

Company Profile

漢力能源科技股份有限公司
HanPower Energy Technology Co., Ltd.

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April 2023

Introduction

- Company Name: HanPower Energy Tech. Co. Ltd.
<https://hanpower.com.tw/>
- Founded In January 2015
- Parent Company: Hanbell Precise Machinery Co. Ltd.
<http://www.hanbell.com/index.html>
- Factory: Youth Industrial Park, Taoyuan, Taiwan
- Office: Nanjing East Rd., Taipei, Taiwan

Vision

Be the best supplier for low-grade heat conversion, ORCs and Steam Turbines, and services for customers.

Mission

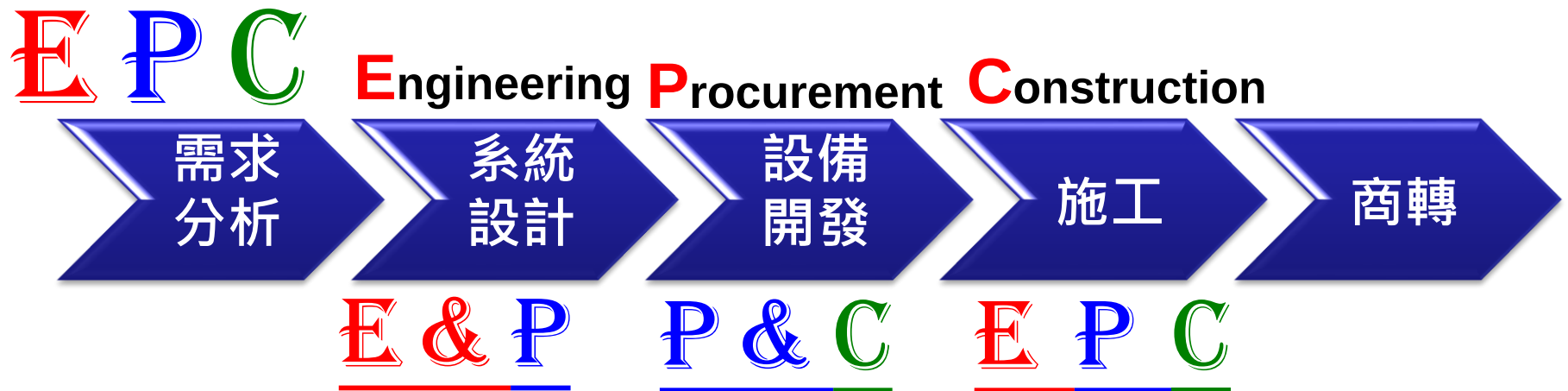
HanPower insists on environmental-friendliness, non-stop innovative technologies, providing tailor-made solutions to meet customers requirement, helping customers to realize the waste heat recovery and to develop renewable energy.

Products & Services

1. Low Grade Heat Recovery

- Screw Expander ORC (10kW ~ 300kW)
- Turbine ORC (250kW~2,000kW)

2. Steam Turbine Genset (50kW~6,000kW)



Screw Expander ORCs

■ Engine Core

- Dual Screw Expander + Generator

■ Type

- Semi-Hermetic Type
 - Screw Expander → Induction Generator
- Open-Drive Type
 - Screw Expander → Coupling → Synchronous Generator

■ Product Characteristics

- Capacity Range: 10kW ~ 300kW
- Turn Down Ratio: 10%~110%
- Life $\geq$ 20 years



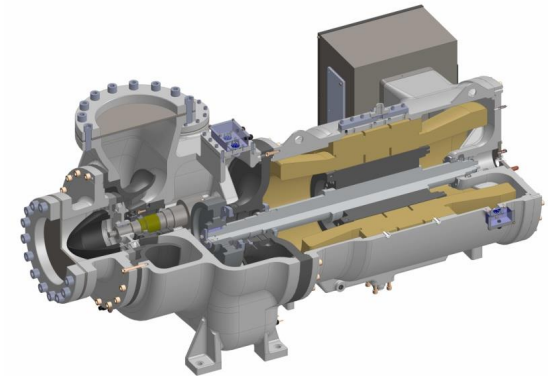
Turbine ORCs

■ Engine Core

- Single Stage/Multi-Stage Axial Turbine + Generator

■ Type

- Semi-Hermetic Type
 - Turbine + GB → Induction Generator
- Open Drive Type
 - Turbine + GB → Coupling → Synchronous Generator



■ Product Characteristics

- Capacity Range: 250kW ~ 2,000kW
- Turn Down Ratio: 30%~110%
- Life $\geq$ 20 years



Steam Turbine Gensets

■ Engine Core

- Impulse-Type Single Stage

■ Models

- Back-Pressure Steam Turbine Gensets

- ST → Coupling → Generator

- ST → GB → Coupling → Generator

- Condensing Steam Turbine Gensets

■ Product Characteristics

- Steam Pressure

- Inlet Pressure $\leq 60\text{bar(g)}$

- Outlet Pressure $\leq 20\text{bar(g)}$

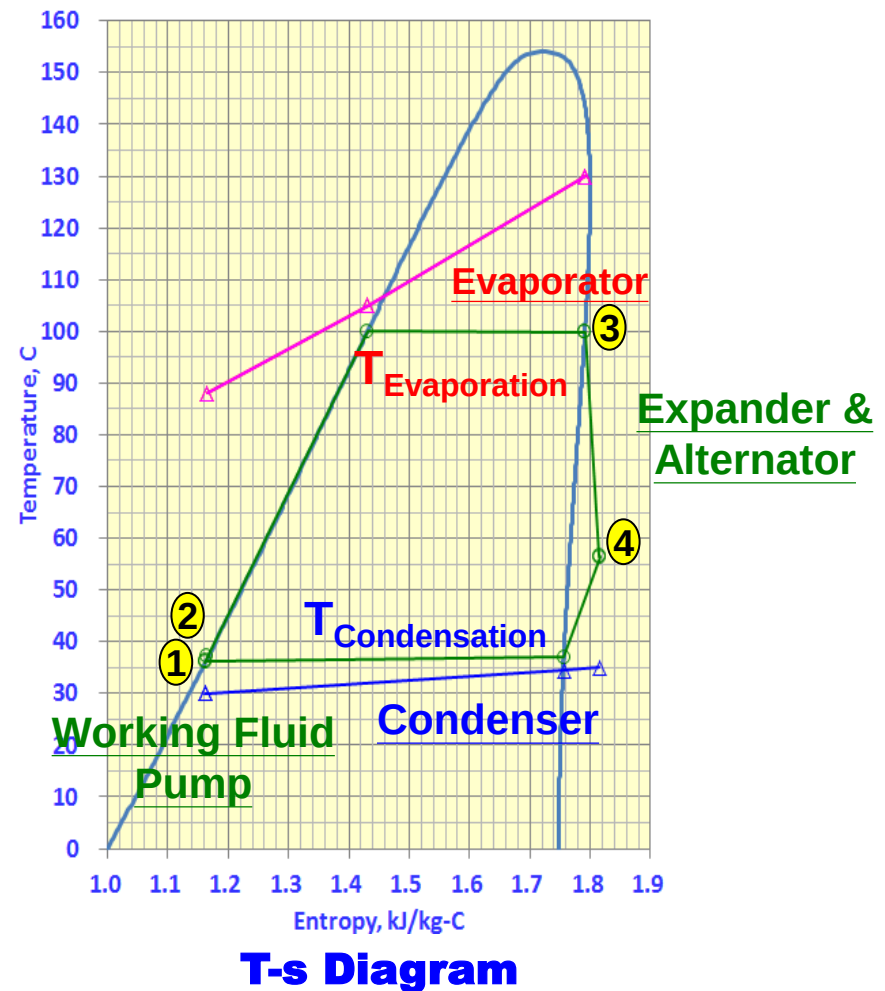
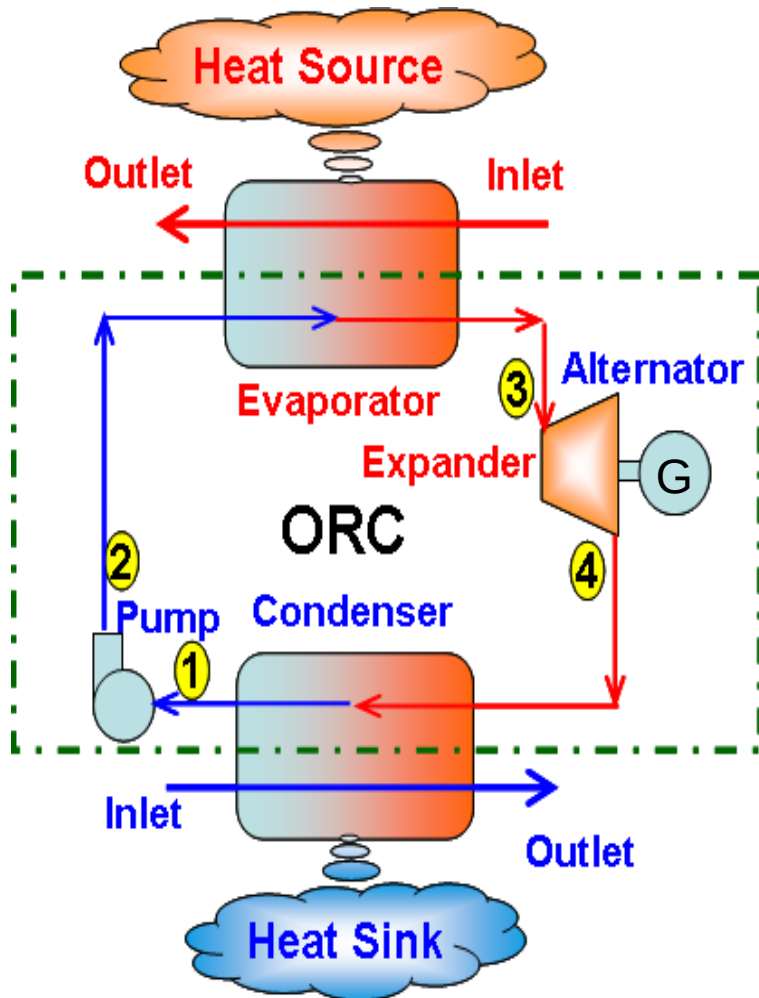
- Capacity Range: 50kW ~ 6,000kW

- Life ≥ 20 years

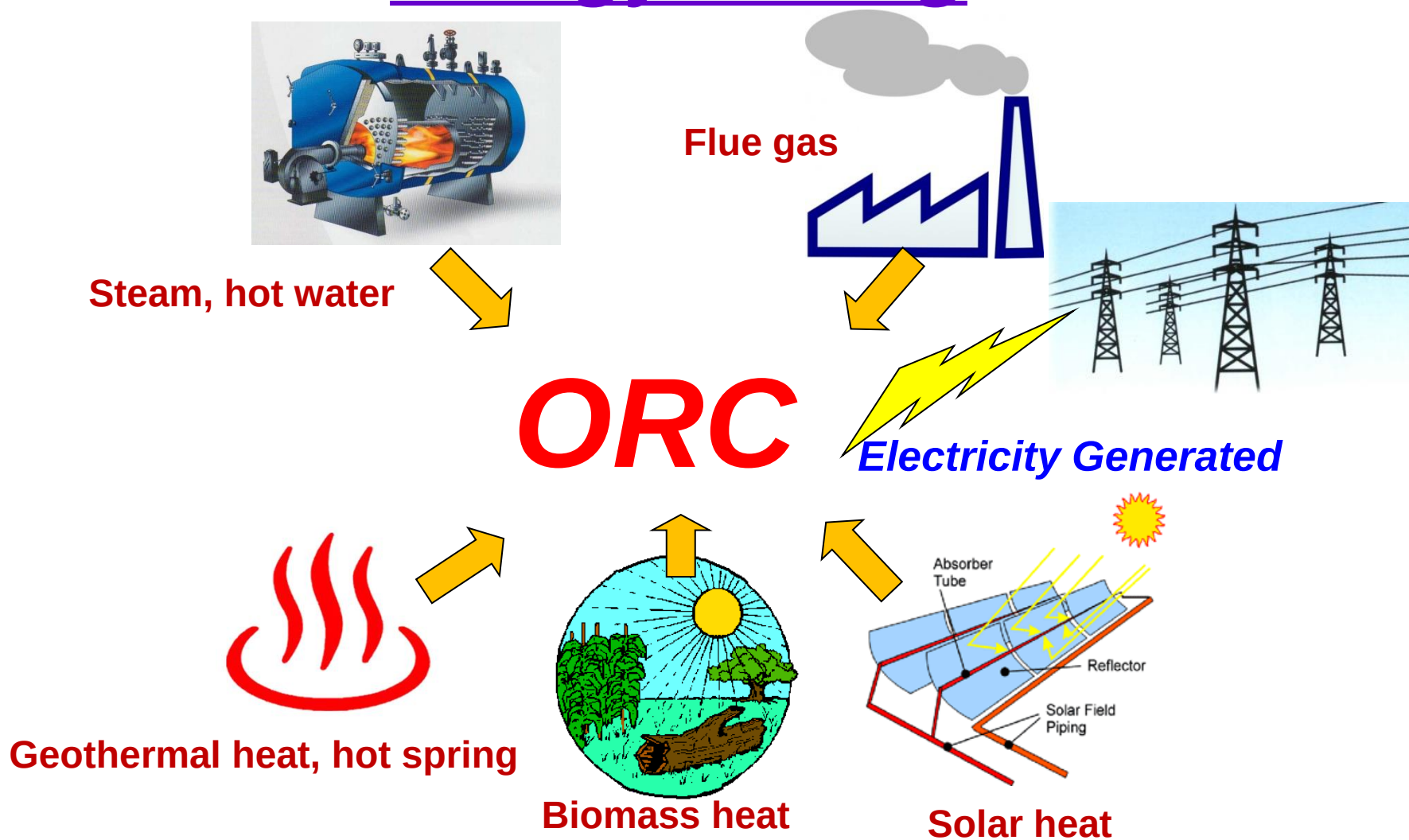


Organic Rankine Cycle

Heat engines, using low B.P. working fluids,
convert low grade heat to power (H2P).



