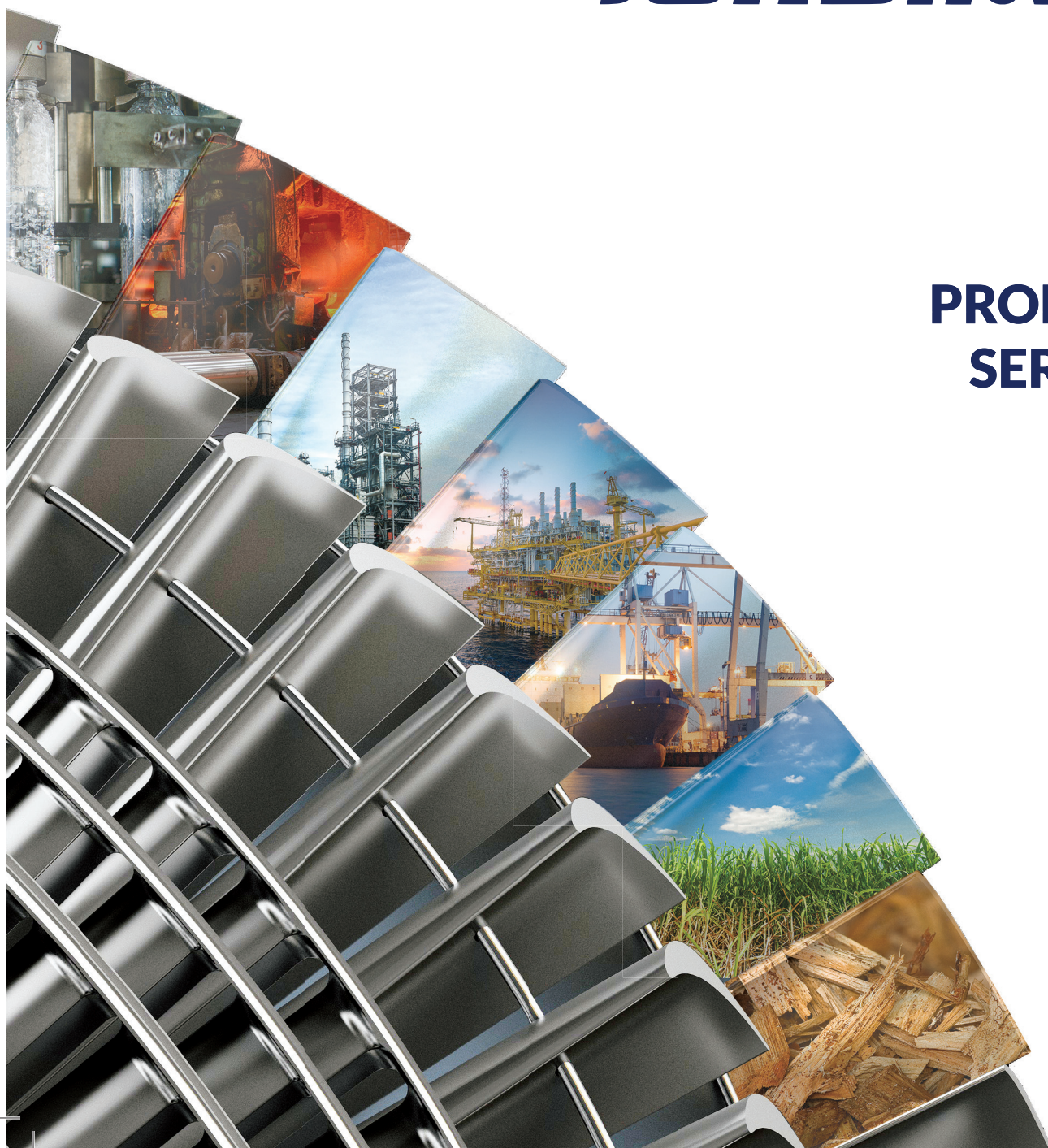




**PRODUCTS
SERVICES**





MOVING ENERGY

SOLUTIONS
SUSTAINABILITY
SAVINGS
BORDERS
RELIABILITY



TYPES OF BIOMASS



Sugarcane Bagasse



Wood
(firewood / bark /
splinter / sawdust)



Husks
(rice / peanut /
nut / coconut)



Forest and
agricultural waste



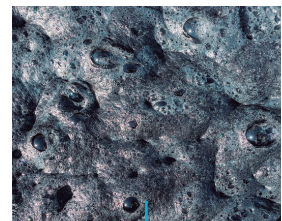
Açai seed



Elephant grass



Urban solid
waste



Sewage
Treatment Station

STEAM TURBINE APPLICATIONS

- Generators
- Compressors
- Exhausts
- Fans
- Pumps
- Mills
- Shredders
- Choppers
- Levelers





REACTION TURBINE

The turbines of the **RT (Reaction) line** were developed for high performance and stability, thus ensuring continuous operational availability. Normally used to drive a power generator, they enable lower steam consumption.

