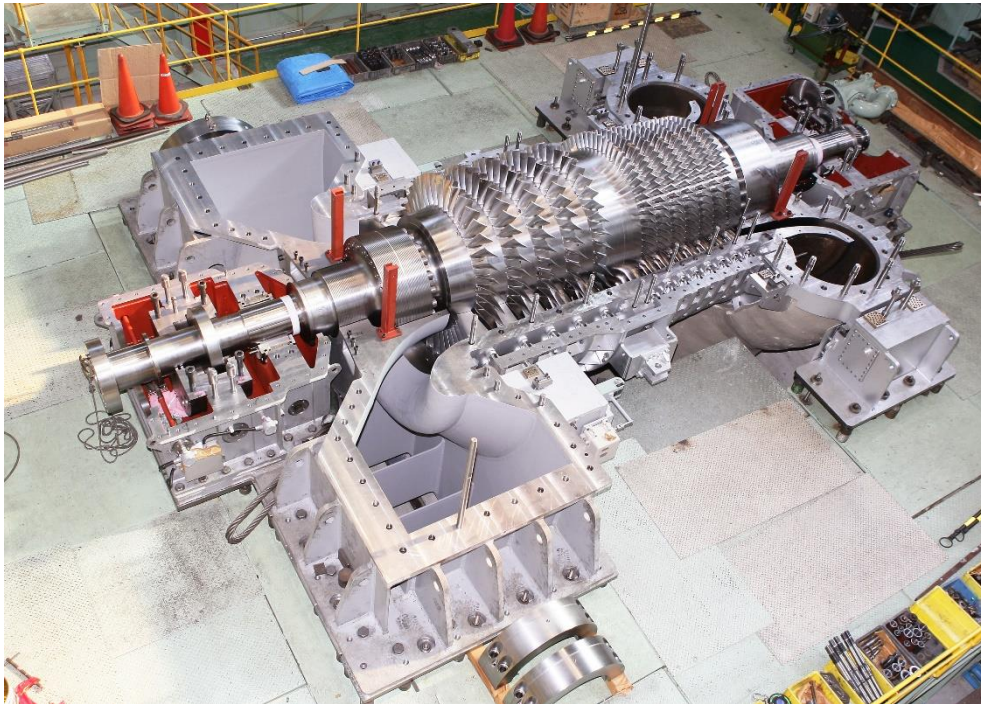


AXIAL FLOW COMPRESSOR



MITSUI E&S Co., Ltd.

The leading company as an equipment supplier, a technology supplier, and a system designer manufacturing axial flow compressor (AX) developed by our own technology.

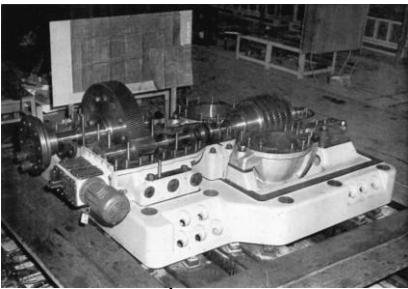
High efficiency and durability MES AX

- Total 106 units delivered.
- World largest 70MW.
- Longest life operation of 43 years.
- Easy maintenance.

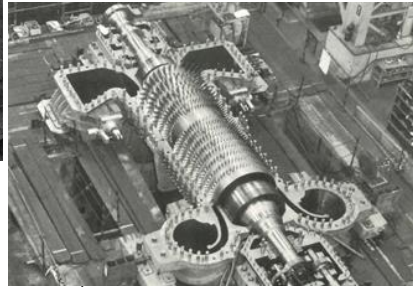
We provide customized designs to satisfy each customer demands.

Moreover, advanced after service contributes to longer life operation with the best condition after installed.

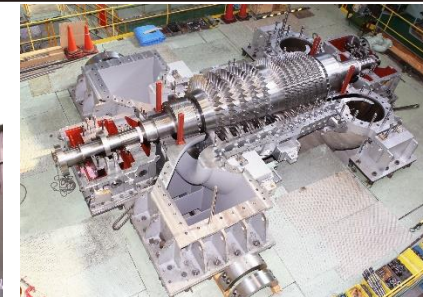
History Time Line



1972
World largest MA180
NSC Kashima

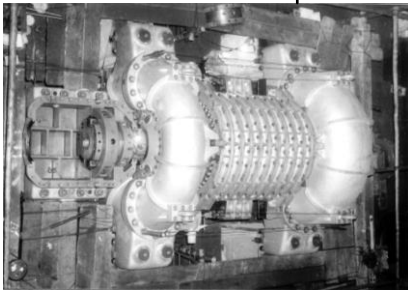
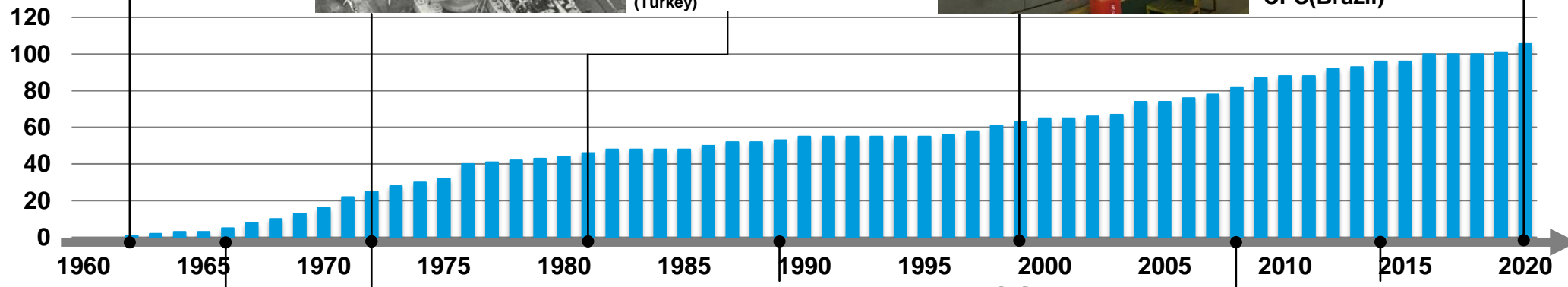


1999
MA180
NSC Kimitsu

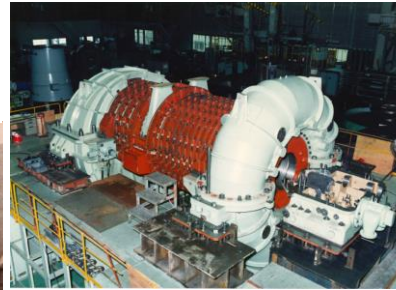
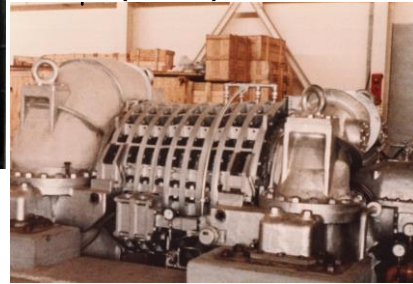


2014
MA160
CPS(Brazil)

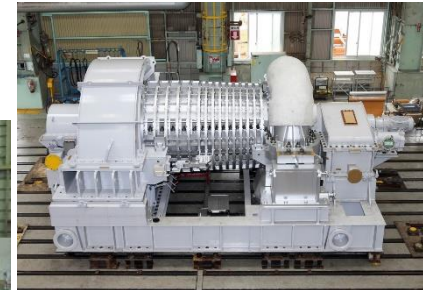
1962
First MA60
JAXA



1972
First overseas MA120
POSCO(Korea)



2008
MA180
for World largest BF
NSC Oita



2020
MA120
TATA Steel(India)

1966
MA140
JFE Steel

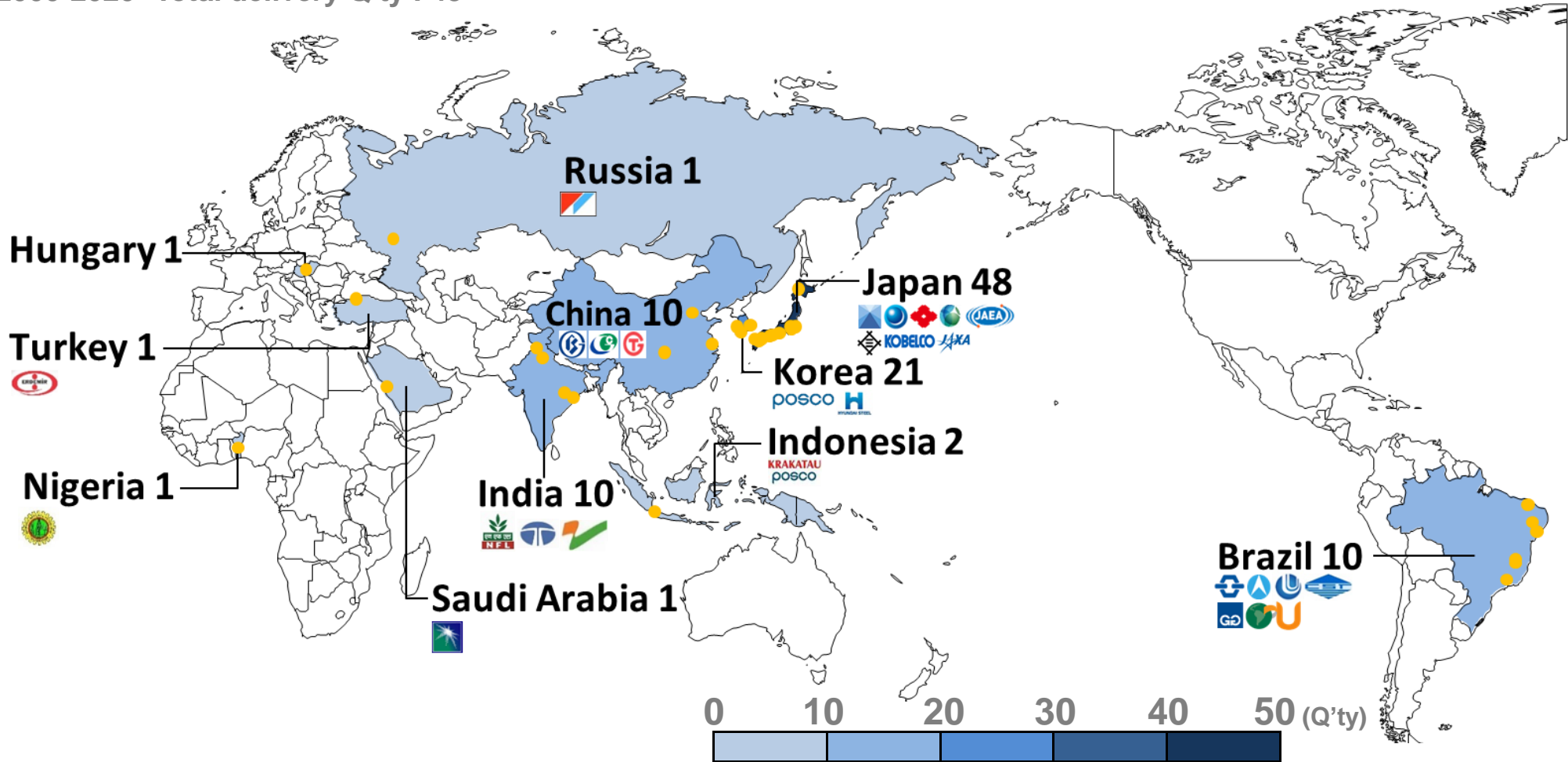
1989
MA180
Shanghai Baoshan Steel Works
(China)

