Howden
A Chart Industries Company

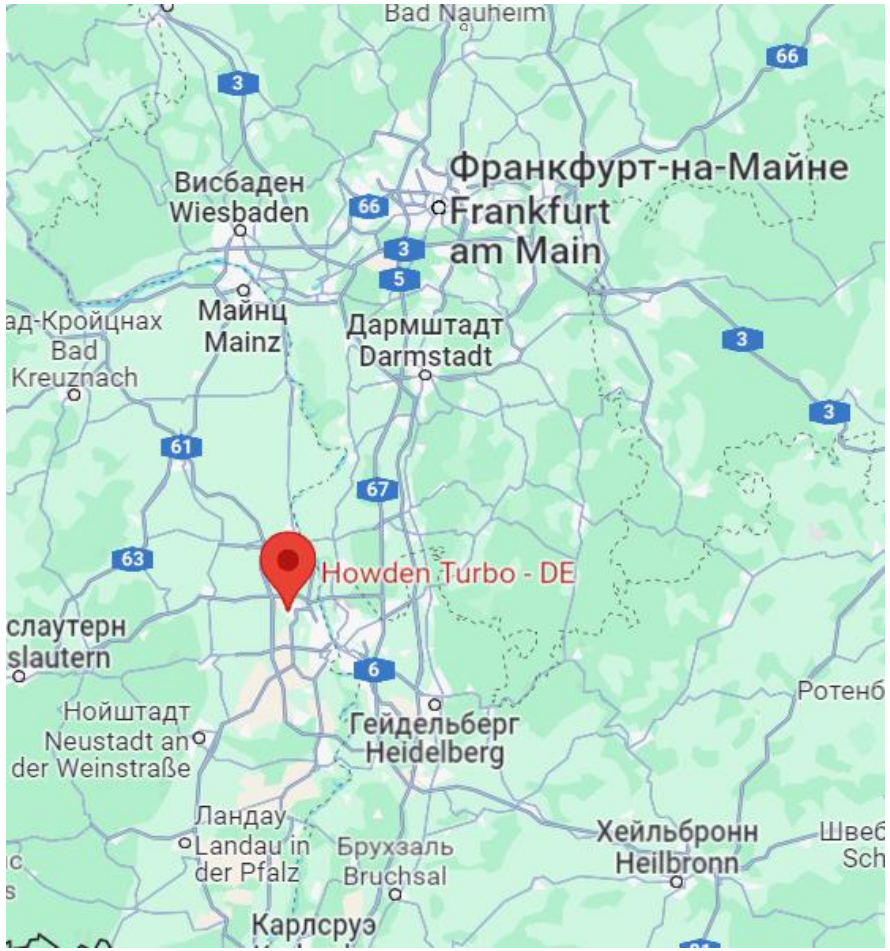
Howden Turbo KK&K Steam Turbines

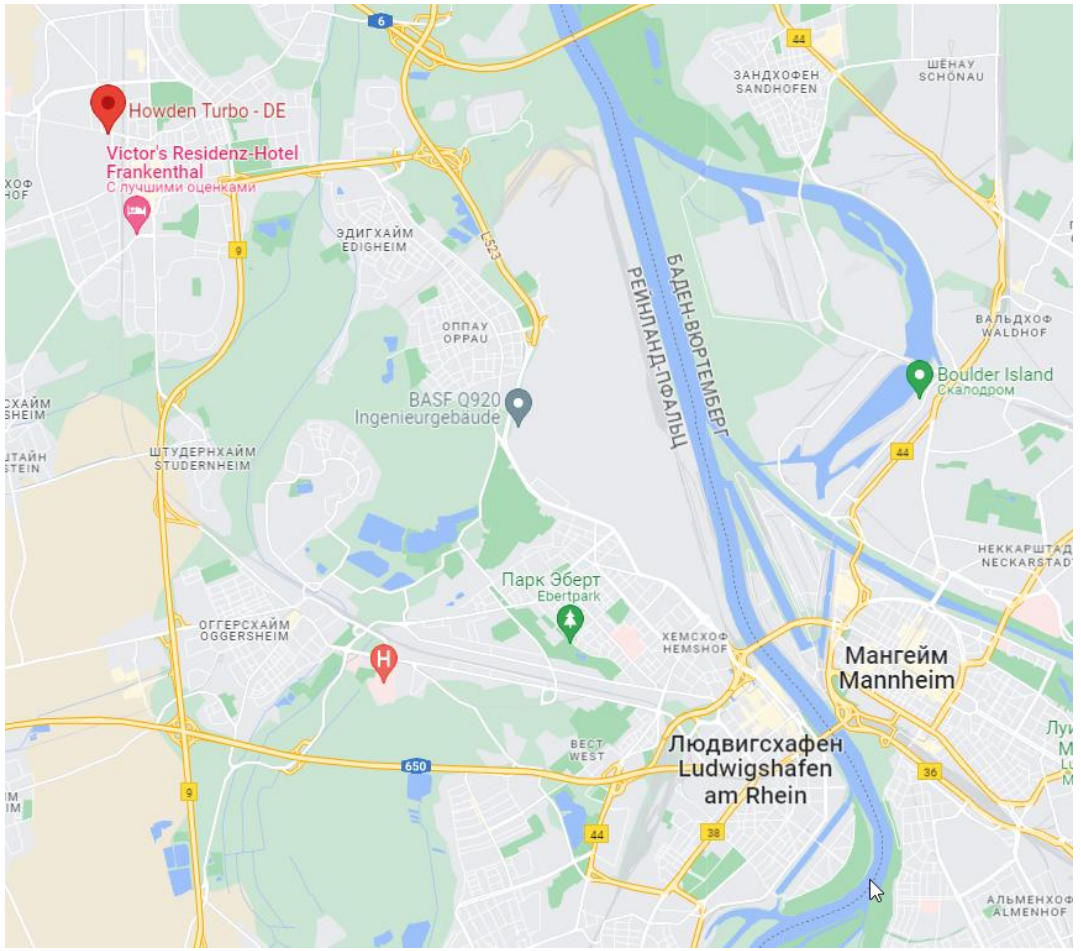
Flexible and Efficient steam turbines

Revolving Around You™

Howden Turbo KK&K Steam Turbines

Location





Howden Turbo KK&K Steam Turbines

Production facility in Frankenthal

Business area and products

Production of pre-engineered turbo compressors and steam turbines for industrial applications and process solutions such as chemical and oil refining, metallurgy and wastewater treatment, service support for the entire product line.