This turbine line features flexible modular construction which allows the machine to be customized to best suit plant needs.

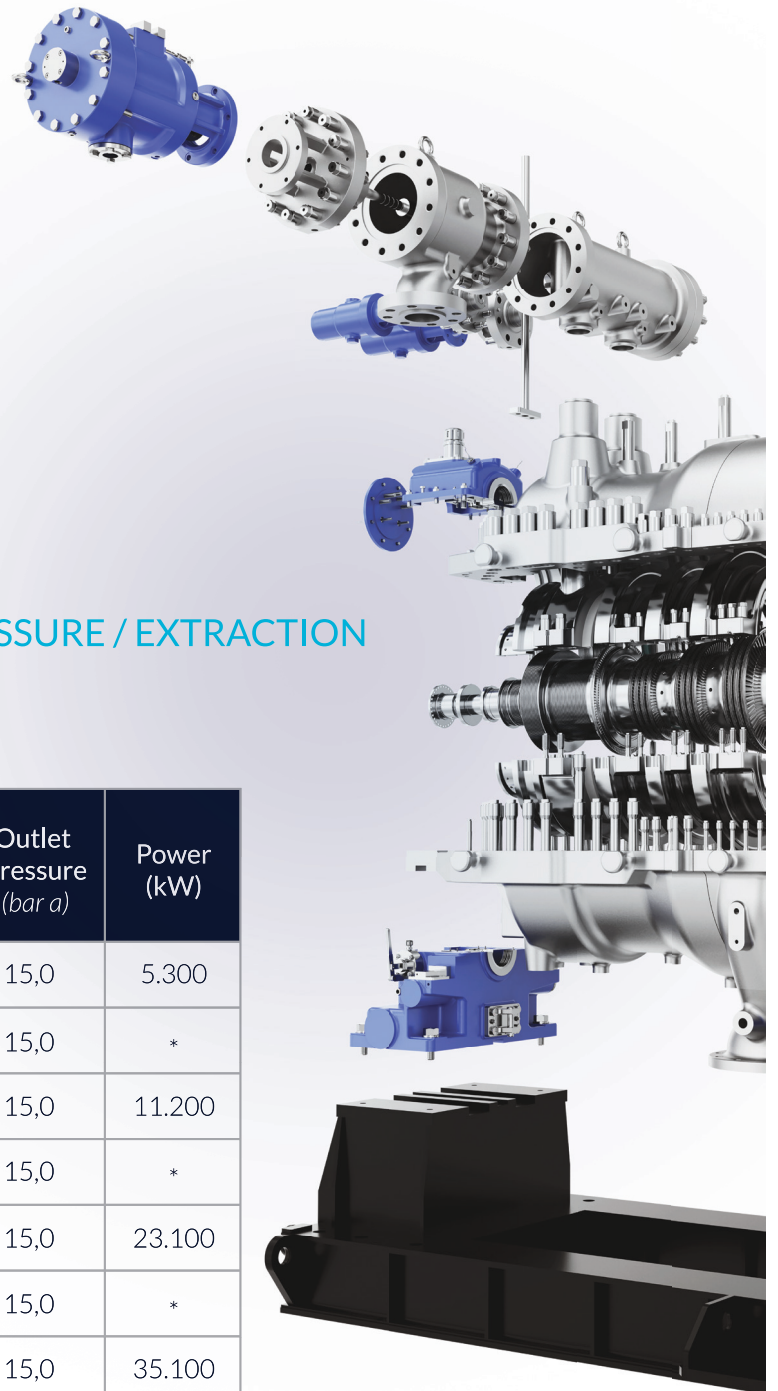
KEY FEATURES:

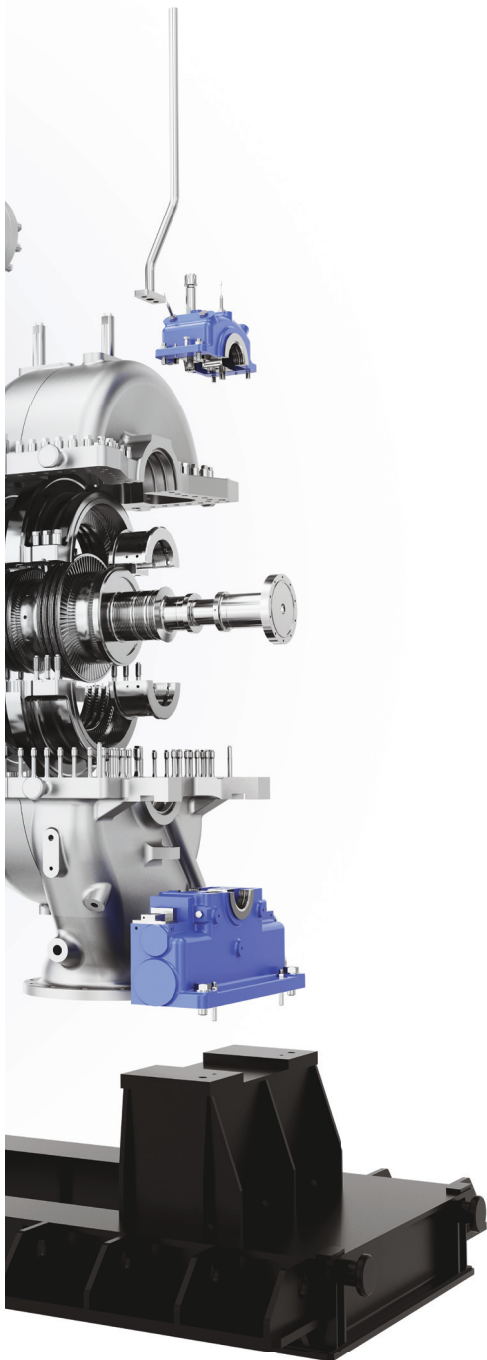
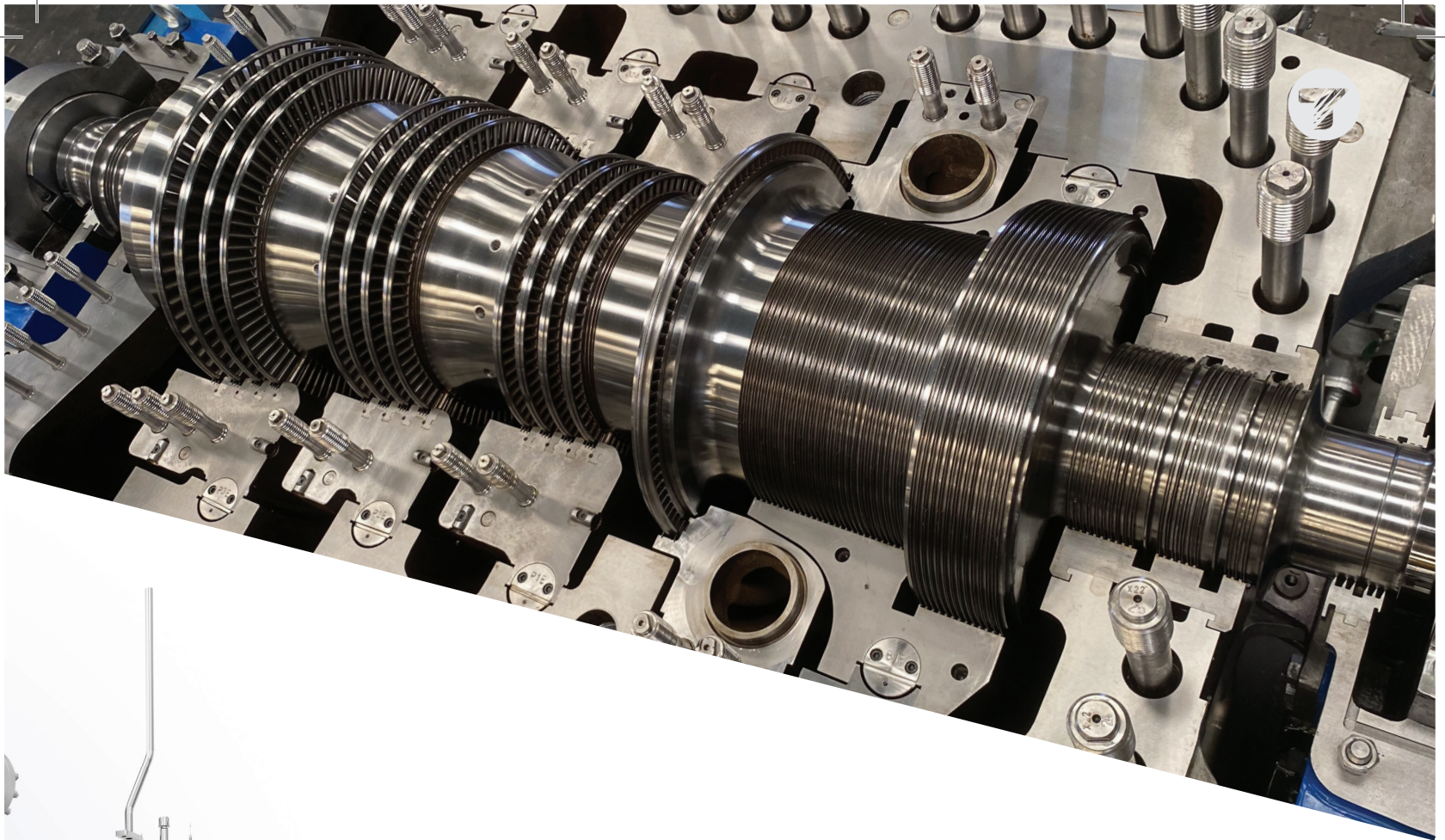
- Class 900 psi
- High efficiency
- Greater Operational Stability
- Robust construction
- Modular construction
- Back pressure or condensation

