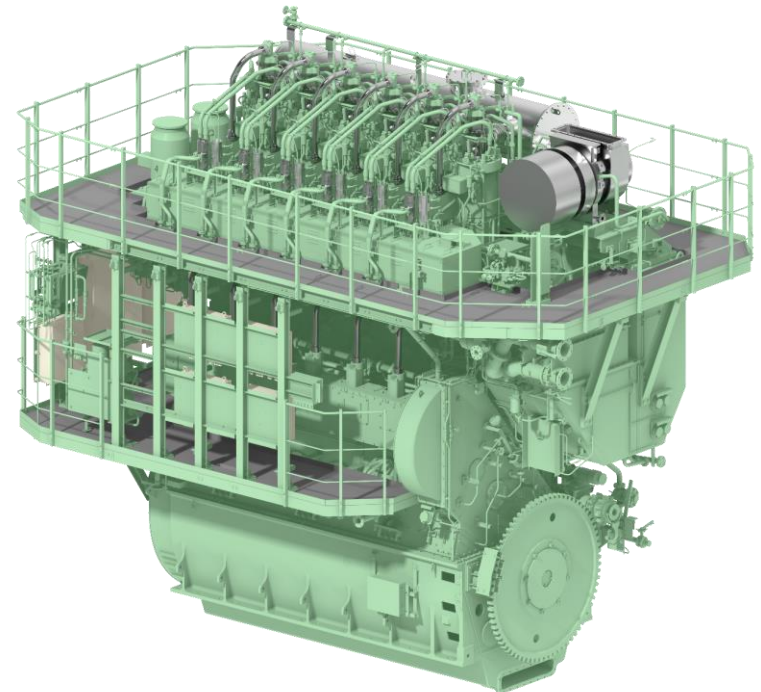


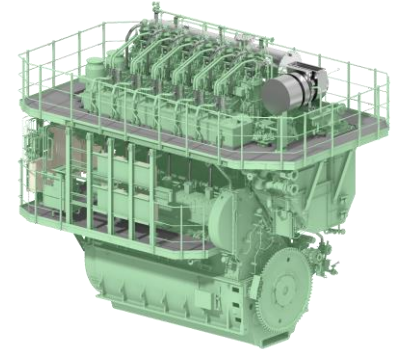
# UEC-LSJ series

Mar. 2023

Japan Engine Corporation



- **Excellent fuel-efficient engine**
- **J-ENG's Stratified injection system** is applied.  
Fuel and water are layered and injected.  
**Achieved Significant fuel efficiency** without NOx increase.
- **Simple system** leads **less operation and maintenance work**  
In case of MGO/MDO mono-fuel, N/A heat trace
- It is possible to apply **carbon-free fuel** such as **ammonia** instead of water to layered injection, and to further reduce GHG by using biofuel, etc., **especially as a solution for zero emission of small and medium-sized vessels**. We have received more inquiries.

