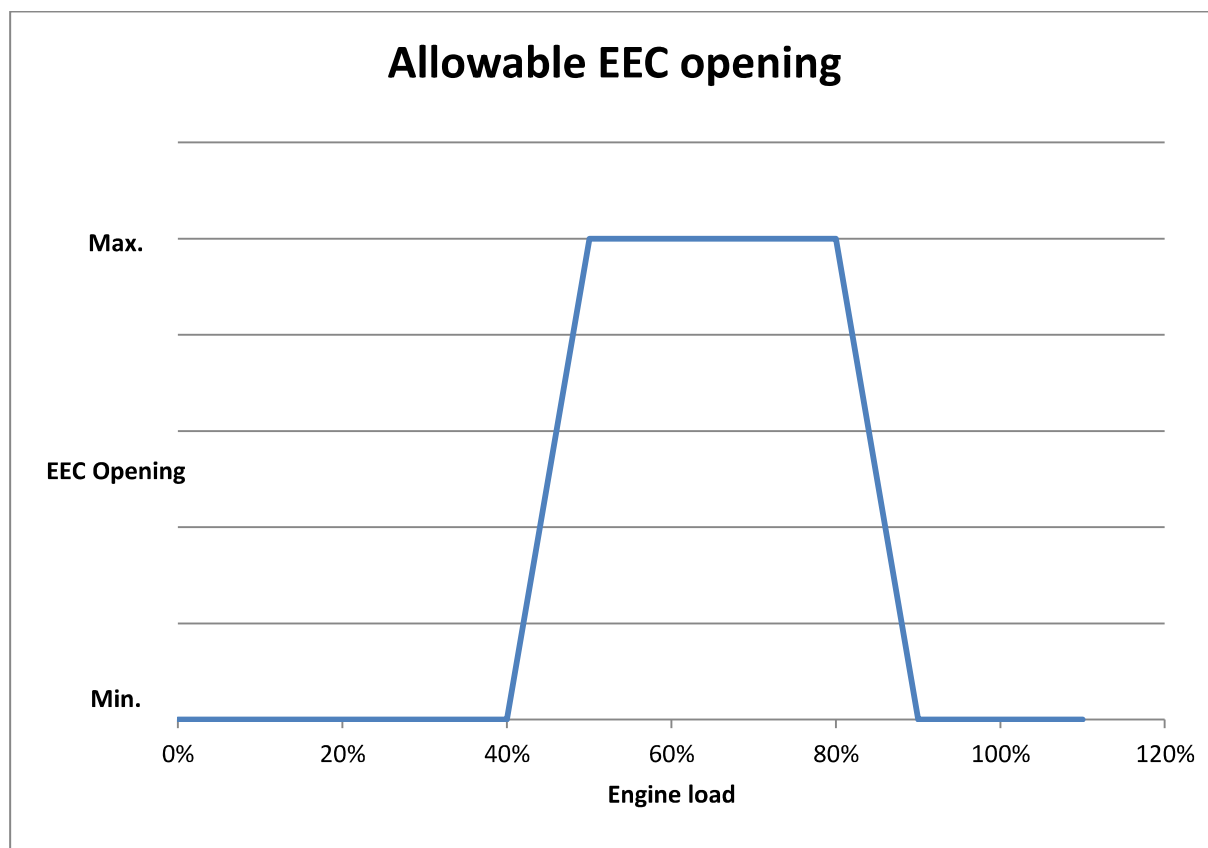
High efficiency turbocharger matching:

Tier III technology	Mode	Installed EGB rate	Allowable EEC bypass rate	Allowable EGB opening for EEC
EGRBP	Tier II	9%	-	0%
	Tier III		-	0%
EGRTC	Tier II	Non	-	N/A
	Tier II (TCCO)		-	N/A
	Tier III		-	N/A
LPSCR	Tier II	6%	3.0%	50%
	Tier III		-	0%
HPSCR	Tier II	3%	3.0%	100%
	Tier III		3.0%	100%
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EGRBP + SO _x scrubber	Tier II	9%	-	0%
	Tier III		-	0%
EGRTC + SO _x scrubber	Tier II	Non	-	N/A
	Tier II (TCCO)		-	N/A
	Tier III		-	N/A
LPSCR + SO _x scrubber				
In-parallel (SO _x scrubber)	Tier II	6%	1.5%	25%
In-parallel (LPSCR)	Tier III		-	0%
In-line (SO _x scrubber)	Tier II	6%	1.5%	25%
In-line (SO _x scrubber + LPSCR)	Tier III		-	0%
HPSCR + SO _x scrubber	Tier II	3%	1.5%	50%
	Tier III		1.5%	50%

MAN Diesel & Turbo



Allowable opening of EEC as a function of engine load:



TECHNICAL INFORMATION

Date : 2017. 11. 27
Our Ref. : HHI-TI-0331
Tel. : +82 52 202-7327~9
Fax. : +82 52 202-7692

To whom it may concern.