REACTION TURBINE SERIES - COUNTER PRESSURE / EXTRACTION RT / RT - E

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (C°)	Outlet Pressure (bar a)	Power (kW)
RT400	10.500	70,0	520	15,0	5.300
RT400 E	10.500	70,0	520	15,0	*
RT500	8.400	70,0	520	15,0	11.200
RT500 E	8.400	70,0	520	15,0	*
RT600	7.000	70,0	520	15,0	23.100
RT600 E	7.000	70,0	520	15,0	*
RT700	6.000	70,0	520	15,0	35.100
RT700 E	6.000	70,0	520	15,0	*
RT800	5.200	70,0	520	15,0	49.900
RT800 E	5.200	70,0	520	15,0	*





REACTION TURBINE SERIES - CONDENSATION / EXTRACTION RT - CO / RT-ECO

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (C°)	Outlet Pressure (bar a)	Power (kW)
RT400 CO	10.500	70,0	520	0,1	5.100
RT400 ECO	10.500	70,0	520	0,1	*
RT500 CO	8.400	70,0	520	0,1	10.400
RT500 ECO	8.400	70,0	520	0,1	*
RT600 CO	7.000	70,0	520	0,1	19.300
RT600 ECO	7.000	70,0	520	0,1	*
RT700 CO	6.000	70,0	520	0,1	27.800
RT700 ECO	6.000	70,0	520	0,1	*
RT800 CO	5.200	70,0	520	0,1	45.500
RT800 ECO	5.200	70,0	520	0,1	*



MULTI-STAGE TURBINES

TURBIMAQ multistage turbines, installed in Brazil and abroad, produce approximately 1.2 GW of power in electrical and mechanical drives.