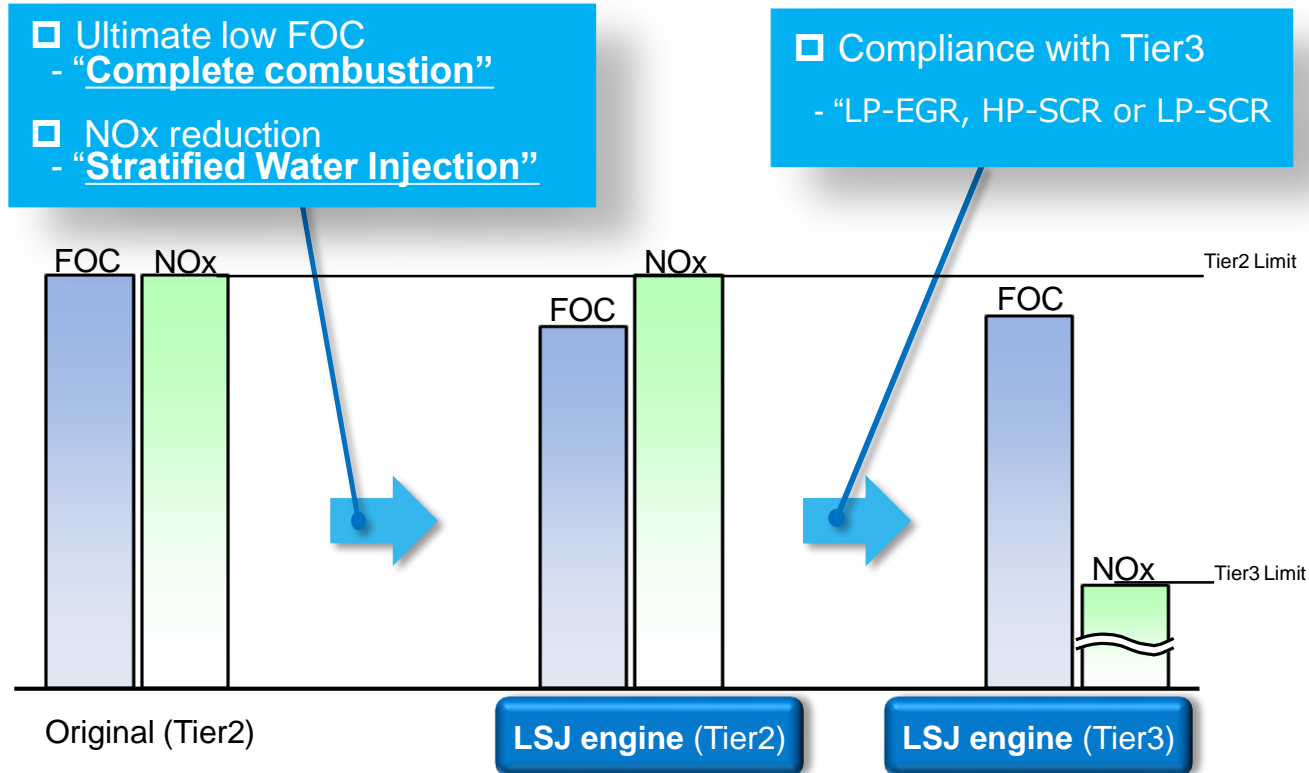


6UEC35LSJ



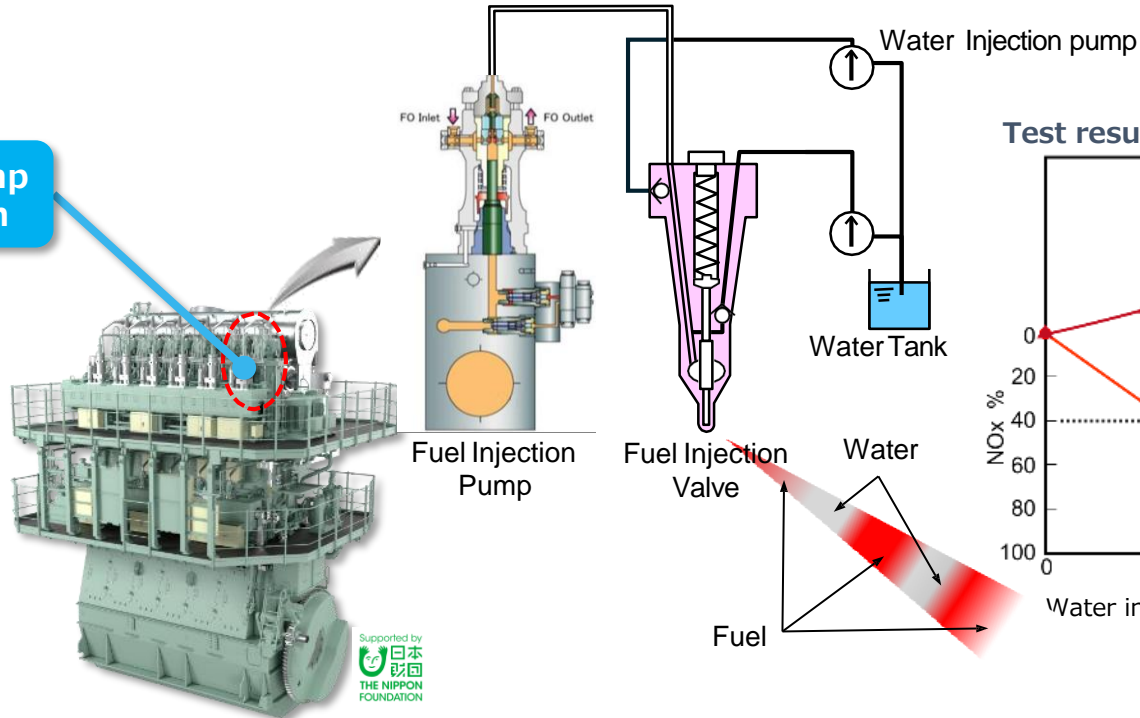
6UEC50LSJ

## Low FOC achieved by the combination of existing UE engine technologies

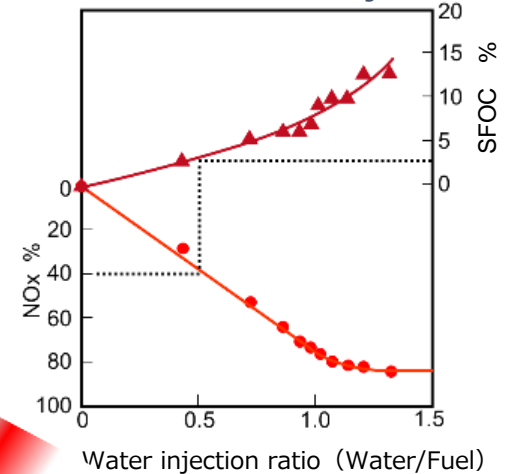


Water pumped into fuel line during non-injection period,  
Injected by Fuel Pump