Energy Saving



Renewable Energy

Arrangement & Key Components

Model

Engine Core

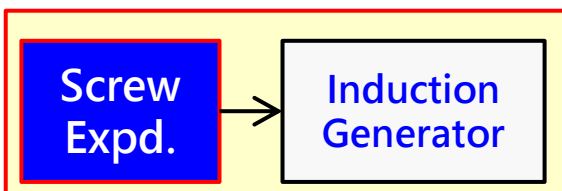
Heat Exchanger

Control/Communication

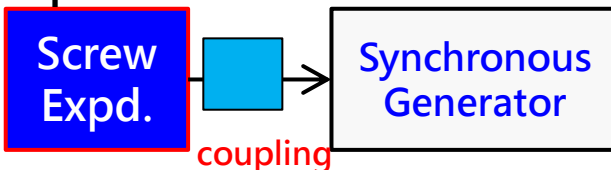


10~300kW

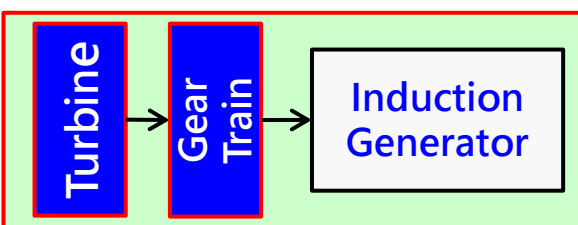
Hermetic Genset



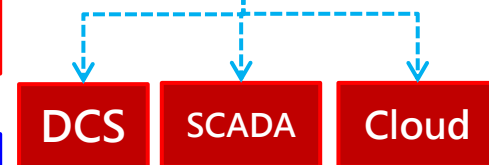
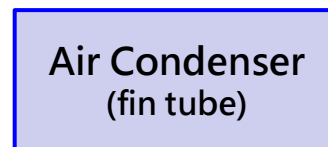
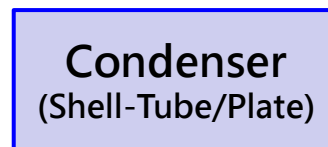
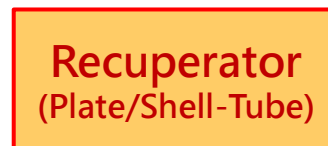
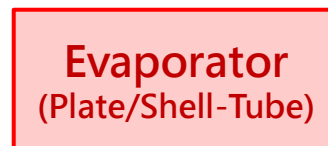
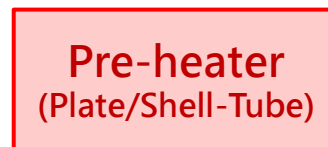
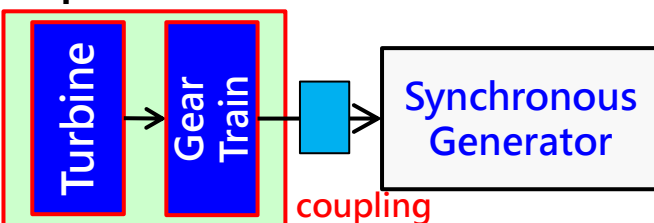
Open Drive Genset



Hermetic Genset

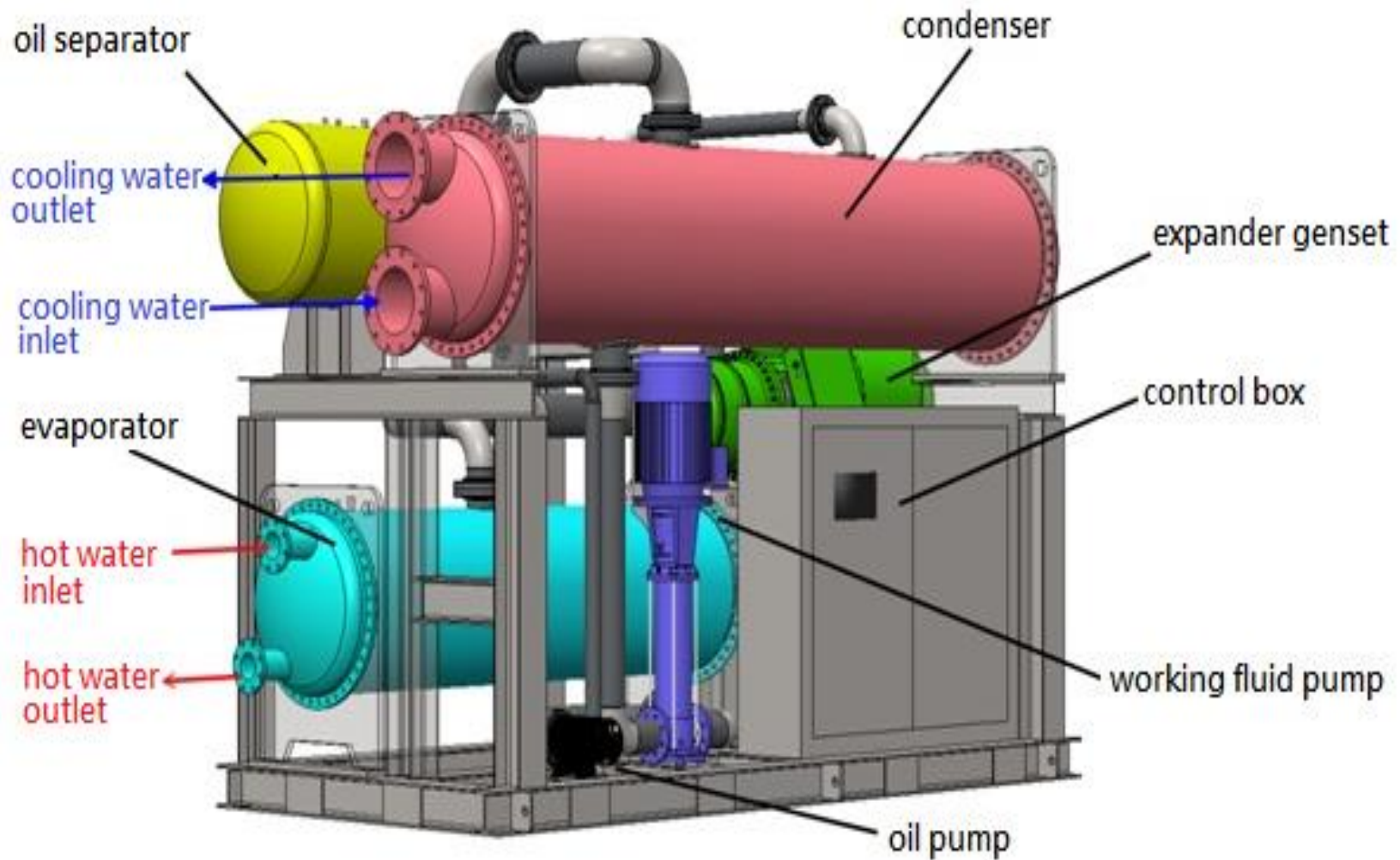


Open Drive Genset



250~2,000kW

ORC Unit



Screw Expander ORC Facts

■ High Performance Screw Expander

- Patented high efficiency rotor profile
- High reliable & robust rotor-bearing system

■ High Performance Generator

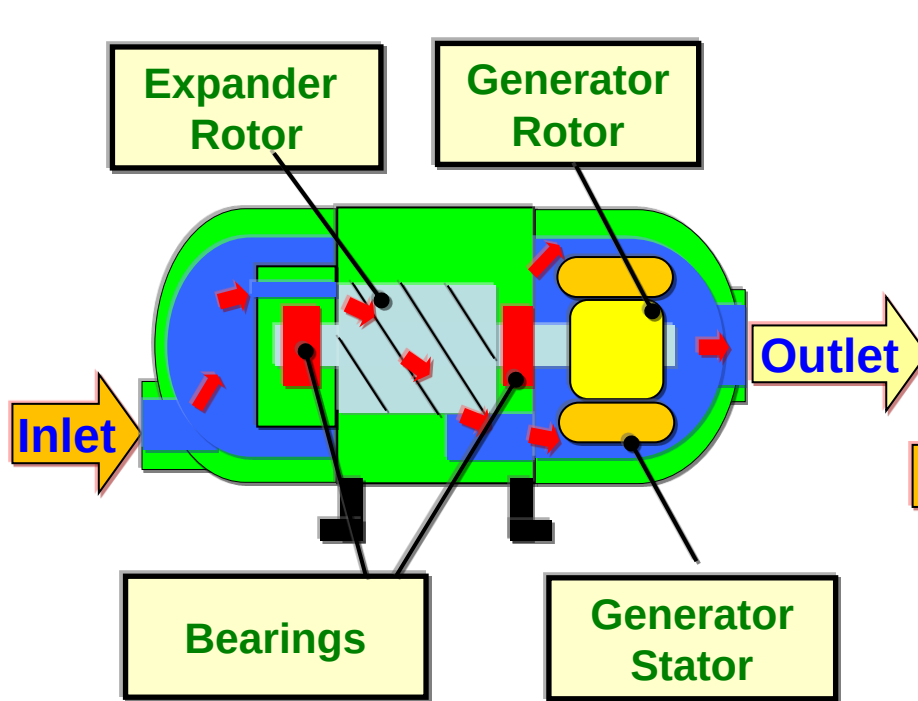
- 50/60Hz Induction generator/Synchronous generator
- Voltages : 220, 380~440, 3K/6K/10K

■ ORC Characteristics

- Series products
 - **Power range from 10kW to 300kW**
 - **Tailor-made to meet users' requirements**
 - **100% owned technology & MIT**
- High turn down ratio: 10%~110% power output
- Hermetic Type/Open Drive Type
- Product life time over 20 years

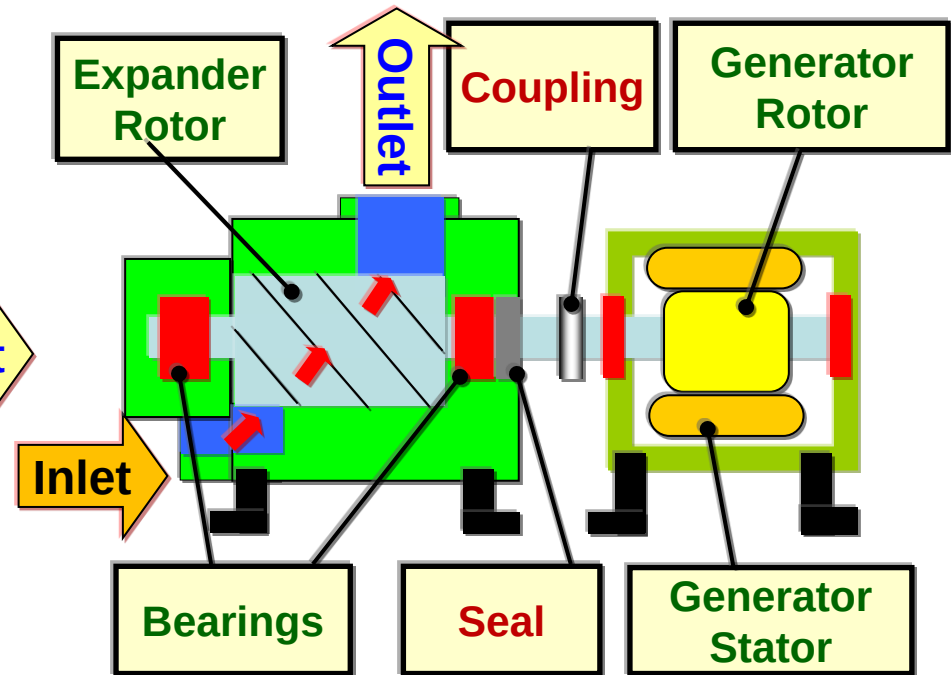


Hermetic Screw-Expander Genset



Hermetic Type

- No Coupling: Common Shaft
- No Mechanical Seal
- No Fan: Working fluid Cooling



Open Drive Type

- X Coupling: misalignment, Vib. ↑
- X Seal: Leak-off, Maintenance ↑
- X Fan: Reducing Generator Eff. ↓

