



Energy Saving Solutions

Green Technologies

Solution Providers

- Mitsui E&S
- Mitsubishi Heavy Industries
- Eco Flettner
- TGE Marine
- HH Engineering & Service
- Fuji Electric

Mitsui E&S

- Slide type Fuel Valve Retrofit
- EcoNozzle
- EcoCam
- E-VIT
- Engine Derating
- Low Load optimization tuning
- Chief Load Limiter
- ASR (Rough Sea Auto Speed)
- ALC (Auto Engine Load Control)
- Adaptive Sea-condition Control Governor
- PMI Auto Tuning(Online PMI)

➤ **Slide type Fuel Valve Retrofit**

Compared to conventional types, it improves the spray and combustion conditions and is expected to improve fuel efficiency.

Slide type fuel valve is necessary for low load operation when the main engine is under 40% load.

*Applicable to MC and MC-C main engine types.

Expected fuel consumption reduction effect: 2%

➤ **EcoNozzle**

The atomizer for the slide type fuel valve is designed to optimize fuel efficiency, and is expected to improve fuel efficiency.

*Applicable engines are limited to certain S50MC-C Mk.7/8 and NOx Tier II compliant main engines.

Expected fuel consumption reduction effect: 2%

➤ **EcoCam**

The EcoCam system is expected to improve fuel economy by increasing the cylinder pressure under 60% load of the main engine.

*Applicable engines are limited to certain S50/60MC-C.

Expected fuel consumption reduction effect: 2%

➤ **E-VIT**

The E-VIT system is expected to improve fuel economy by increasing the cylinder pressure under 75% load of the main engine.

*Applicable models are limited to NO_x Tier I compatible main engines with mechanical VIT.

Expected fuel consumption reduction effect: 2%

➤ **Engine Derating**

Fuel consumption improvement can be expected by optimizing the engine performance in the low load range by derating the MCO.

*Applicable to both MC and ME Engine types, time will be needed for consideration of the necessary modifications

Expected fuel consumption reduction effect: 2-3%

➤ **Low load optimization tuning**

Improved fuel efficiency is expected by tuning changes that focus on the low load range of the main engine (Low Load Optimize or Part Load Optimize).

*Applicable to ME Main Engine types

Expected fuel consumption reduction effect: 1-3%

➤ **Chief Load Limiter**

The main engine load limit is set in the control room, and when the load on the hull increases, such as during rough weather, limiting the main engine load to a certain level is expected to suppress deterioration of fuel efficiency

*Applicable to MC & MC-C Engine types

➤ **Adaptive sea-condition control governor**

By automatically selecting the optimal control mode according to the sea conditions, it can be effective in suppressing deterioration of fuel consumption.

*Applicable to MC & MC-C Engine types

➤ **PMI Auto Tuning(Online PMI)**

PMI Auto tuning, which utilizes the automatic cylinder pressure measurement function, is expected to suppress fuel efficiency deterioration by controlling the maximum cylinder pressure.

*Applicable to ME Engine types

➤ **Rough Sea Auto Speed Reduction (ASR)**

By estimating changes in sea conditions from changes in the main engine speed and fuel index, and automatically adjusting the amount of speed reduction during rough weather.

It is expected to suppress deterioration in fuel consumption.

*Applicable to MC, MC-C and ME engine types.

Expected fuel consumption reduction effect: 1%

➤ **Auto Engine Load Control (ALC)**

The target main engine operating load is set on the bridge, and the main engine speed is automatically adjusted to control the main engine load to a constant level.

It is expected to suppress deterioration of fuel consumption by automatically lowering the engine speed when hull resistance increases.

*Applicable to ME engine types

Expected fuel consumption reduction effect: 1%

***The expected fuel savings by using ASR & ALC simultaneously is 2,06%**

Mitsubishi Heavy Industries

- Ducted Reduction Fin (Half-moon duct)
- Hub Vortex Free Cap
- Retractable Fin Stabilizers
- Propeller Retrofit

Ducted Reduction Fin(DRF)

- DRF is a product which consists of a half moon shaped duct with fins installed in front of propeller.
- DRF generates a flow whose direction is opposite to the rotational direction of propeller and it improves efficiency of propeller by retrieving rotating flow which is to be lost without the device and producing net forward thrust by the duct.
- DRF works efficiently when it is installed to low-speed and heavy ship such as Bulk Carrier and Tanker.
- Expected performance improvement in energy saving is 5% ~ 8%.

