



**CIMAC**

THE INTERNATIONAL COUNCIL ON COMBUSTION ENGINES

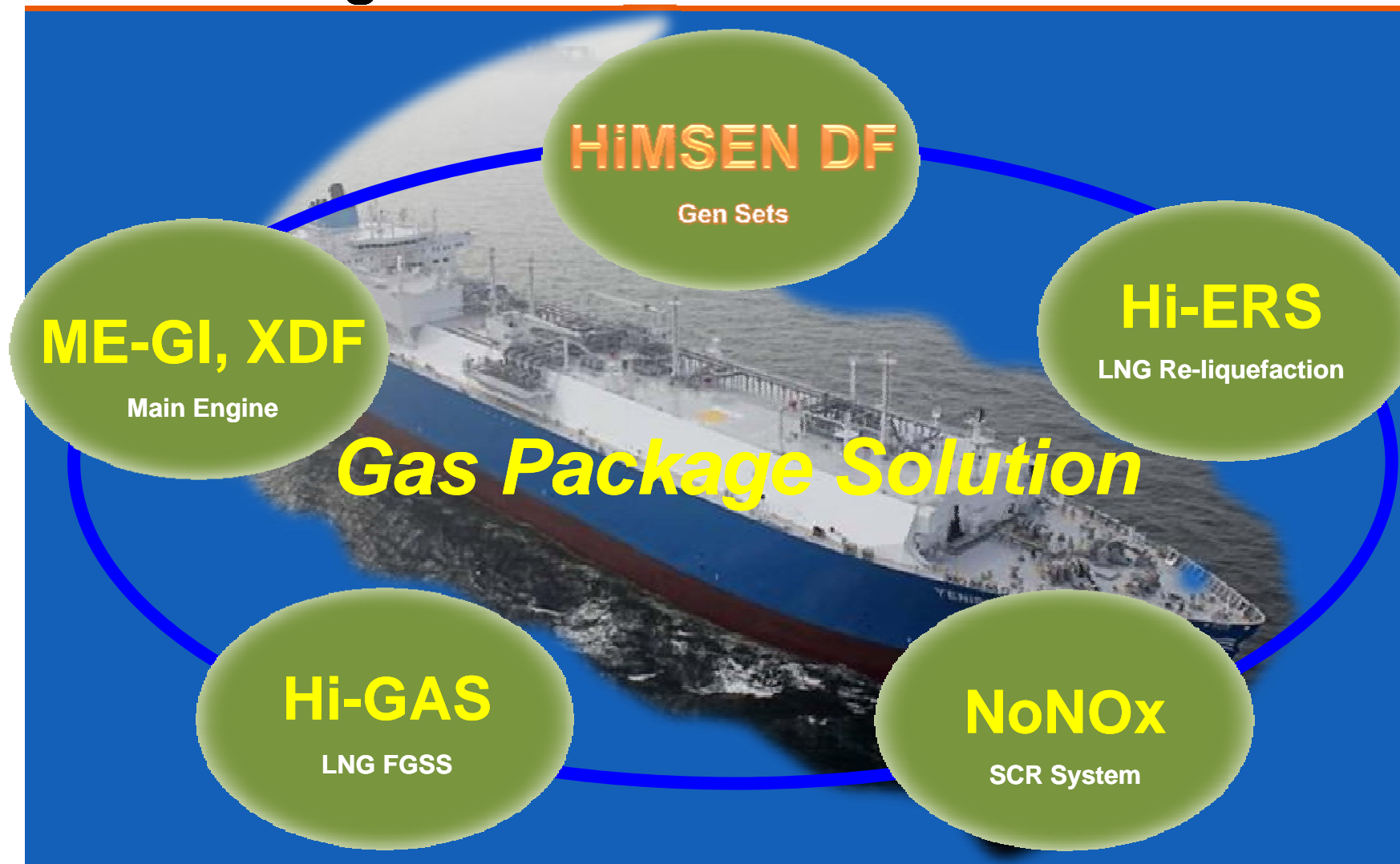
**HiMSEN**

# *Development of High Efficiency HiMSEN Dual Fuel Engine*

## *H27DF*

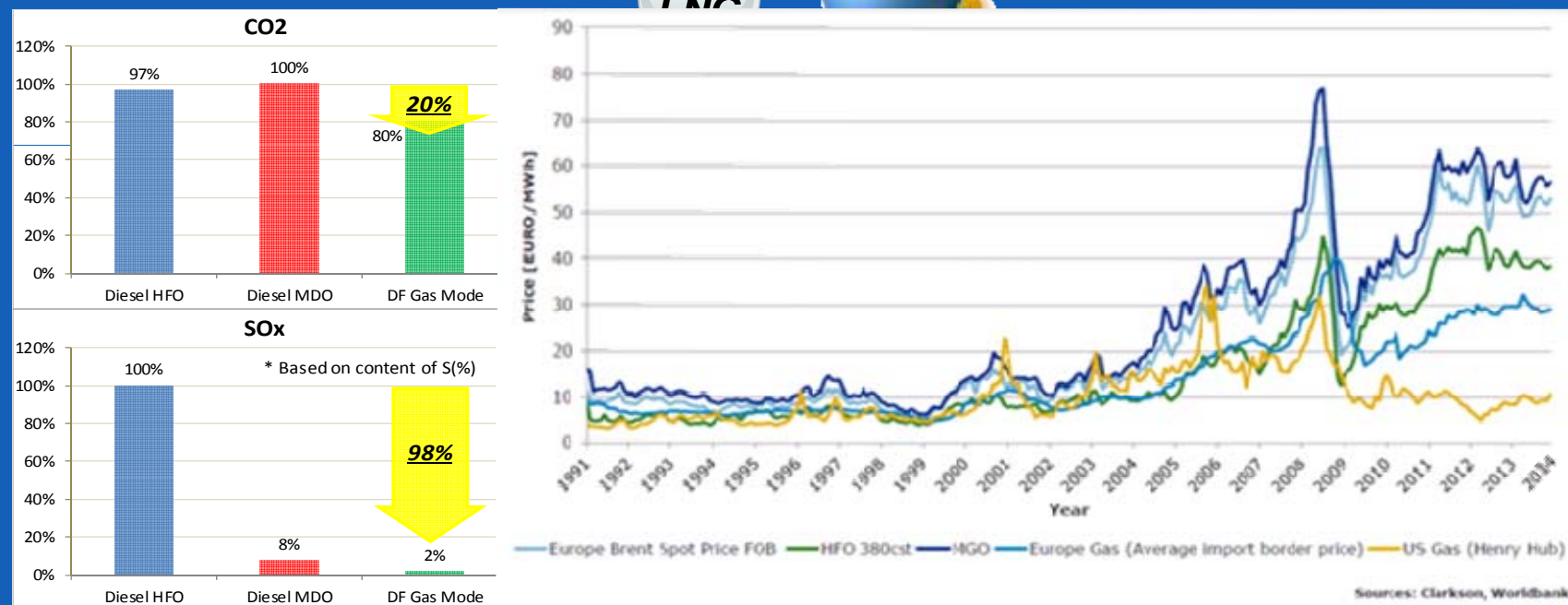
*by S. C. Jeong  
Engine & Machinery Division  
Hyundai Heavy Industries Co., Ltd.*