Production area

120.000 m²

Production capacity

220 - 250 units/year

Employees

abt. 600 + abt. 30 trainees

Howden Turbo KK&K Steam Turbines

Production facility in Frankenthal

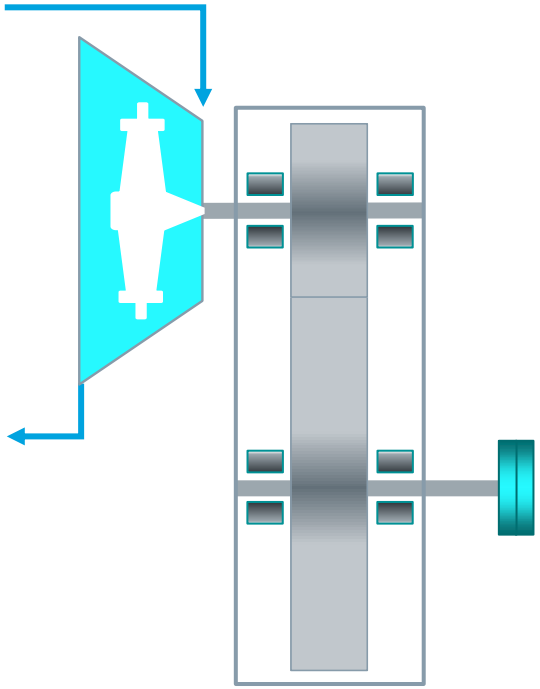
Steam Turbines

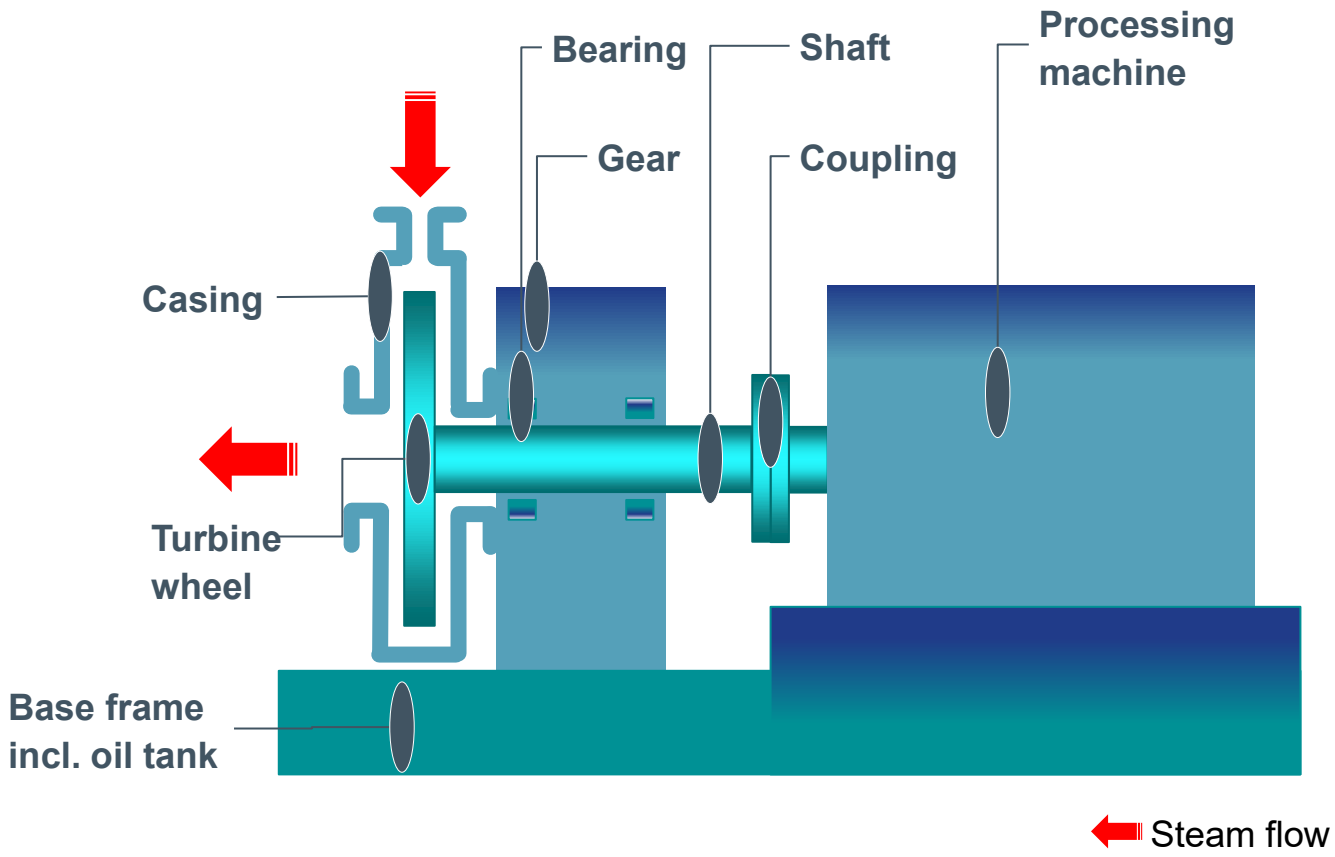
Industrial Compressors

Environmental Compressors

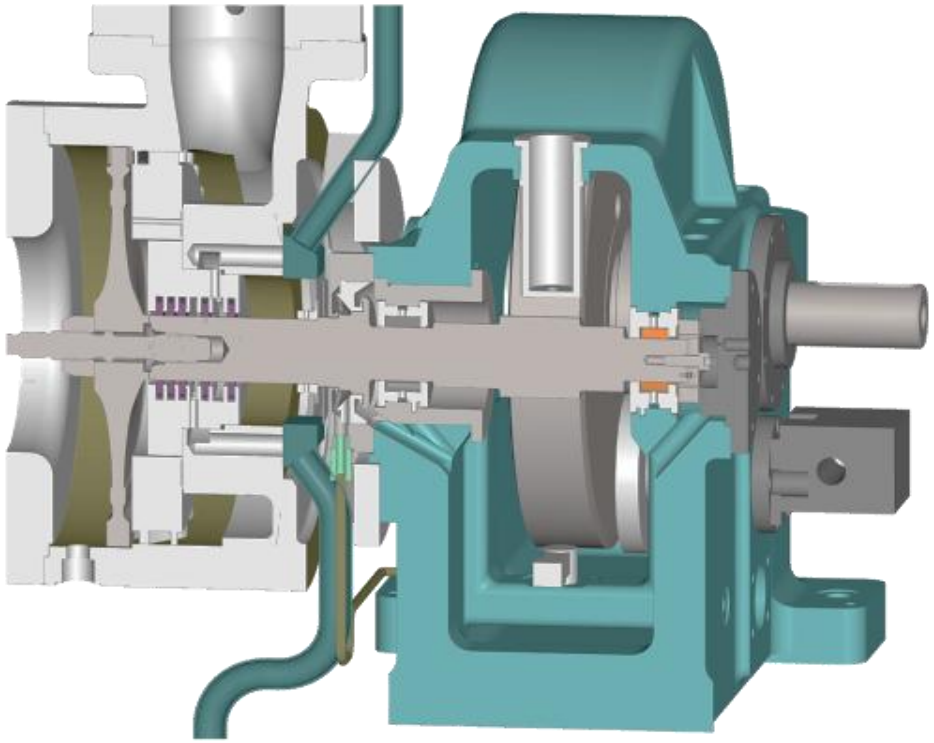
Aftermarket

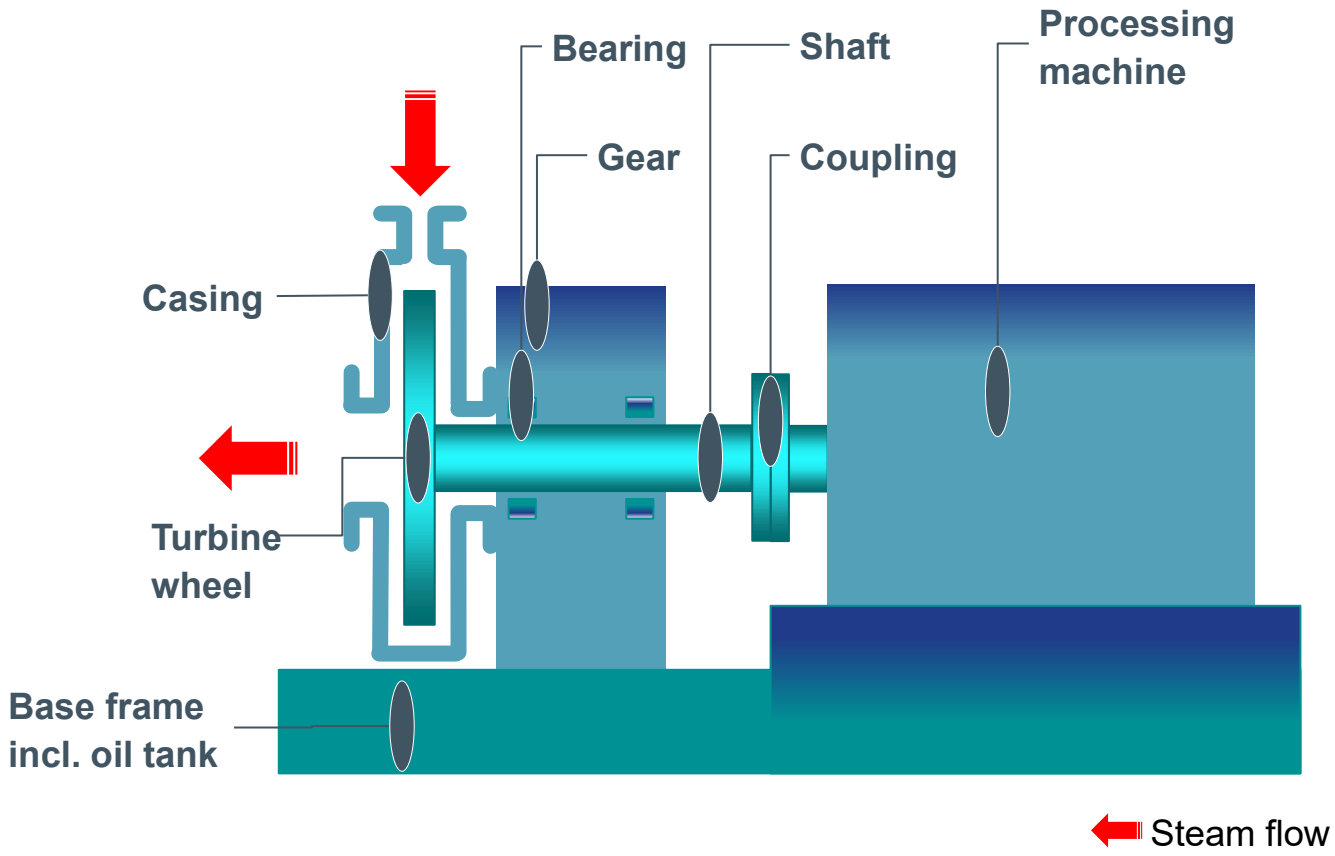
Overhung design, integrated gearbox, integrated oil system