Hub Vortex Free Cap

- HVFC recovers an efficiency loss caused by hub vortex.
- About 1-3% propulsive efficiency improvement can be expected.
- Improvement can be expected to the all kinds of vessels.
- Delivery record is more than 300 caps.
- No bad influence for the propulsive performance and decrease rudder erosion by hub vortex cavitation.

Retractable Fin Stabilizers

- Retractable fin stabilizers feature an extremely responsive hydraulic system and have powerful computational ability.
- Deliver optimal responses to changing wave patterns, and by using “fuzzy control” can handle even the most irregular waves.

Propeller MAP retrofit

- The MAP (Mitsubishi Advanced Propeller) meets the need for energy saving propellers that perfectly fit ships.
- Mitsubishi designs the most suitable propeller blade for each ship, tailored to each specification, using extensive technical know-how and in-depth experience in shipbuilding.

Eco Flettner

- The most mature wind propulsion technology for commercial shipping is the Flettner rotor, a rotating cylinder which takes advantage of the so-called Magnus effect.
- Short payback time (ROI) : 4 years on average.
- Significant potential fuel savings of more than 15%.
- Less CO₂, SO_x, NO_x and other emissions.
- Improved energy efficiency of ships.

TGE MARINE

- TGE Marine Gas Engineering is the leading liquefied gas systems' provider, specializing in the design and engineering of cargo handling systems and tanks for any type of liquefied gas carriers, bunker ships and FSRUs.
- Furthermore TGE Marine works under EPCS agreements on liquefied fuel gas systems for LNG, LPG, CO₂, Ammonia(NH₃) and future fuels.
- TGE Marine Gas Engineering is committed to use nature's resources responsibly. Their goal is to enhance vessels with clean and efficient systems to reduce the ecological footprint.

H&H Engineering & Service

- NO_x reduction by SCR Catalyst on Ships
- Remote NO_x spot check

NO_x reduction by SCR Catalysts

- The SCR method is intended to control the NO_x emissions by means of a selective catalytic reduction. This is the most common method for removal of NO_x in combustion engines and non-engine combustion processes (biomass, glass furnace, SNCR-SCR combination, industrial boilers).
- This is injected in the exhaust gas where it evaporates and releases NH₃ – ammonia. On the SCR catalyst surface the reduction occurs and converts the NO_x to harmless N₂ which is inert and a natural component of the air. The equally harmless H₂O is a by-product.

Remote NOx spot check

- Annual Nox Spot Check is a procedure to verify that the installed Selective Catalyst Reactor is effective and has the conversion rate to reduce the NOx emissions from the engine below IMO Tier III limits. There are no limitations regarding SCR type for our principals' Remote NOx Spot Check.
- The vessel will provide a copy of the NOx Technical File (NTF).
- The NOx spot check procedure in the mentioned NTF will be set up in a remote app.
- Our principals will ship a Class Approved pre-calibrated handheld Analyzer to the vessel.
- The vessel crew will receive instructions to download the app and the login to the app.
- The crew will perform the measurement and our principals will get a notification, once finished.
- Our principals will issue the information in a document and sign the report as approved.
- Ship owner can use this document to prove that NOx spot check has been performed.

FUJI ELECTRIC

- SOX Scrubber (Exhaust Gas Cleaning System)
 - ❖ Real-time concentration of exhaust gas components.
 - ❖ Compact design, low maintenance and complies with 0.1% SO_x zones
 - ❖ High Desulfurization
 - ❖ High pH (4-5) / No corrosion of distance piece of discharge line
 - ❖ World's smallest Size
 - ❖ Own design & Production (Laser type Gas Analyzer and Water Quality Mater / Fuji Original)
 - ❖ Calibration is simple and easy: Crew can be done on board)

Let's Build Sustainable Shipping Together

- ✓ Contact us to discuss your vessel's Energy Saving Potential