ME Series

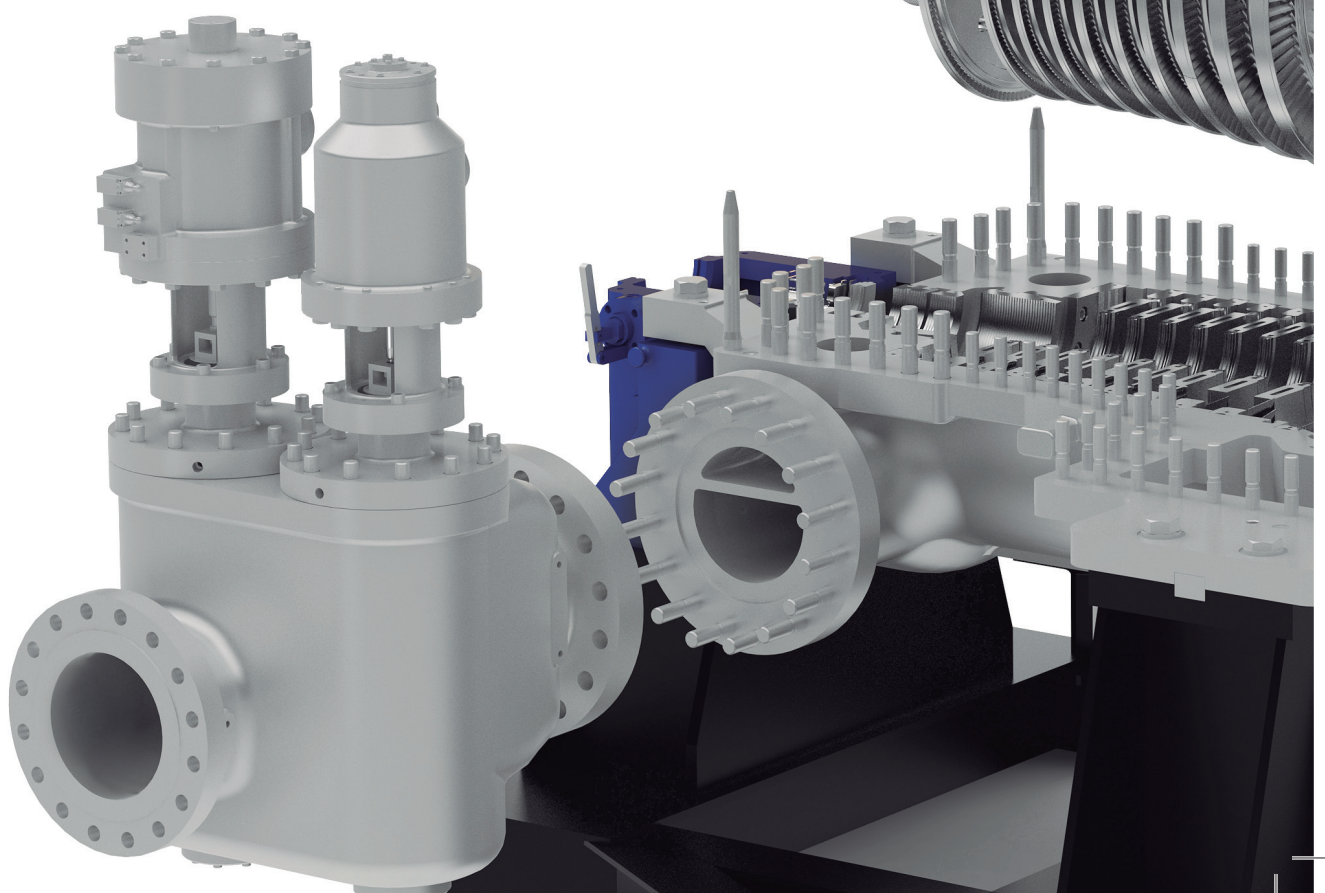
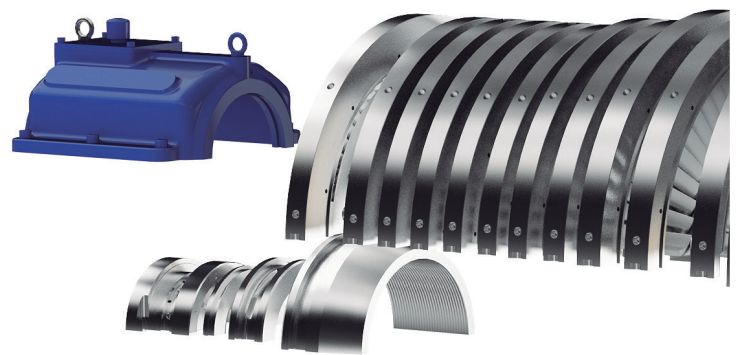
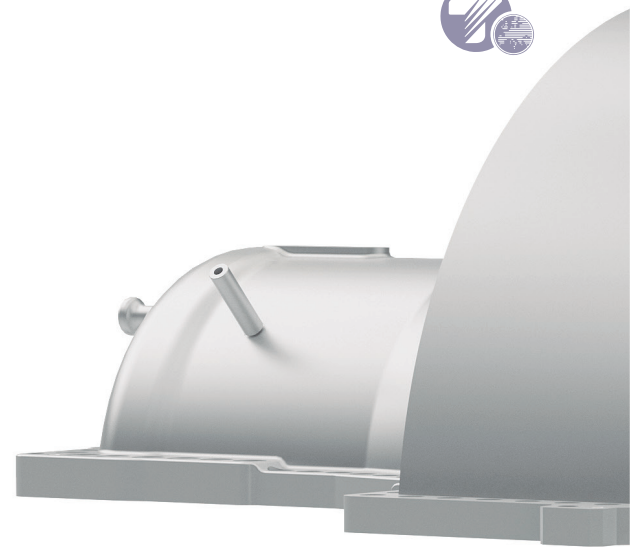
Counterpressure turbines, usually applied mechanical drives and in some cases, electric drives.