Turbine ORC Facts

■ High Performance Turbine

- Axial type, simple construction
- Rigid rotor, no resonance through operating speeds.
- Isentropic efficiency $\geq 80\%$ (1-stage), $\geq 85\%$ (2-stages)

■ High Performance Generator

- 50/60Hz Induction generator/Synchronous generator
- Voltages : 380~440, 3K/6K/10K

■ ORC Characteristics

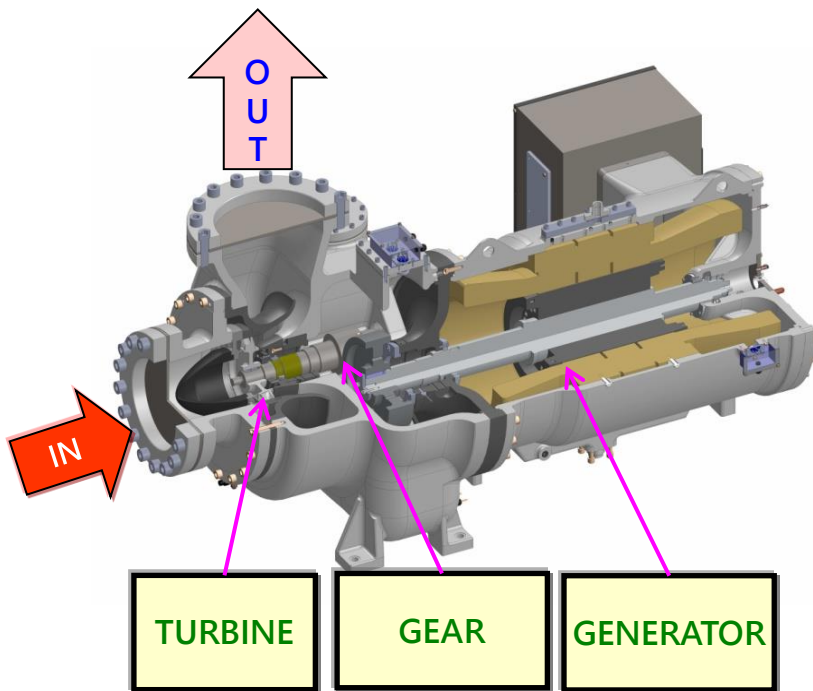
- Series products
 - **250kW ~ 2,000kW**
 - **Tailor-made**
 - **100% Made In Taiwan**
- High turn down ratio, 30%~110% power output
- Hermetic Type/Open Drive Type
- Product life over 20 years



Hermetic Type Turbine Genset

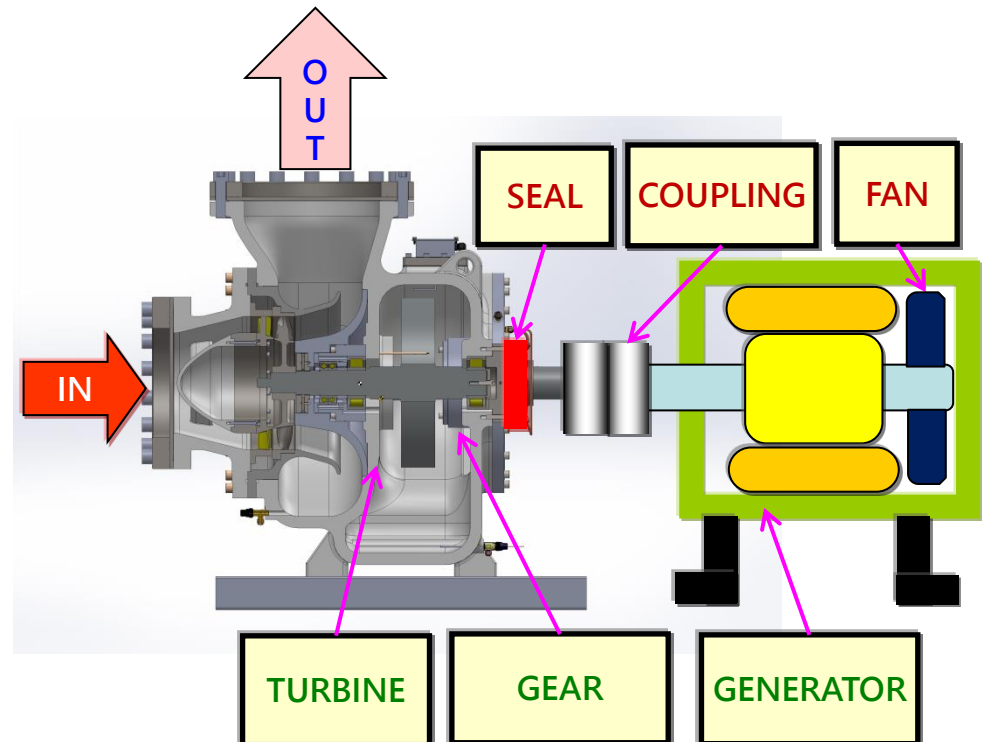
Hermetic Type

- No Coupling: Common Shaft
- No Mechanical Seal
- No Fan: Working fluid Cooling



Open Drive Type

- ✗ Coupling: misalignment, Vib. ↑
- ✗ Seal: Leak-off, Maintenance ↑
- ✗ Fan: Reducing Generator Eff. ↓



Applications & Services

■ Low-Grade Heat to Power (H2P)

■ Industrial waste heat, geothermal heat, biomass heat, solar heat

Heat Source	Hot Water	Steam	Flue Gas
Application Temperature	$\geq 80^{\circ}\text{C}$	$\geq 70^{\circ}\text{C}$	$\geq 150^{\circ}\text{C}$

■ ORC Provider

- Optimizes ORC to meet heat sink/source conditions
- Provides a variety of ORC layout and power rating

■ Total Solutions

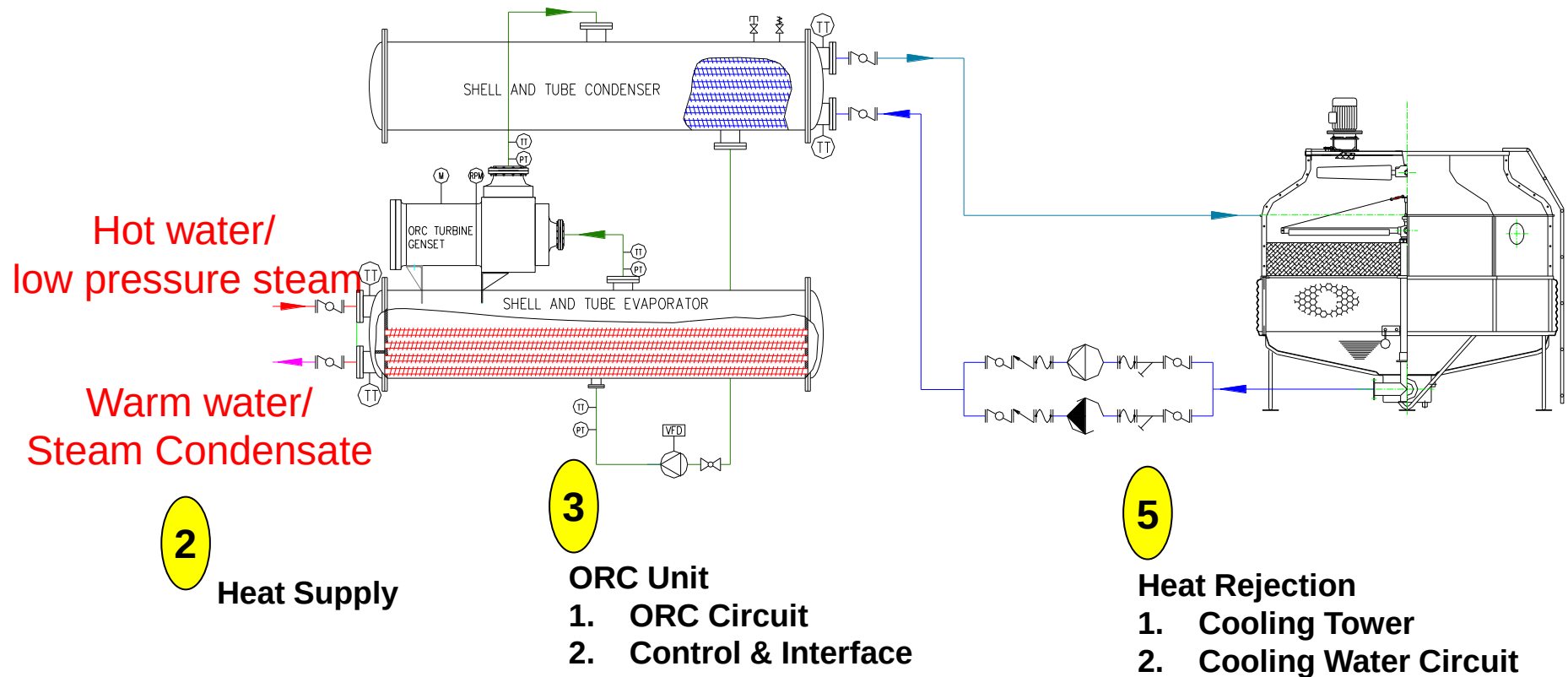
- Requirement analyses
- ORC system and unit Optimization
- Installation & commissioning
- Logistic service