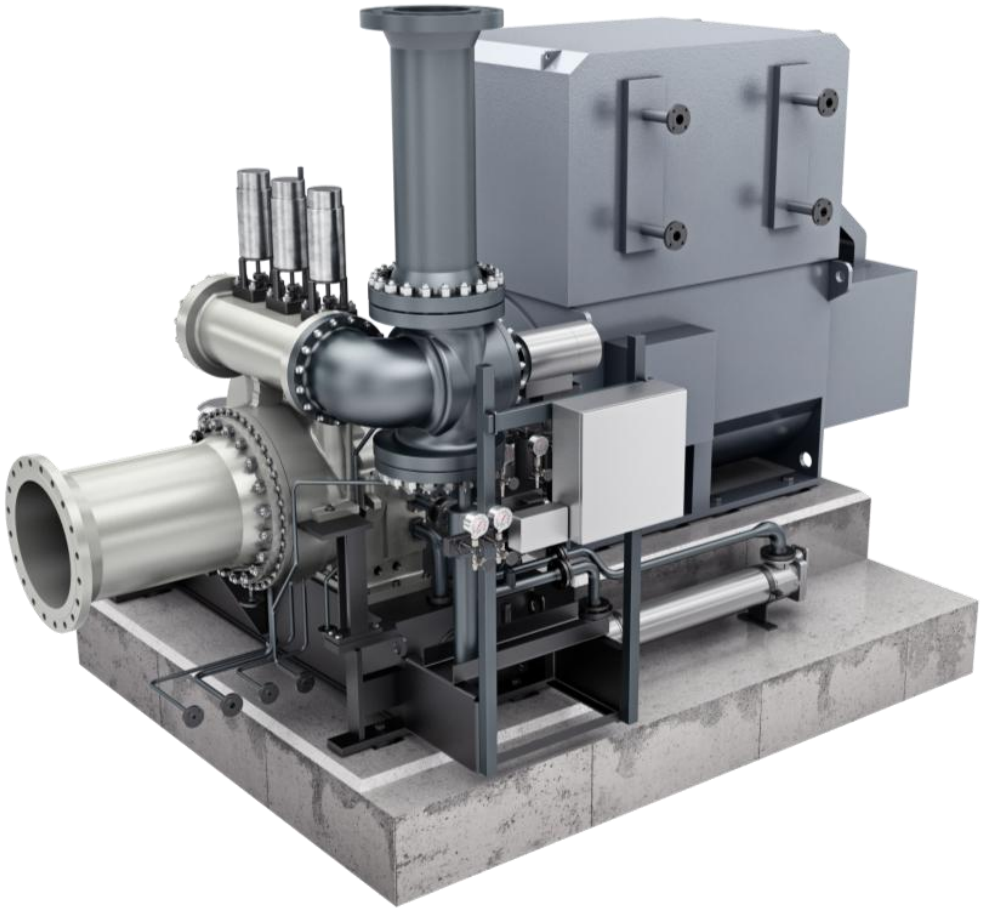


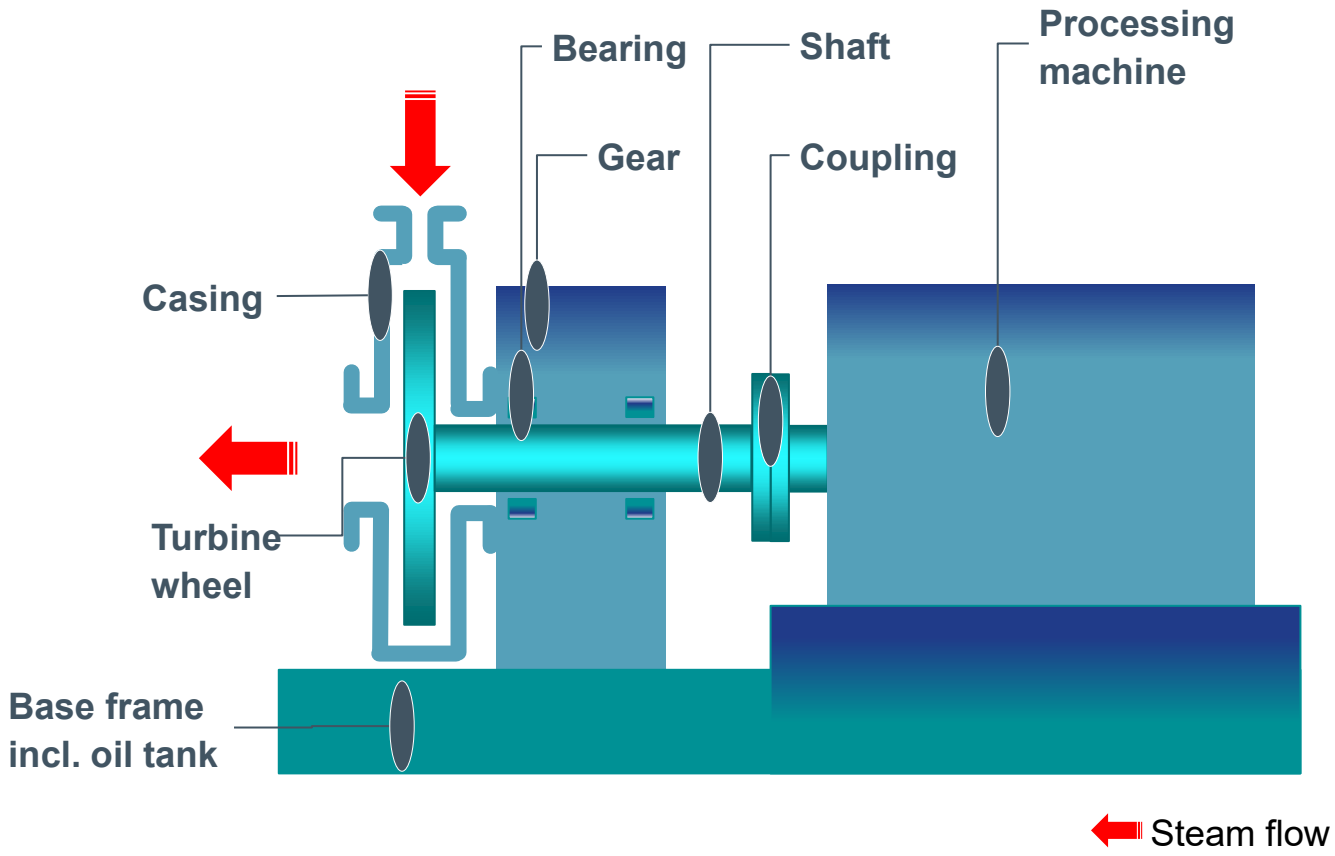
Overhung design, integrated gearbox, integrated oil system





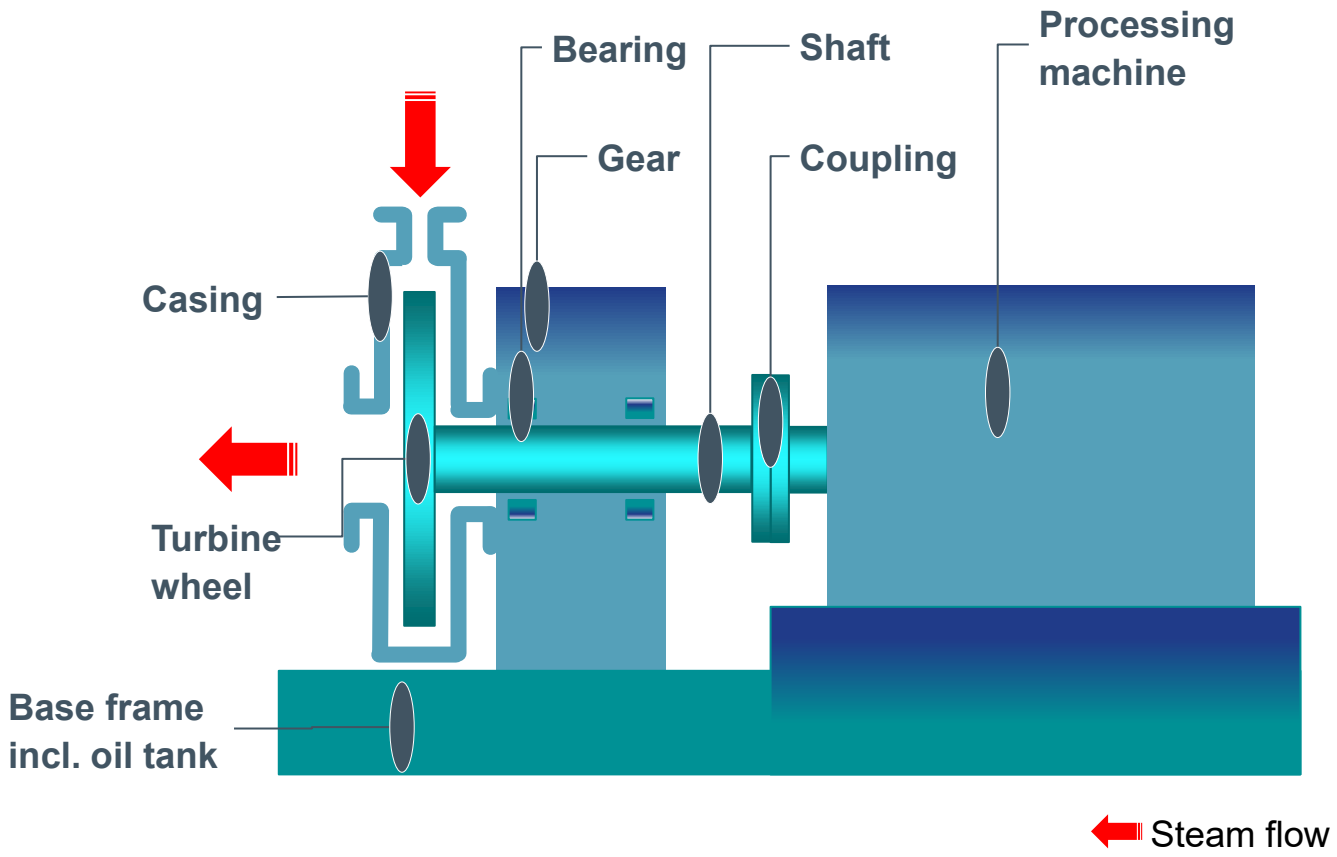
Overhung design, integrated gearbox, integrated oil system





Flexibility in operation:

- start in 1-3 minutes from cold condition to nominal load
- no pre-heating and schaft turning required
- stable minimal load at 3-10% of nominal
- effective partial load
- 3 years of continious operation (no stops)
- no EOH approach for service intervals calculation (real OH only)

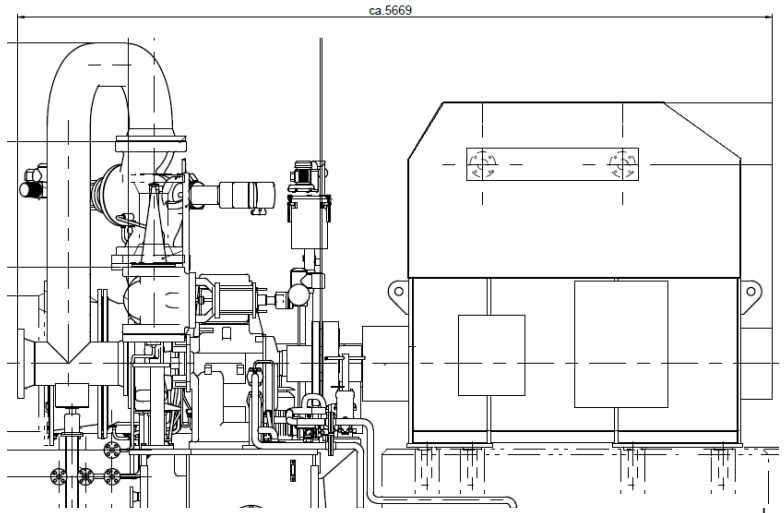


Flexibility by designing and installation:

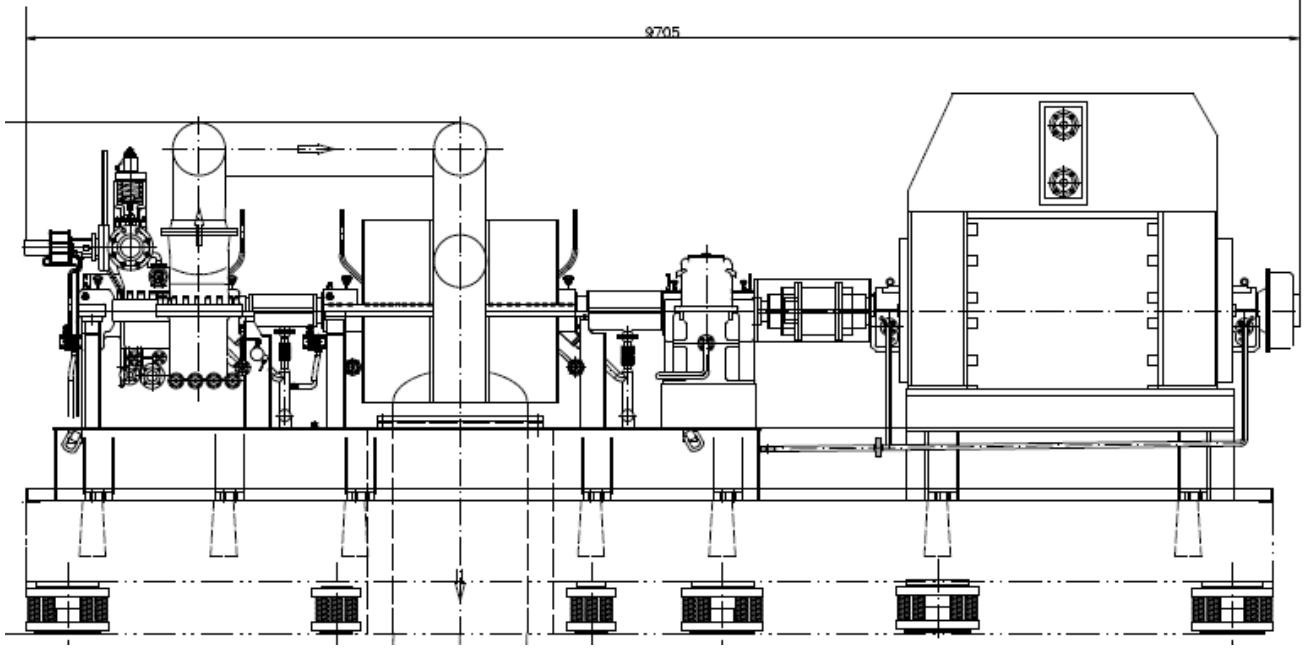
- compact footprint

(comparison 2,5 MW KK&K vs. 2,5 MW multistage)

- quick installation and commissioning



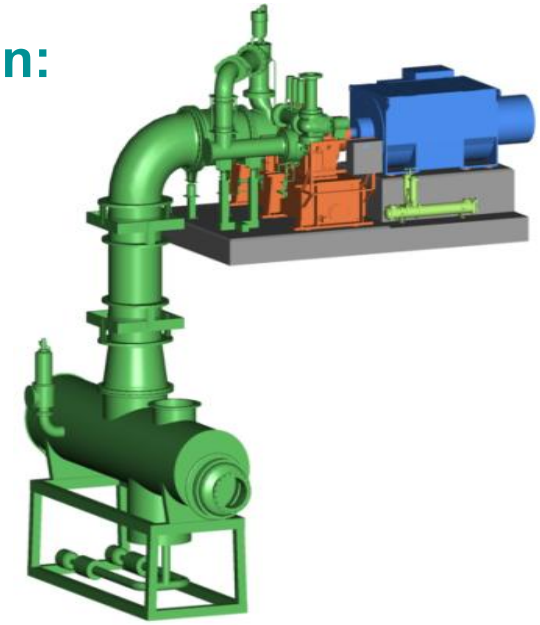
KK&K
Howden Turbo
5,7 m

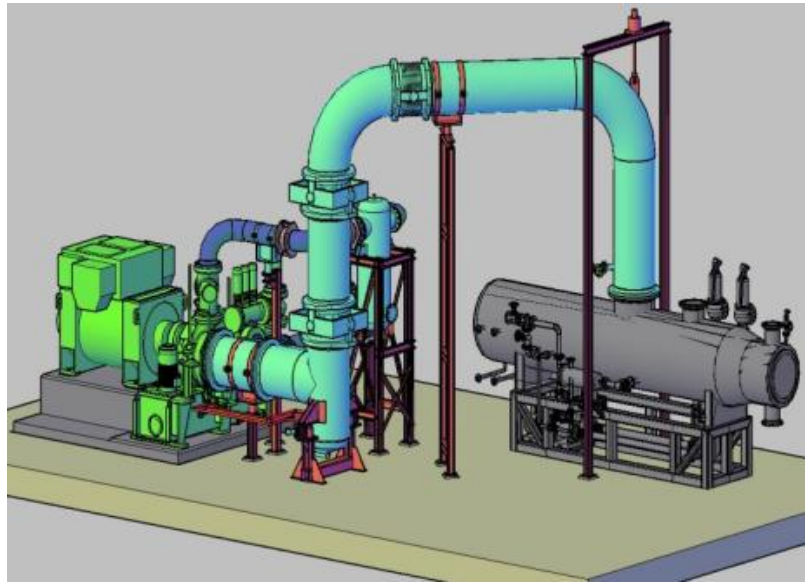


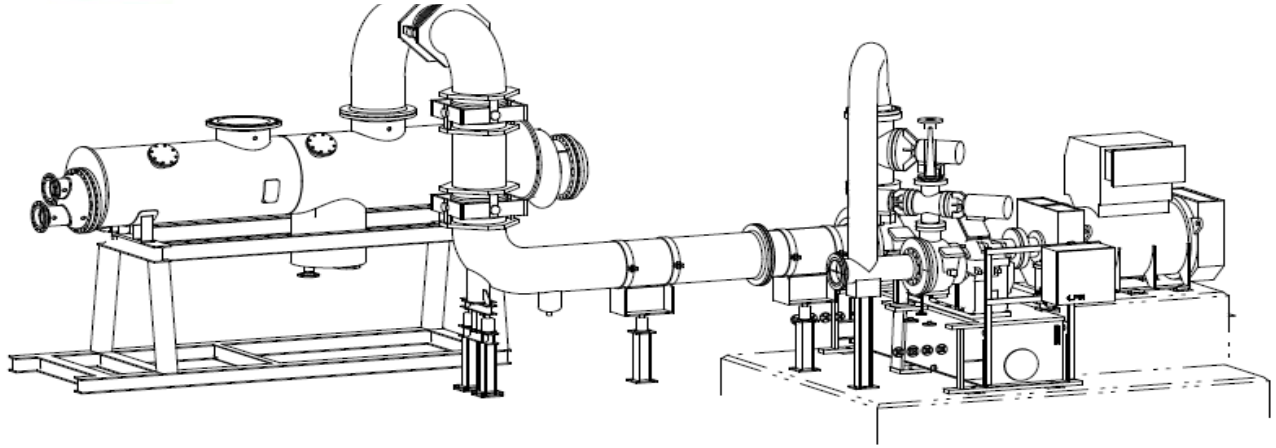
Multistage
9,7 m

Flexibility in designing and installation:

- no limits for condenser arrangements

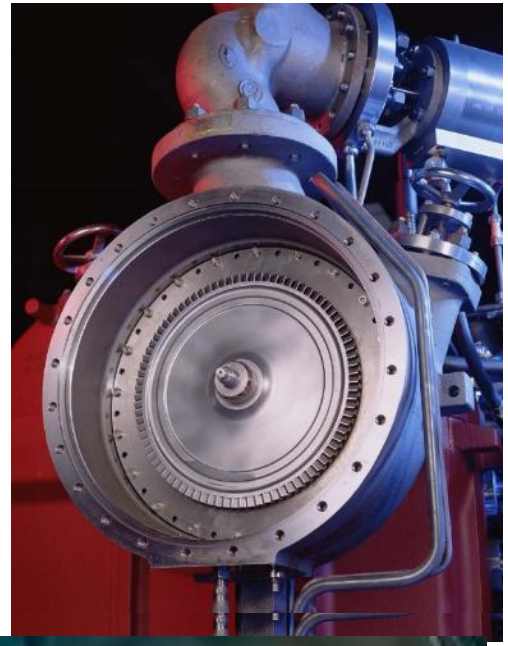






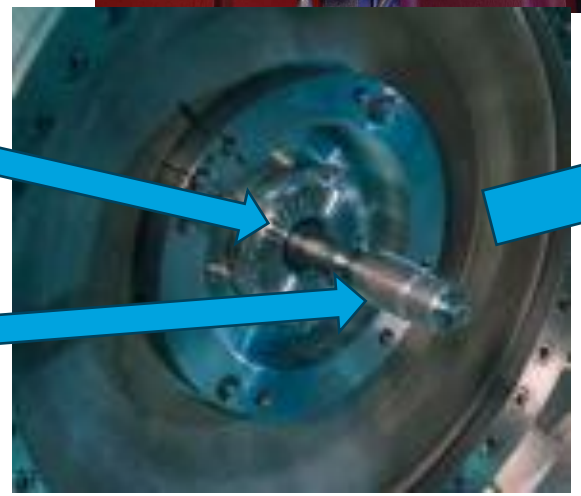
Flexibility by maintenance:

- schort downtime (10 days max.)
- easy access to turbine internals



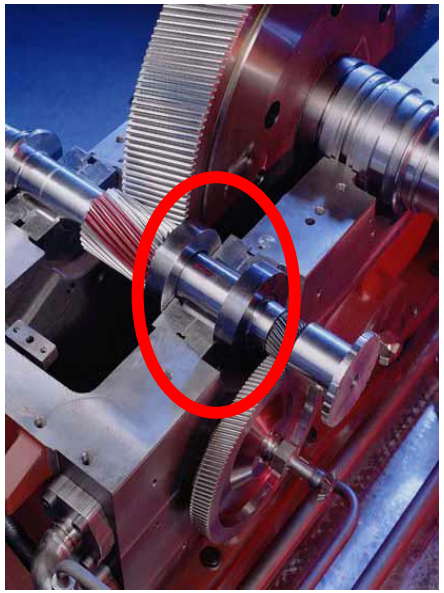
Shaft end with
Hirth-connection

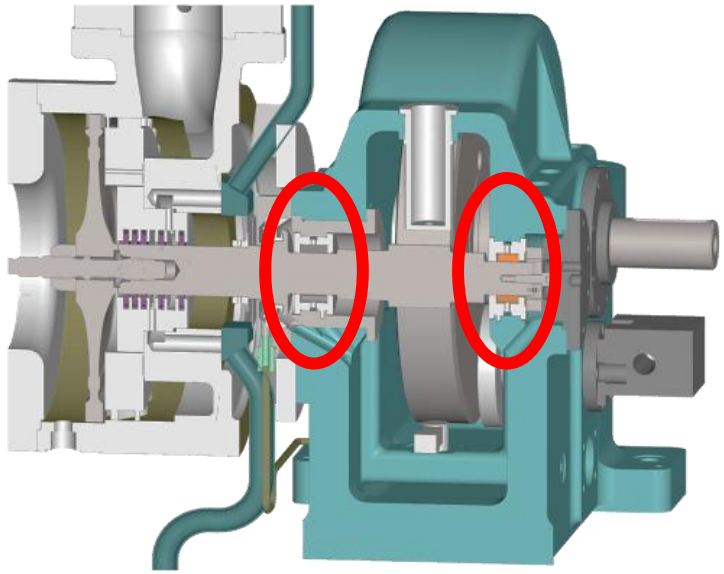
Tension bolt



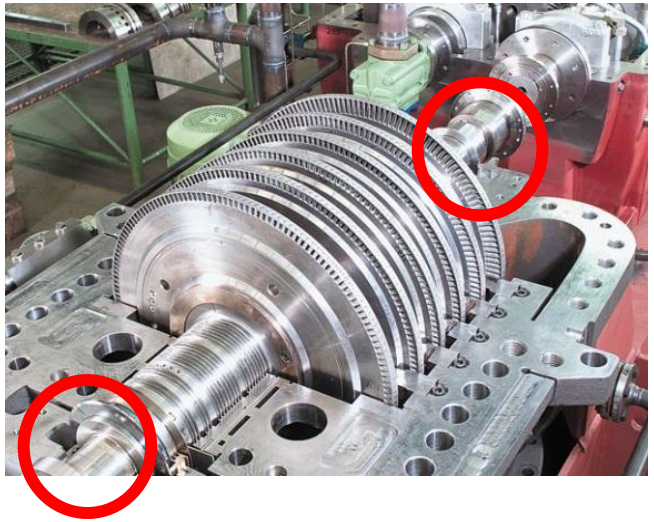
Flexibility by maintenance:

- No bearings in „hot“ turbine space (access to bearings without turbine casing opening)





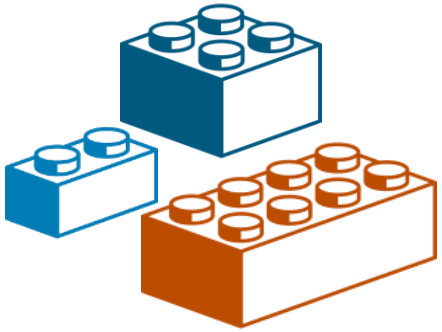
KK&K Howden Turbo Design

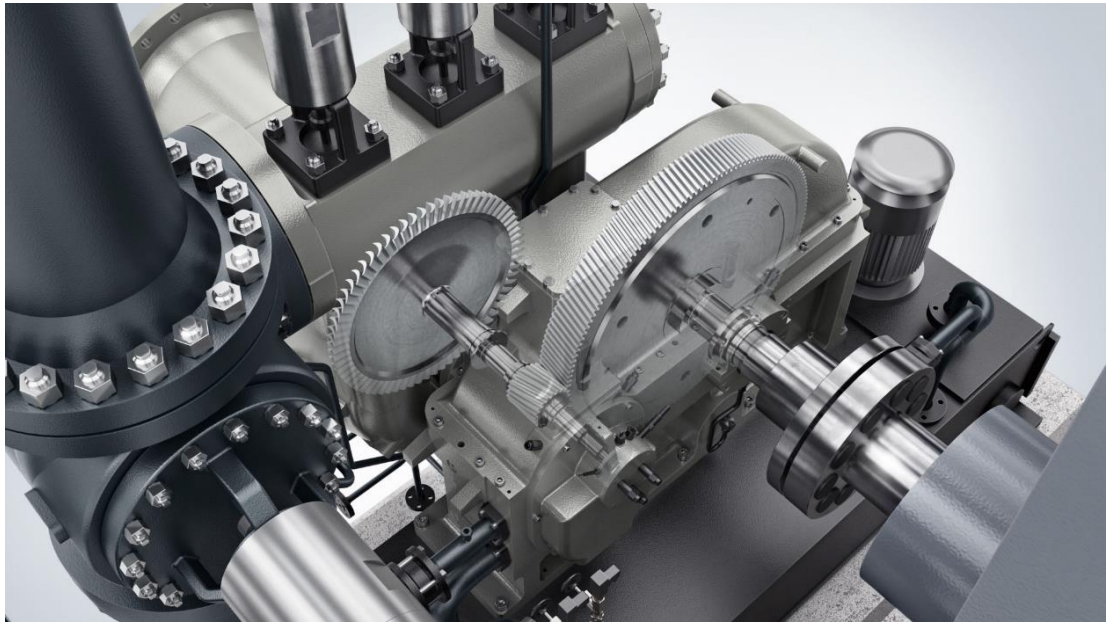


Multistage design

Flexibility in application

- Building Block System
  - modular approach
  - defined interconnections
  - standardized modules

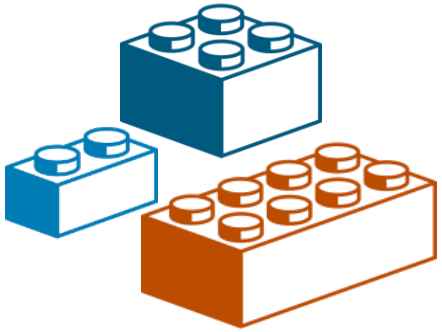


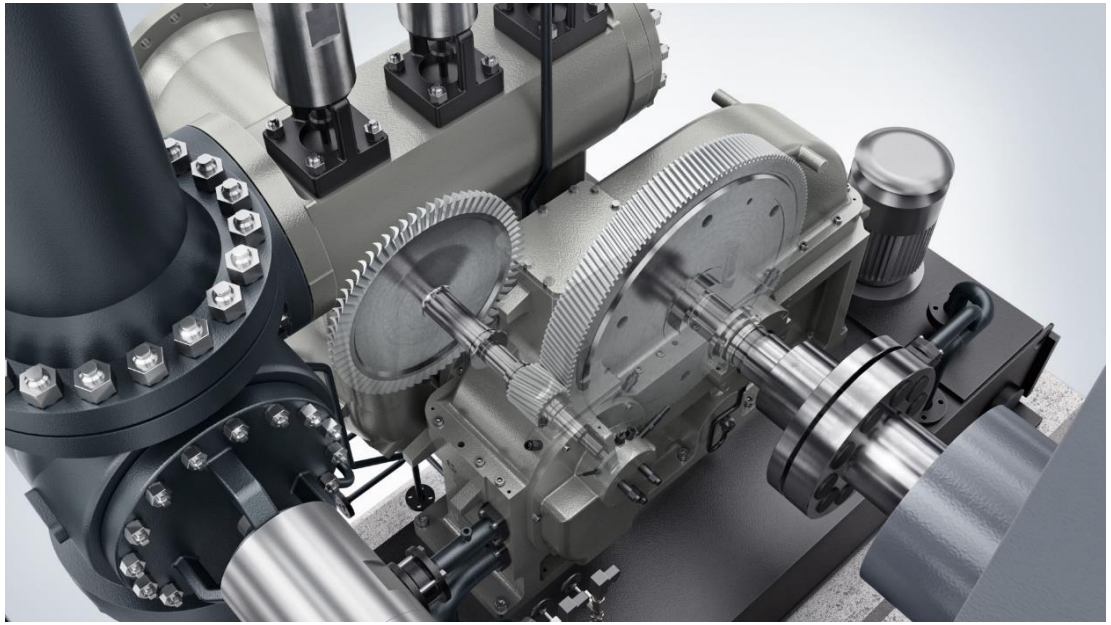


- Wide range of application
  - Inlet:
    3 bar (a) up to 131 bar(a)
    overheated steam up to 530ºC or dry saturated steam
  - Exhaust:
    back pressure up to 40 bar(a) or condensing at vacuum

Flexibility in application

- Building Block System
  - modular approach
  - defined interconnections
  - standardized modules