Fuel valve and pump  
for water injection



Test result of water injection



# Stratified Water Injection unit

## Stratified water injection unit

Water injection pump

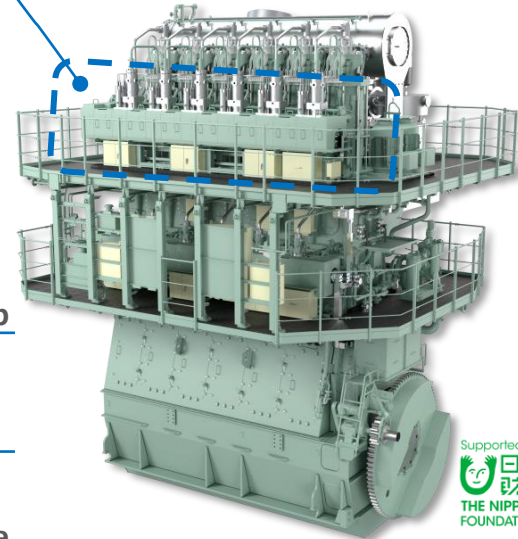
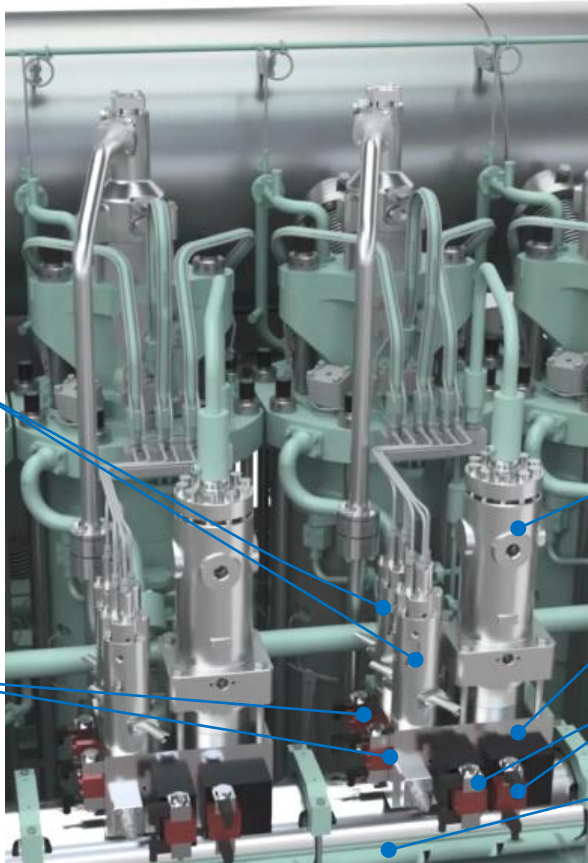
Solenoid valve  
(for water injection)