Hot Water (Oil)/Low Pressure Steam

1

System Engineering

1. System/Sub-System Specifications
2. System Integration & Testing

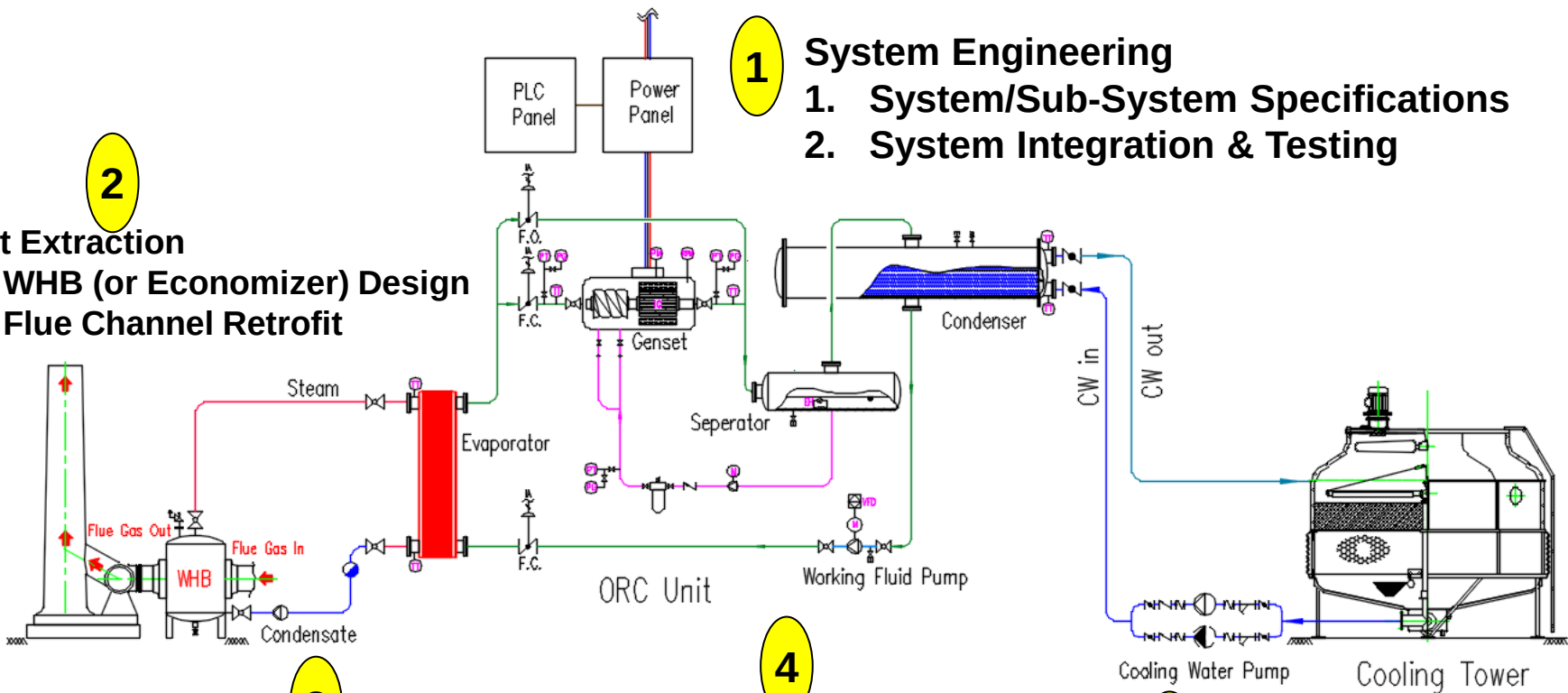


Flue Gas Heat Recovery

2

Heat Extraction

1. WHB (or Economizer) Design
2. Flue Channel Retrofit



1

System Engineering

1. System/Sub-System Specifications
2. System Integration & Testing

3

Heat Supply

Steam (or Hot Water) Supply

4

ORC Unit

1. ORC Circuit
2. Control & Interface

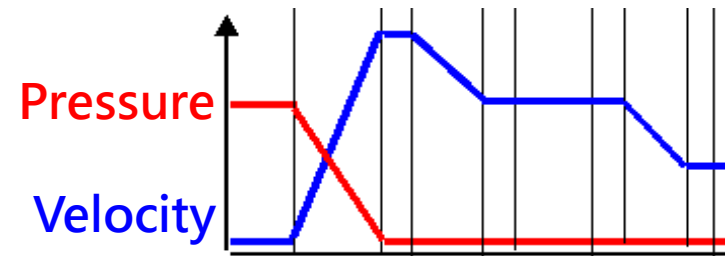
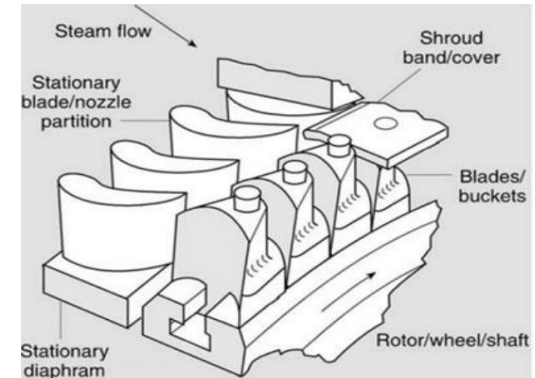
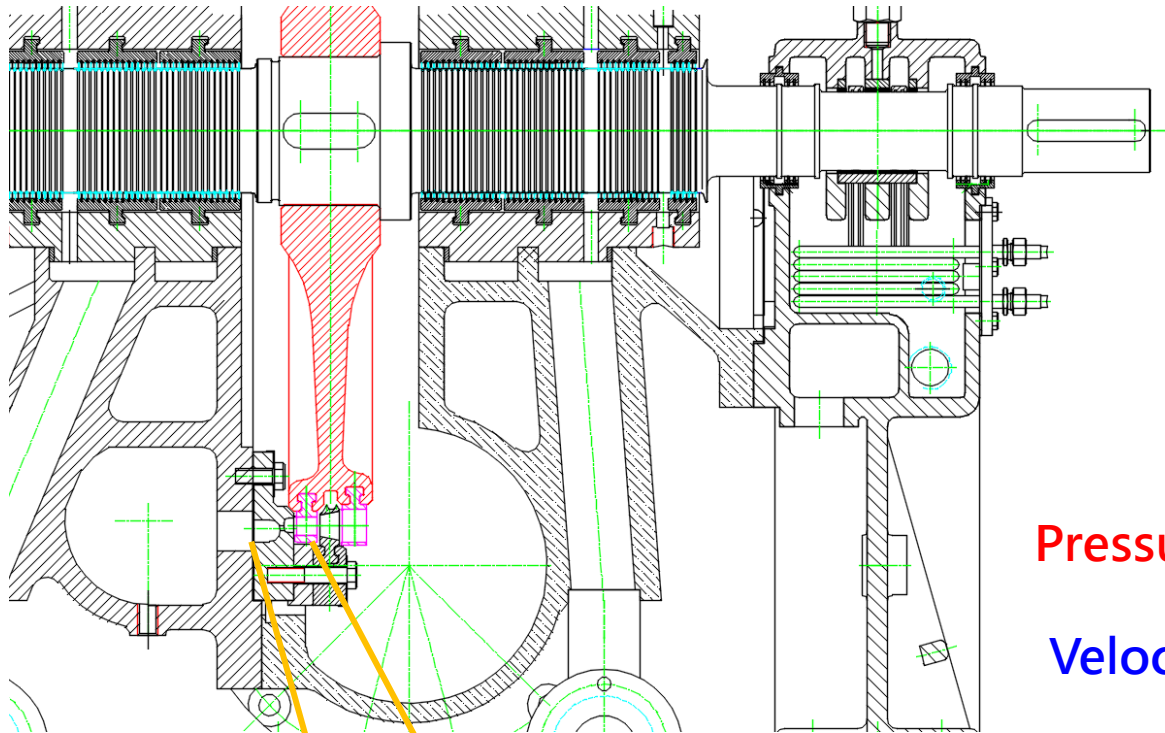
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Heat Rejection