## ***Gas Package Solution***





# Potentials of DF Engine



## Emission Regulations

- Additional Equipment for diesel engines

## Fuel Flexibility

- Oil price fluctuations



## **Contents**

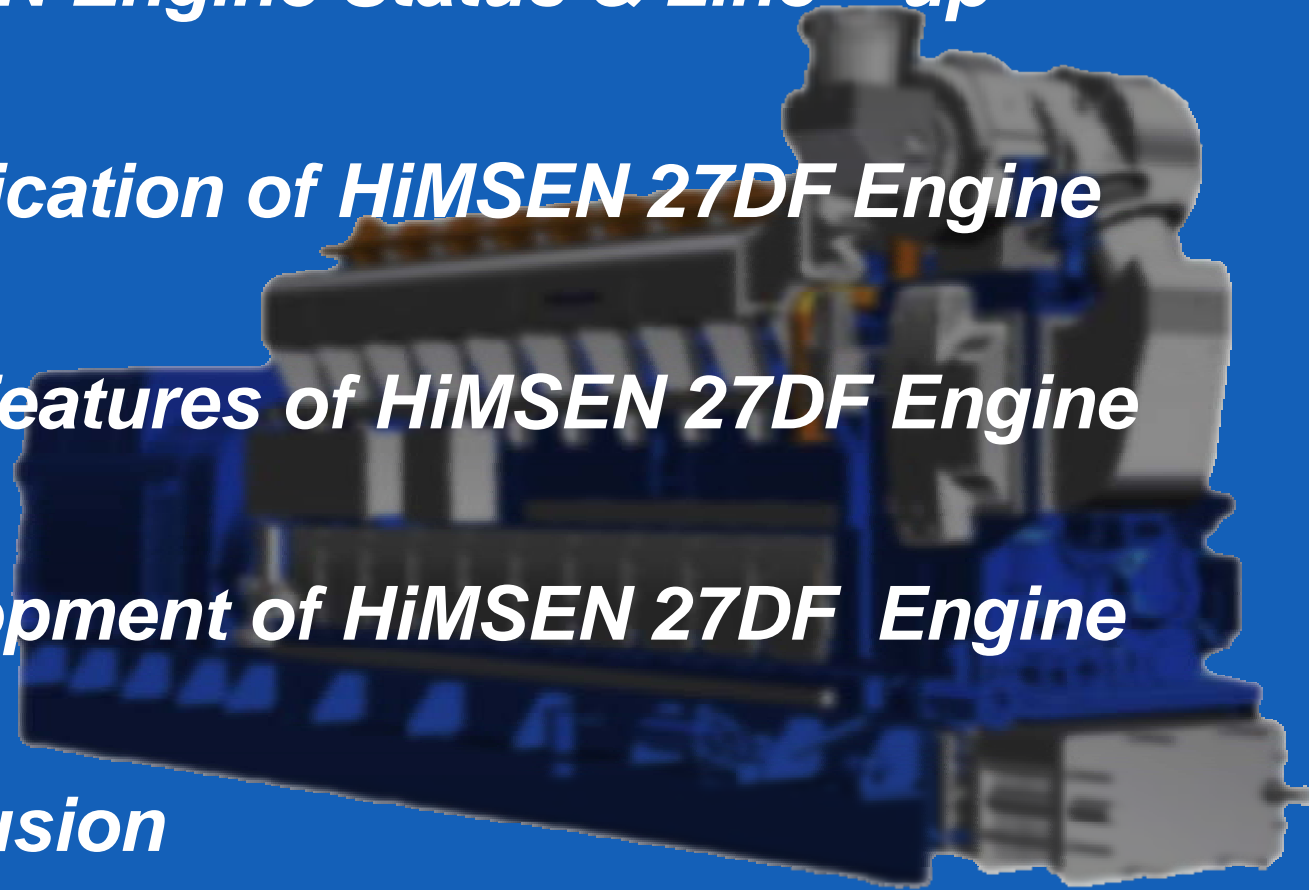
*HiMSEN Engine Status & Line – up*

*Specification of HiMSEN 27DF Engine*

*Main Features of HiMSEN 27DF Engine*

*Development of HiMSEN 27DF Engine*

*Conclusion*





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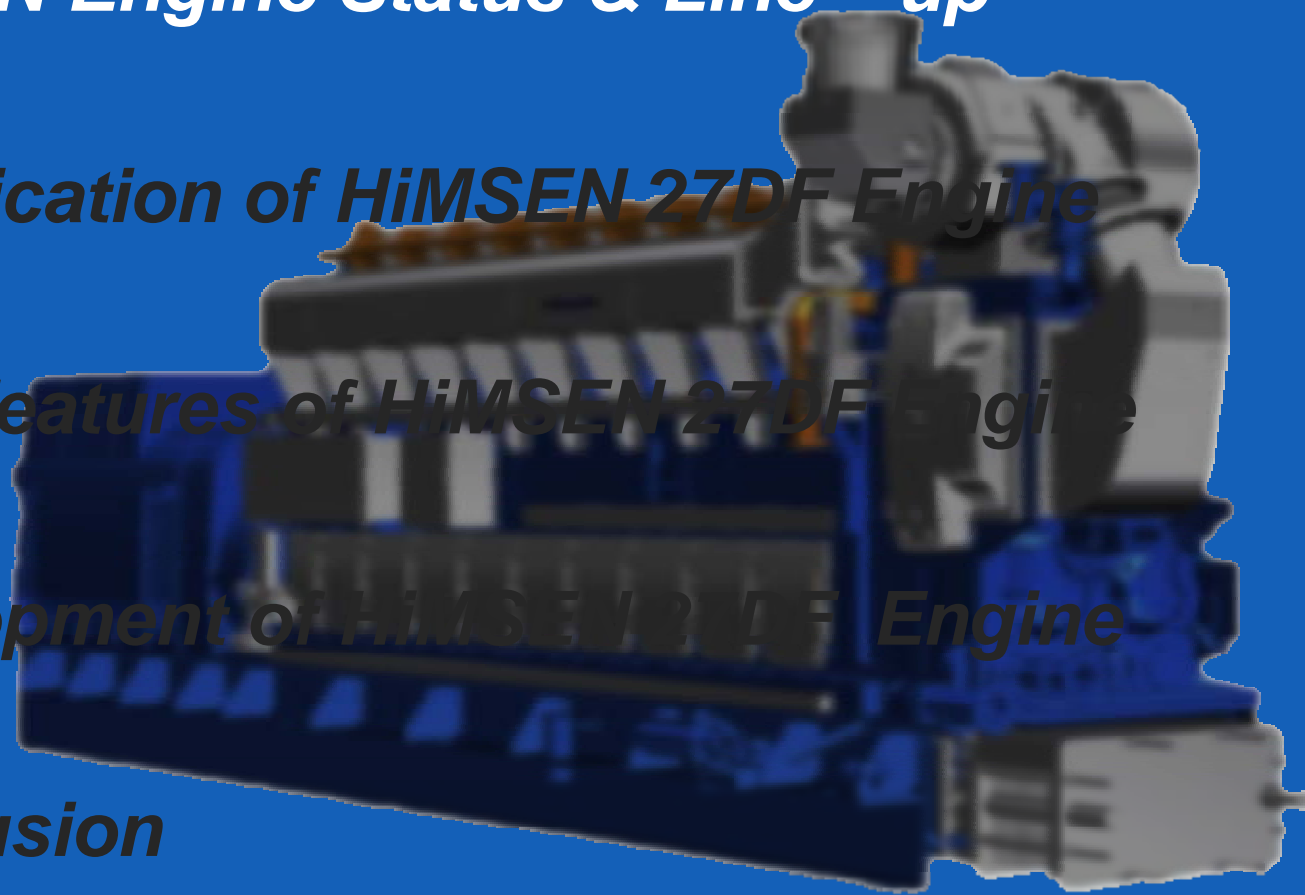
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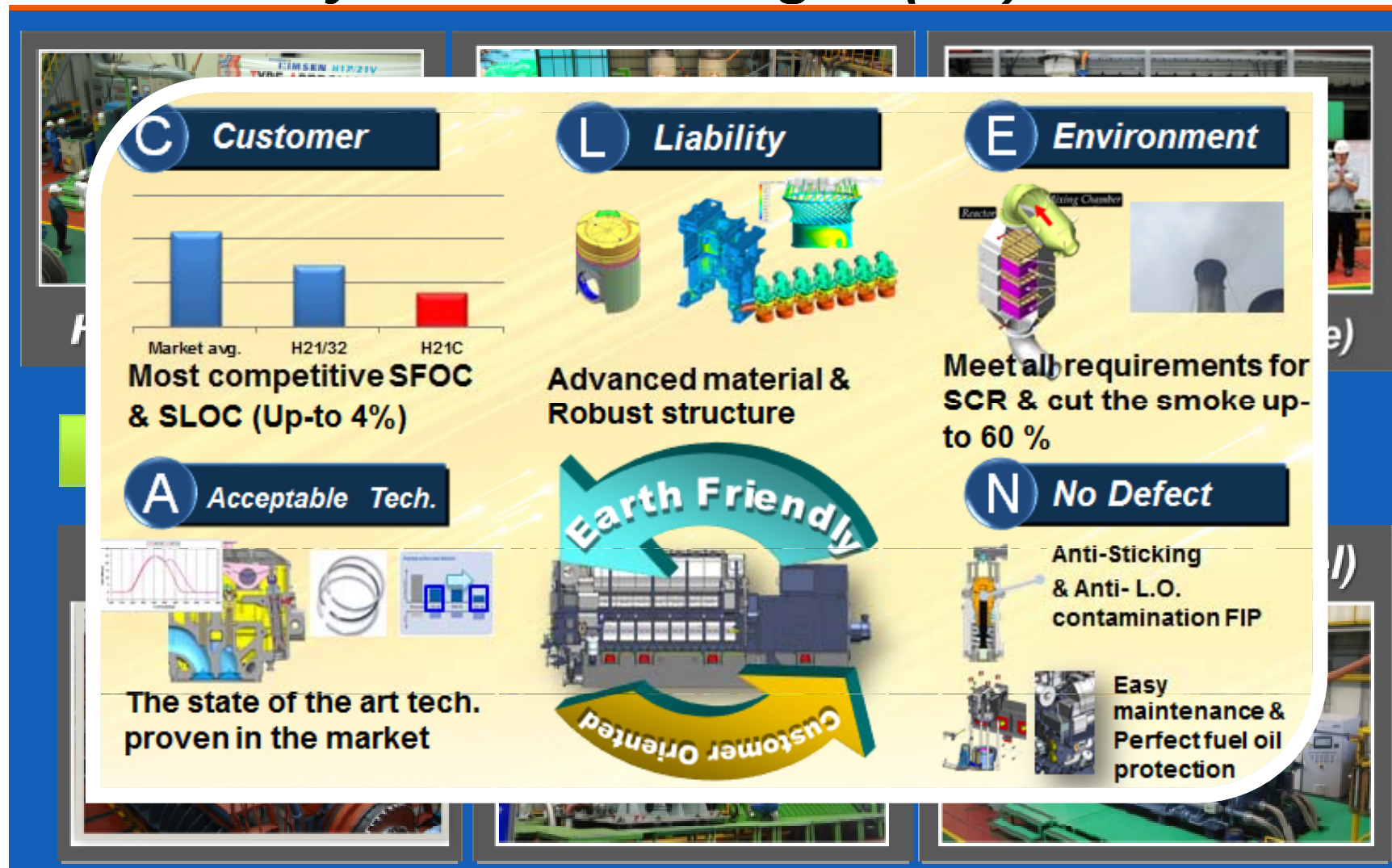