Fuel pump

Control valve unit

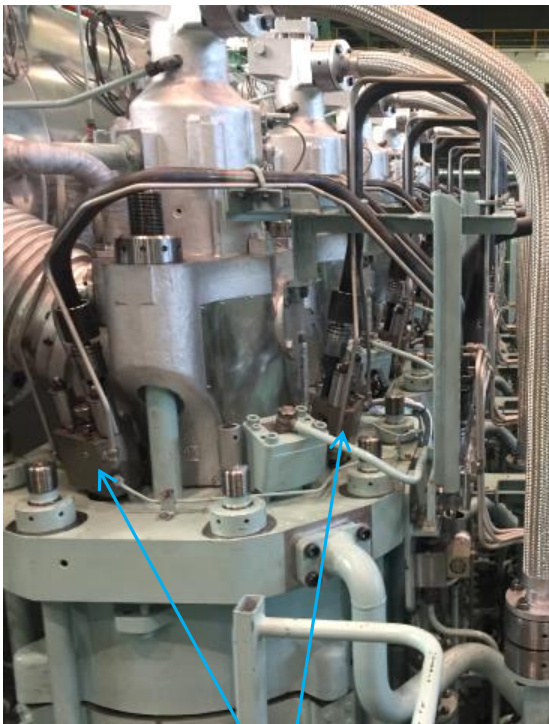
Solenoid valve  
(for fuel injection)

Accumulator block



6UEC50LSJ

# Stratified Water Injection unit on UEC50LSJ



Fuel injection valves  
(Stratified injection spec)



Water injection pump

Fuel injection pump



6UEC50LSJ

# Advantage of MGO/MDO mono-fuel

	<b>MGO/MDO</b> Mono-fuel	<b>VLSFO</b> S≤0.5%	<b>HFO</b> S≤3.5%	<b>LNG</b> (Dual Fuel)
Fuel type	<b>MGO</b> (or MDO)	<b>VLSFO</b> <b>+MGO</b>	<b>HFO</b> <b>+MGO</b>	<b>LNG</b> <b>+MGO</b>
Fuel availability	good	good	limited	limited
System in vessel	very simple (mono·no heating)	current	SOx scrubber applied	DF engine + LNG tank, supply system
Capital investment	small	unnecessary	big	enormous
Operation / Maintenance	easy	current	complicated	very complicated need qualified crew
Others	Improved engine reliability, Reduction of operation and maintenance work	Variations in fuel properties, Possibility of trouble	Purchase ability of scrubber, Expansion of prohibited bleed off area	Good environmental performance
Application	promising MGO/MDO mono-fuel <b>UEC-LSJ</b>	Major	limited	very limited