1. Cooling Tower
2. Cooling Water Circuit

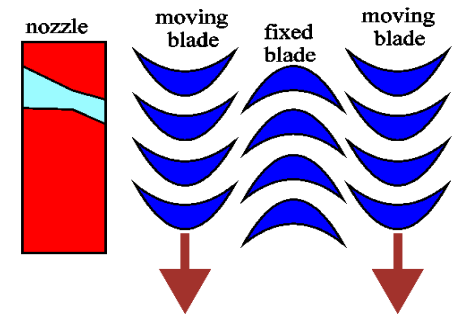
Energy Transform

Pressure → Velocity → Shaft Power

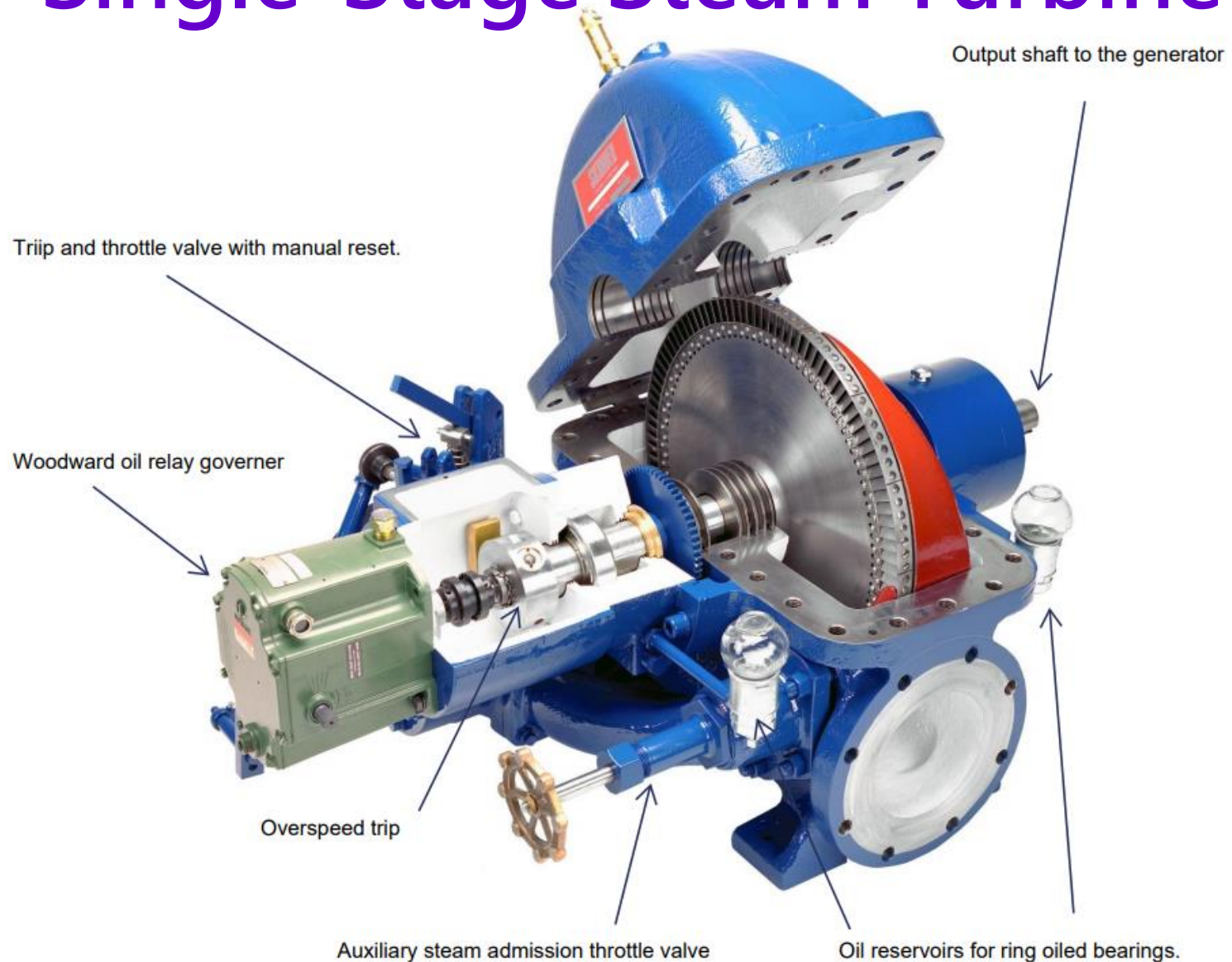


**Nozzle
(Stator)**

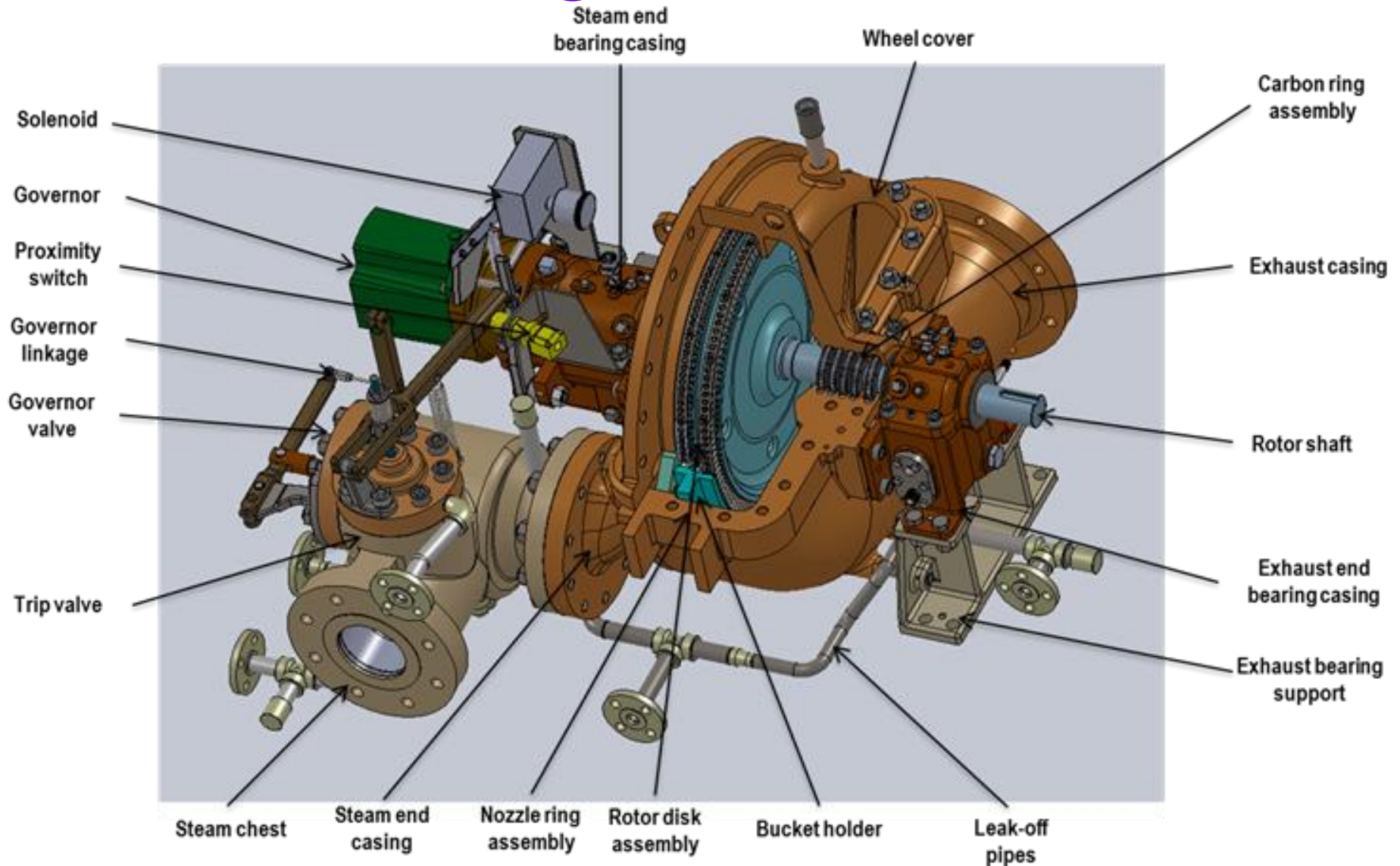
**Blade
(Rotor)**



Single-Stage Steam Turbine

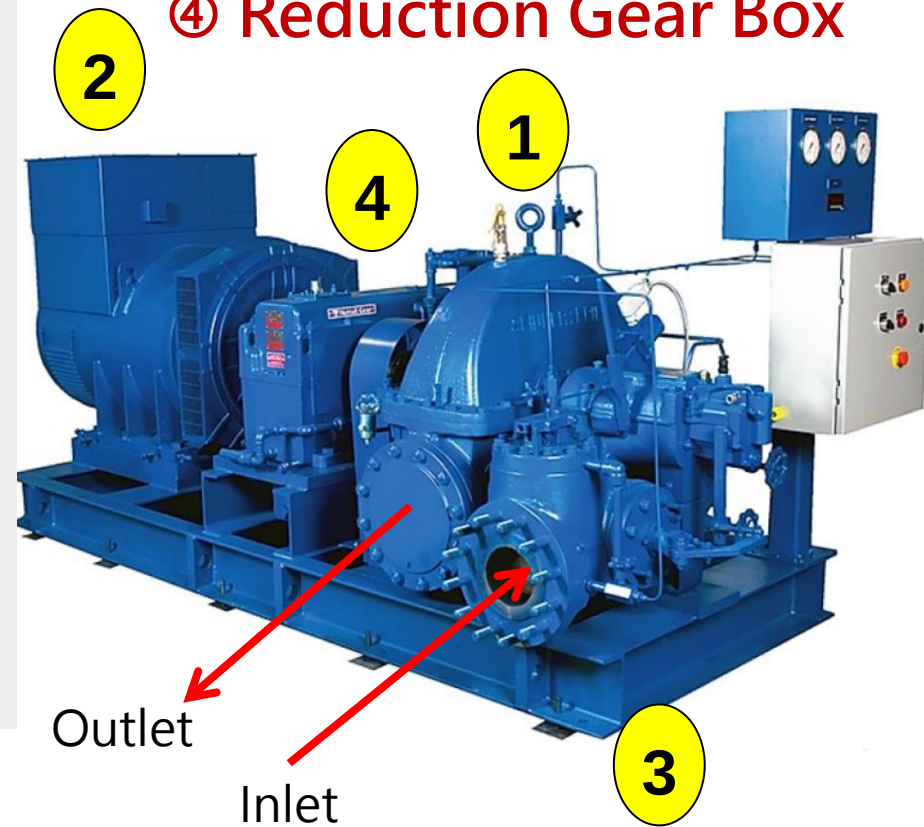
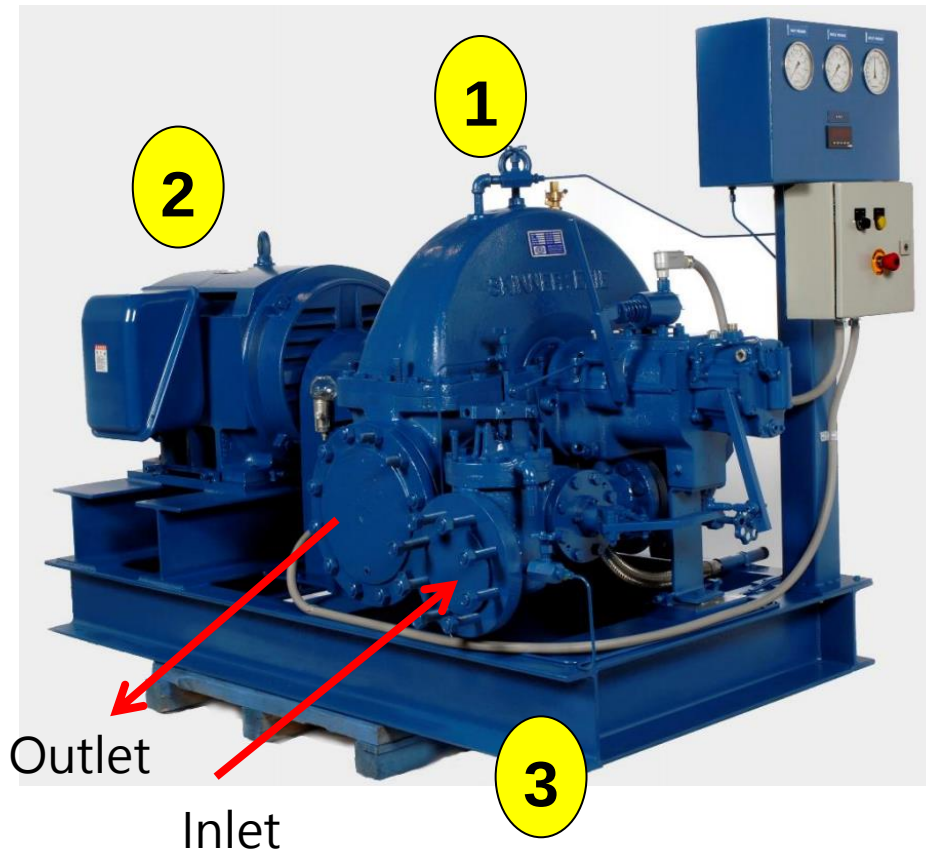