## *The History of HiMSEN Engine(1/2)*

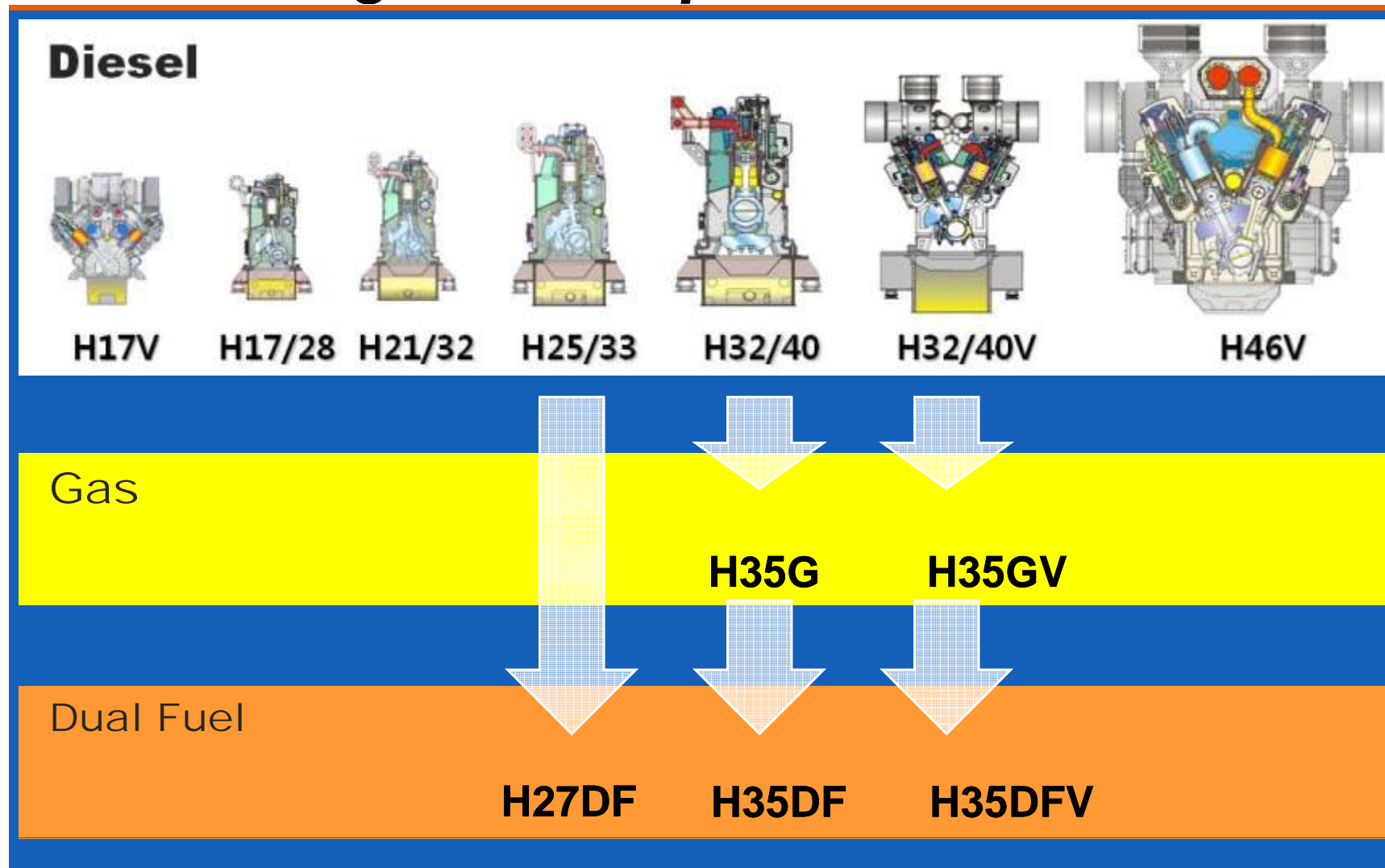




## The History of HiMSEN Engine(2/2)



# HiMSEN Engine Line-Up







***HiMSEN Total Production : Over 9,915 sets  
from 2000 ~ to Aug. 2015***





## **Contents**

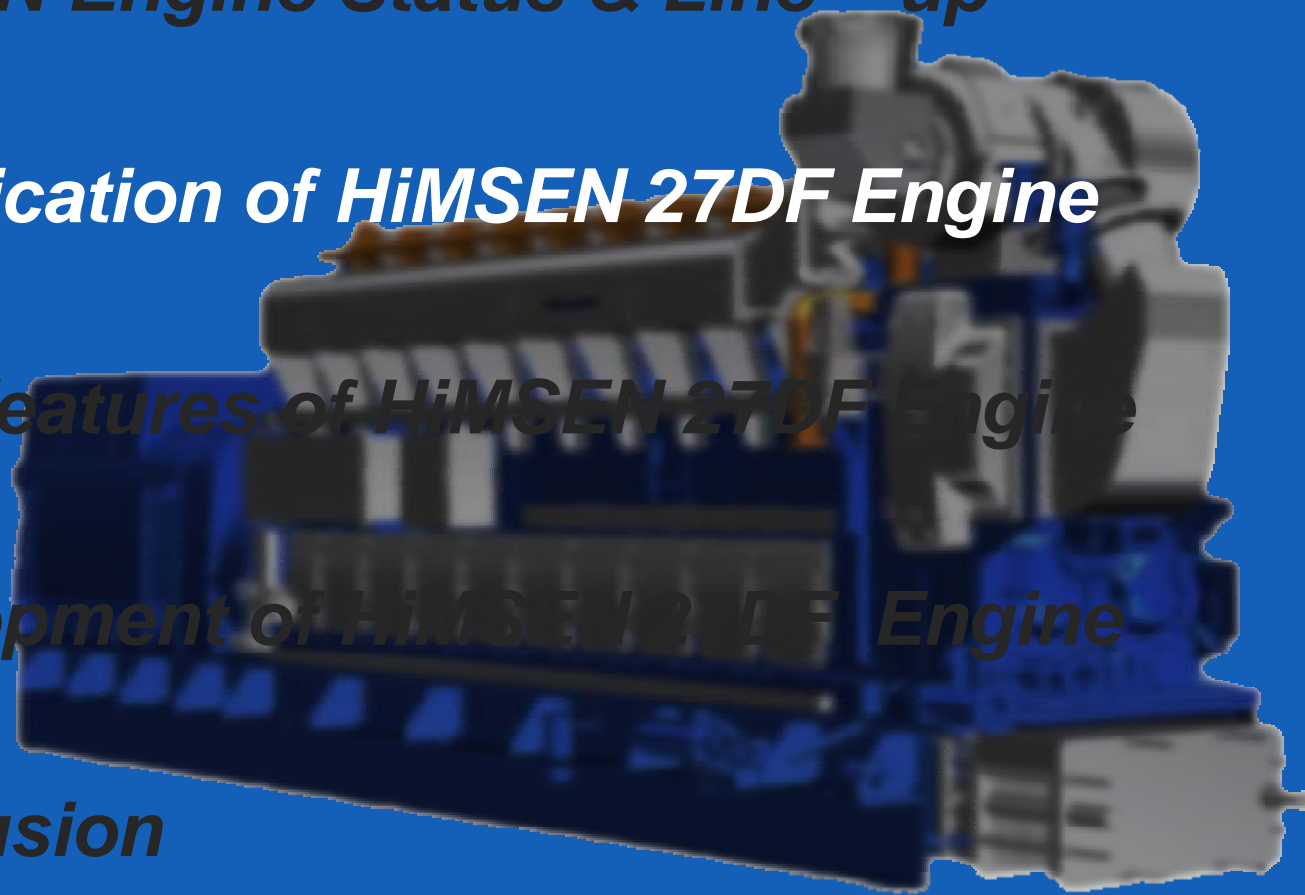
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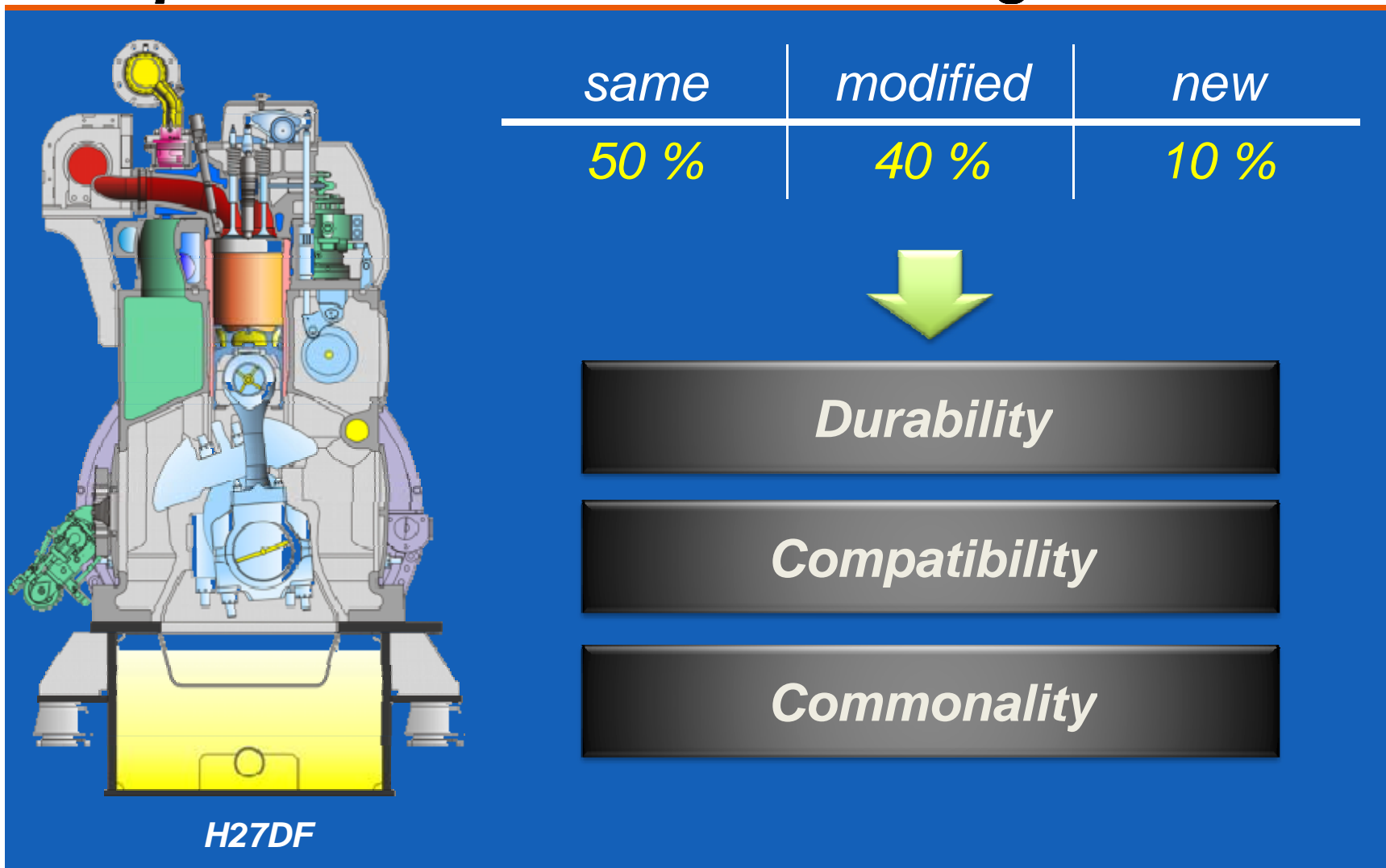
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## Components for HiMSEN 27DF Engine