Supply Record of AX for World Users

Delivery Q'ty: 106 units

1962-1999 Total delivery Q'ty : 63

2000-2020 Total delivery Q'ty : 43

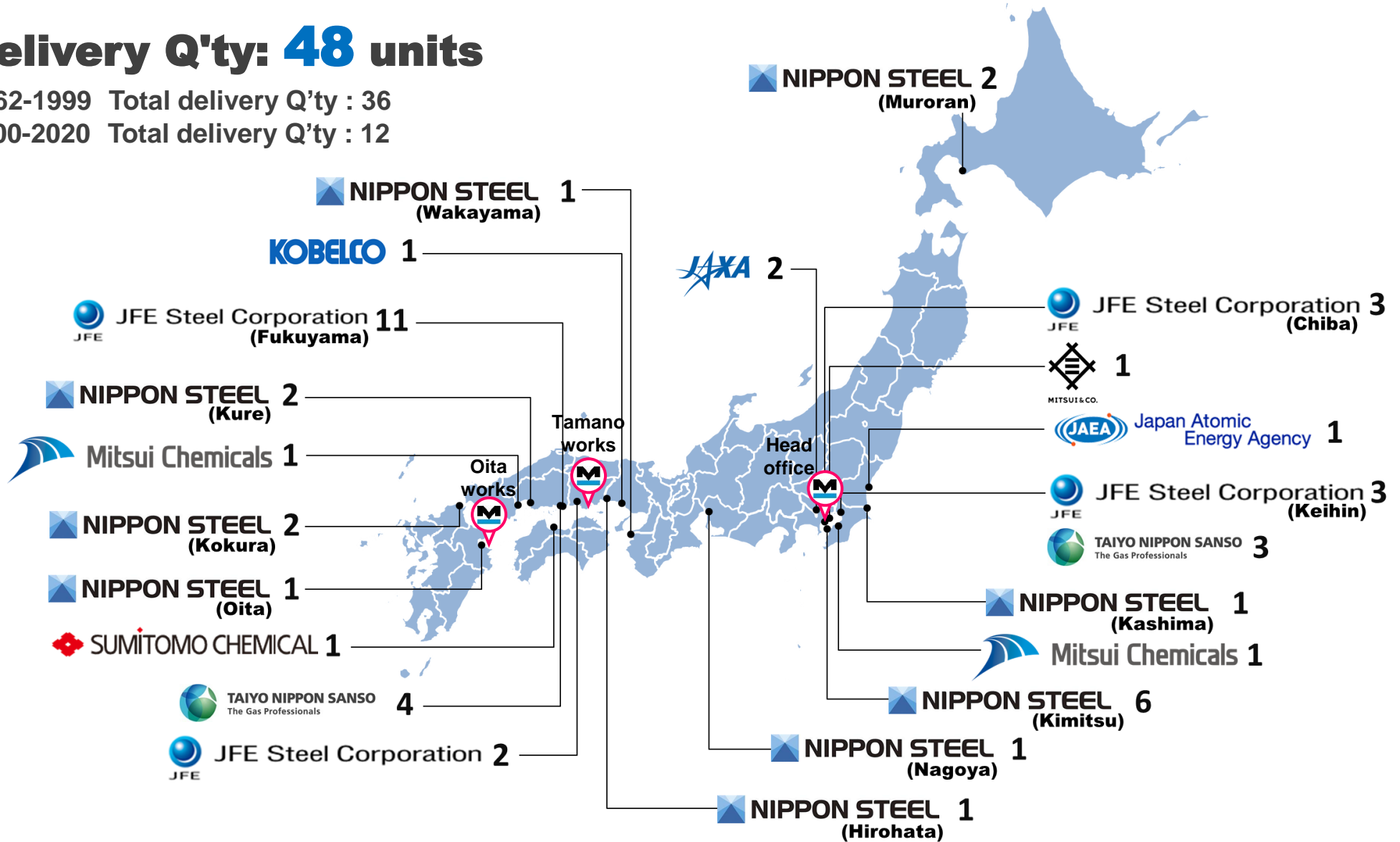


Supply Record of AX for Domestic Users

Delivery Q'ty: 48 units

1962-1999 Total delivery Q'ty : 36

2000-2020 Total delivery Q'ty : 12



Features of Axial flow compressor

1. Self-developed AX

- Diverse customer demands are satisfied with customized designs.

2. Wide operation range

- The wide operation range can be achieved with all adjustable stator blades and self-developed cascade.

3. Higher efficient operation

- 50% reaction blades and high efficiency diffuser are adopted for better performance.

4. Easy maintenance

- Horizontally split and single wall casing structure contribute to easy maintenance.

5. High durability

- High reliability due to constant speed operation enables AX to offer long life operation.

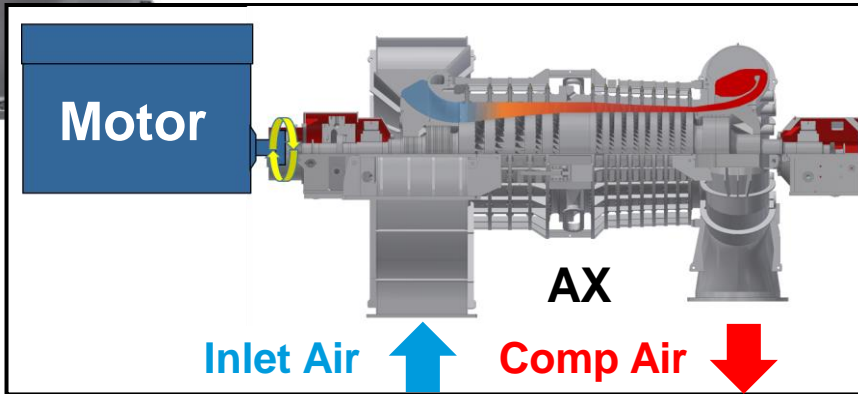
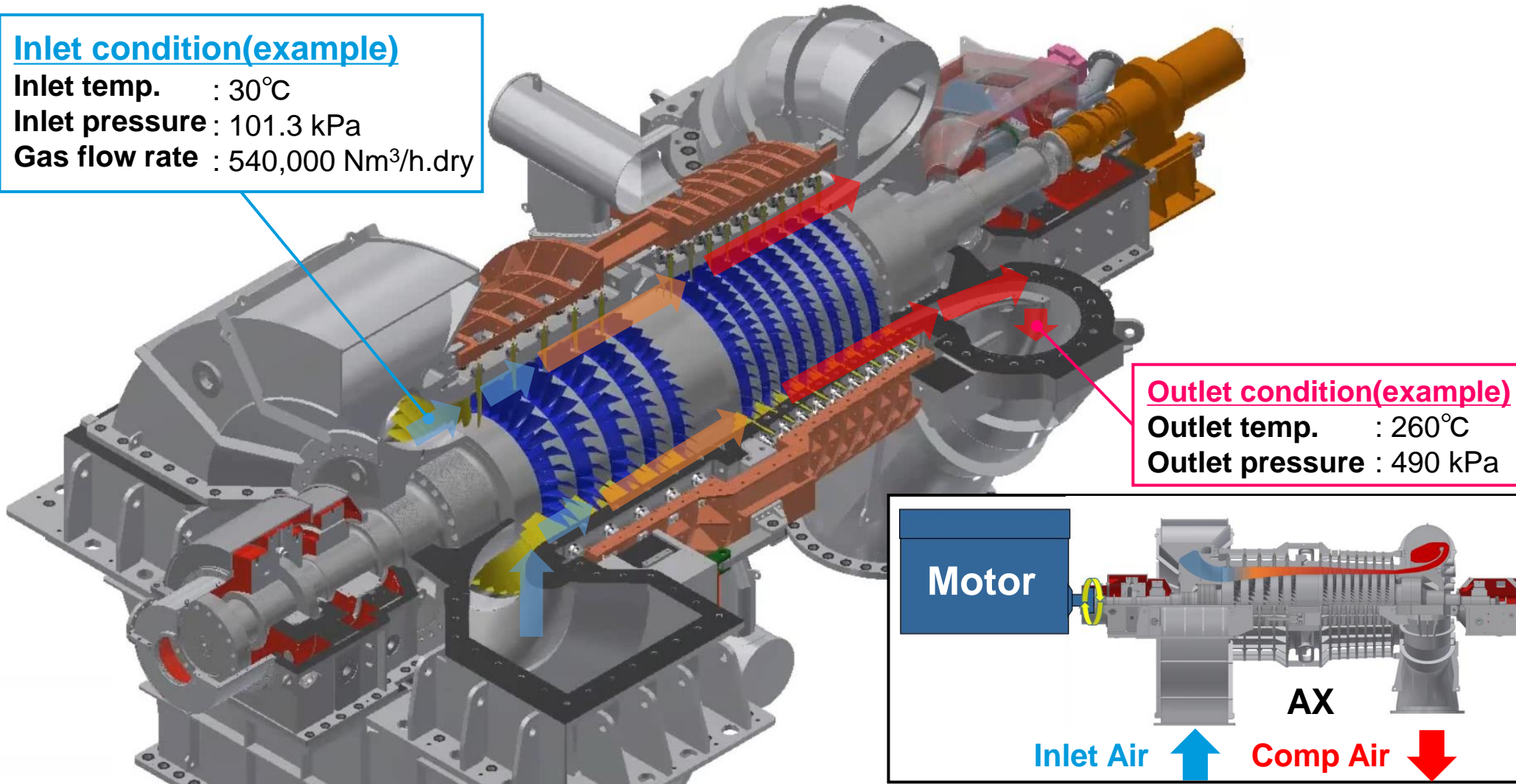
Mitsui Original Axial Flow Compressor

Inlet condition(example)