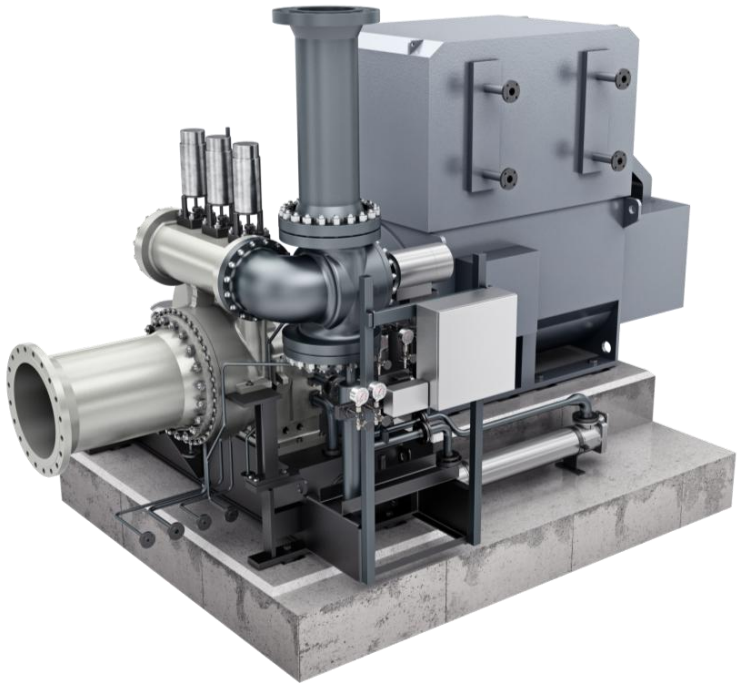


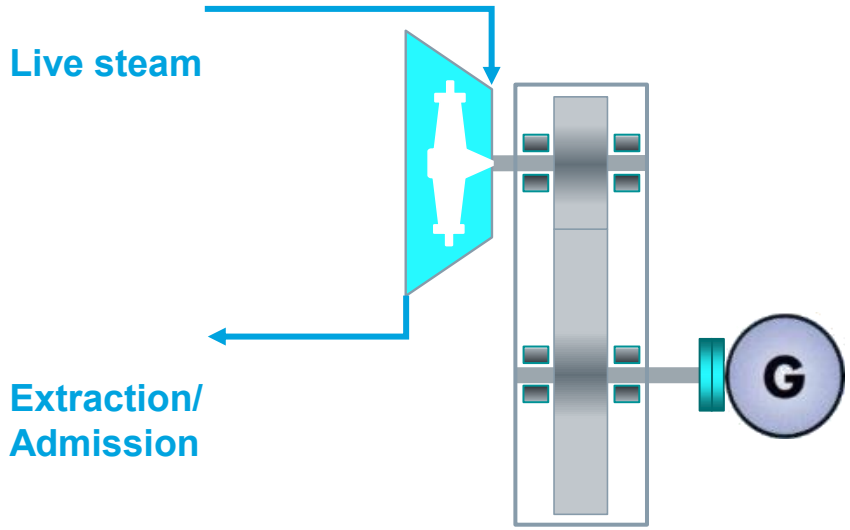


- Wide range of application
  - Inlet:
    1,5 bar (a) up to 131 bar(a)
    overheated steam up to 535°C or dry saturated steam
  - Exhaust:
    back pressure up to 40 bar(a) or condensing at vacuum

Flexibility in application

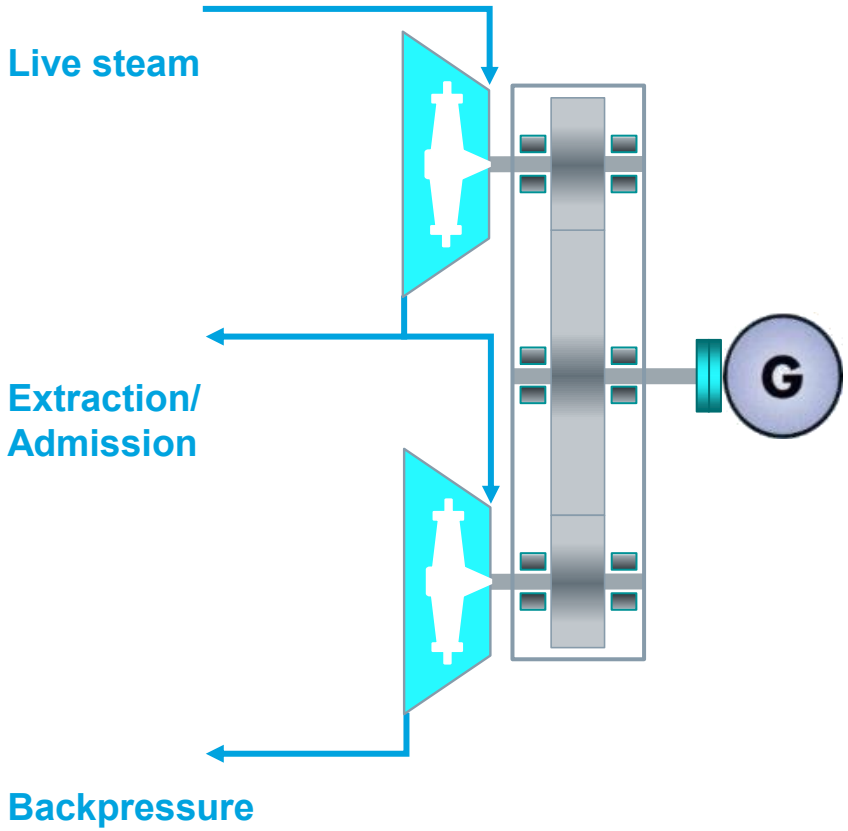
- Integrally Geared Single Stage Steam Turbine
  Type KK&K/Howden **MONO**