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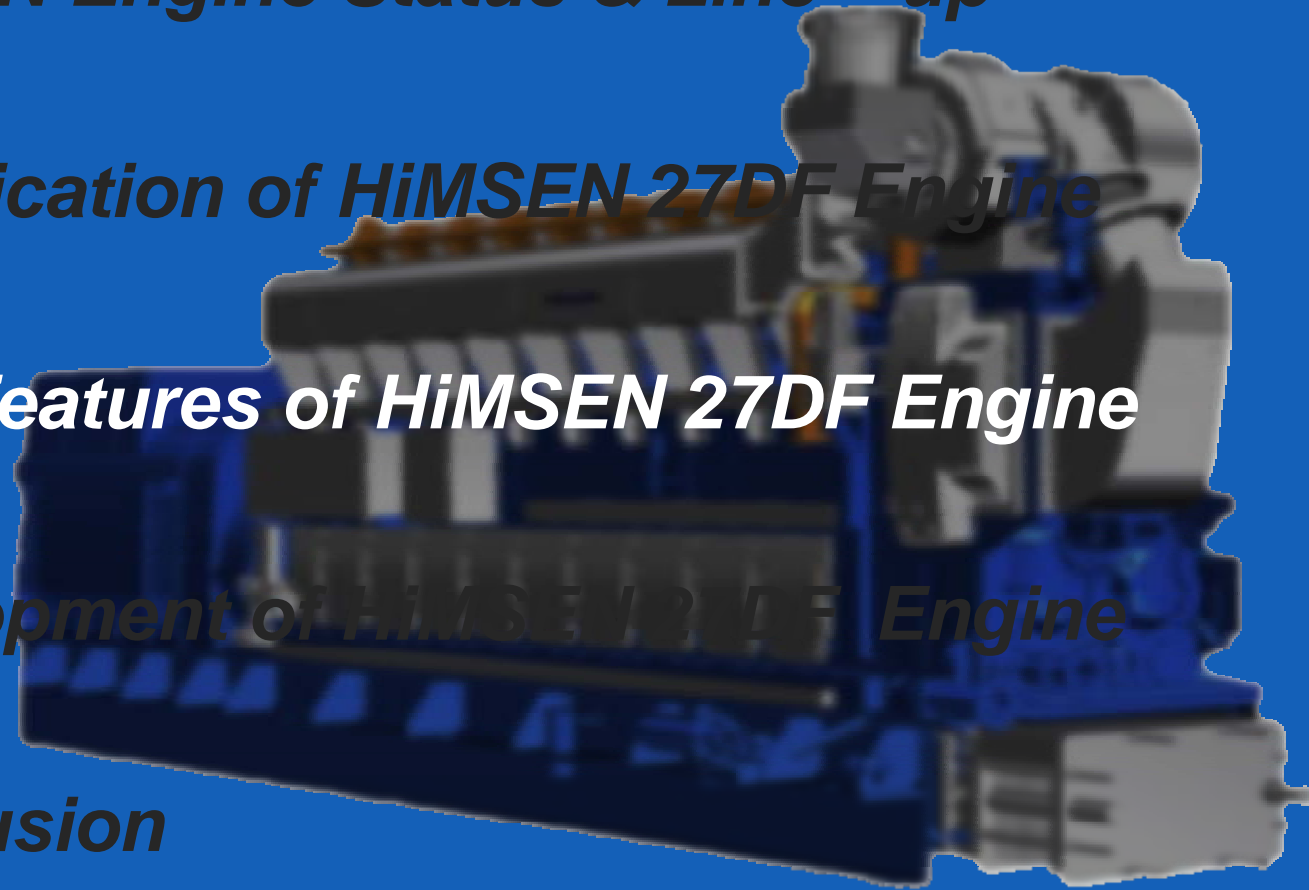
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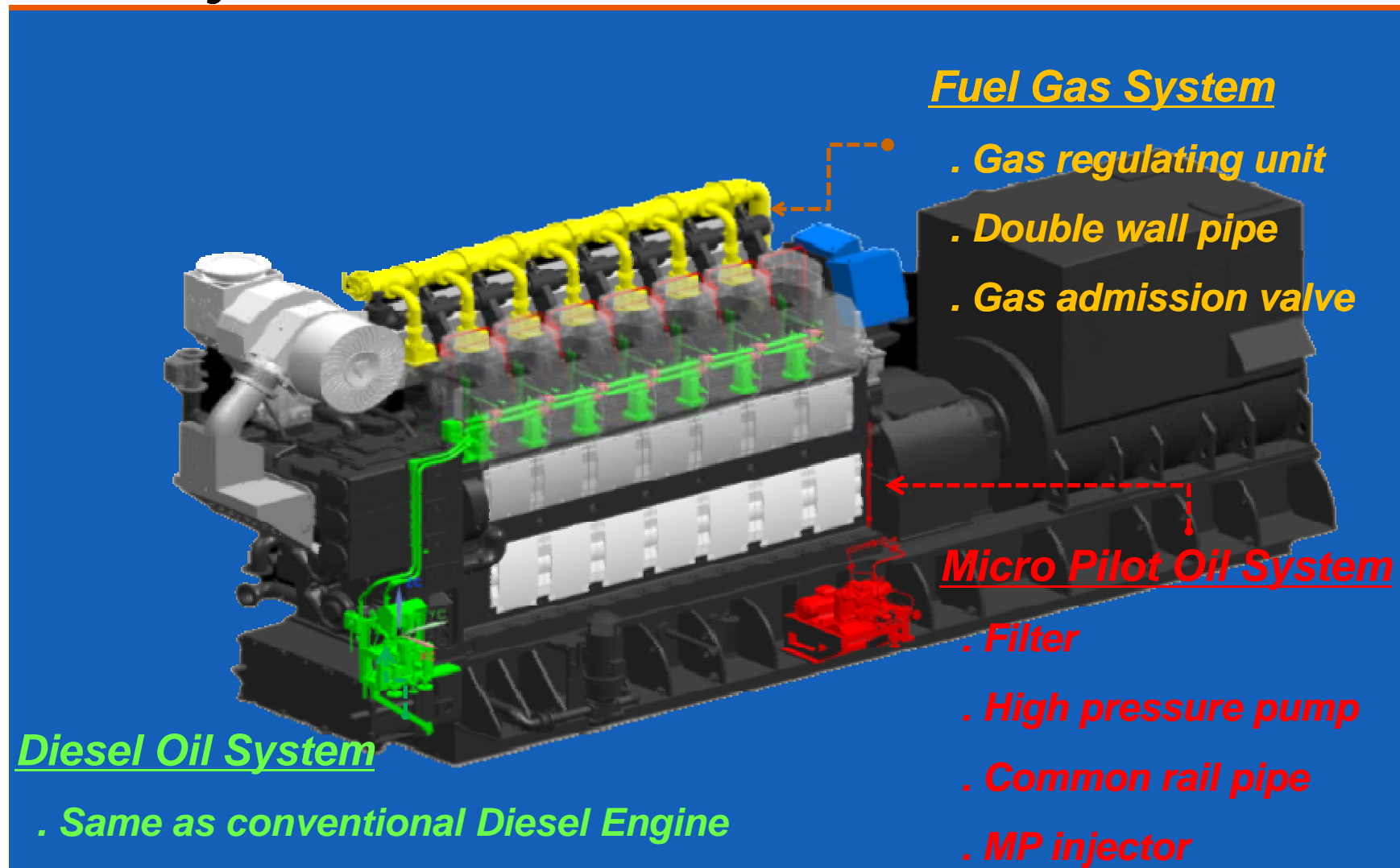
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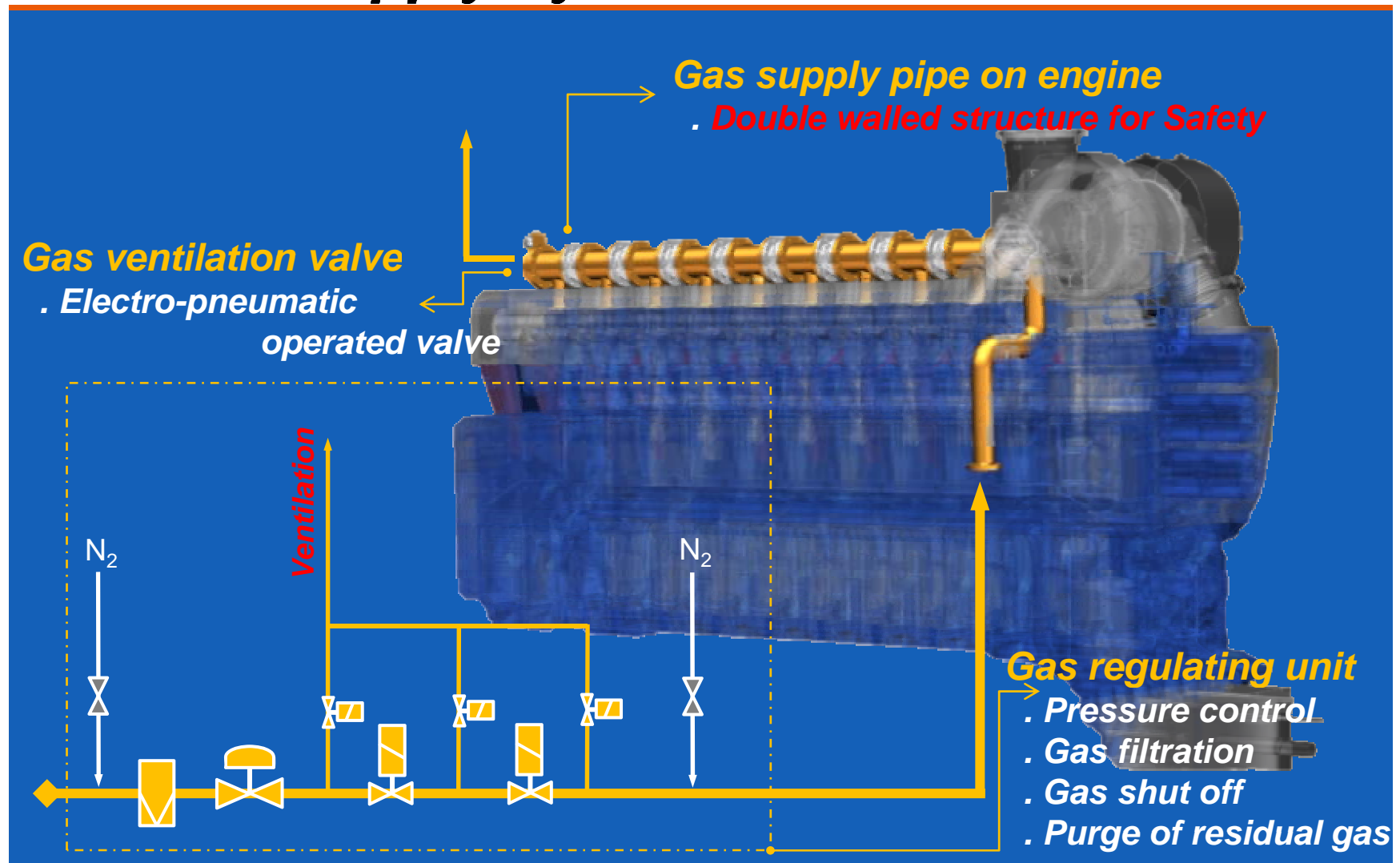