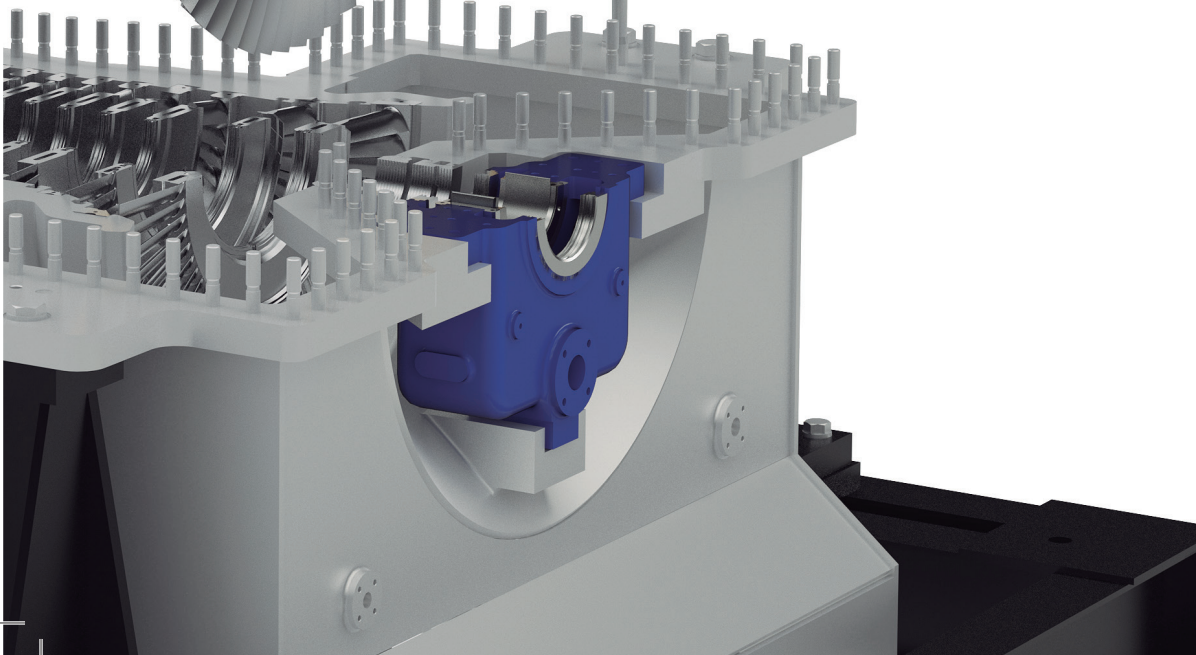
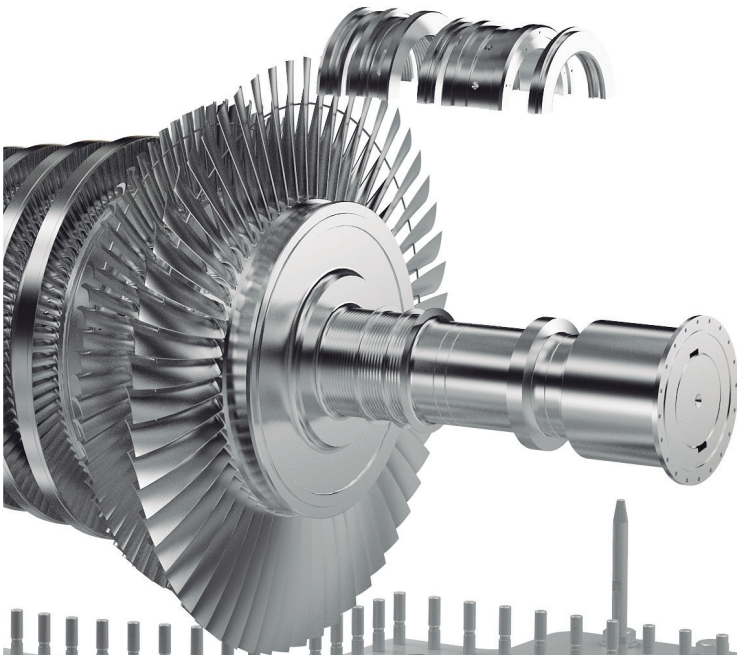
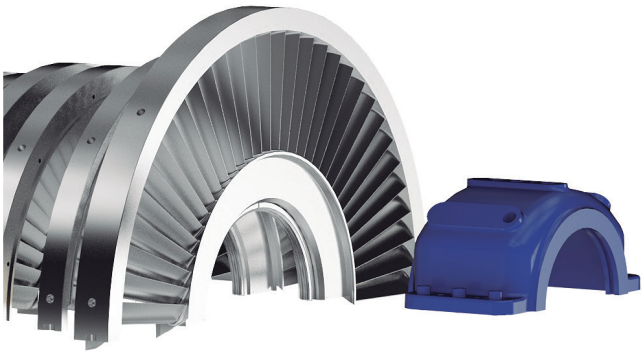
MEGA/MEGA-E Series