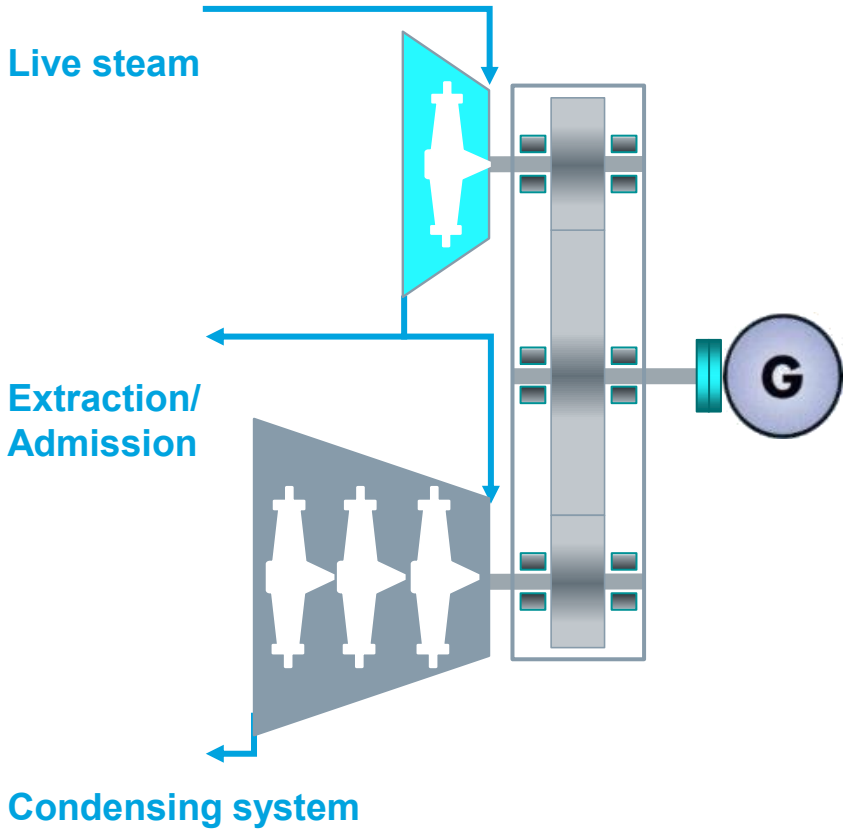
Flexibility in application

- Integrally Geared Two Stage Steam Turbine
  Type KK&K/Howden **TWIN**



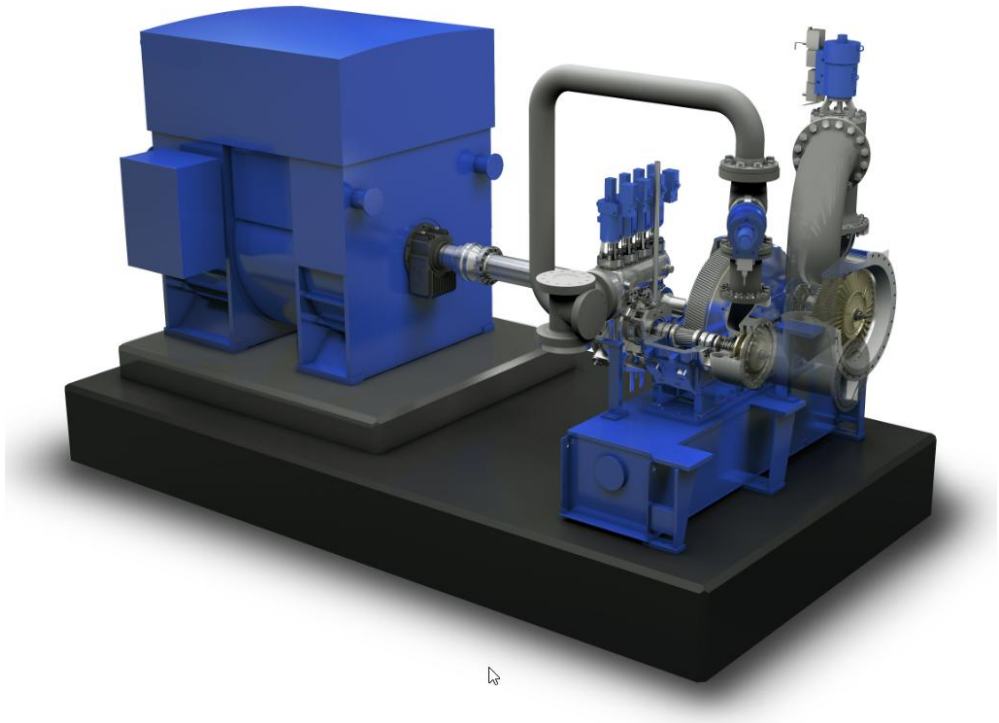
Flexibility in application

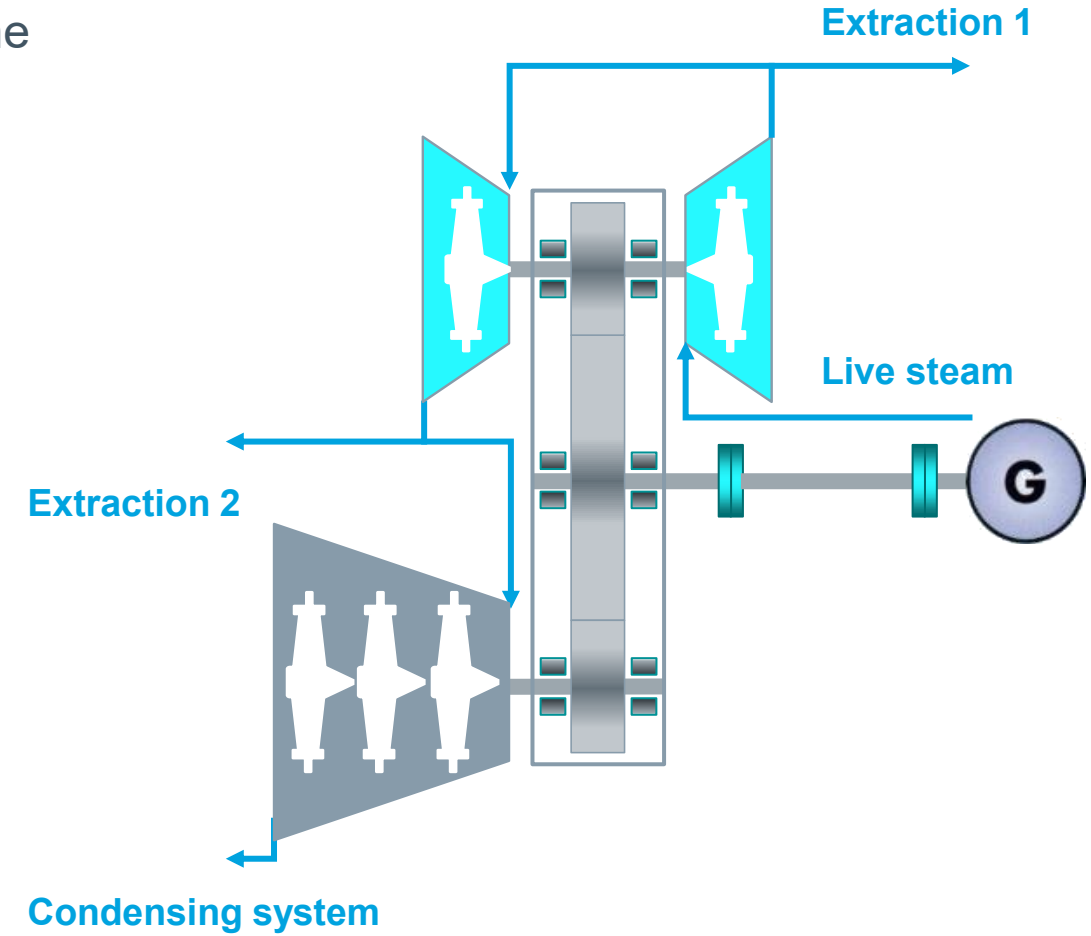
- Integrally Geared Two Stage Steam Turbine Type KK&K/Howden **TWIN**



Flexibility in application

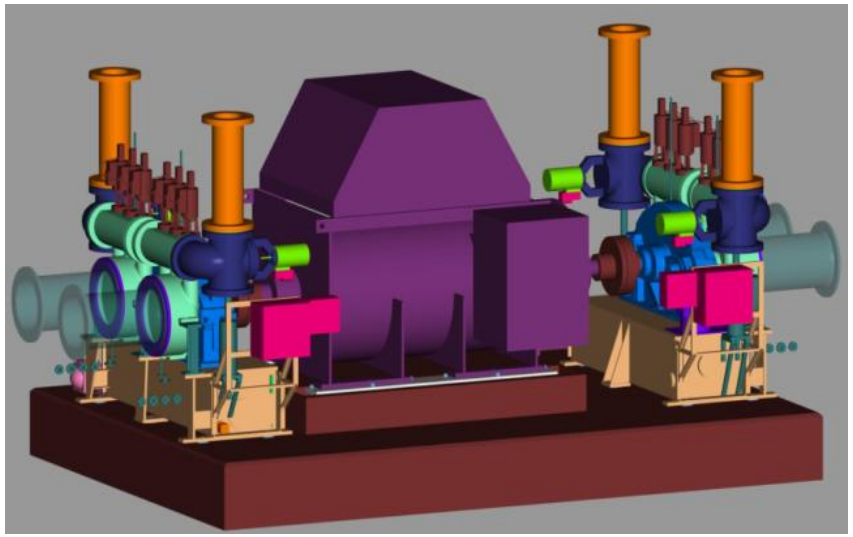
- Integrally Geared Three Stage Steam Turbine Type KK&K/Howden **TRI**

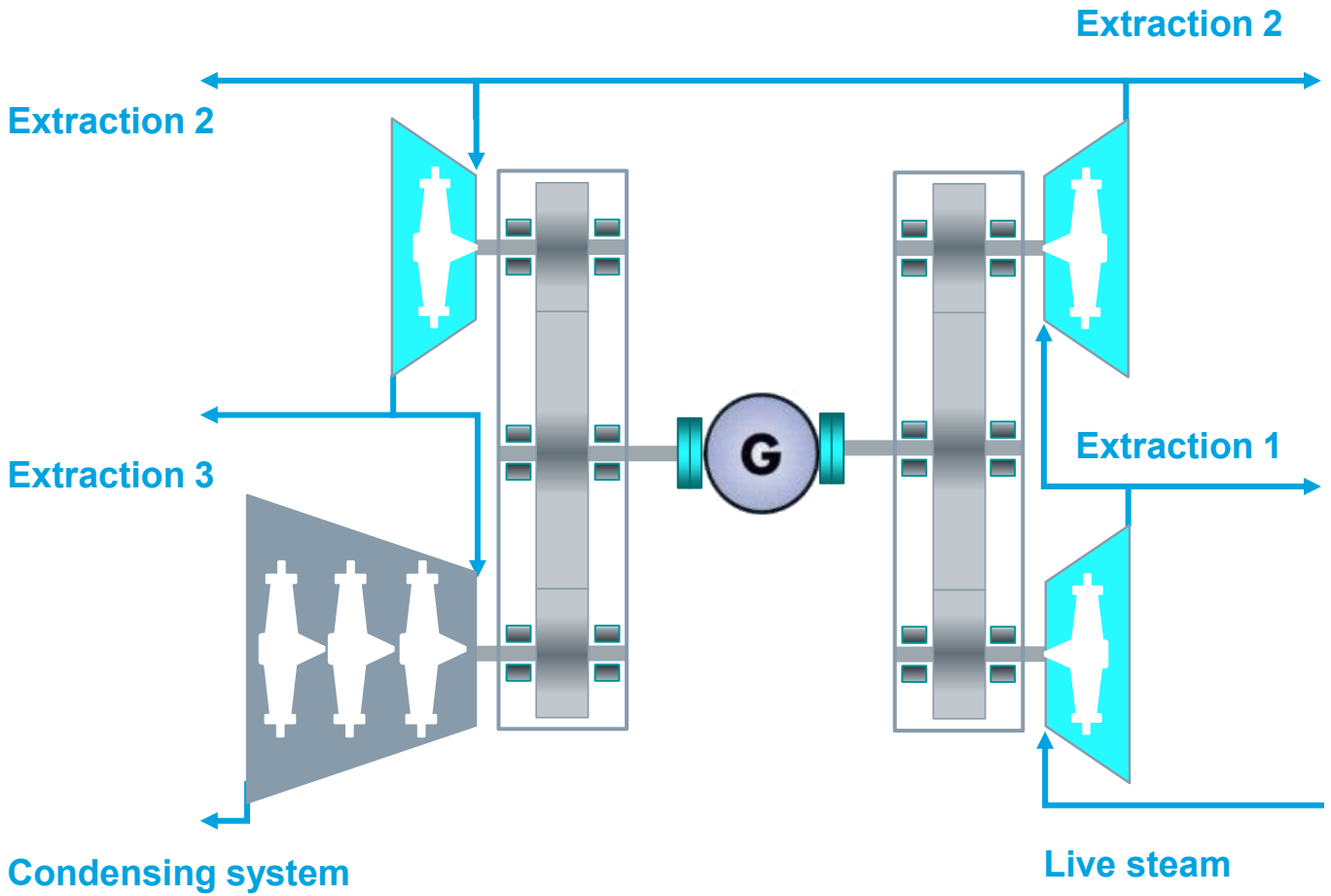




Flexibility in application

- Integrally Geared Multi Stage Steam Turbine Type KK&K/Howden **COMBI**





Howden Turbo KK&K Steam Turbines

Product portfolio

The KK&K Steam Turbines **MONO**, **TWIN** and **TRI** are also available as part of a special engineered and tailor made solution. We can customise our steam turbines to optimally suite your needs. Any requirements or specifications like ATEX or API 611/612 (with comments) are possible with no limits in complexity. For example **COMBI** trains with multiple extractions or **EXP** (expanders) for gas expansion, also tailor made solutions for ORC processes (Organic Rankine Cycle).

COMBI trains can reach up to 24 MW (integrated gearbox) and up to 40 MW (external gearbox)

KK&K BASE	KK&K BASE	KK&K MONO CBA	KK&K MONO	KK&K TWIN	KK&K TRI	KK&K COMBI
up to 750 kW Mechanical Drive	up to 1 000 kW Generator Drive	up to 5 000 kW API 611 Mechanical Drive Generator Drive	up to 12 000 kW Mechanical Drive Generator Drive	up to 12 000 kW Generator Drive	up to 12 000 kW Generator Drive	Up to 24 MW Generator Drive
						

Steam Turbines in compact design, saturated steam applicable, 40 kW up to 24 MW (max. 40 MW), backpressure- / condensing appl., start-up without preheating, turboset and mechanical drive, daily start / stop possible

Typical and Special applications

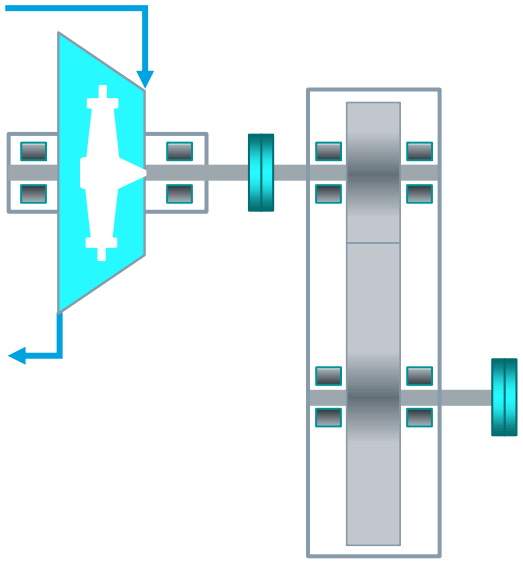
- power production
- mechanical drive for rotating equipment (pumps, compressors, blowers)
- API 611 steam drives
- heat and power for CHP
- instead of (in parallel with) pressure reduction stations (existing power plants, industry)
- utilization of steam with unstable fluctuating flow and parameters (waste-to-energy, industrial)
- effective utilization of saturated steam (steel and non-ferrous processing plants, etc.)
- back-up quick starting rotating machines (turbine driven boiler feed water pumps, other rotating equipment)
- effective “plug&play” skids for small waste-to-energy plants (100 – 1000 kW)
- high speed direct drives for rotating machines
- grid balancing flexible turbines

Howden Turbo KK&K Steam Turbines

Applications

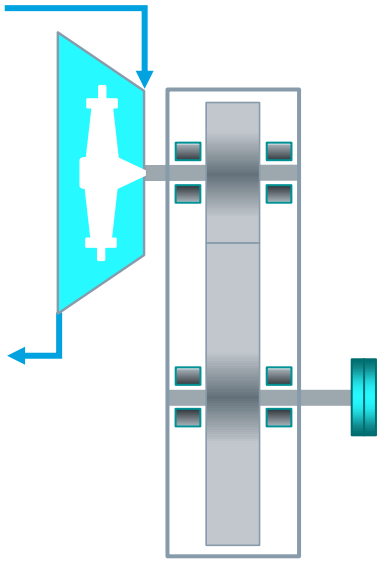
Mechanical drive

- API-Design



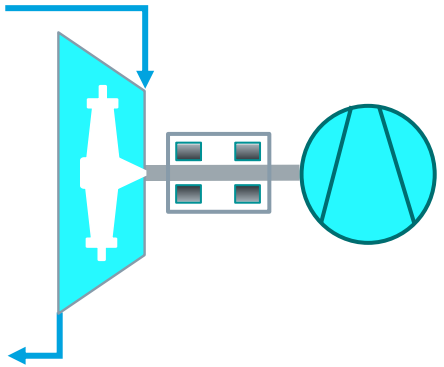
- Between bearing
- Separate gearbox
- Two couplings
- Single / multi-stage turbine

- Integrally geared



- Overhung turbine
- Integrated gearbox
- One coupling
- Single stage turbine

- Fully integrated unit



- Overhung turbine
- No gearbox
- No coupling
- Compressor on shaft

Howden Turbo KK&K Steam Turbines

Selected references

Project: Kirkuk Refinery, Iraq

Customer:	SPEC Energy / HCKD
Country:	UAE / Czech Rep.
Application:	Recycle Gas Compressor Drive
Scope of supply:	2 x CBA 5 Turbines

General Description

- Intercompany Project with Howden CKD
- Customer receives a One-Stop-Solution from Howden with a turbine driven rotating equipment
- Standard configuration as no customer specifications were imposed
- Installation of CBA turbines in the Middle East and in a refinery

Technical Description

- Fully quipped CBA 5 turbines incl. lube oil system, steam trip and control valves, instrumentation
- ATEX configuration
- One compressor is driven directly, the other with a gearbox

Key Specifications

- Speed 8.440 / 8.300 rpm
- Power output 560 / 1.122 kW
- Live steam parameters
  - Inlet pressure: 43 bar
  - Inlet temperature: 305 ºC
- Exhaust steam parameters
  - Back-pressure: 4,5 bar

Howden Turbo KK&K Steam Turbines

Selected references

Project: Zhejiang Zhoushan

Customer:	Shenyang Ding Jiatong
Country:	P.R. China
Plant type:	Petrochemical
Power output:	27 kW (BASE)
Speed:	3000 rpm

General Description

- Installed in lube oil system of main compressor
- Ensure lube oil supply to compressor as main driver

Technical Description

- Oil unit integrated in base frame
- Quick-start without pre-heating
- ATEX

Key Specifications

- Speed 3000
- Power output 27 kWW
- Live steam parameters

  Inlet pressure: 41 bar
  Inlet temperature: 330 ºC

- Exhaust steam parameters

  Back-pressure: 5.8 bar

Howden Turbo KK&K Steam Turbines

Selected references

Project: IFFCO

Customer:	Technip
Country:	India
Plant type:	Sulfuric Acid
Power output:	800kW
Speed:	7200rpm
Inlet pressure:	16 bar
Inlet temperature :	265° C

General Description

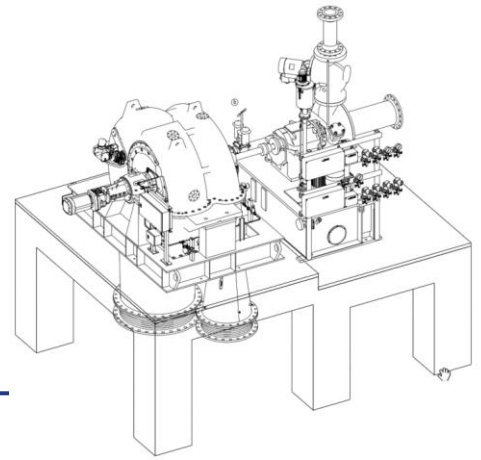
- steam turbine CFR5 driving an SFP14.0 main air blower
- Incl. sub-supplied gearbox

Why Howden Turbo ?

- Blower and steam turbine out of a single hand

Key Specifications

- Speed 15225 rpm
- Power output 4555 kW
- Live steam parameters
  - Inlet pressure: 63 bar
  - Inlet temperature: 480 ºC
- Exhaust steam parameters
  - Back-pressure: 5.9 bar

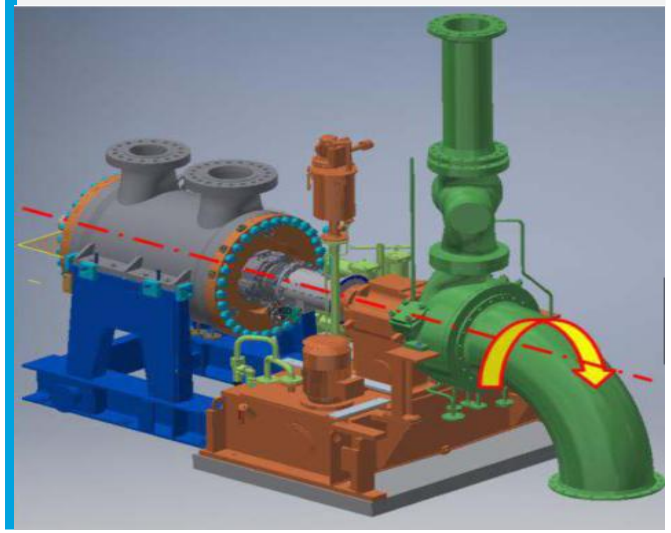


Howden Turbo KK&K Steam Turbines

Selected references

Project: Port Harcourt Refinery / HTC

Customer:	Tecnimont / HTC
Country:	Italy / The Netherlands
End Customer:	Port Harcourt Refinery, Nigeria
Application:	Recycle Gas Compressor Drive
Scope of supply:	MONO AFA 6 turbine



General Description

- Refurbishment of Port Harcourt Refinery Co. (PHRC) by Tecnimont

Technical Description

- Steam Turbine is MONO AFA 6 db (direct drive – no gearbox) as per manufacturer standard as much as possible
- Integrated lube oil system in stainless steel
- ATEX configuration
- Close cooperation between HTO and HTC regarding project specifications

Key Specifications

- Speed 11.400 rpm
- Power output 1.041 kW
- Live steam parameters
  - Inlet pressure: 16,9 bar
  - Inlet temperature: 260 ºC
- Exhaust steam parameters 0,12 bar a

Howden Turbo KK&K Steam Turbines

Selected references

Project: Kirkuk Refinery, Iraq

Customer:	SPEC Energy / HCKD
Country:	UAE / Czech Rep.
Application:	Recycle Gas Compressor Drive
Scope of supply:	2 x CBA 5 Turbines

General Description

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- Exhaust steam parameters
  - Back-pressure: 4,5 bar

Howden
A Chart Industries Company

Thank you

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