Multi-Stage Steam Turbine



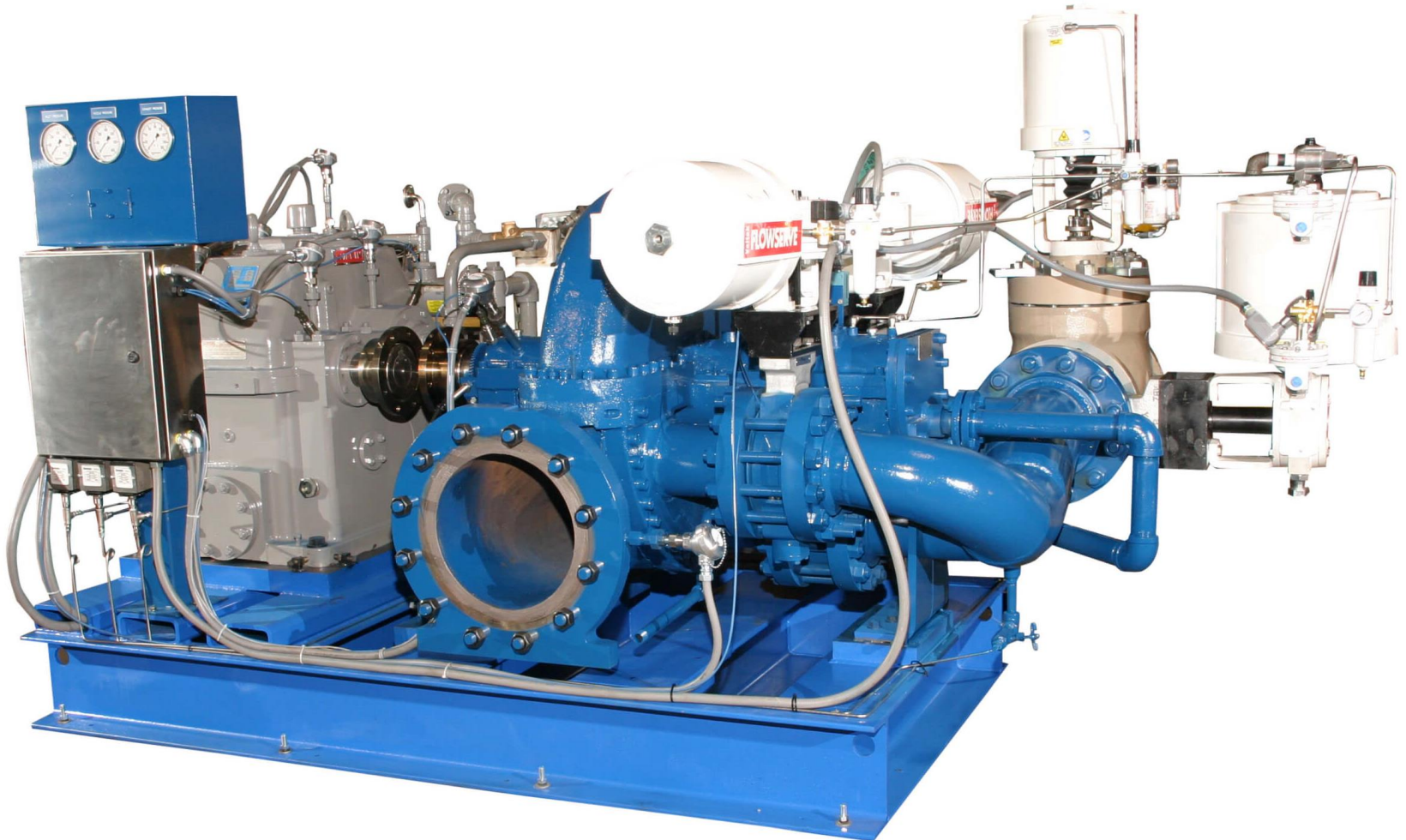
Generator Unit

- ① Steam Turbine
- ② Generator
- ③ Base Plate
- ④ Reduction Gear Box

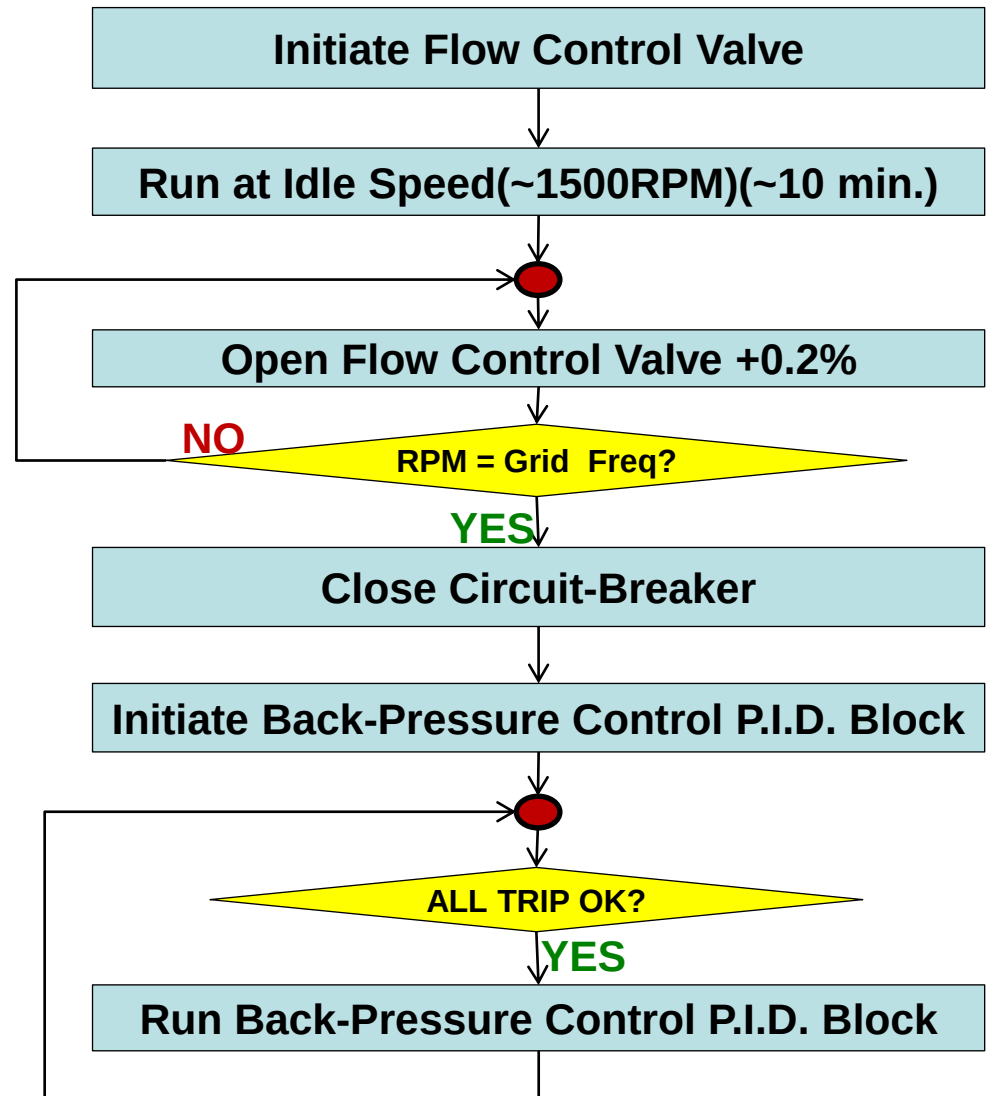
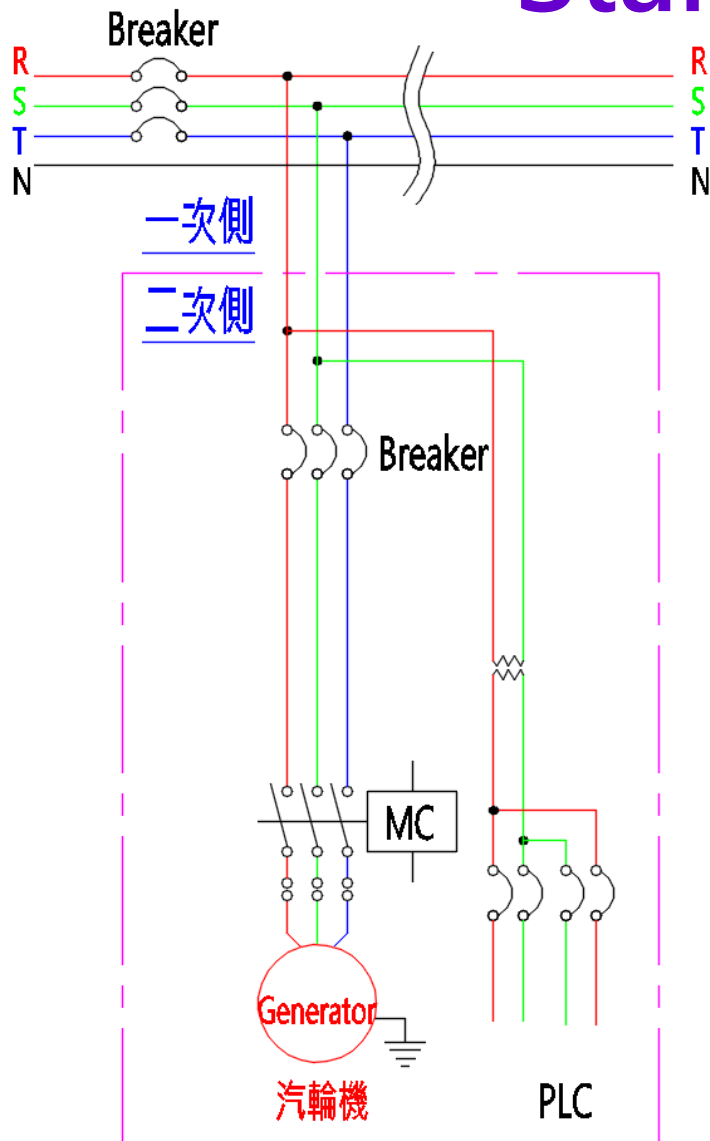


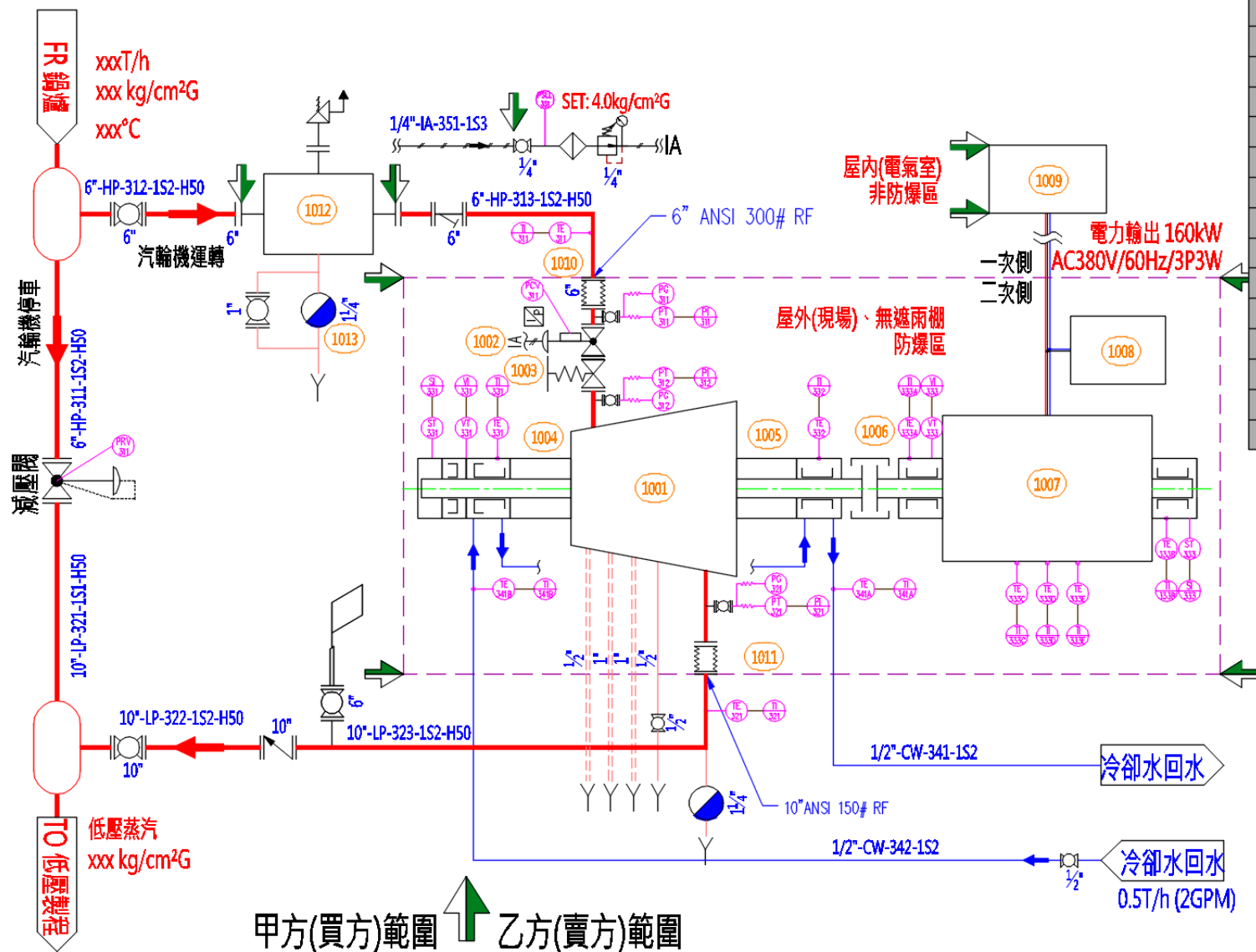
Shaft Power Unit

■ Turbomachine Drive: Pump, Fan, Blower, Compressor, etc.



Start Sequence





	A	B
1		主要部件说明
2	編號	名稱
3	1001	汽輪機
4	1002	比例式流量控制閥
5	1003	機械式緊急斷開閥
6	1004	軸承室(控制室側)
7	1005	軸承室(渦輪室側)
8	1006	排性聯軸器
9	1007	感應發電機
10	1008	PLC控制盤
11	1009	電力開關盤
12	1010	排性換頭(蒸氣入口側)
13	1011	排性換頭(蒸氣出口側)
14	1012	汽液分離器
15	1013	卻水塔(DSC F5Fx 32)

Layout & Reference Dimension

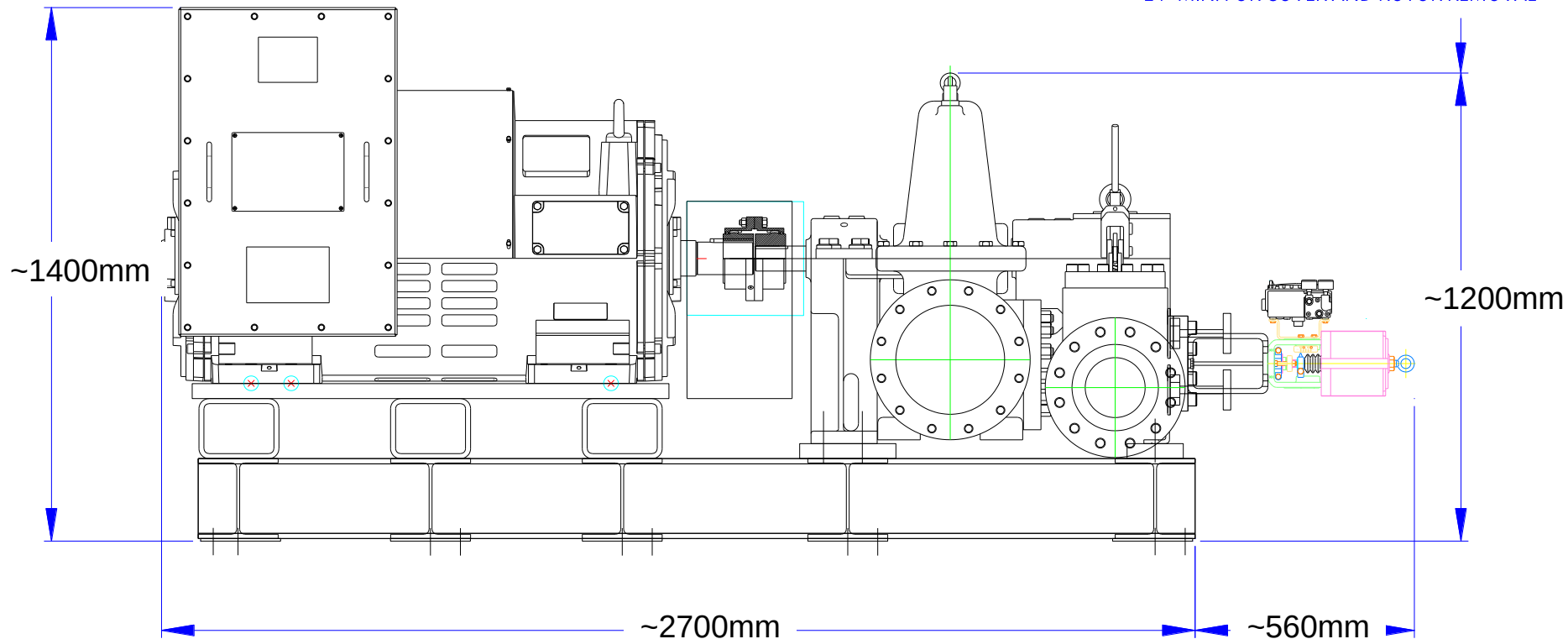
Reference Dimension(mm) : L 2700 x W 1200 x H1400