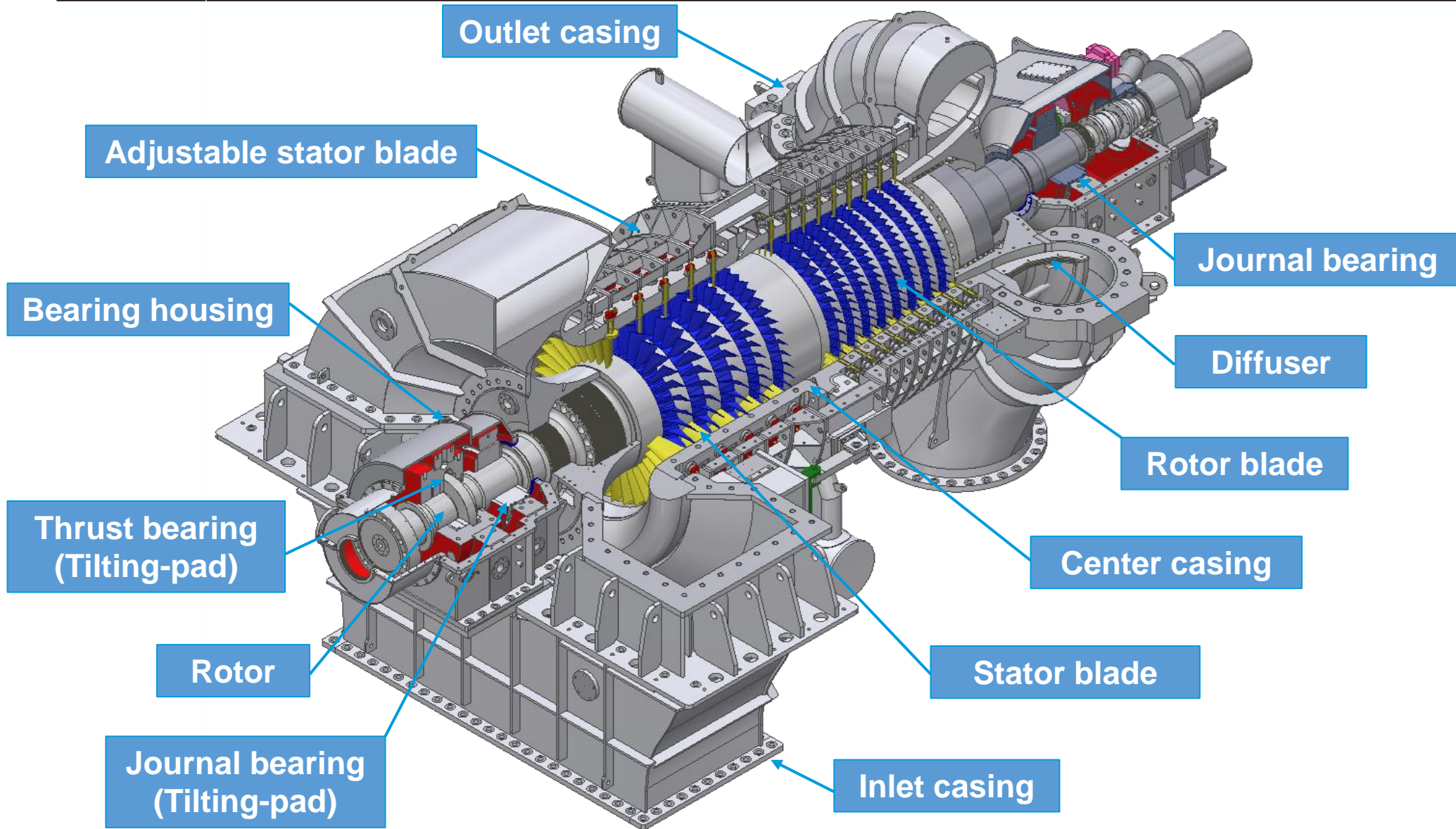
Inlet temp. : 30°C
Inlet pressure : 101.3 kPa
Gas flow rate : 540,000 Nm³/h.dry

Outlet condition(example)