## Fuel System





# Fuel Gas Supply System







## Exhaust Gas System

### Latest turbocharger with high pressure ratio

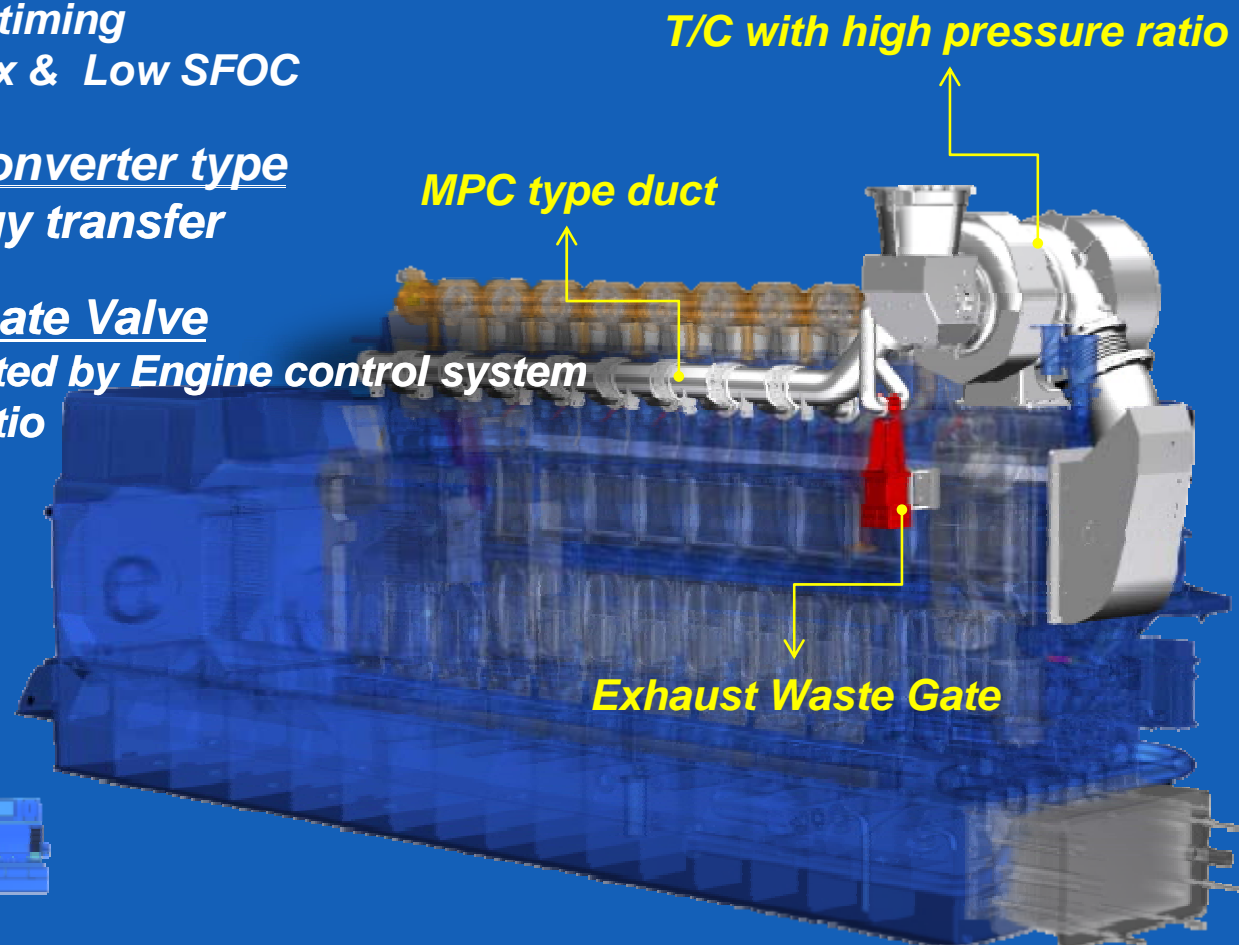
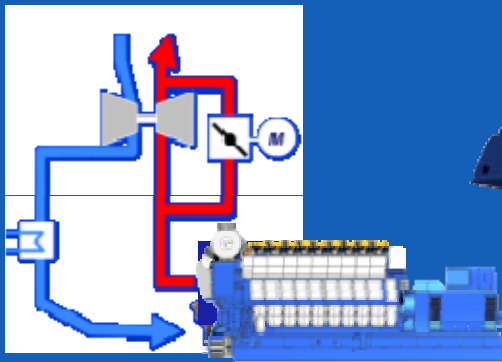
- . Enhanced miller timing
- . Reduction of NOx & Low SFOC