Generator

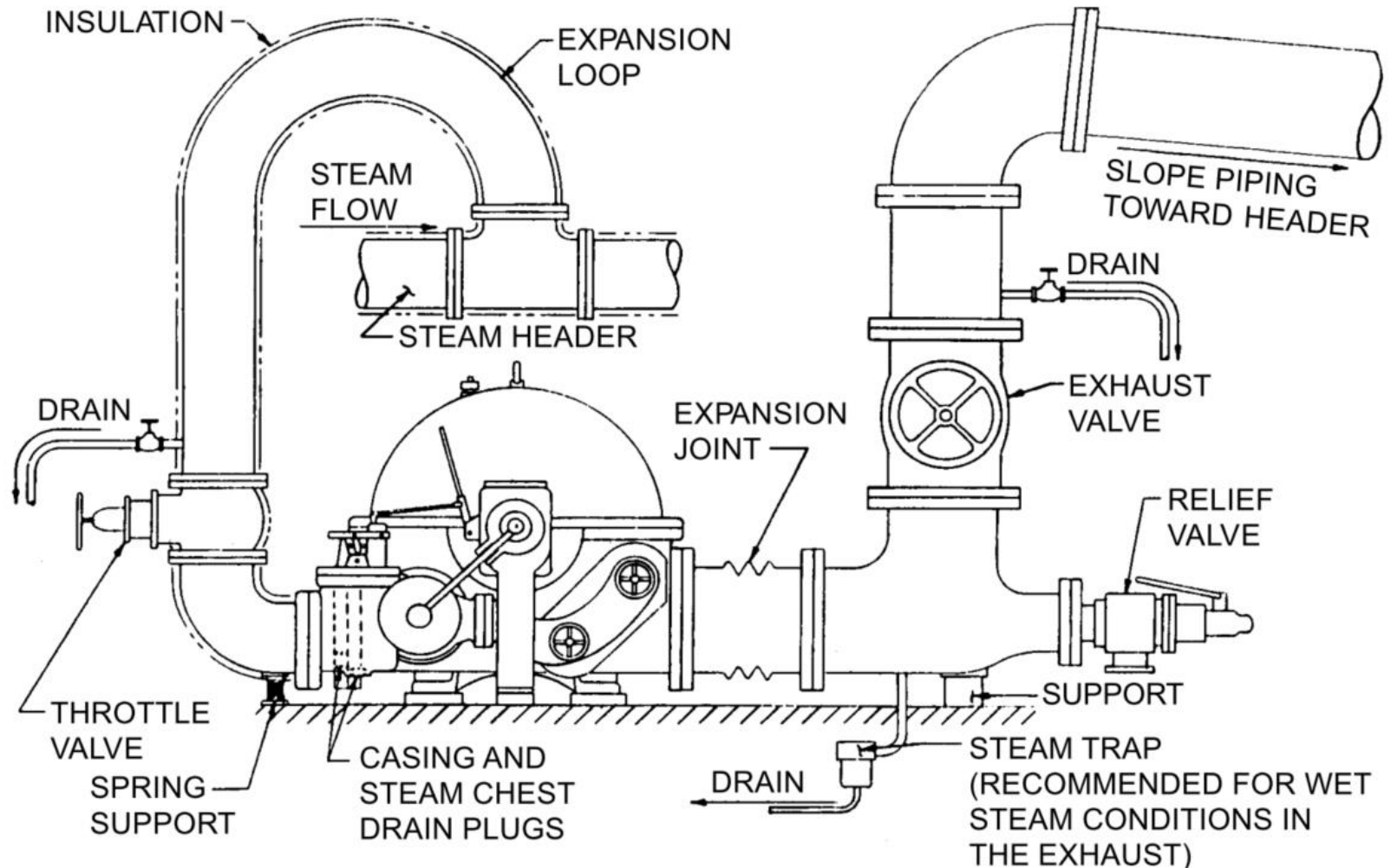
Coupling

Steam Turbine

14" MIN. FOR COVER AND ROTOR REMOVAL



Site Installation (ref.)



Zone A: Newly Commissioned, Zone B: Acceptable for Long Term Operation
Zone C: Unacceptable for long-term continuous operation, Zone D: to be cause damage

VIBRATION :
Velocity in mm/sec RMS
Guideline as per ISO 10816

220kW Screw-Expander ORC

■ Site: Chemical Plant, Taiwan

■ FAT ⁽¹⁾: Oct. 2014

■ SAT ⁽²⁾: Nov. 2014

(1) FAT: Factory Acceptance Test

(2) SAT: Site Acceptance Test

■ R134a Screw-Expander ORC +
Induction Generator

■ Heat Source: Hot Water

● 200T/hr, 82°C→62°C

■ Heat Sink: Cooling Water

● 800T/hr, 32°C→36.8°C



230kW Screw-Expander ORC

■ Site: Steel Company, Thailand

■ FAT: Feb. 2016

■ SAT: Aug. 2016

■ R245fa Screw-Expander ORC + Induction Generator

■ Heat Source: Flue Gas → Hot Water

● 140°C → 100°C

■ Heat Sink: Cooling Water

● 32°C → 39°C



210kW Screw-Expander ORC

- Site: Solar Thermal Energy, China
- FAT: March 2016
- SAT: May 2016
- R245fa Screw-Expander ORC + Induction Generator
- Heat Source: Hot Oil
 - 67T/hr, 180°C→102°C
- Heat Sink: Cooling Water
 - 200T/hr, 30°C→38°C



220kW Screw-Expander ORC

- Site: Steel Company, Taiwan
- FAT: June 2016
- SAT: Dec. 2016
- R245fa Screw-Expander ORC + Induction Generator
- Heat Source: Flue Gas → Hot Water
 - 60T/hr, 136°C → 104°C
- Heat Sink: Cooling Water
 - 318T/hr, 36°C → 41°C



330kW Screw-Expander ORC

- Site: Electrical Company, China
- FAT: Dec. 2016
- SAT: Aug. 2017

- R134a Screw-Expander ORC + Induction Generator
- Heat Source: Hot water
 - 105T/hr, 95°C→59.3°C
- Heat Sink: Cooling Water
 - 686 T/hr, 15°C→20°C



132kW Screw-Expander ORC

- Site: Steel Company, Taiwan
- FAT: Feb. 2018
- SAT: June 2018
- R245fa Screw-Expander ORC + Induction Generator
- Heat Source: Flue Gas → Steam
 - 2.5 bar, saturated
 - Flow Rate: 2 T/hr
- Heat Sink: 32°C Cooling Water



136kW Screw-Expander ORC

- Site: Chemical Company, Taiwan
- FAT: APril, 2018
- SAT: Feb., 2019
- R245fa Screw-Expander ORC + Induction Generator (AC380V/60Hz/3P3W)
- Installation Area
 - Outdoor
 - Explosion-Proof Area
- Heat Source:
 - 3.5bar Superheated Steam
- Heat Sink: Cooling Water
 - 32°C/38°C



240kW Screw-Expander ORC

- Site: Chemical Company, Taiwan
- FAT: July 2019
- SAT: Sep. 2019



- R245fa Screw-Expander ORC + Induction Generator
(AC33,000V/60Hz/3P3W)

- Installation Area

- Outdoor
- Explosion-Proof Area

- Heat Source:

- Boiler Blow Down Water (40bar)

- Heat Sink: Cooling Water

- 32°C/38°C

212kW Screw-Expander ORC

- Site: Chemical Company, China
- FAT: Sep. 2017
- SAT: Dec. 2017
- R245fa Screw-Expander ORC + Synchronous Generator (AC380V/50Hz)
- Heat Source: Hot Water
 - 133T/hr, 130°C→115°C
- Heat Sink: Cooling Water
 - 181 T/hr, 32°C→42°C



1,000kW Turbine ORC

■ Site: Chemical Company, China

■ FAT: March 2019

■ SAT: June 2019

■ R245a Turbine ORC (open type) +
Synchronous Generator (AC10,000V/50Hz)

■ Heat Source: Hot Water

● 197 T/hr, 127°C→70°C

■ Heat Sink: Cooling Water

● 1460 T/hr, 26°C→33°C

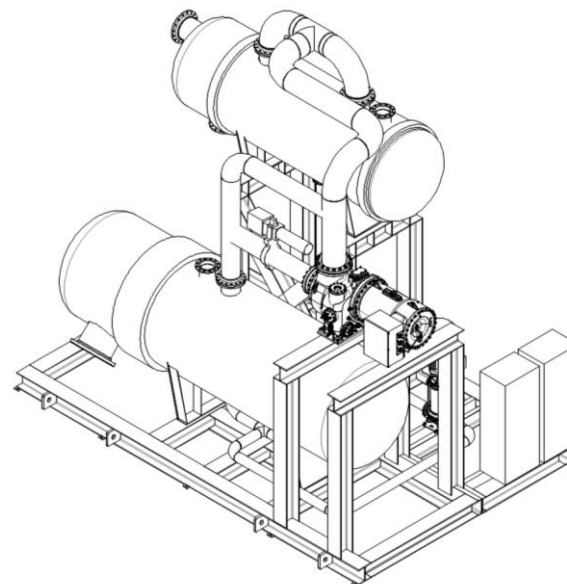


930kW Turbine ORC

- Site: Chemical Company, China
- FAT: Nov. 2019
- SAT: April 2020



- R245fa Turbine ORC + Induction Generator (AC10,500V/50Hz/3P3W)
- Installed at Explosive-Proof Area
- Heat Source: Steam + Hot Air
 - T: 188~255°C
- Heat Sink: Cooling Water



500kW Turbine ORC

■ Site: Chemical Company, Taiwan

■ FAT: March 2020

■ SAT: May 2020

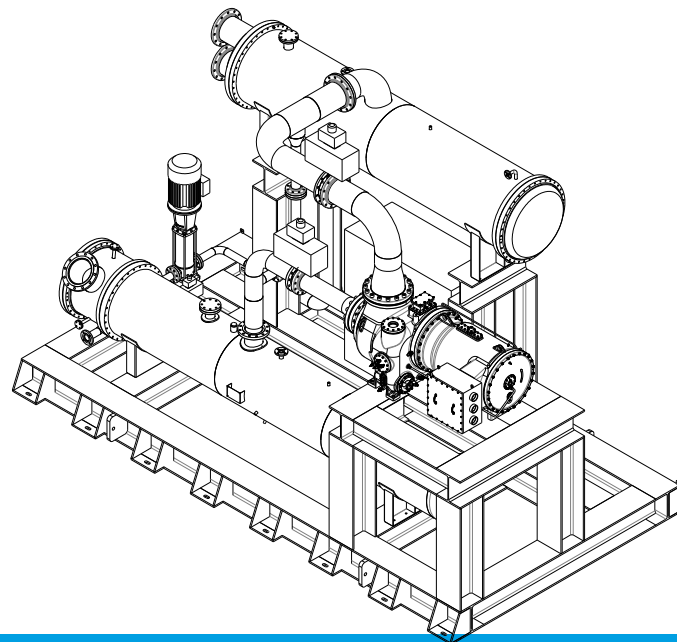
■ R245fa Turbine ORC + Induction Generator (AC460V/60Hz/3P3W)

■ Heat Source: Steam

● 7 T/hr, 2.5 bar Saturated Steam

■ Heat Sink: Cooling Water

● 486T/hr, 30°C→37°C

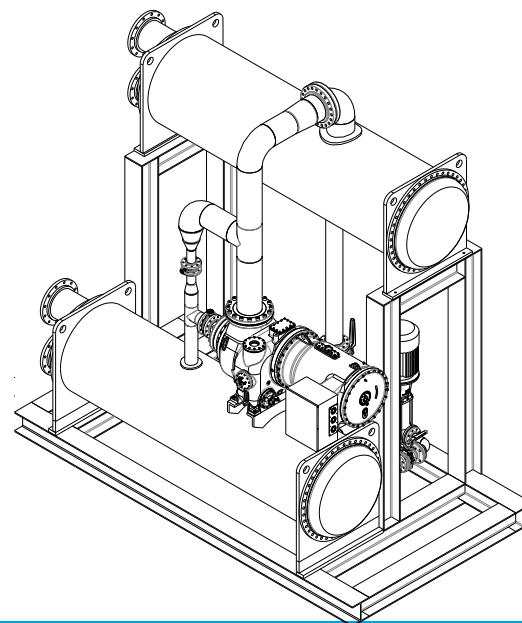


530kW Turbine ORC

- Site: Chemical Company, China
- FAT: Nov. 2019
- SAT: June 2020



- R134a Turbine ORC + Induction Generator (AC400V/50Hz/3P3W)
- Heat Source: Hot Water
 - 392 T/hr, 95°C→65°C
- Heat Sink: Cooling Water
 - 1460 T/hr, 26°C→33°C



980kW Turbine ORC(Steam+CO₂)

- Site: Chemical Company, Taiwan
- FAT: Aug. 2020
- SAT: Dec. 2020
- R245fa Turbine ORC + Induction Generator (AC3.3kV/60Hz/3P3W)
- Heat Source: Steam + CO₂
- Heat Sink: Cooling Water



300kW Turbine ORC

■ Site: Geothermal Site, Taiwan

■ FAT: June 2021

■ SAT: June 2022

■ R245fa Turbine ORC + Induction
Generator (AC380kV/60Hz/3P3W)

■ Heat Source: Geothermal Liquid

■ Heat Sink: Cooling Water

● 30°C→37°C



400kW Turbine ORC

■ Site: Geothermal Site, Taiwan

■ FAT: May 2021

■ SAT: Sep. 2022

■ R245fa Turbine ORC + Induction
Generator (AC380kV/60Hz/3P3W)

■ Heat Source: Geothermal Heat

● Steam + Liquid

■ Heat Sink: Cooling Water

● 30°C→37°C



550kW Turbine-ORC

- Site: Geothermal Site, Taiwan
- FAT: June 2021
- SAT: Oct. 2021



- R245fa Turbine ORC + Induction Generator (AC380kV/60Hz/3P3W)
- Heat Source: Geothermal Liquid
 - 90 T/hr, 140 °C
 - Heat Exchanger
 - Material: Titanium
 - Plate Type: 3 +1
- Heat Sink: Cooling Water
 - 30°C→37°C

680kW Multi-Satge Turbine ORC

- Site: Chemical Company, Taiwan
- FAT: June 2022
- SAT: Nov. 2022

- R1233zd Turbine ORC + Induction Generator (AC11.4kV/60Hz/3P3W)
- Heat Source: Steam
 - 7.5 T/hr, 2 bar Saturated Steam
- Heat Sink: Cooling Water
 - 486T/hr, 30°C→37°C



70kW Back Pressure Steam Turbine

■ Site

- Food Industry/Philippines

■ SAT

- Oct. 2017

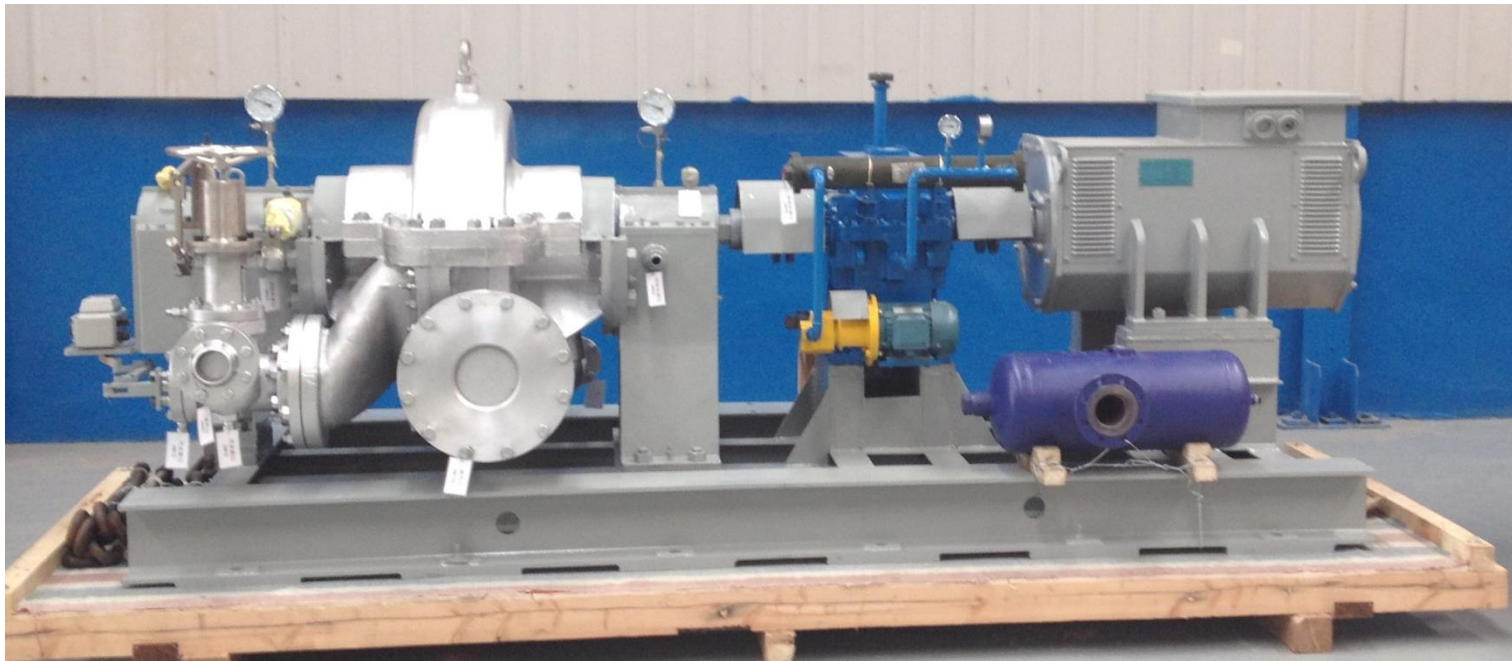
■ Induction Generator (AC400V, 60Hz)

■ Inlet Condition

- 2.0T/h, 10kg/cm²G Saturated

■ Outlet Condition

- 1.0kg/cm²G



125kW Back Pressure Steam Turbine

■ Site

- Chemical Industry/Taiwan

■ SAT

- Nov. 2019

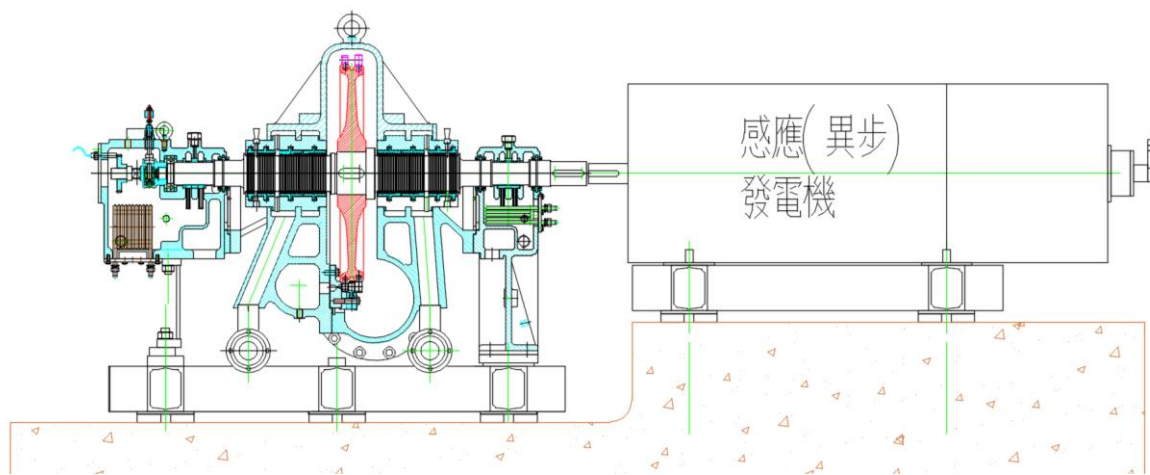
■ Induction Generator(AC440V, 60Hz)

■ Inlet Condition

- 6.0T/h, 17kg/cm²G Saturated

■ Outlet Condition

- 6.0kg/cm²G



300kW Back Pressure Steam Turbine

■ Site

- Chemical Industry/Taiwan

■ SAT

- Oct. 2019

- Induction Generator(AC480V, 60Hz)

■ Inlet Condition

- 12.0T/h, 17kg/cm2G Saturated

■ Outlet Condition

- 5.5kg/cm2G



400kW Back Pressure Steam Turbine

■ Site

- Petrochemical Industry/Taiwan

■ SAT

- Nov. 2022

■ Induction Generator(AC380V, 60Hz)

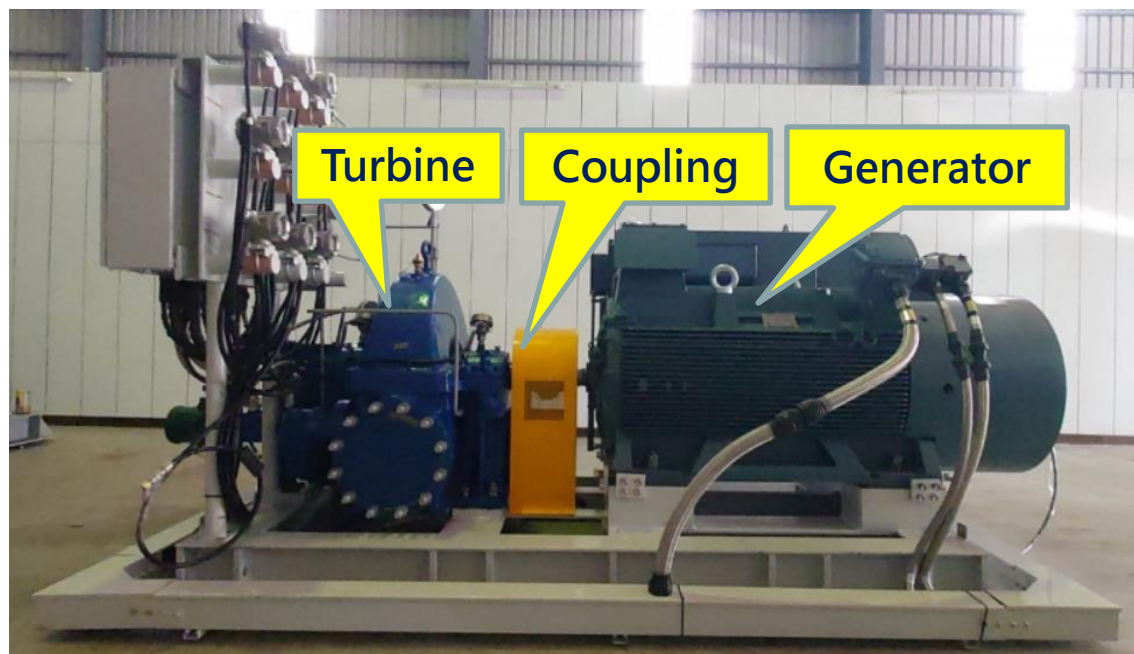
■ Installed Location: Explosive Area

■ Inlet Condition

- 16.0T/h, 13kg/cm²G Saturated

■ Outlet Condition

- 3.5kg/cm²G



500kW Back Pressure Steam Turbine

■ Site

- Petrochemical Industry/Taiwan

■ SAT

- Oct. 2017

- Induction Generator(AC400V, 60Hz)

- Installed Location: Explosive Area

- Inlet Condition

- 9.0T/h, 35kg/cm²G Saturated

- Outlet Condition

- 3.5kg/cm²G



1,000kW Back Pressure Steam Turbine

■ Site

- Fertilizer Ptrochemical Industry/Taiwan

■ SAT

- Oct. 2017

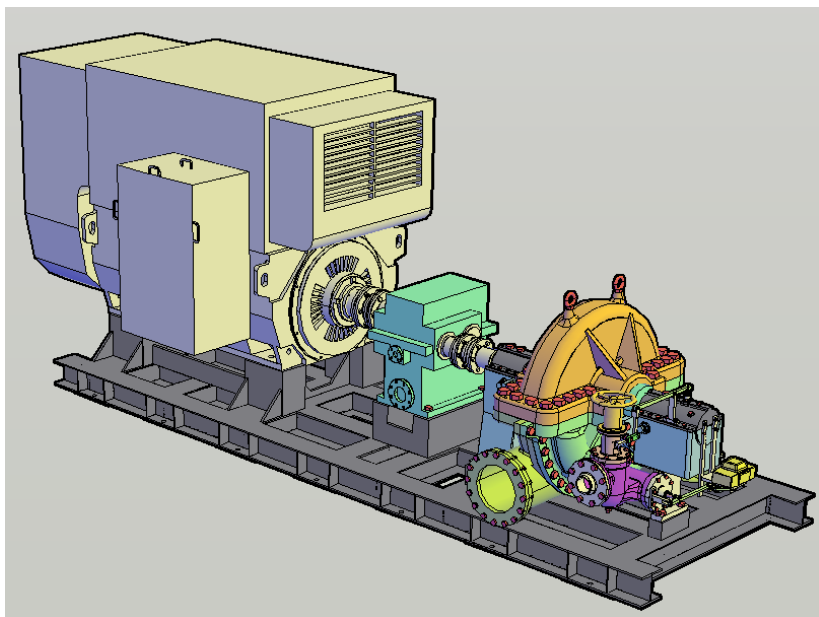
■ Induction Generator(AC11.6kV, 60Hz)

■ Inlet Condition

- 20.5T/h, 40kg/cm²G Saturated

■ Outlet Condition

- 5.0kg/cm²G



Thank You