Outlet temp. : 260°C
Outlet pressure : 490 kPa

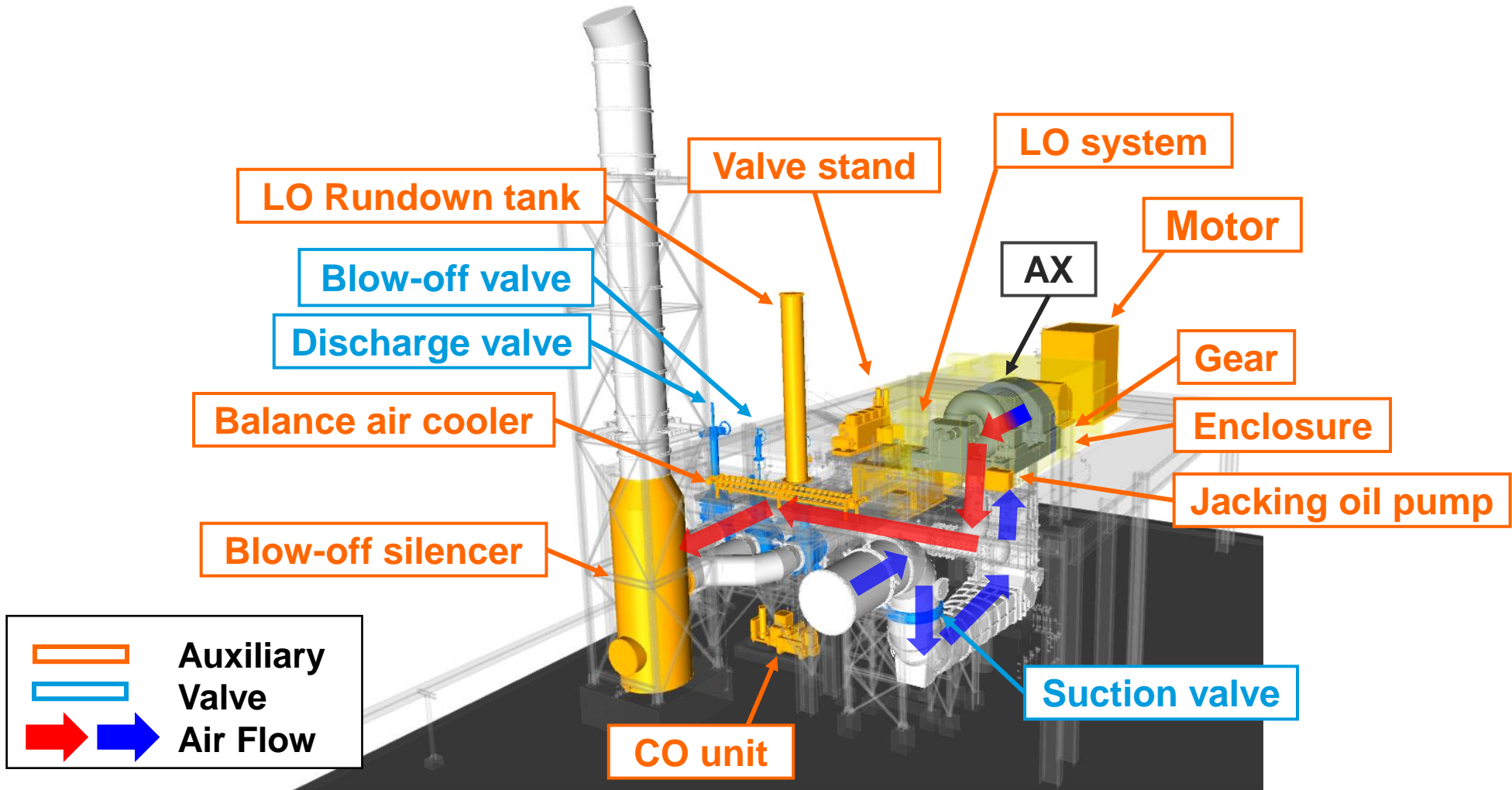


Mitsui Original Axial Flow Compressor

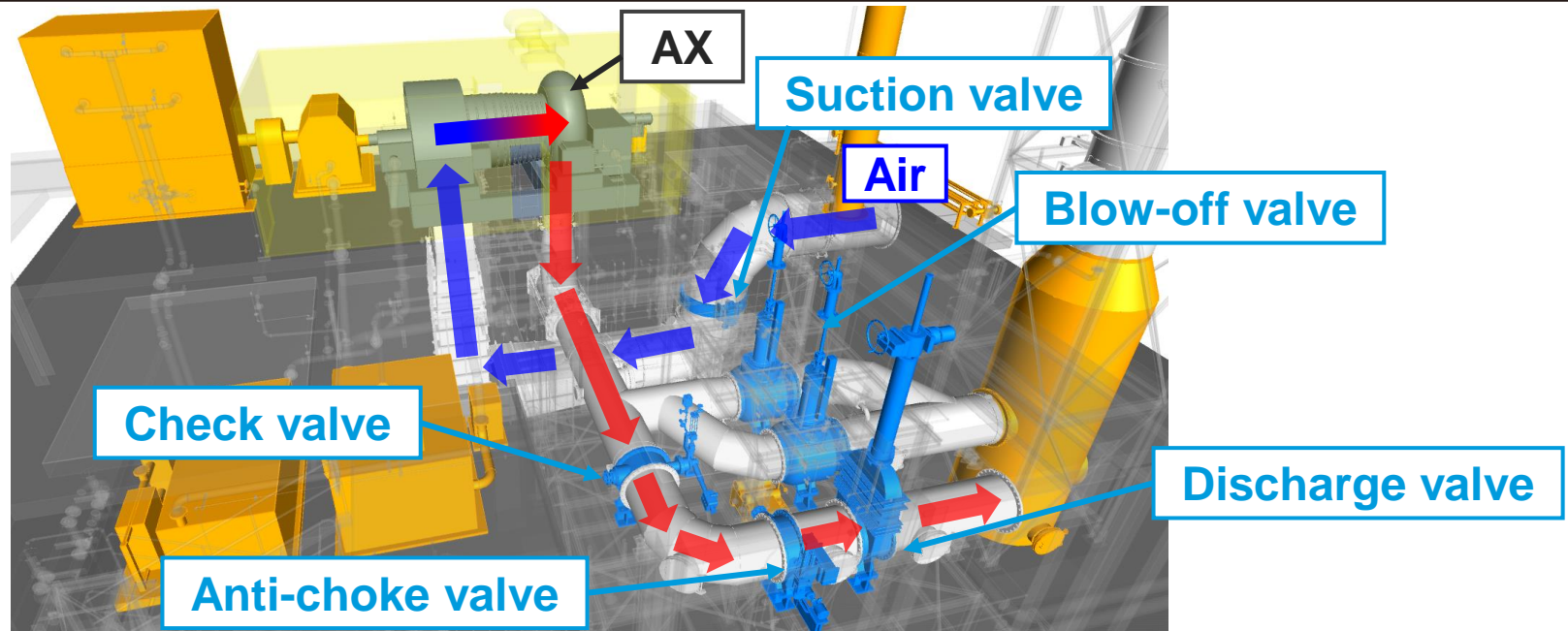


3D Installation Model

MES can propose entire plant design as well as AX design to customers

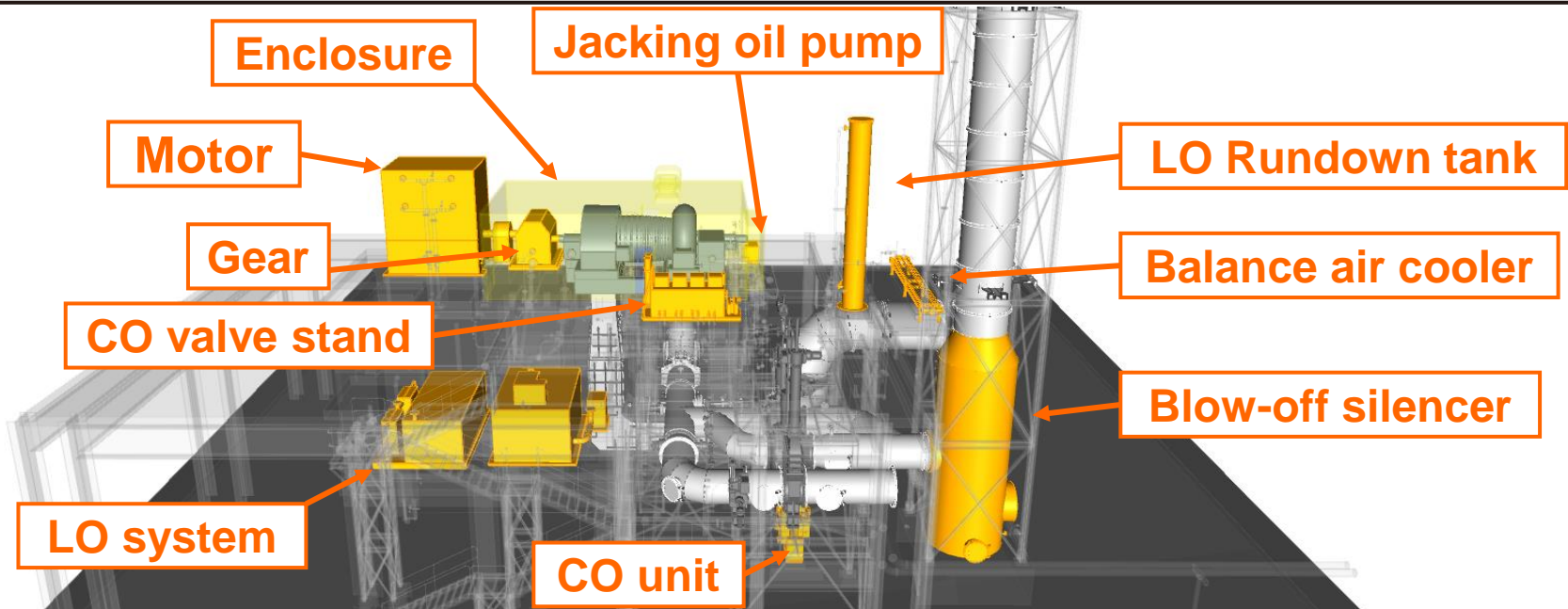


Major Valves of AX



Name	Valve Type	Function
Suction valve	Butterfly valve	Lessens start-up torque for AX with synchronous motor drive.
Discharge valve	Gate valve	Blocks the AX line from BF.
Check valve	Check valve	Prevents reverse flow in emergency.
Anti-choke valve	Butterfly valve	Prevents choke operation.
Main blow-off valve	Globe valve	①Blows off on occurrence of surging or reverse flow. ②Blows off the extra air when the air volume becomes lower than the minimum discharged volume. ③Blows off the discharged air when BF is not in operation.
Sub blow-off valve	Globe valve	Enhances the stability of blow-off control at low air volume corresponding main blow-off valve.

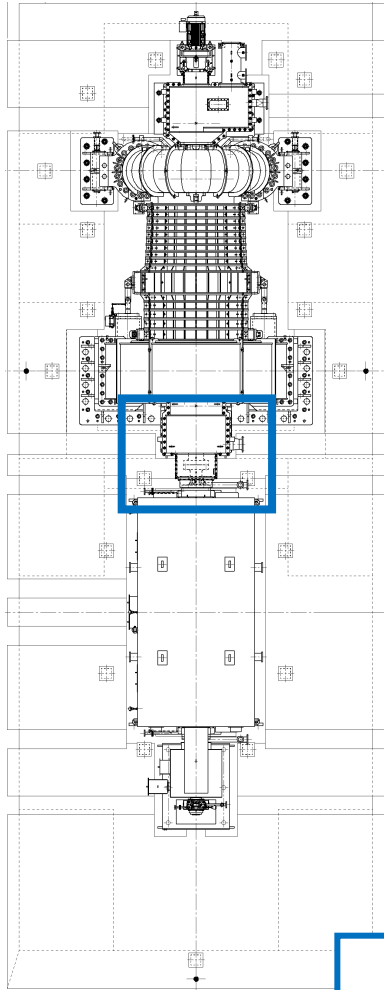
Major Auxiliaries of AX



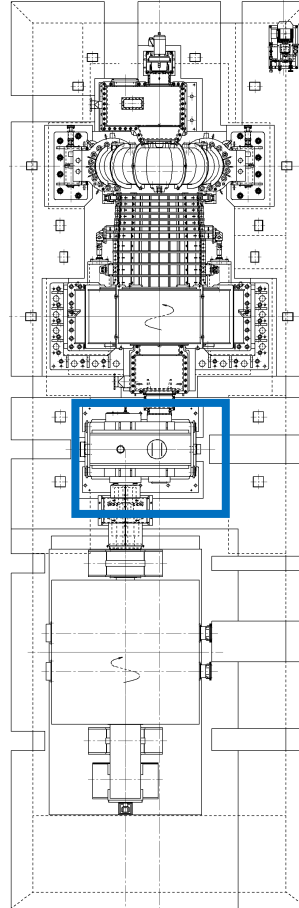
Name	Function
Blow-off silencer	Deadens(lessens) the noise behind blow-off valve.
Balance air cooler	Chills the air that returns into valance room in the suction side from discharge side.
Jacking oil pump	Has oil film form between the shaft and bearing pad before turning starts so that start-up torque becomes lower, having the capacity of turning motor decrease.
Enclosure	Deadens(lessens) the noise caused by the operation.
CO valve stand	Adjusts the volume of control oil to regulate the hydraulic cylinders.
CO unit	Provides high pressure control oil to each hydraulic cylinder of SB, Blow-off valves and Anti-choke valve.
LO system	Provides lube oil to each bearing on AX and motor.
LO rundown tank	Provides required lube oil to AX and motor for emergencies until AX at rated revolution speed stops completely . (for approximately half an hour)

Motor Type

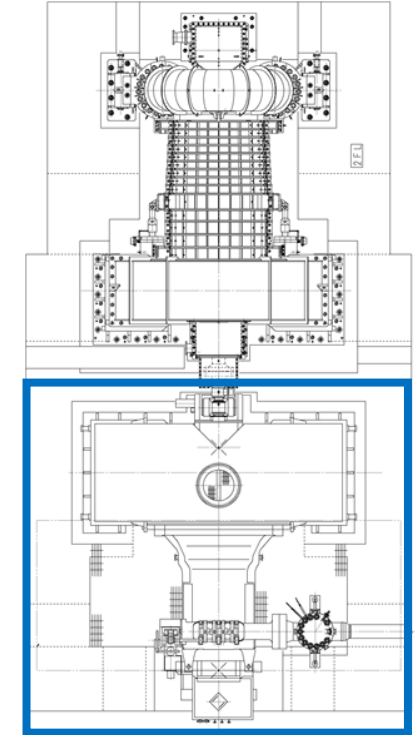
2 POLE MOTOR TYPE



4POLE MOTOR TYPE



STEAM TURBINE TYPE



All ST、SM(2P、4P) types can be provided.

Type Notation of Axial Flow Compressor

MA – SERIES;

MA
(□)

□

(□)

Stator blade control type

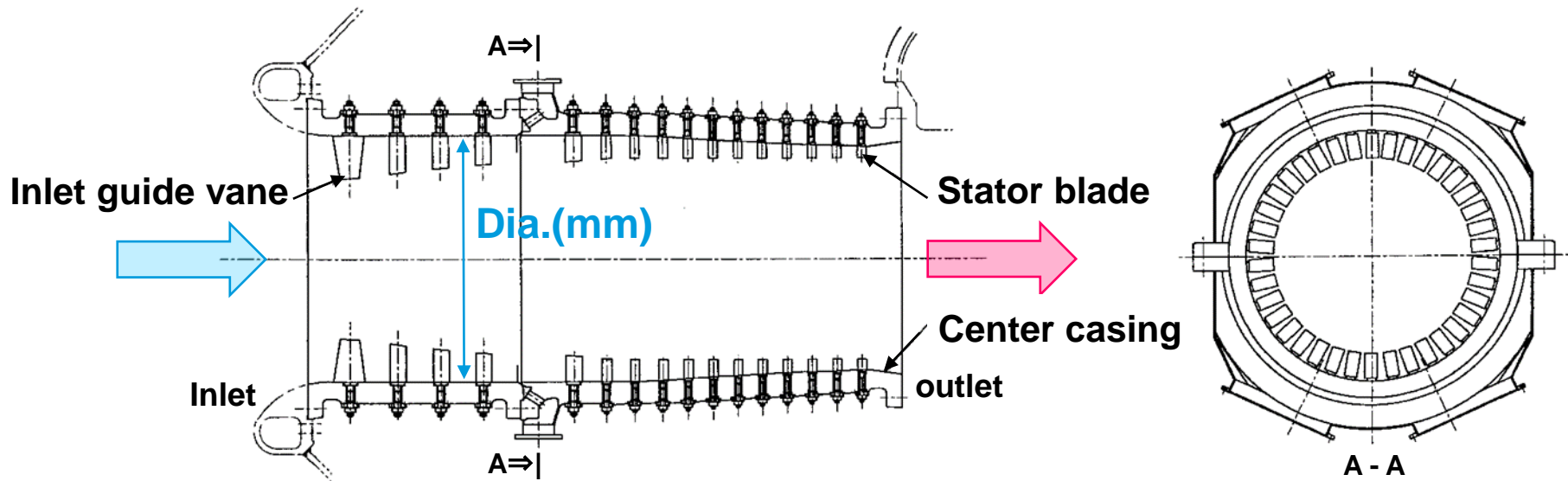
{ Adjustable
Static

Casing Size (Diameter)

{ 80= ~800mm 100=~1000mm 120= ~1200mm
140= ~1400mm 160=~1600mm 180=~1800mm

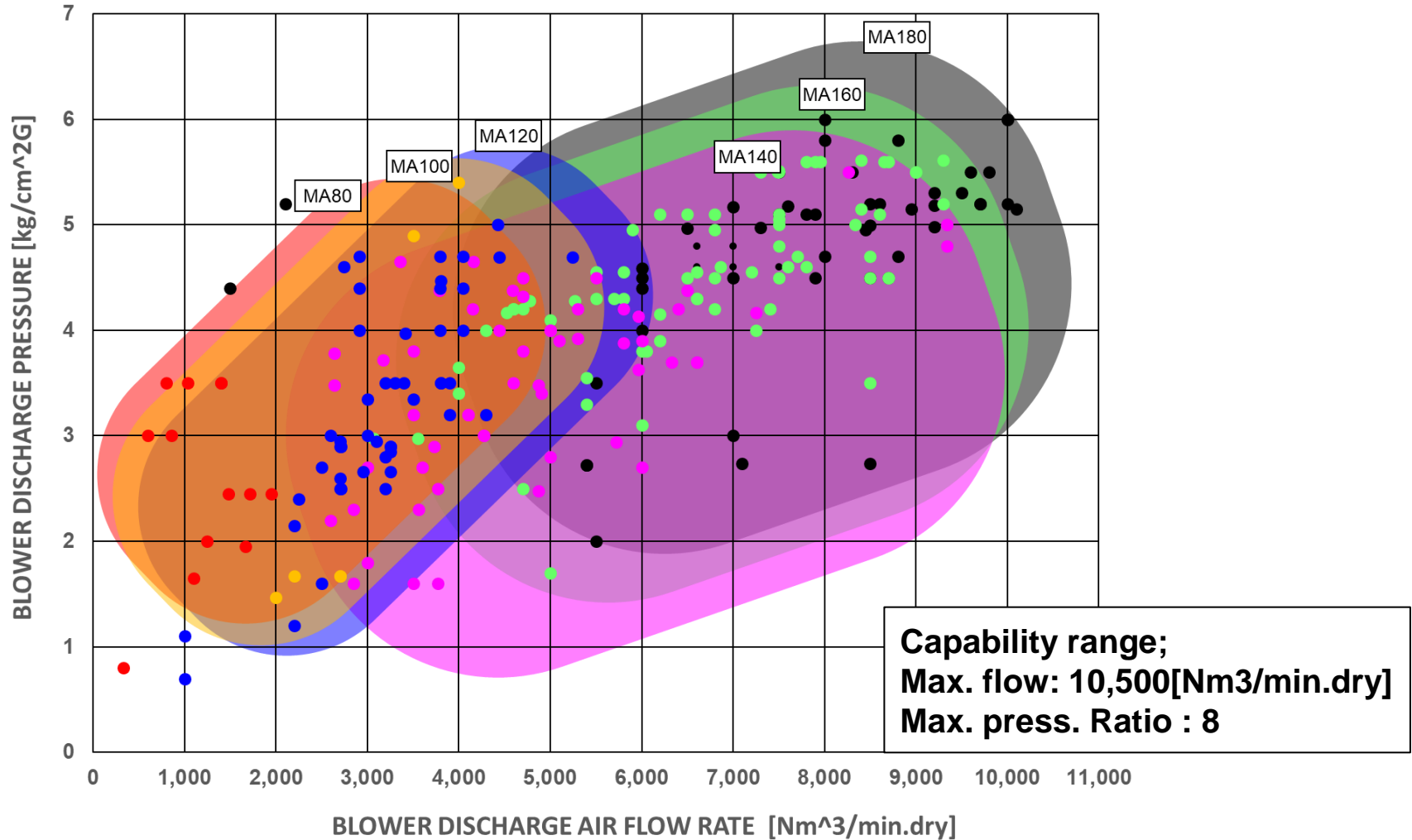
MA = Mitsui Axial Flow Compressor

(□) = No. of stage



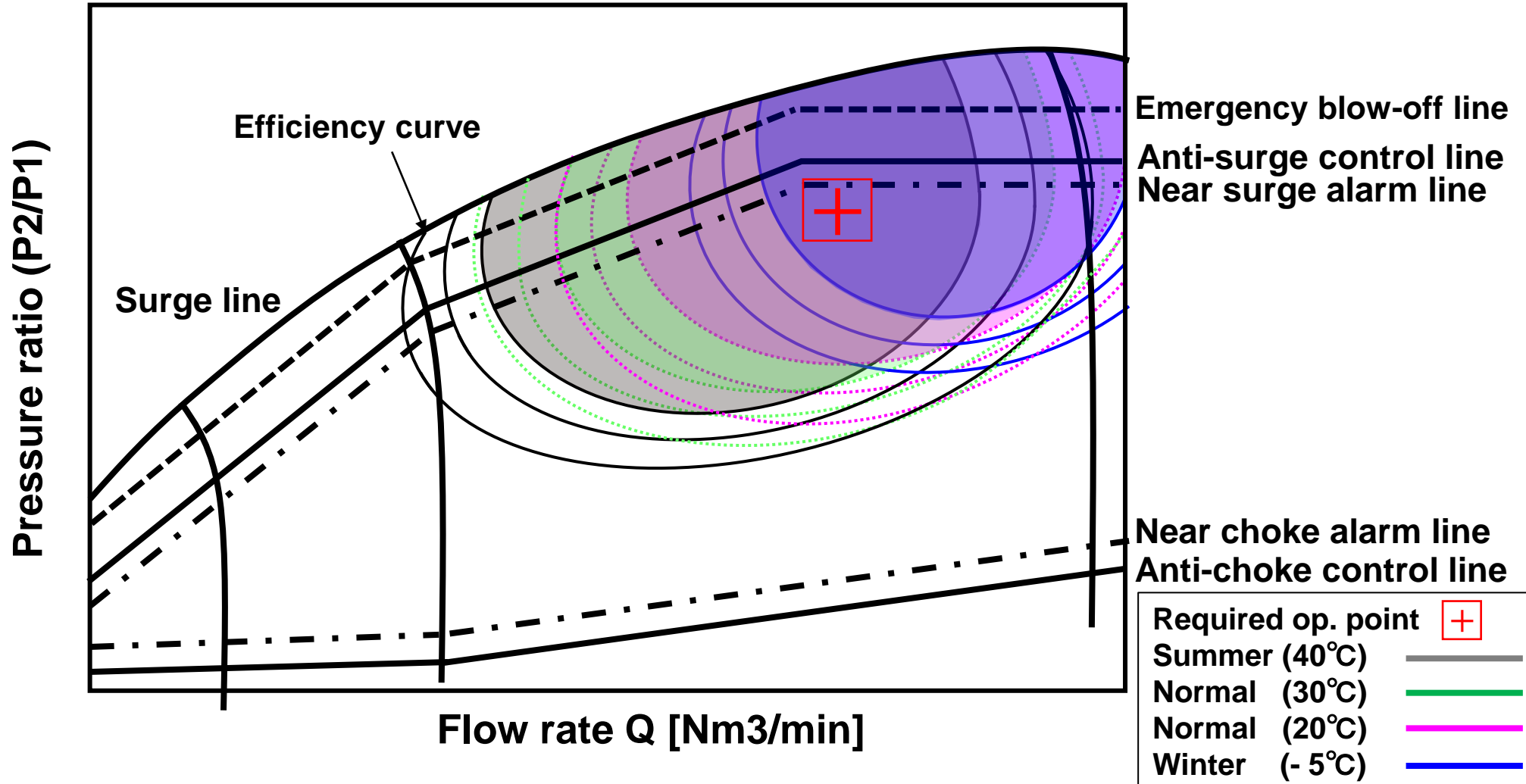
Experienced Operating Range

Mitsui AX Individually designed can be provided to satisfy each customer demands.



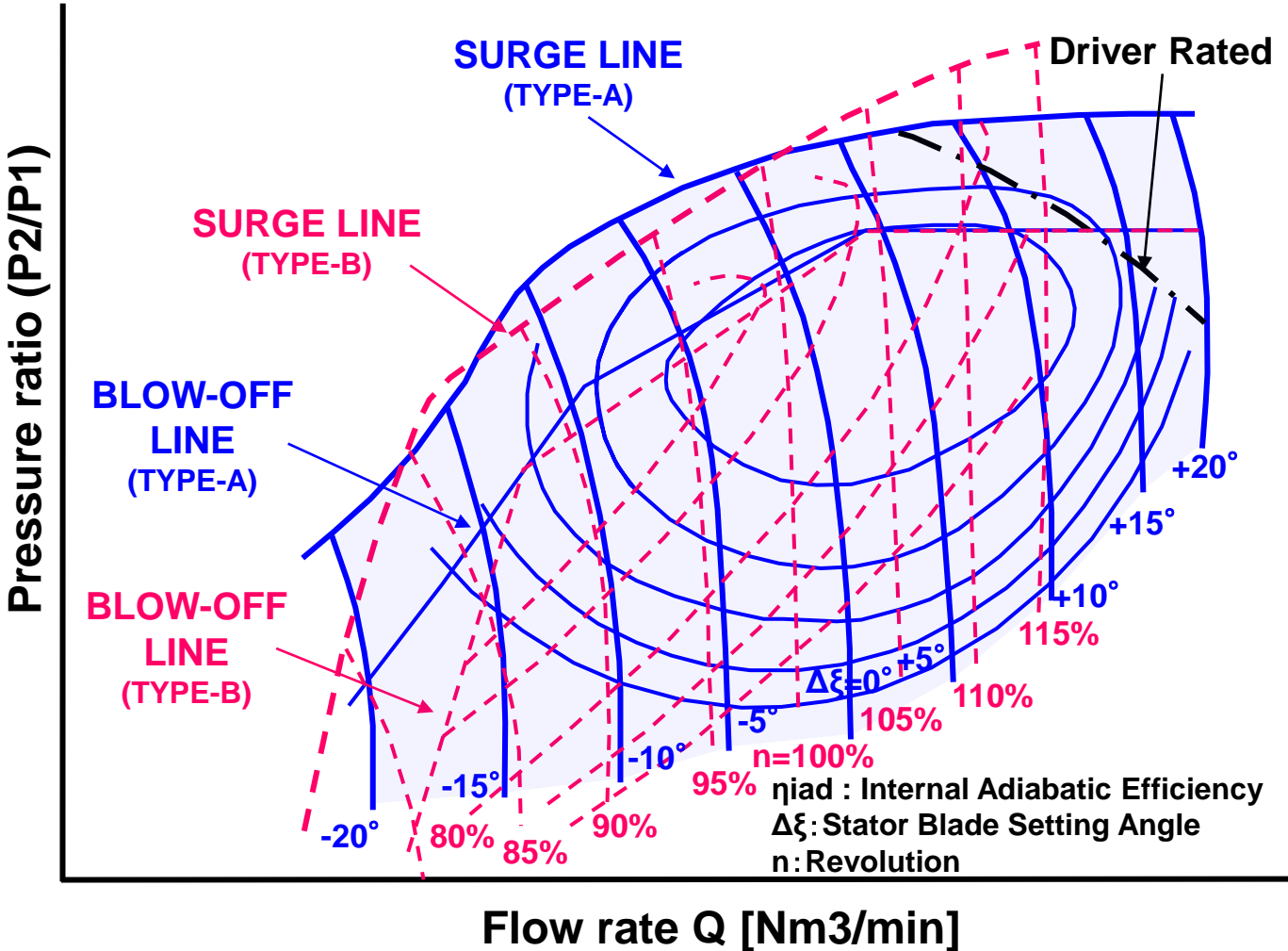
Operation Range in the Different Temperature

High efficiency operations can be achieved in the changes on inlet temperature through a year.



Comparison of Performance Characteristics

— (TYPE-A: Constant Speed, Variable Stator) (MES-M)
- - - (TYPE-B: Variable Speed, Fixed Stator)

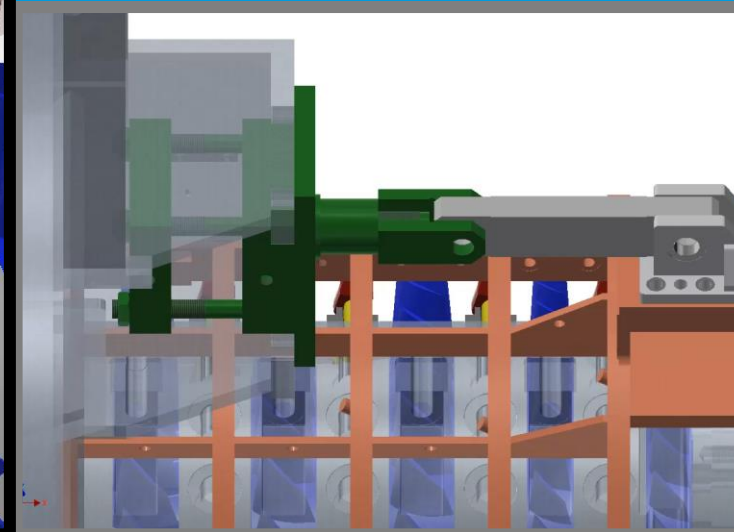
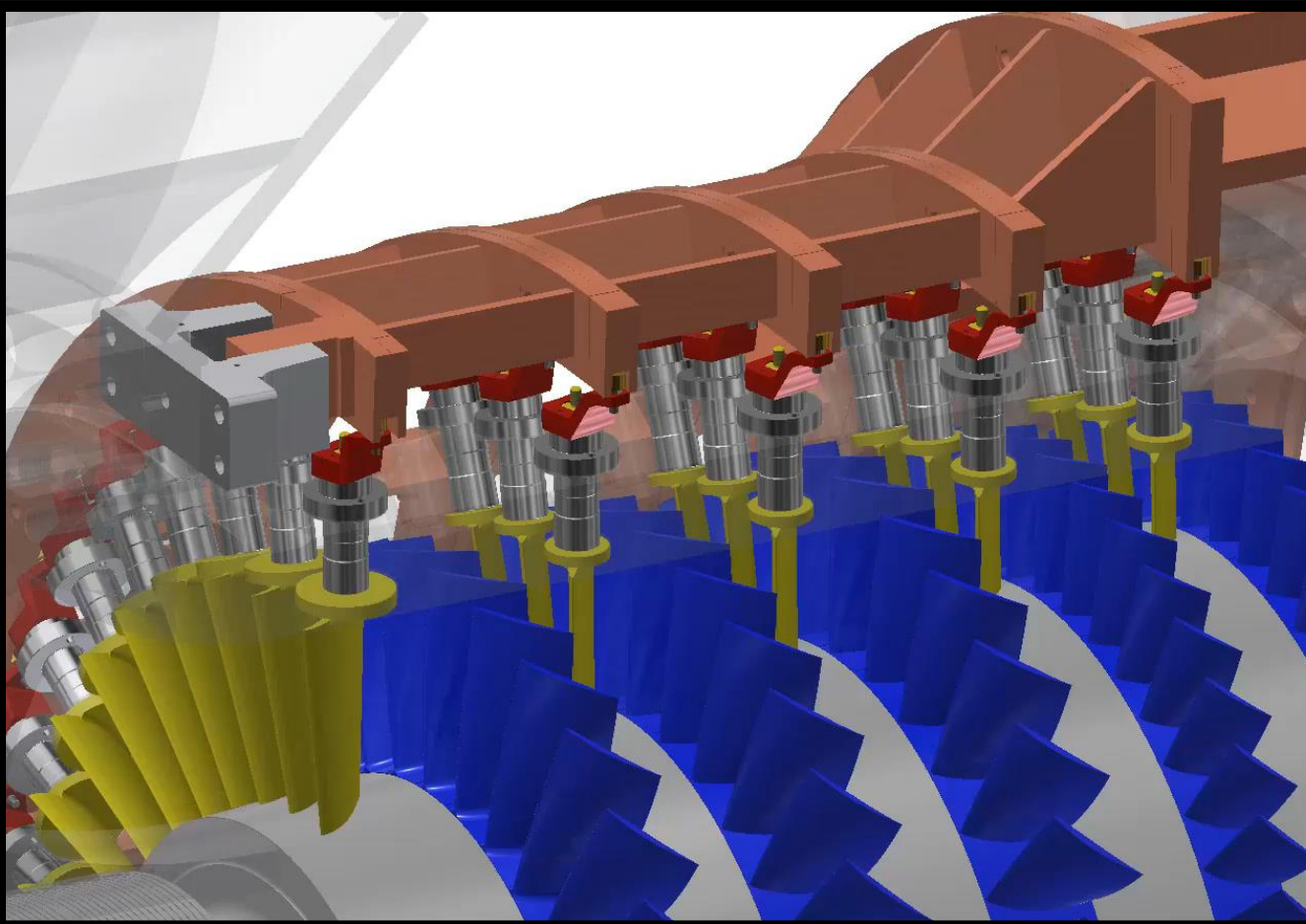


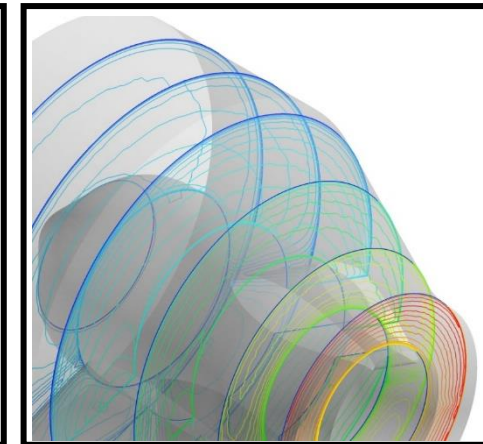
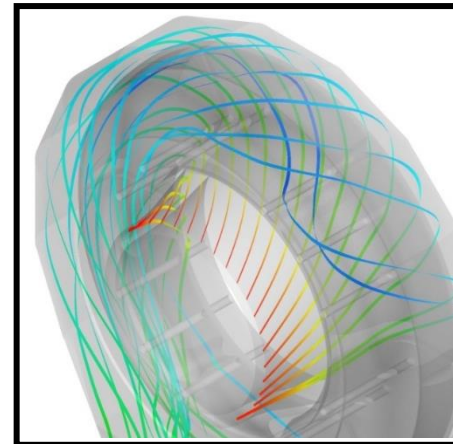
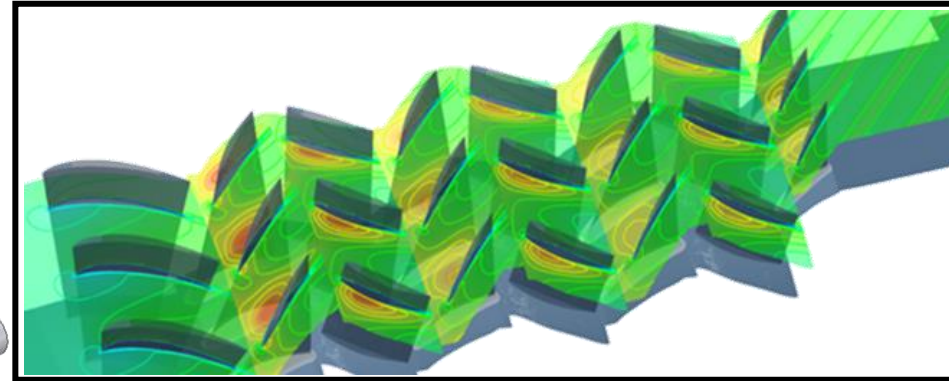
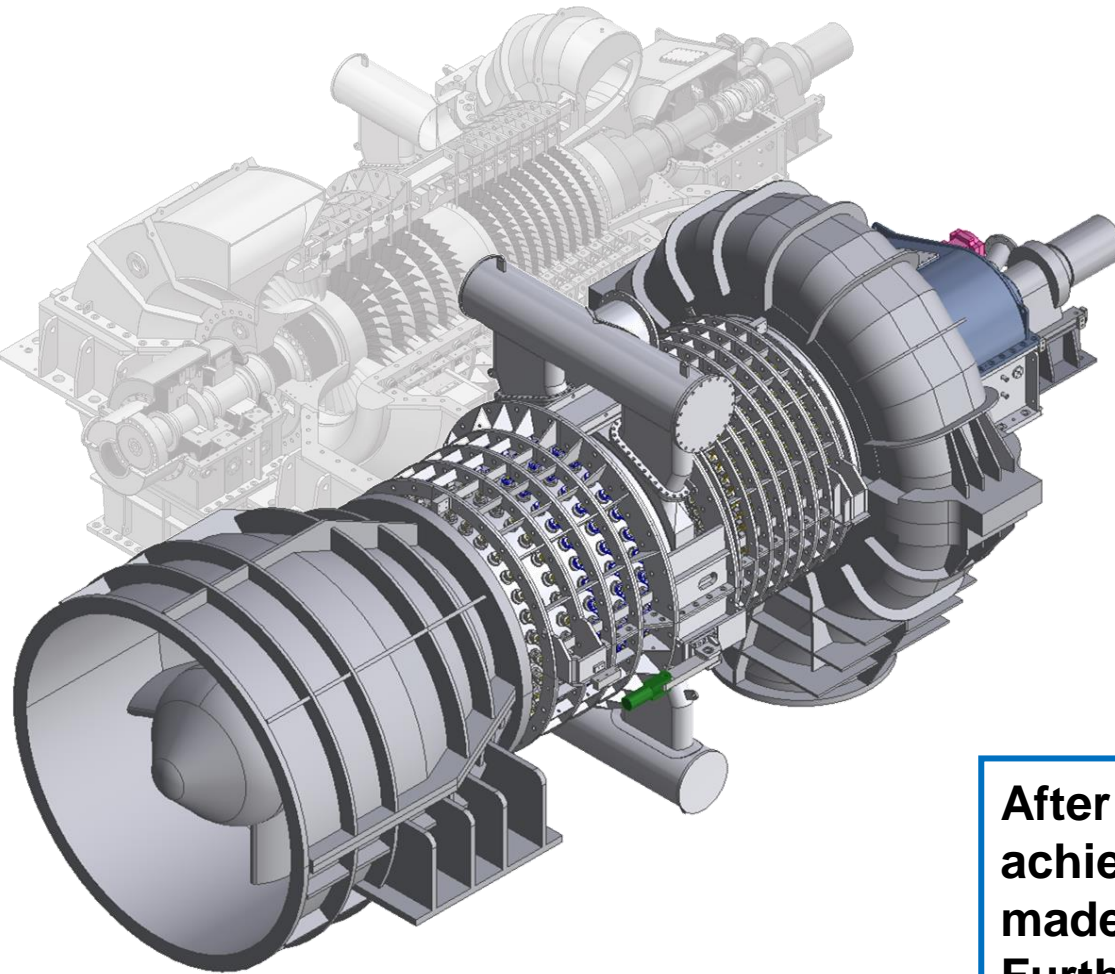
- TYPE-A (MES-M)**
- Surge line is relatively flat, and operating range is wider.
 - Higher efficiency is attainable for wider operating range from low flow up to large flow.
 - Type-A is suitable for the recent Blast Furnace Blower of high pressure operation.

- - - TYPE-B**
- Surge line is rather steep, and operating range is narrow.
 - Peak efficiency is higher in the range of low flow rate and high head ratio.
 - Type-B tends to be adopted for the compressor for Petroleum and/or Chemical plants and Blast Furnace Blower of normal pressure operation.

Adjustable Stator Blade Mechanism

All adjustable stator blade mechanism is adopted for wider operation range.

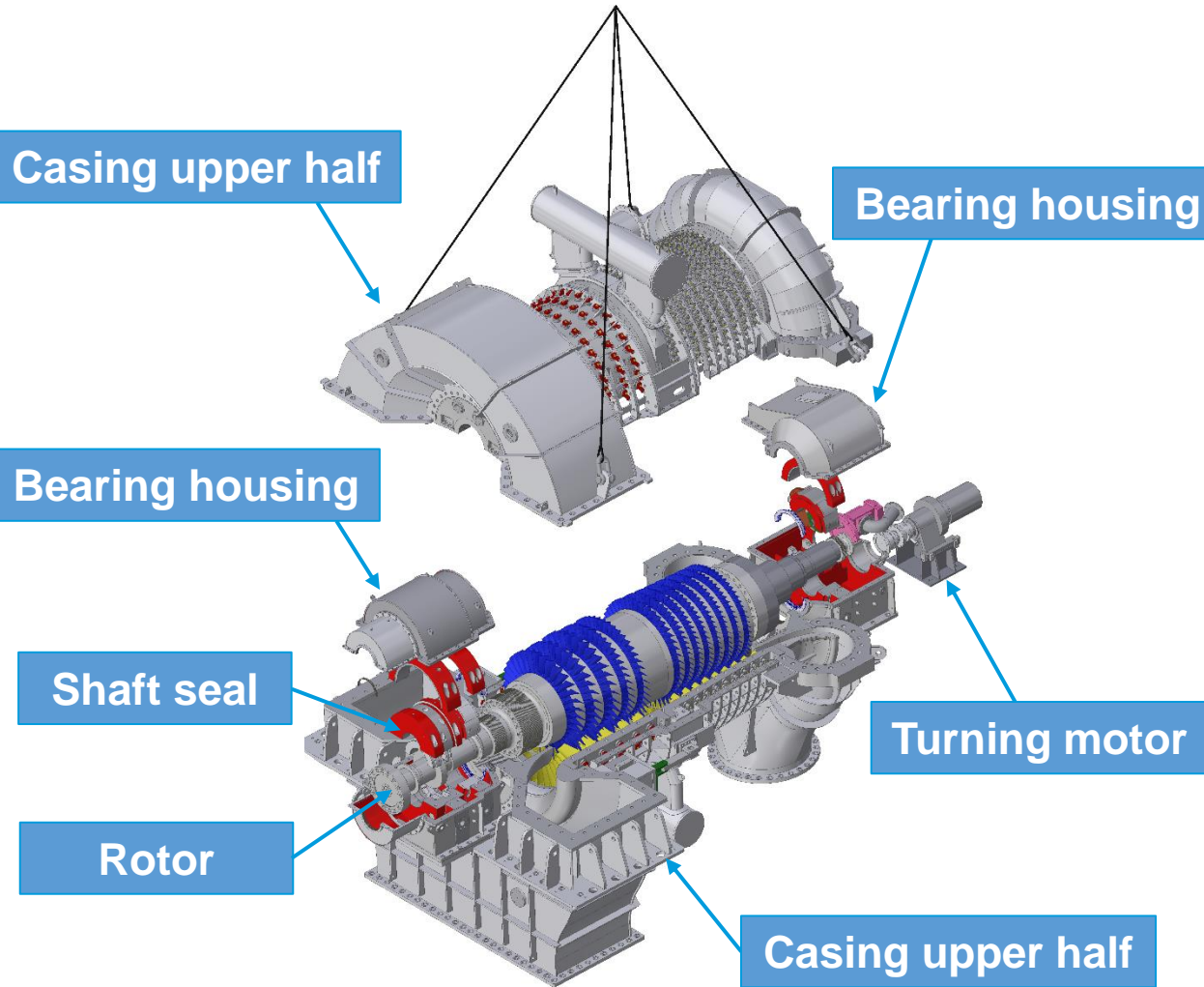




After first AX was developed in 1962, we have achieved wider high efficiency range and made it easy to use. Further developments for better performance and automatic operation are made continually.

Easy Maintenance

Original structure for easy maintenance and installation, such as single wall casing, is adopted.



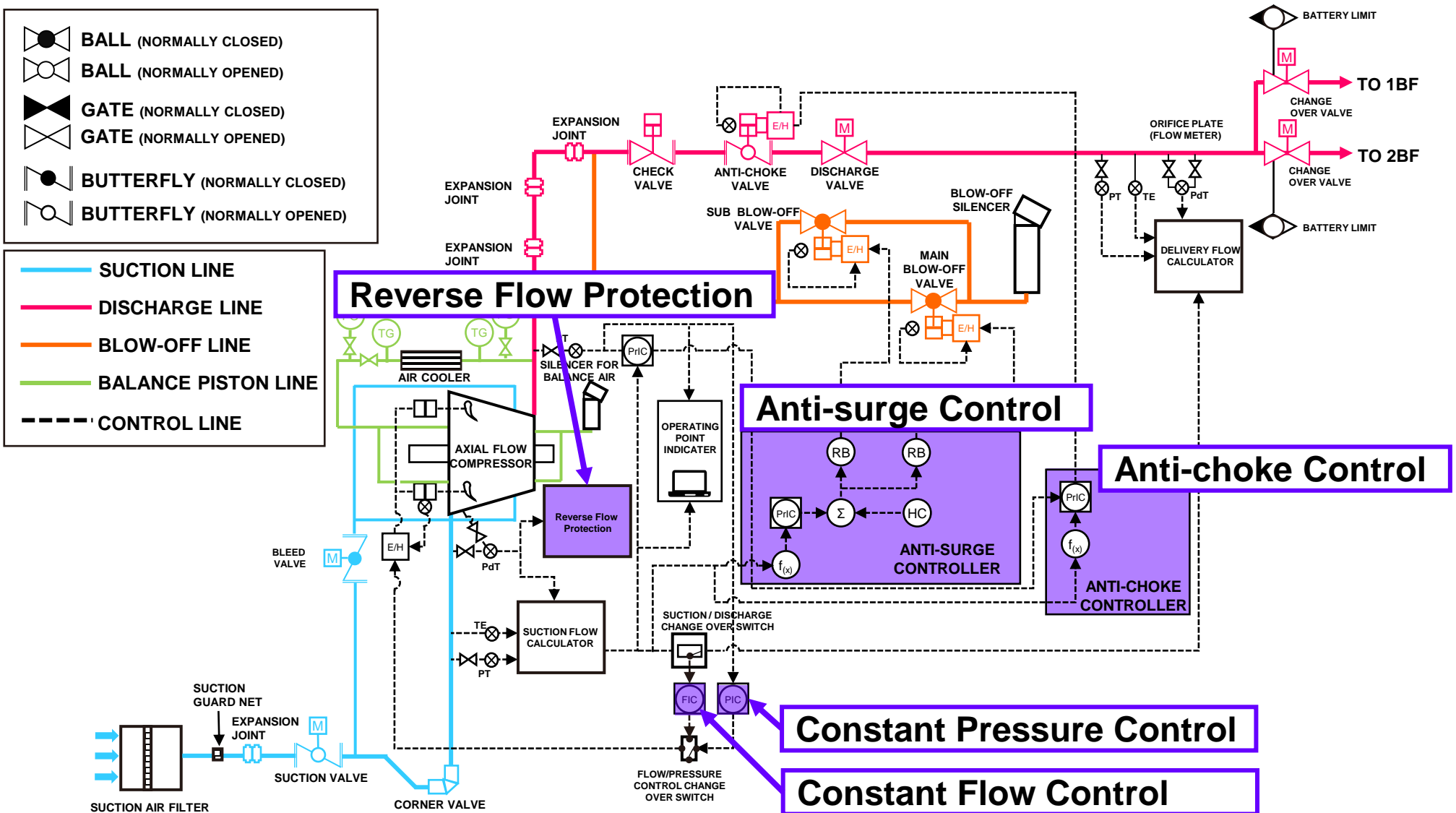
One point lifting up upper casing for easy overhaul and internal inspection



Lifting up rotor for lower casing inspection

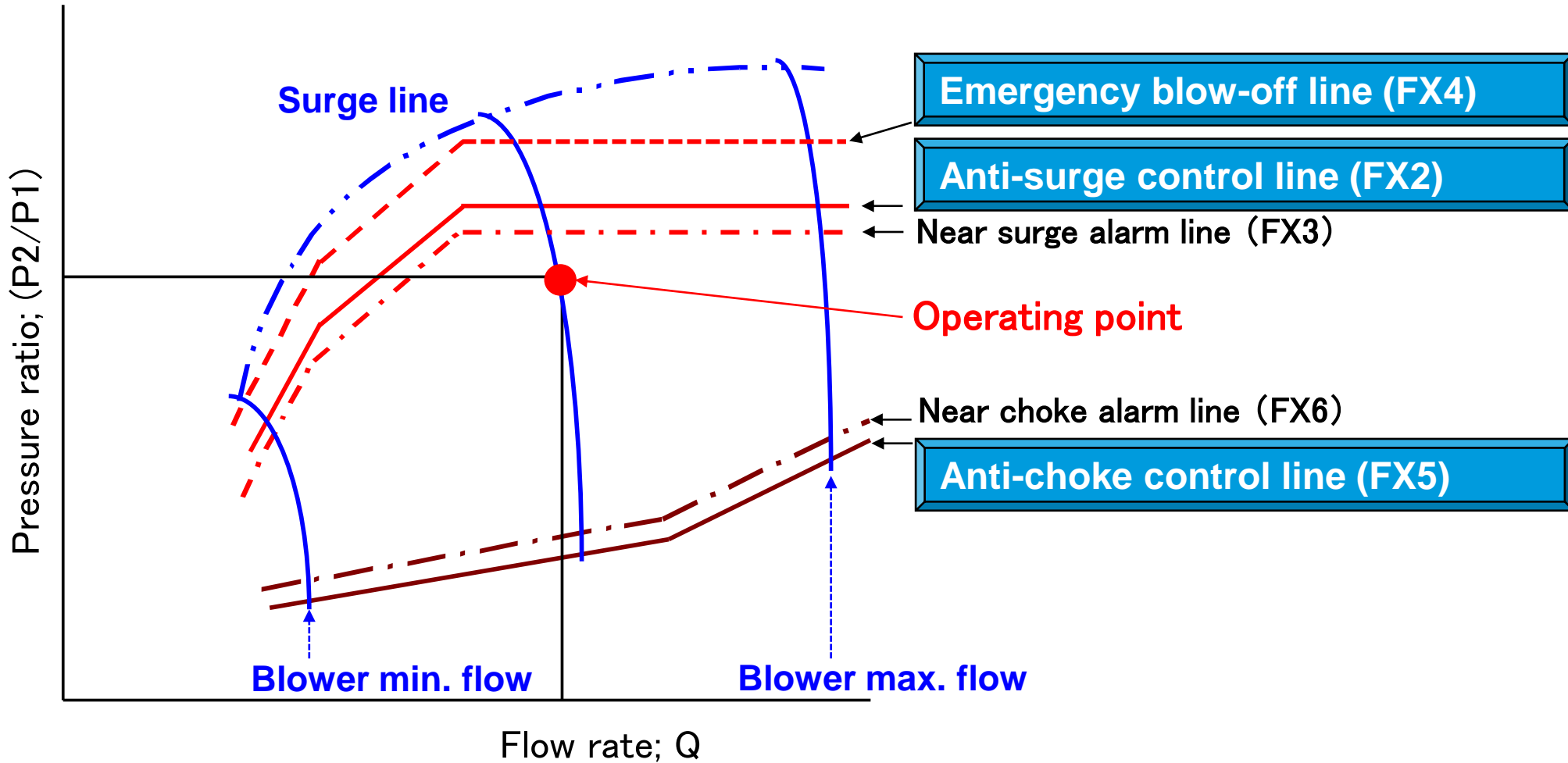
- 1. Constant flow control system**
- 2. Constant pressure control system**
- 3. Anti-surge control system**
- 4. Anti-choke control system**
- 5. Reverse flow protection system**
- 6. Quick depress control system (Optional)**
- 7. O₂ Enrichment flow control system (Optional)**

Schematic Diagram of AX Control for Blast Furnace



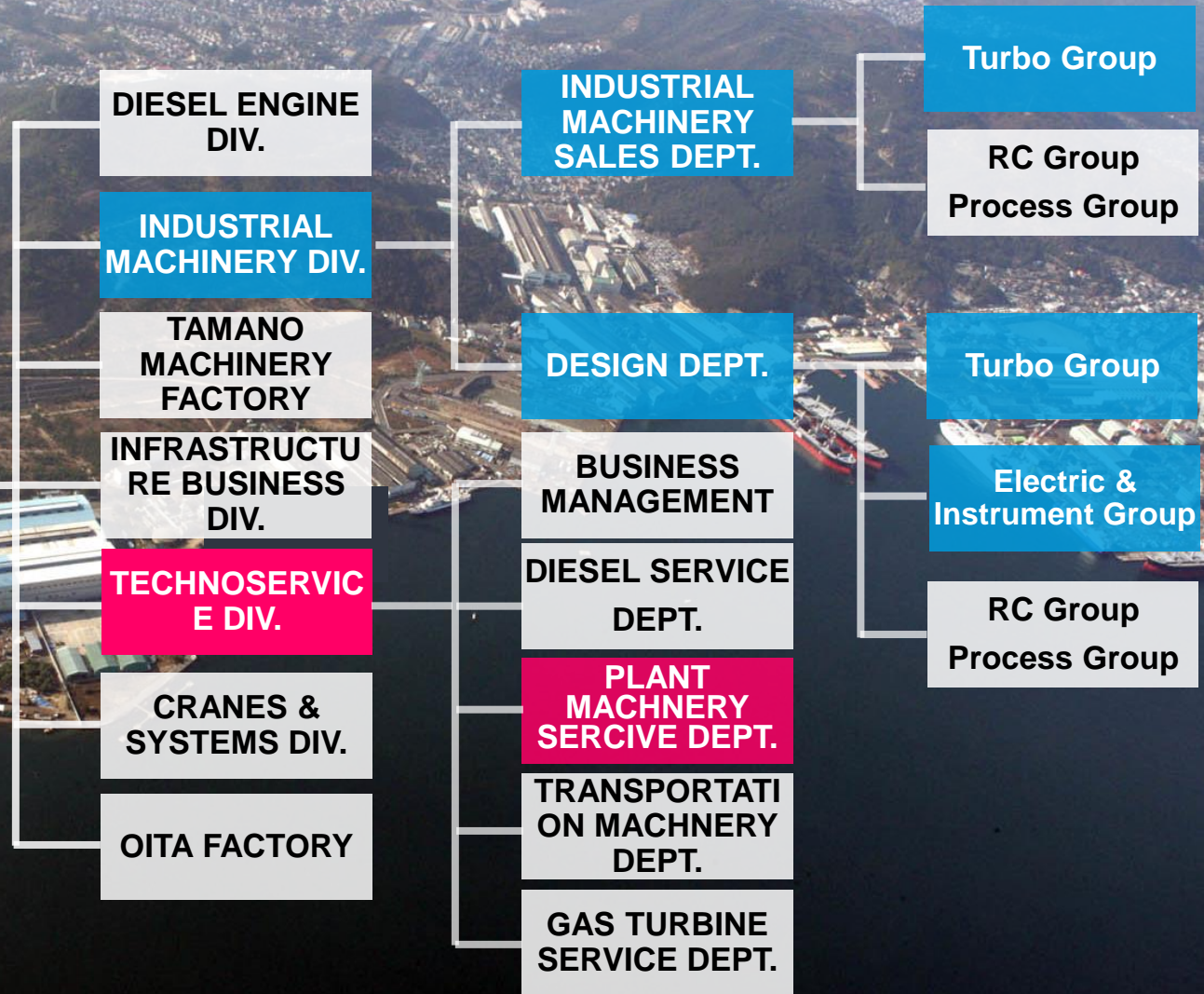
Anti-surge & Anti-choke Control Line

To prevent operation under extraordinary phenomenon, such as surging or choking, **anti-surge and choke line** are provided.








After Service

Specialized department can supply consumable parts and propose improvement.

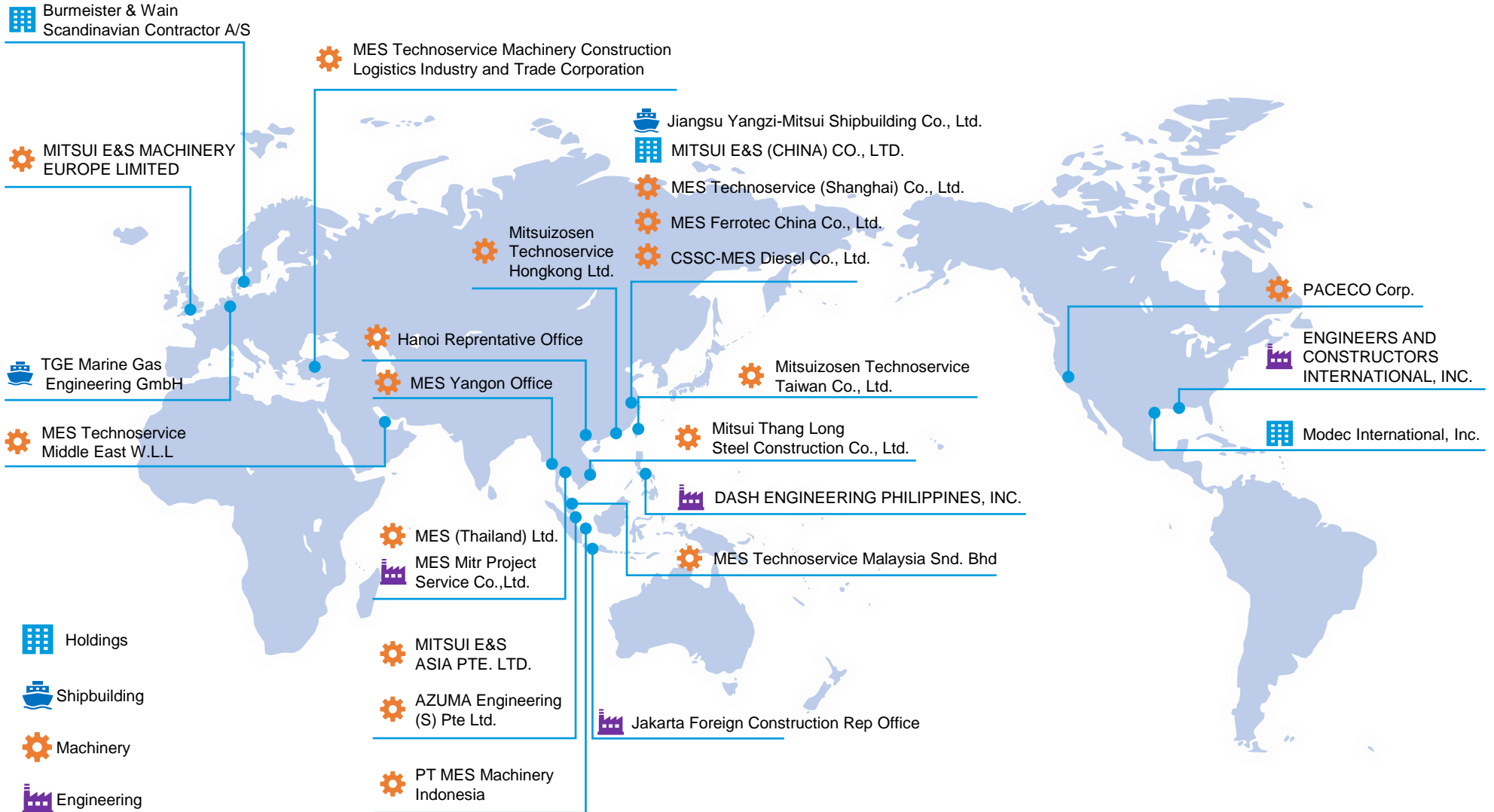


Domestic Network

-  Holdings
-  Shipbuilding
-  Machinery
-  Engineering
-  Business Service



Overseas Network



A blue-tinted landscape photograph of a coastal industrial area. In the foreground, there are dark, silhouetted hills. The middle ground shows a large body of water with several industrial structures, including cranes and buildings, along the shoreline. In the background, there are more hills and mountains under a clear sky. The overall scene is a coastal industrial zone, possibly a port or refinery.

Thank you