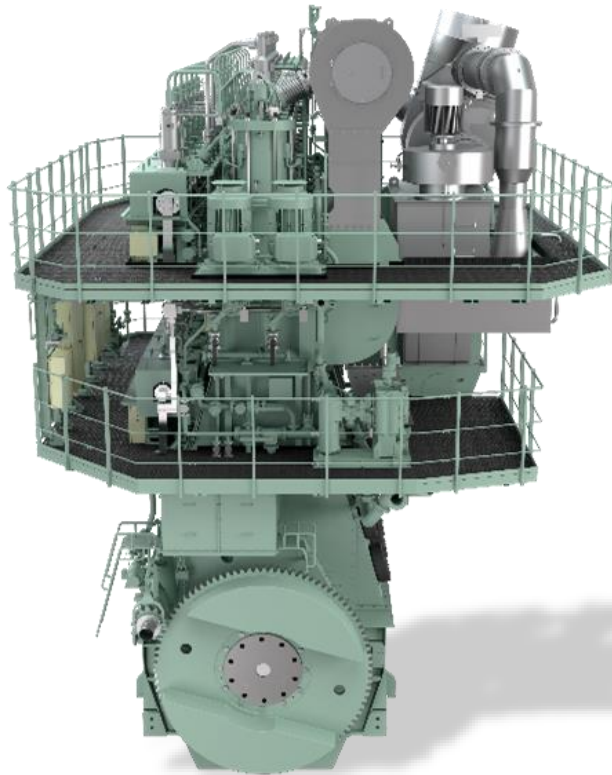
# Aim of Stratified water injection + MGO/MDO mono-fuel

## For shipping company

- Excellent fuel-efficient (Both sailing and anchored)
- Reduce Non-operation risk
- CSR improvement

## For crew

- Easy operation (No fuel change over)
- Less maintenance work  
⇒ Burden reduction



## For ship owner

- Improved engine reliability
- Reduce Non-operation risk
- Maintenance cost reduction
- Reduce Marine pollution risk

## For shipyard

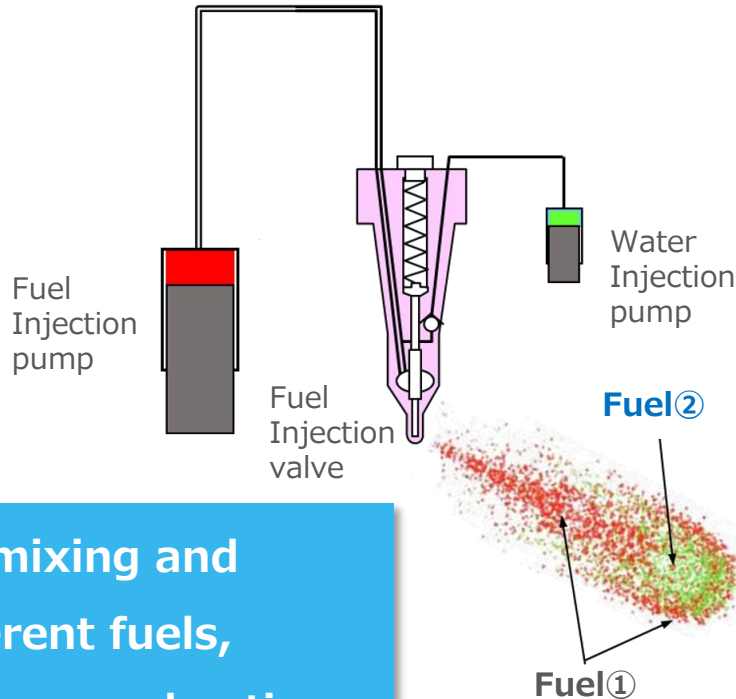
- No SOx scrubber
- Simplified engine room (mono-fuel, no-heating)

## Benefits for all shipping stakeholders



# Mixing liquid fuel with Stratified injection technology

## Applicable to co-combustion of different liquid fuels



### 【Sample】

**Fuel ①** : MGO, Biofuel etc.

**Fuel ②** : Ammonia  
Methanol  
Ethanol  
LPG  
Biofuel etc.

Potential for mixing and spraying different fuels,  
Applicable to co-combustion

## One of the best solution for GHG reduction of small and medium-size vessels

- UEC-LSJ has the potential to meet the gradual tightening of GHG reduction regulations using stratified injection technology.
- ⇒ Operation while minimizing the decrease of vessel's value may possible
- Compared to LNG, UEC-LSJ does not require a large initial investment and has an advantage in life cycle cost.
- Does not require a qualified crew member like LNG.
- ⇒ Excellent solution for both CAPEX / OPEX
- ⇒ Easy to deal with ship crew problems

Started development of GHG reduction engine using stratified injection system

Thank you for your attention