Subject: EEC system for Tier III Technology and/or SOx Scrubber

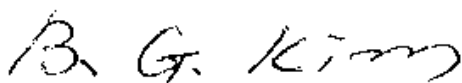
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Questions or comments relating to this Technical Information Letter should be directed to our 2-Stroke Engine Design & Engineering Dep't.

Best regards,



B. G. Kim / Senior Engineer

Head of 2-Stroke Engine Design & Engineering Dep't

	Technical Information		
DOC. NO. : HHI-TI-0331	27th Nov. 2017	Engine Type :	All Hyundai-MAN B&W ME-C/B with Tier III Technology and/or SOx scrubber
<div>PAGE 1 OF 3</div>			
<p><u>SUBJECT: EEC system for Tier III Technology and/or SOx Scrubber</u></p> <p>We have issued Technical Information HHI-TI-0258(2014-04-21) that EEC “Economizer Egnery Control” can increase the exhaust gas temperature at engine part load on Hyundai-MAN B&W ME-C/B with PL-EGB or LL-EGB (High efficiency T/C) as optional.</p> <p>According to adopting applications for Tier III technology and/or SOx scrubber, we have received several customers’ questions about combination possibility of those applications with EEC. We would like to inform you of latest strategy for Tier III technology and/or SOx scrubber with EEC combination through this technical information.</p> <p>As mentioned on HHI-TI-0258(2014-04-21), basically the EEC system is offered for engines desinged with an exhaust gas bypass(EGB) valve and high efficiency turbocharger. The EEC system opens the EGB valve to increase the exhaust gas temperature when the demand for steam exceeds the production. If the normal operating condition is with closed EGB valve and a standard turbine back pressure, the maximum allowable bypass rate for the EGB valve is limited to 3% of the exhaust gas flow.</p> <p>On engines with SOx scrubber and EEC system, the maximum allowable bypass rate is limited to 1.5% of the exhaust gas flow because the increased back pressure will reduce the heat load margins.</p> <p>The various combinations of Tier III technologies, SOx scrubber and allowable EEC system opening in Tier II and Tier III running modes are given in the attachment. The EEC system is available for both fuel oil and low-flashpoint fuel (LFF) modes.</p> <p>We hope this information will do you a valuable service.</p> <p>※ Attached : Option for EEC on Tier III Technology and/or SOx Scrubber --- Total 2 pages</p>			
HEAD OF 2-STROKE ENGINE DESIGN & ENGINEERING DEP'T			
☎ +82 52 202-7327~9, FAX: +82 52 202-7692, E-mail: k210hhi@hhi.co.kr			

Options for Economizer Energy Control (EEC) on Tier III Engines

Conventional efficiency turbocharger matching:

- No option for EEC system

High efficiency turbocharger matching:

Tier III technology	Mode	Installed EGB rate	Allowable EEC bypass rate	Allowable EGB opening for EEC
EGRBP	Tier II	9%	-	0%
	Tier III		-	0%
EGRTC	Tier II	Non	-	N/A
	Tier II (TCCO)		-	N/A
	Tier III		-	N/A
LPSCR	Tier II	6%	3.0%	50%
	Tier III		-	0%
HPSCR	Tier II	3%	3.0%	100%
	Tier III		3.0%	100%
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EGRBP + SO _x scrubber	Tier II	9%	-	0%
	Tier III		-	0%
EGRTC + SO _x scrubber	Tier II	Non	-	N/A
	Tier II (TCCO)		-	N/A
	Tier III		-	N/A
LPSCR + SO _x scrubber				
In-parallel (SO _x scrubber)	Tier II	6%	1.5%	25%
In-parallel (LPSCR)	Tier III		-	0%
In-line (SO _x scrubber)	Tier II	6%	1.5%	25%
In-line (SO _x scrubber + LPSCR)	Tier III		-	0%
HPSCR + SO _x scrubber	Tier II	3%	1.5%	50%
	Tier III		1.5%	50%



Allowable opening of EEC as a function of engine load:

