MLIT
Ministry of Land, Infrastructure, Transport and Tourism

ClassNK
R&D PROJECT

KOBELCO
旭海運株式会社
ASAHI SHIPPING CO., LTD.

Using Binary Cycle Power Generation System to Save Energy During Slow Steaming

Micorbinary

Microbinary

Based on world top class KOBELCO Screw compressor technology

Dry screw gas compressor

Semi hermetic screw binary generator

Screw steam generator

Oil free screw air compressor

Screw steam compressor

Oil flooded screw air compressor

Screw heat pump

Screw heat pump

Screw refrigeration compressor

Development Target

- Make additional electricity for environmental equipment by binary system and also decrease CO2 gas.

- **Background**
- Several equipment for environmental conservation are added and electricity demand increase. And operate additional diesel engine generator to make this additional electricity

- **Save fuel of diesel engine generator and decrease CO2 gas by binary system Instead of additional generator operation**

Main Target for saving energy and environmental conservation

Unload main engine operation condition

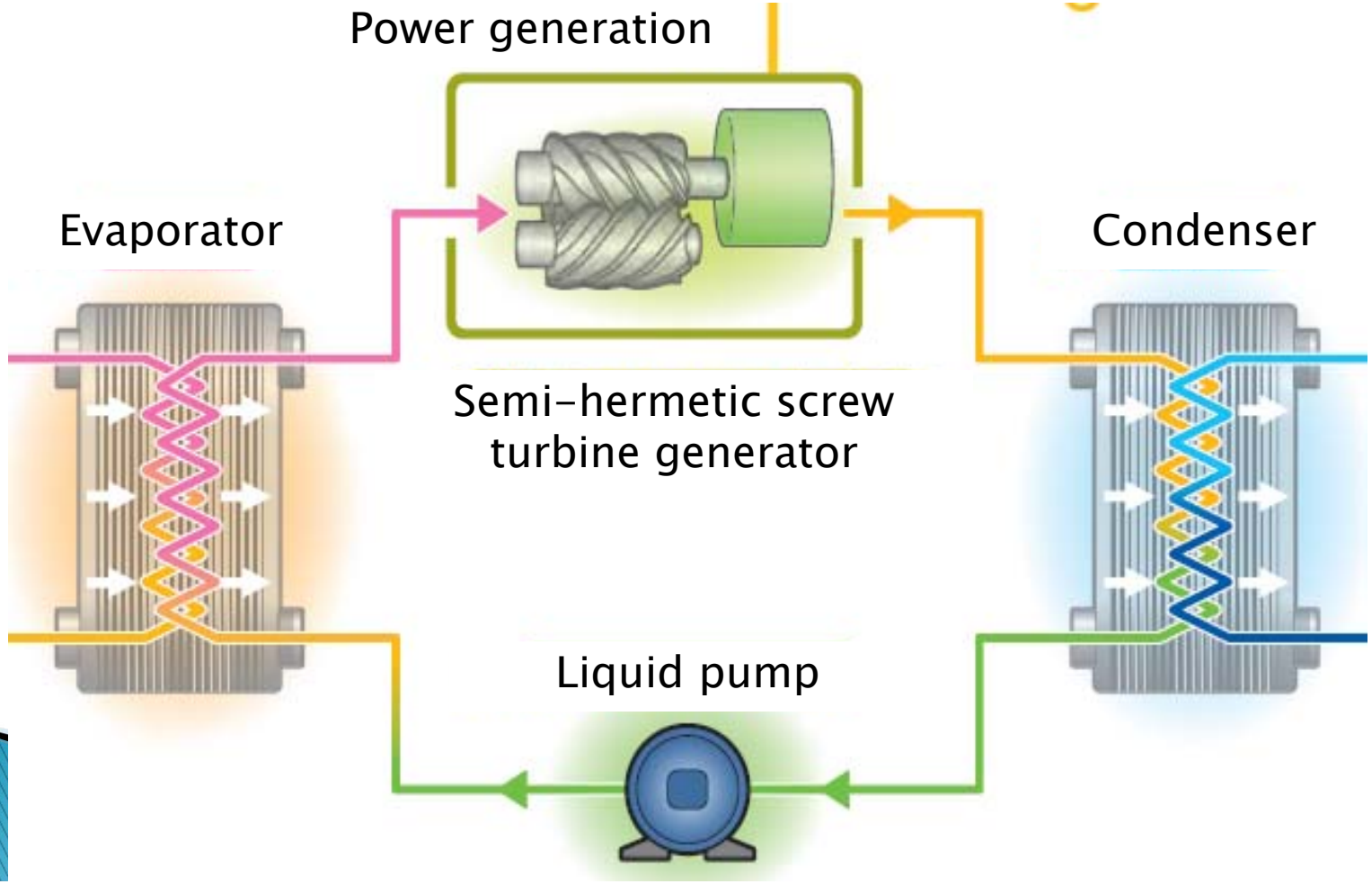
- Power consumption of additional blower for main engine= about 100kW

For new environmental conservation

- Nox Tier3(EGR)= about 200kW
- Pure Sox= about 130kW
- Ballast treat system =about 100KW

KOBELCO Binary cycle power system

- Make electricity by screw turbine using low evaporating temperature refrigerant (HFC245fa)
- Binary cycle power generation is the power generation with 2 heat cycles



Development of Binary cycle power system

- Make low cost, high reliable and short delivery binary system by using other KOBELCO screw air & steam compressors, screw refrigerating machine and heat pump.

Air Compressor

Steam Compressor

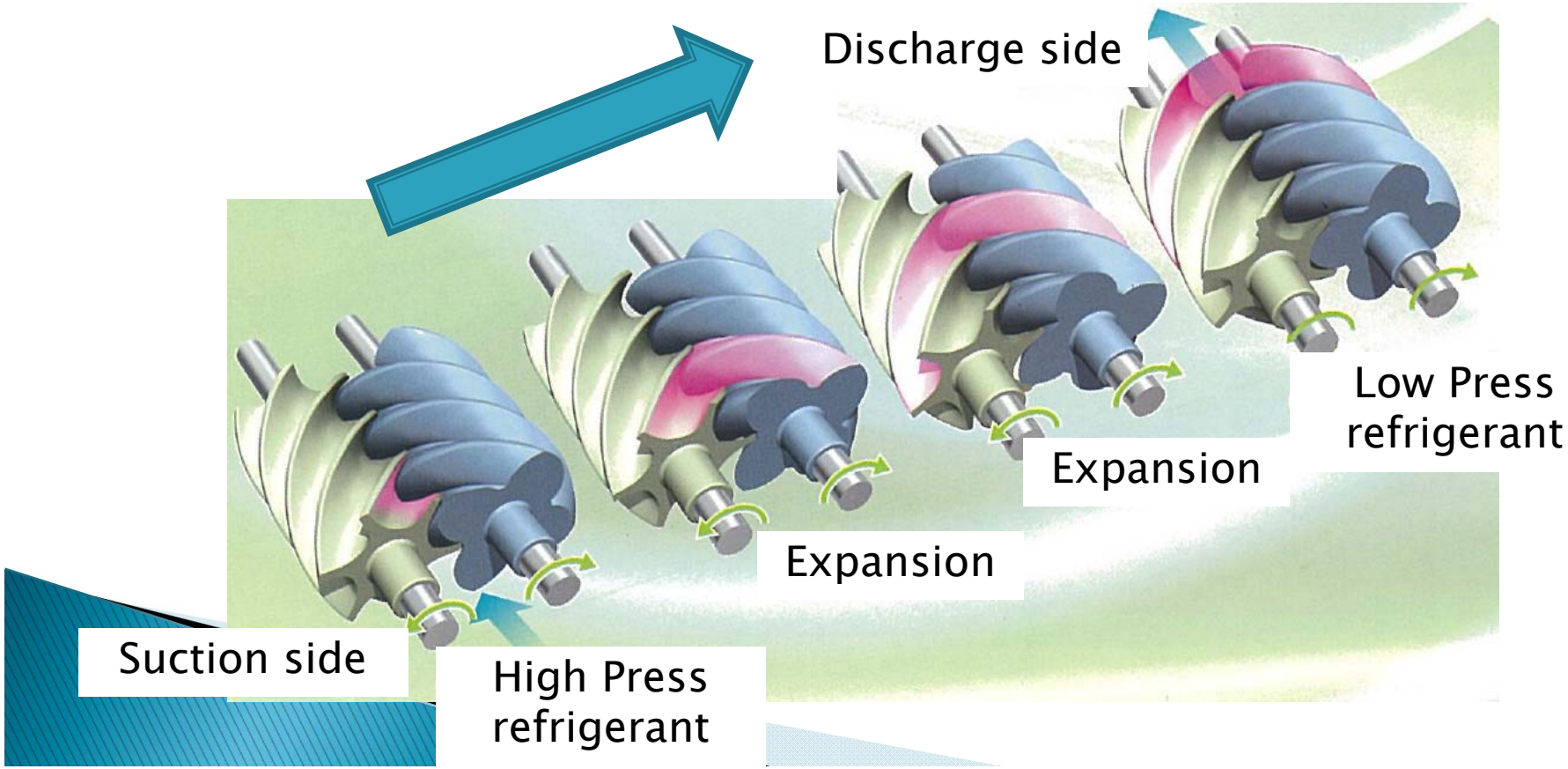
Heat Pump

Refrigeration Compressor

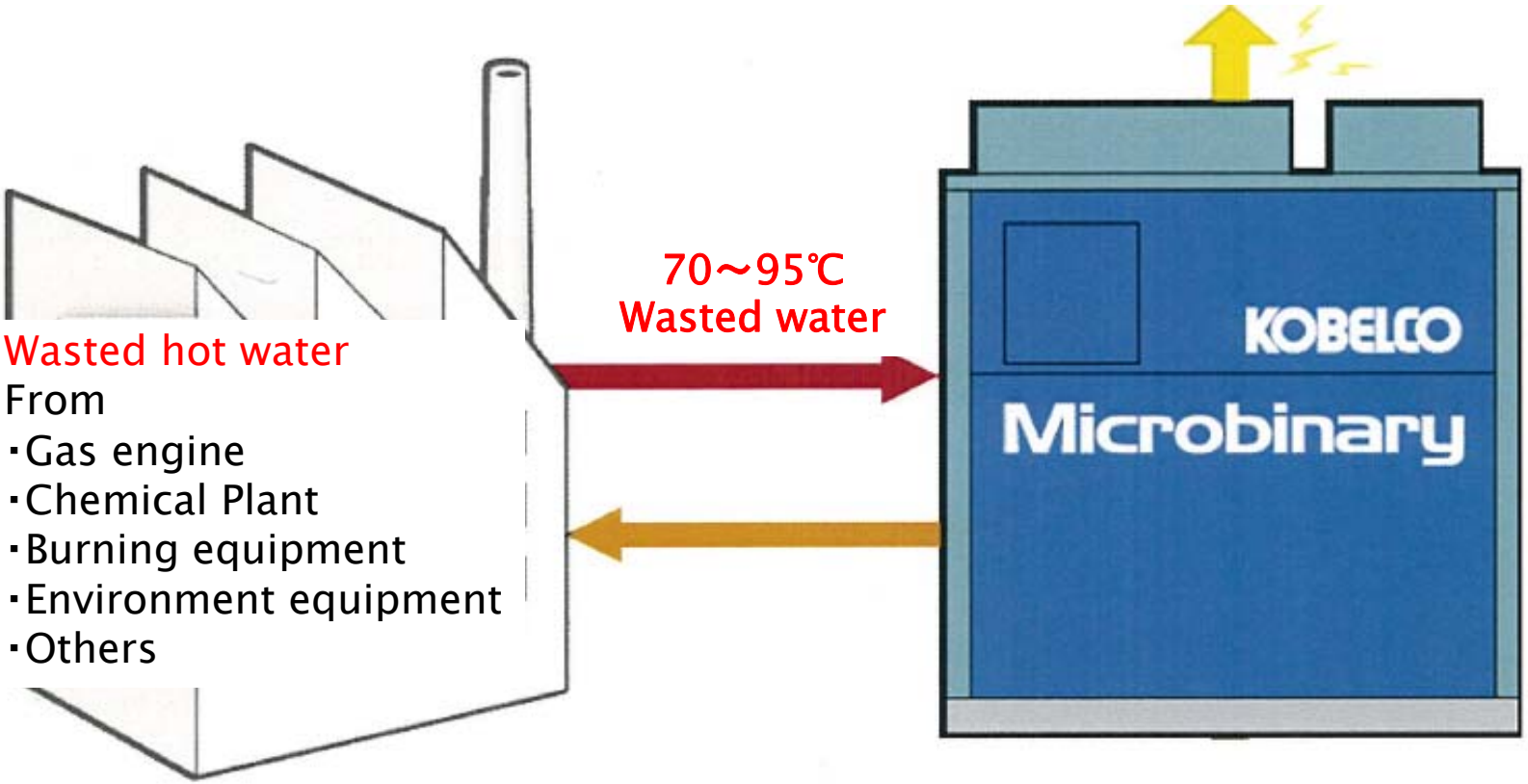
KOBELCO

Expansion process of screw turbine generator

- Advantage of screw turbine generator
- Tough machine against suction refrigerant liquid
- (Turbo machine is weak against suction refrigerant liquid)
- Better performance from unload to full load operation



Experience 1
Binary power generation system for industrial hot wasted energy

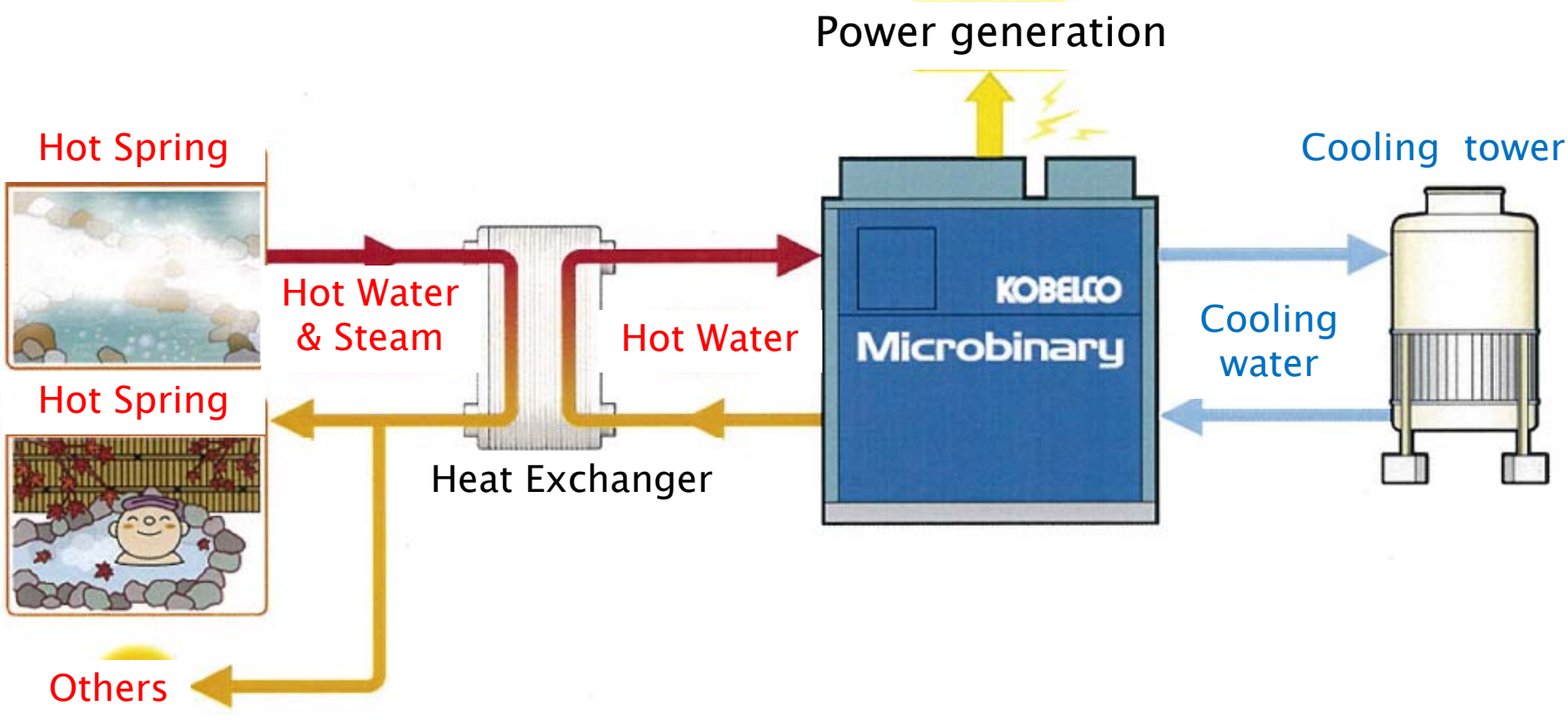


Wasted hot water
From
・Gas engine
・Chemical Plant
・Burning equipment
・Environment equipment
・Others

KOBELCO Steel Plant
KAKOGAWA Sewage Treatment Plant

垣内1　　垣内 哲也(機)回転機技術), 2013/11/19

Experience 2
Binary power generation system for hot spring water and steam



Feature

①High reliable system Same system as on shore has a lot of operation experience

②Wide range operation Include slow steaming

③A few simple maintenance reliable and long life system

④Safety and Reliable system almost no impact for existing system

⑤Compact and lower cost system additional installation with screw turbine

①High reliable system

Microbinary 125S (on shore)

generating out put : 125kW

steam temp : 110～130℃

refrigerant : HFC245fa

expected sound: 75dBA

dimension(mm): W2250×L3385 ×H2379

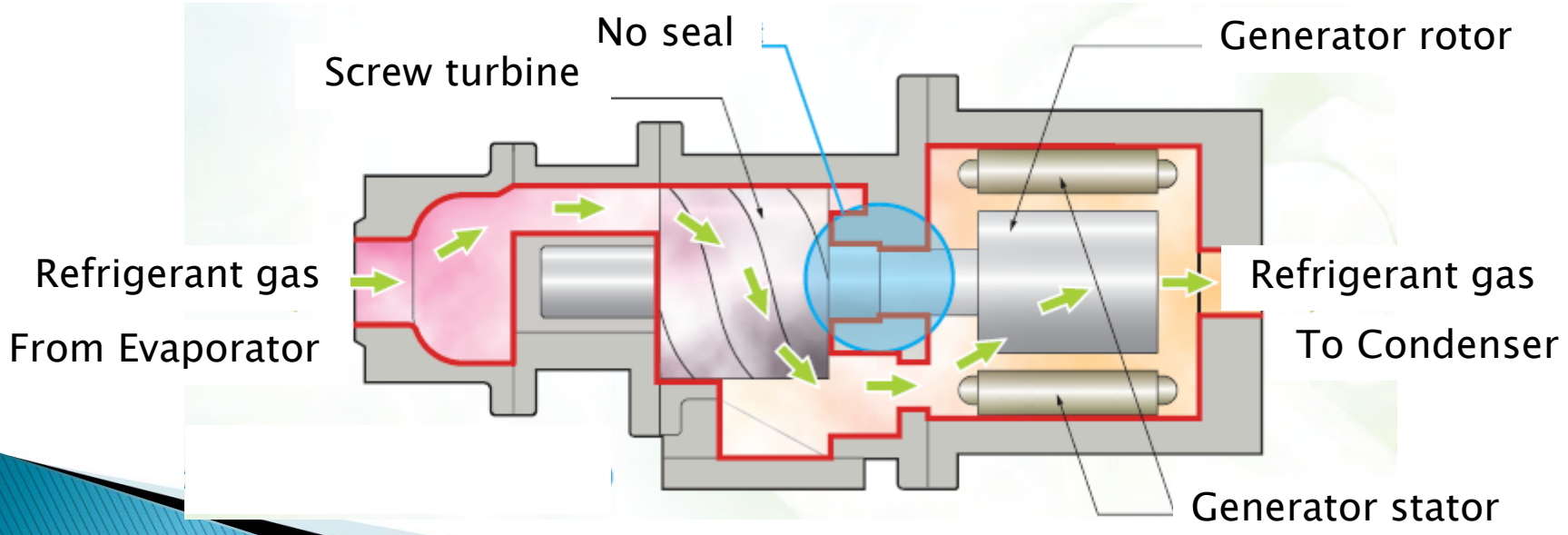
weight : 6700kg(7400kg)

Since august 2013

②Wide range operation
③A few simple maintenance

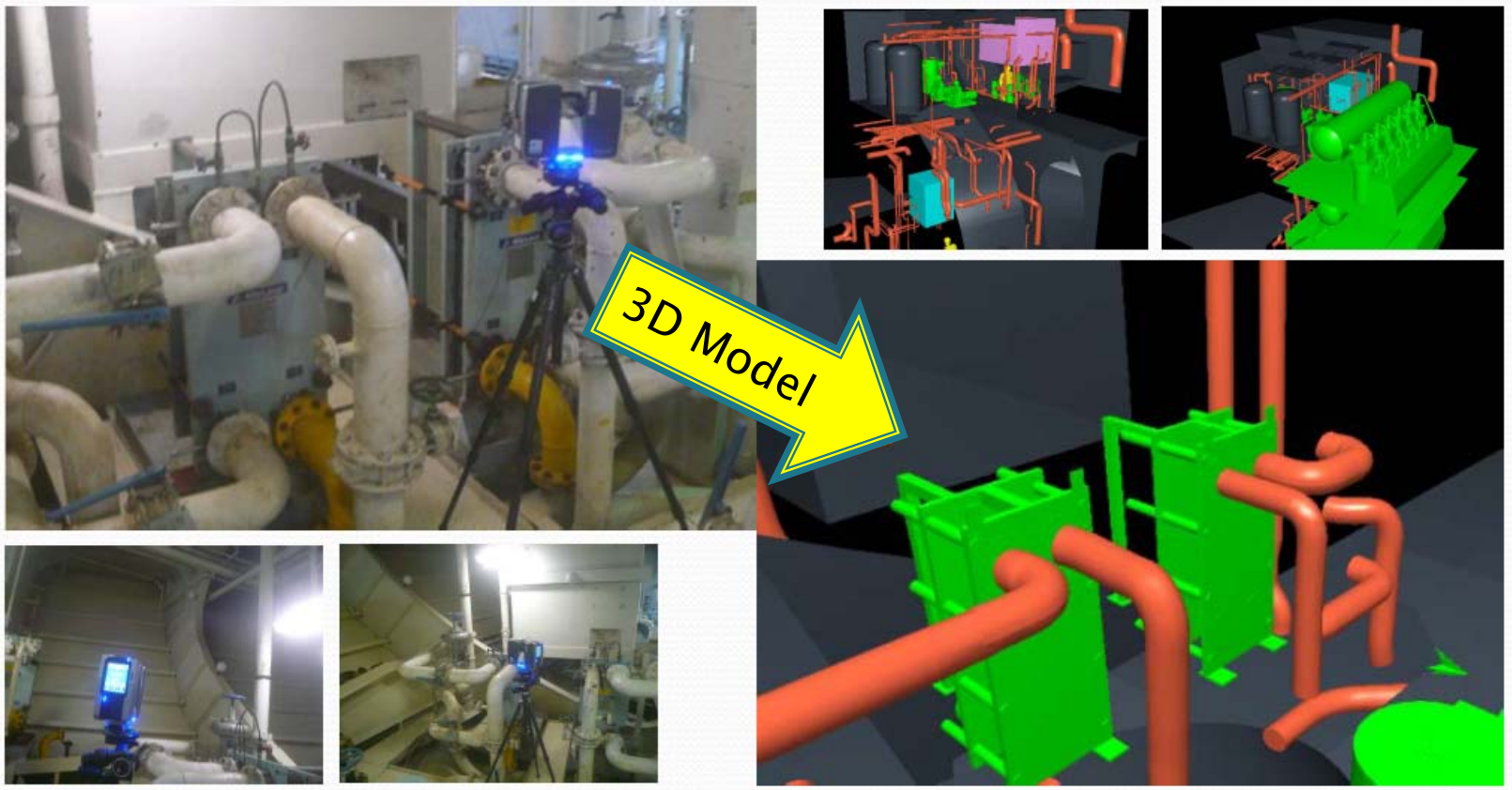
New two stage screw turbine generator

- Two stage screw turbine generator has best performance from unload to full load operation
- No gas leakage with no mechanical seal in the screw turbine generator



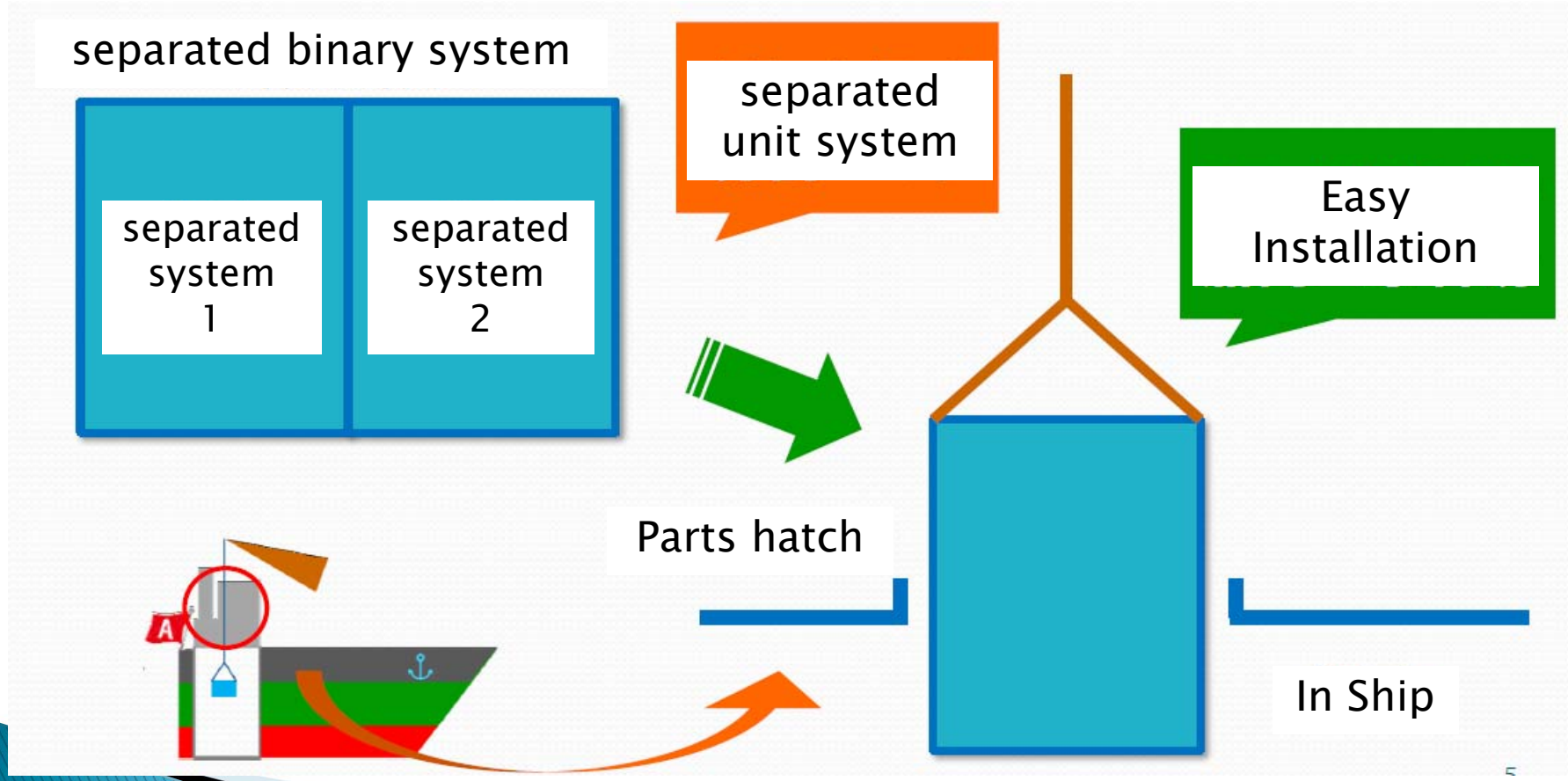
④Safety and Reliable system

- Can be used for existing ships (include older ship without original ship drawing)
- Complete engineering quickly by 3D Scanner and 3D Cad

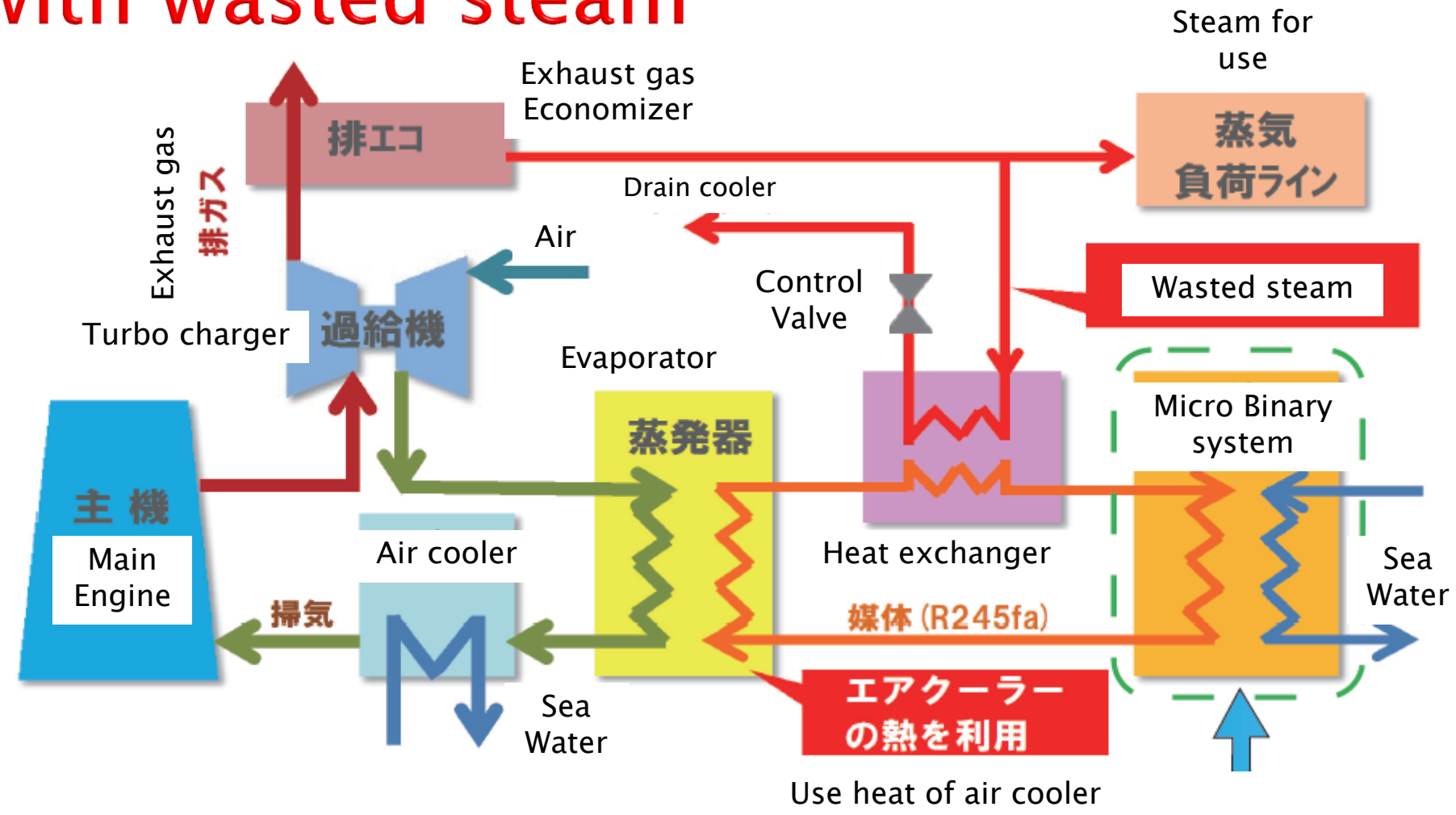


⑤Compact and lower cost system

- Can install separated small size binary system without ship modification
- Screw generator is compact and has longer maintenance life



Saving energy during slow steaming with wasted steam



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R&D project

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