### Modular Pulse Converter type

- . Effective energy transfer

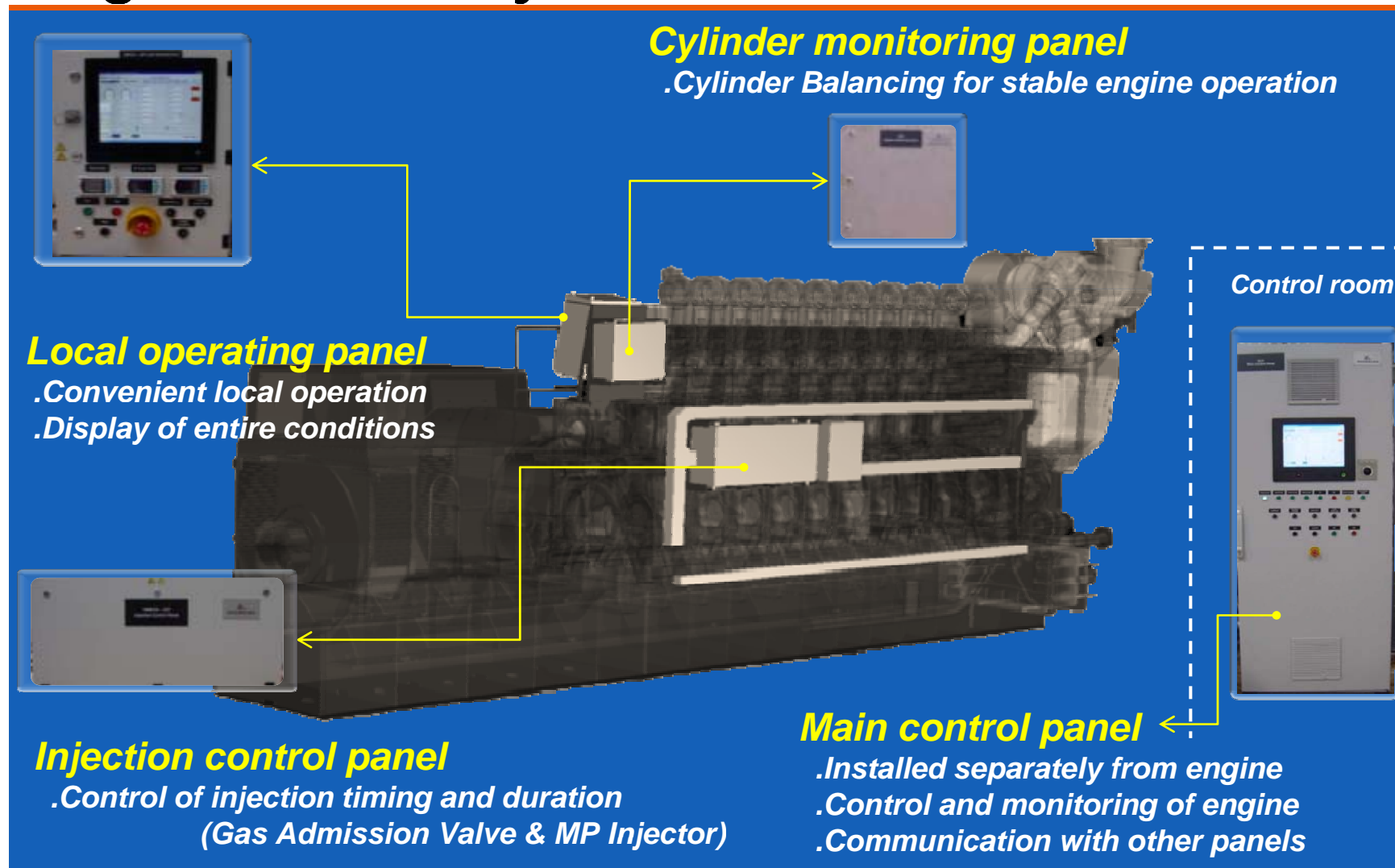
### Exhaust Waste Gate Valve

- . Wastegate adjusted by Engine control system
- . Control of A/F ratio





# Engine Control System



## **Contents**

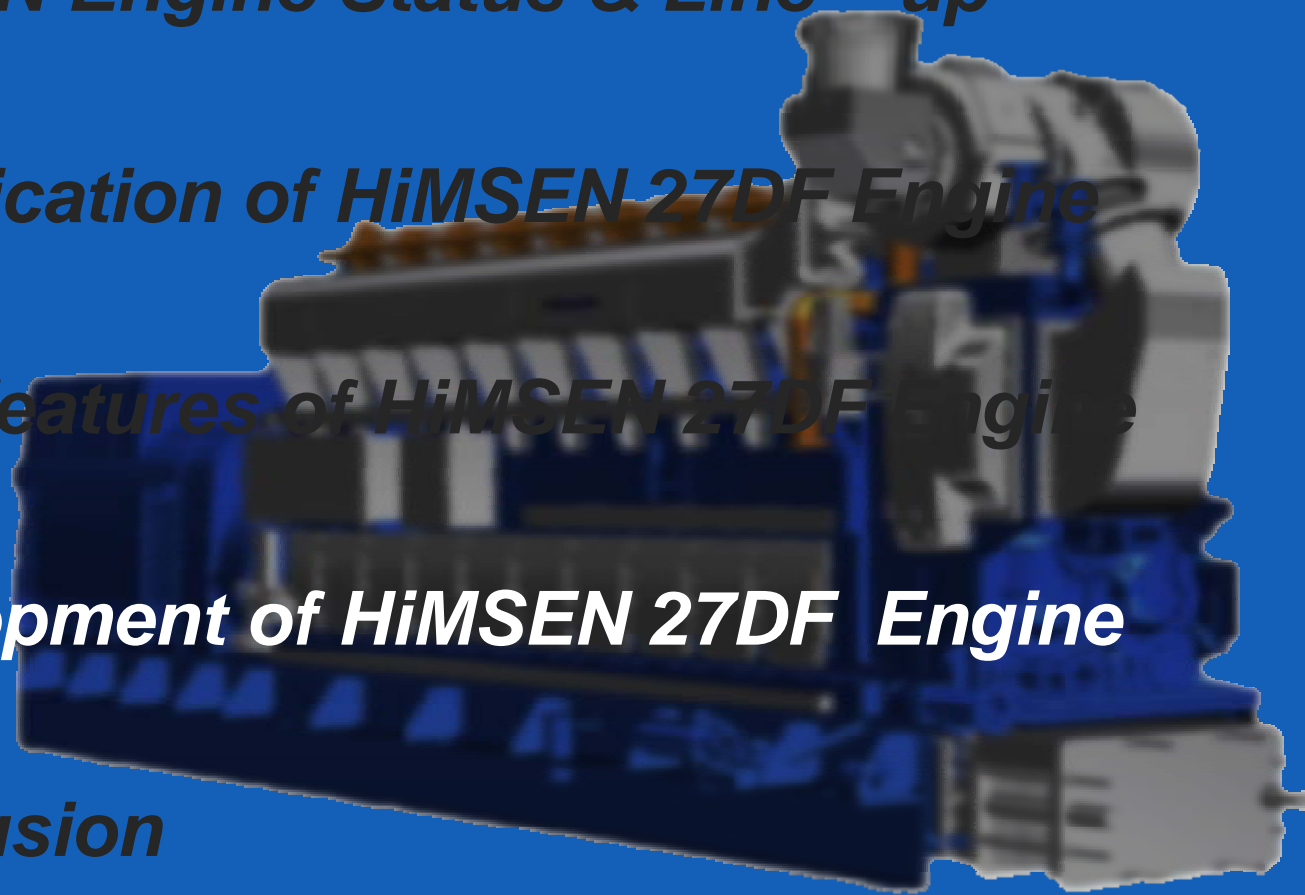
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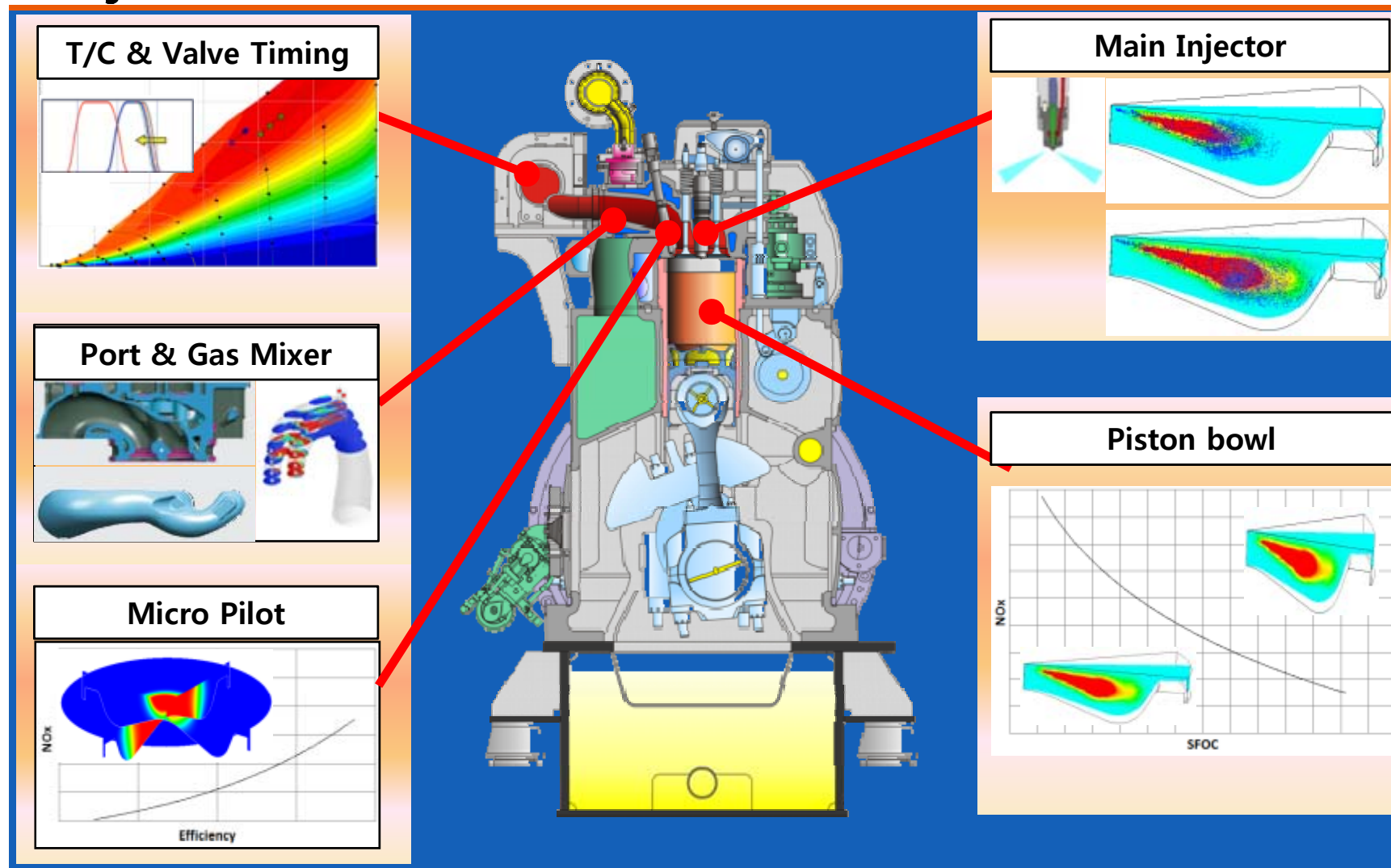
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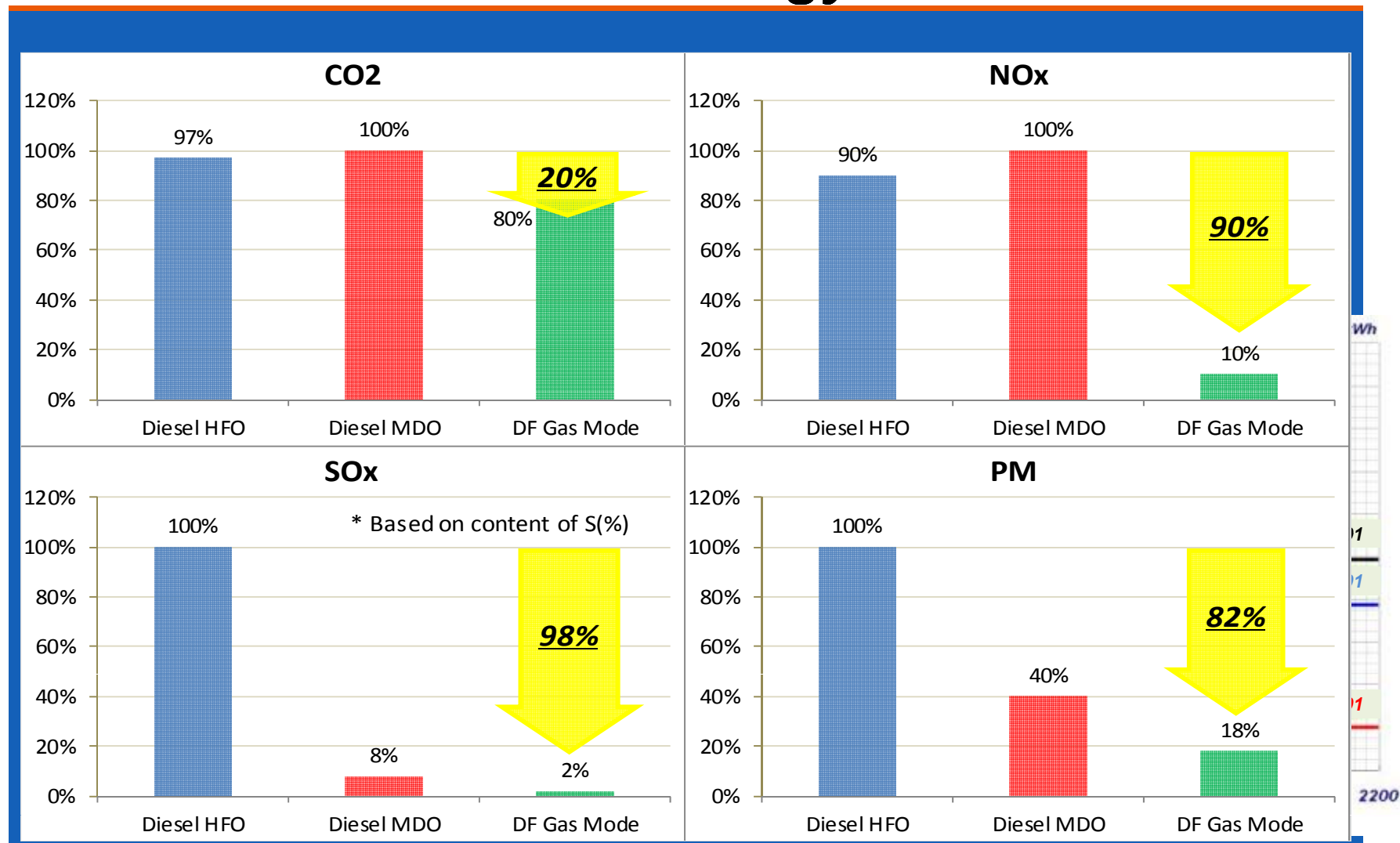


# Major Combustion Parts





# Emission Control Technology





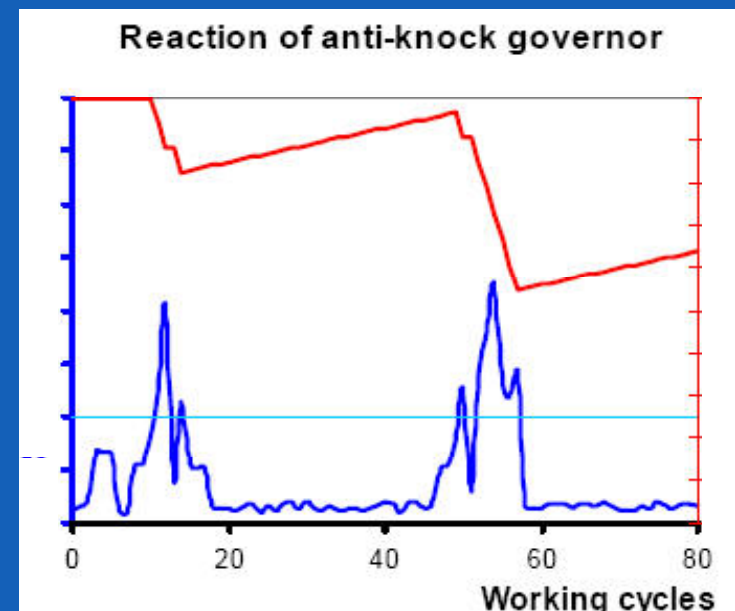
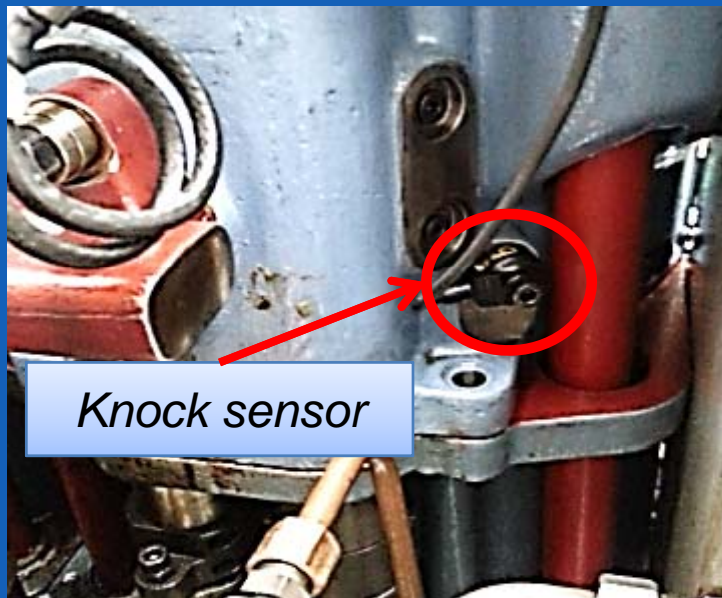




## Main Technology (Knocking Control)

### Anti-Knocking Governor

- . Knock governing test for protecting the engine from unusual combustion
- . The optimized position of knock sensor
- . Individual injection timing retarded on the knock cylinder



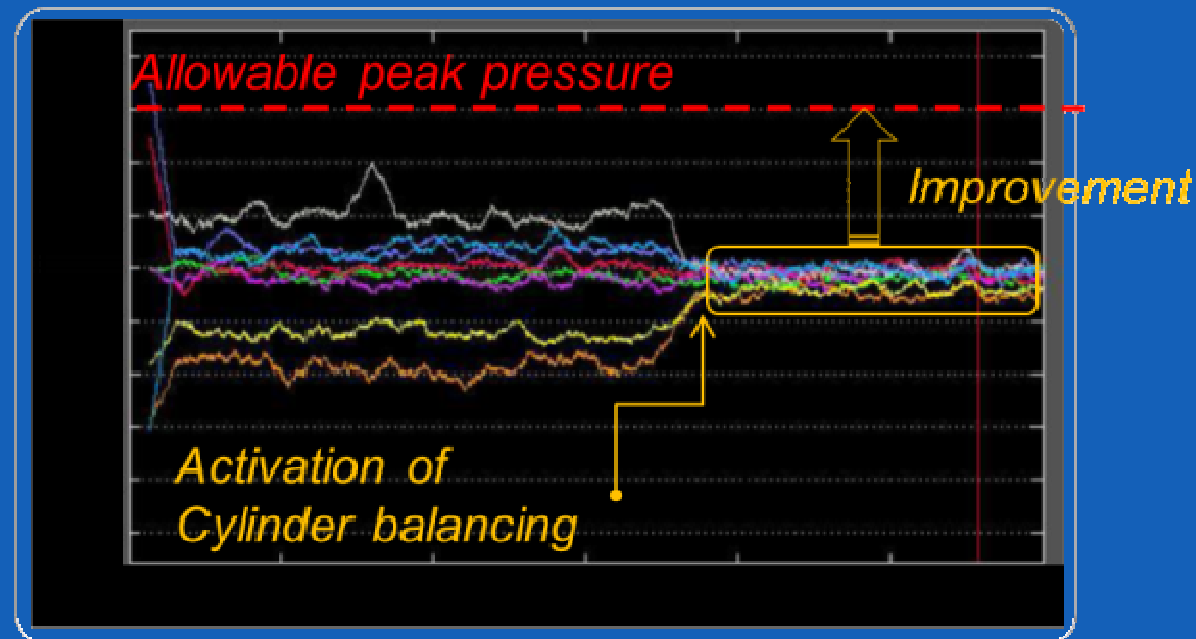


## Main Technology (Cylinder Balancing)

### Cylinder Balancing Control

- . Exhaust gas temp. balancing
- . MEP Balancing
- . Peak firing pressure balancing

**Peak firing pressure balancing**



**[Peak pressure after cylinder balancing]**



## Fuel Changeover

### Diesel to Gas

- . Gas leakage test is carried out in advance
- . About 2 Min. including a leakage test

### Gas to Diesel

- . Just 1 sec. (immediate operation)
- . Automatic change in an emergency condition

**Without Power de-rating  
& Speed interruption**





# ***Type Approval Test for H27DF Engine***

***Type approval test for H27DF***

***September 23<sup>rd</sup> ~26<sup>th</sup>, 2014***

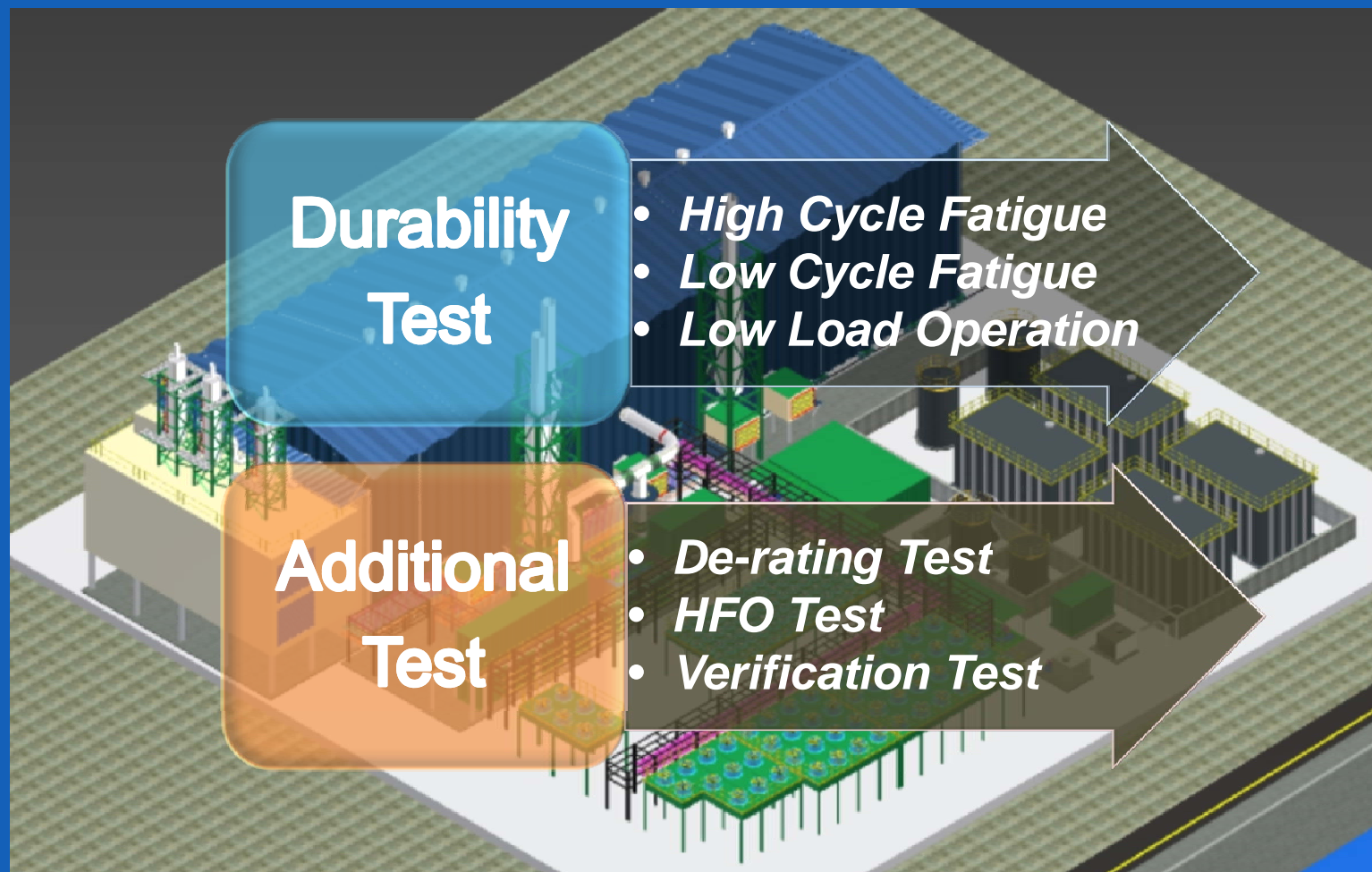
***Class : CCS, ABS, BV, DNV-GL, LR, NK, KR, RINA***







## ***Durability Test***



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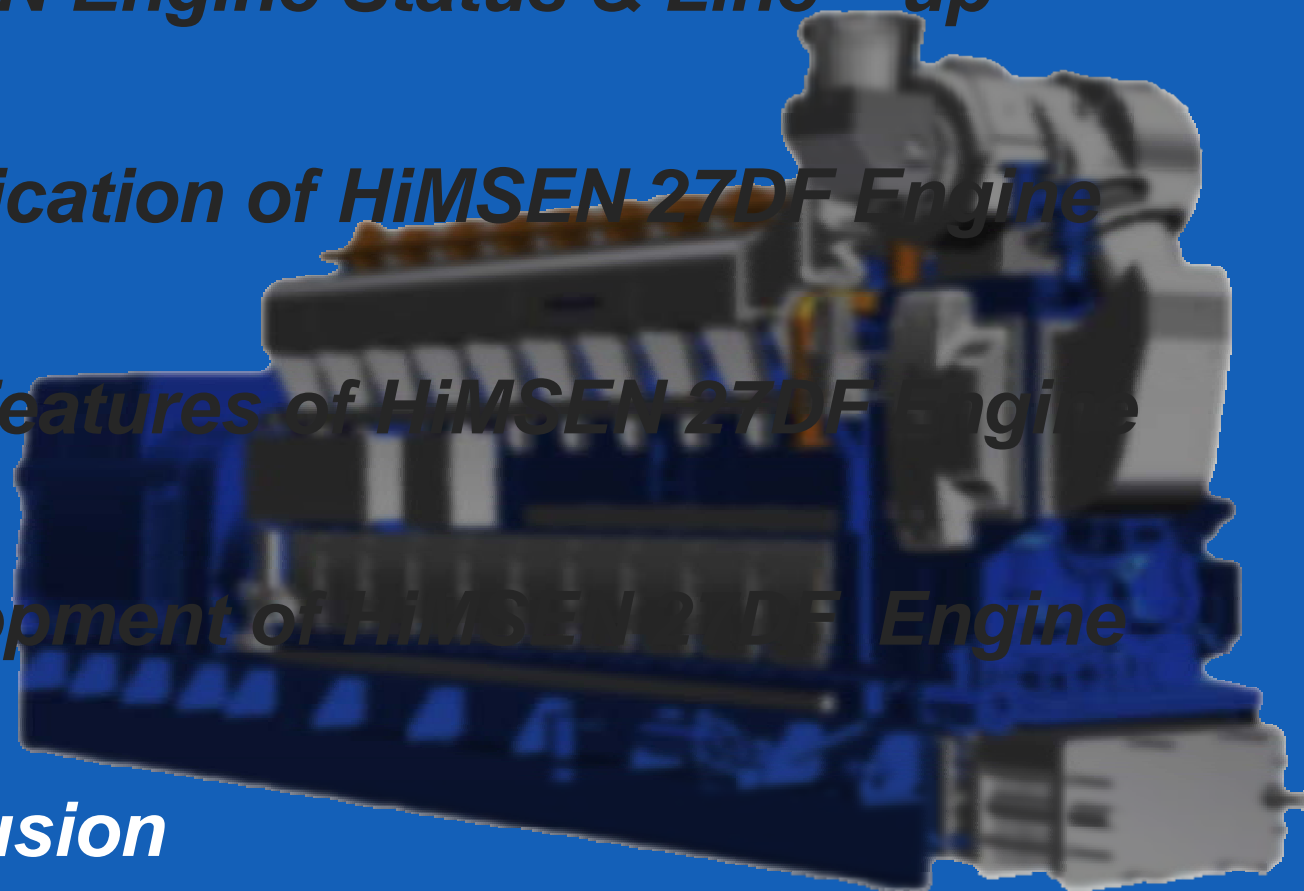
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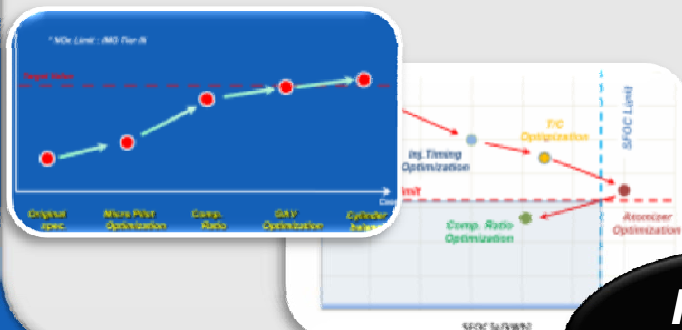




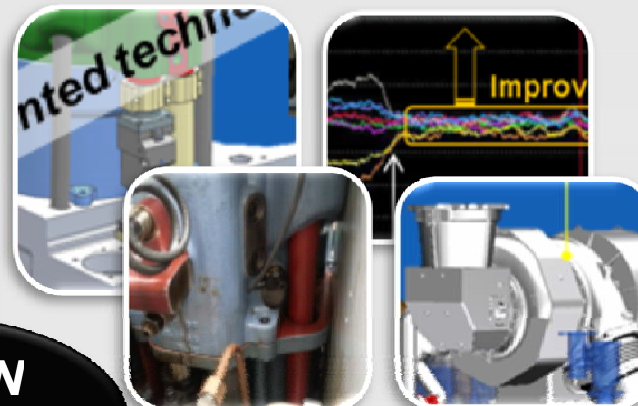
## Conclusion

✓ IMO Tier II and Tier III

✓ High efficiency



✓ State-of-the-art Technology



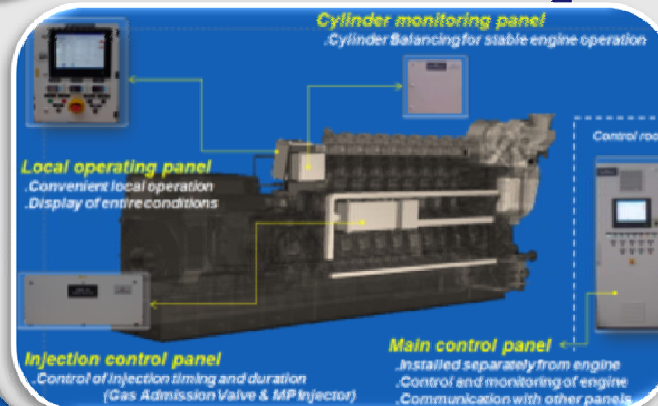
**HIMSEN**  
**H27DF**

✓ Proven Components

| As is | modified | added |
|-------|----------|-------|
| 50 %  | 40 %     | 10 %  |



✓ Customized ECS Design





**CIMAC**

THE INTERNATIONAL COUNCIL ON COMBUSTION ENGINES

**HIMSEN**

# *Thank you !!!*

## **Q & A**

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