Counterpressure turbines, applied in electrical and mechanical drives. Allowing the installation of steam extraction block (model MEGA-E), controlled or uncontrolled (bleed).

MEGA-CO / MEGA - ECO Series

Condensing turbines, applied when the goal is to maximize the generation of electricity with lower fuel consumption. This series is widely used in Thermal Power Plants and also allows the installation of steam extraction block (model MEGA-ECO), controlled or not controlled (bleed).





General Constructive Characteristics

- Pressure lubrication system;
- Radial plain bearings and tilting pads;
- Steam sealing by labyrinths;
- Labyrinth-type oil sealing;
- Speed control system;
- Control and quick closing valves driven by hydraulic actuators;
- Mechanical over-speed protection, incorporated in the turbine shaft;
- Electronic over speed protection (optional);
- Steam outlet flange on top (ground zero) or under (mezzanine)

** Only applicable for the turbines of the MEGA-CO / MEGA-ECO series

TECHNOLOGY
EXPERIENCE
PERFORMANCE





ME SERIES

Counterpressure turbines, usually applied mechanical drives and in some cases, electric drives.

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
400ME	7000	42	430	6	1300
500ME	6000	42	430	6	2100
700ME	5000	42	430	6	2700
800ME	4000	42	430	6	4000



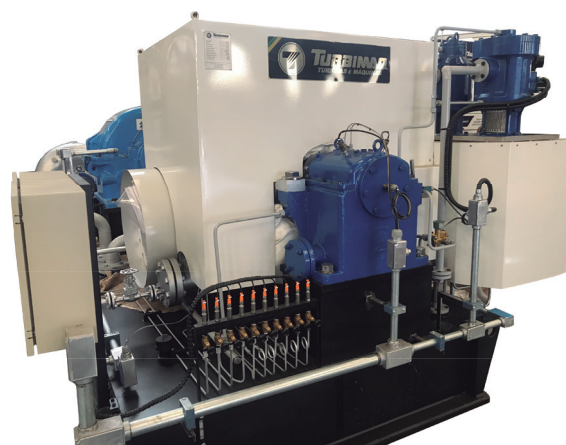
MEGA/MEGA-E Series

Counterpressure turbines, applied in electrical and mechanical drives. Allowing the installation of steam extraction block (model MEGA-E), controlled or uncontrolled (bleed).

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
MEGA300	10500	48	480	15	1800
MEGA300E	10500	48	480	15	*
MEGA400	8000	48	480	15	3500
MEGA400E	8000	48	480	15	*
MEGA500	7000	48	480	15	5000
MEGA500E	7000	48	480	15	*
MEGA600	6000	48	480	8	8000
MEGA600E	6000	48	480	8	*
MEGA15000	6000	48	480	8	17000
MEGA15000E	6000	48	480	8	*
MEGA25000	6000	70	520	8	27000
MEGA25000E	6000	70	520	8	*
MEGA35000	6000	70	520	8	42000
MEGA35000E	6000	70	520	8	*

*Upon request





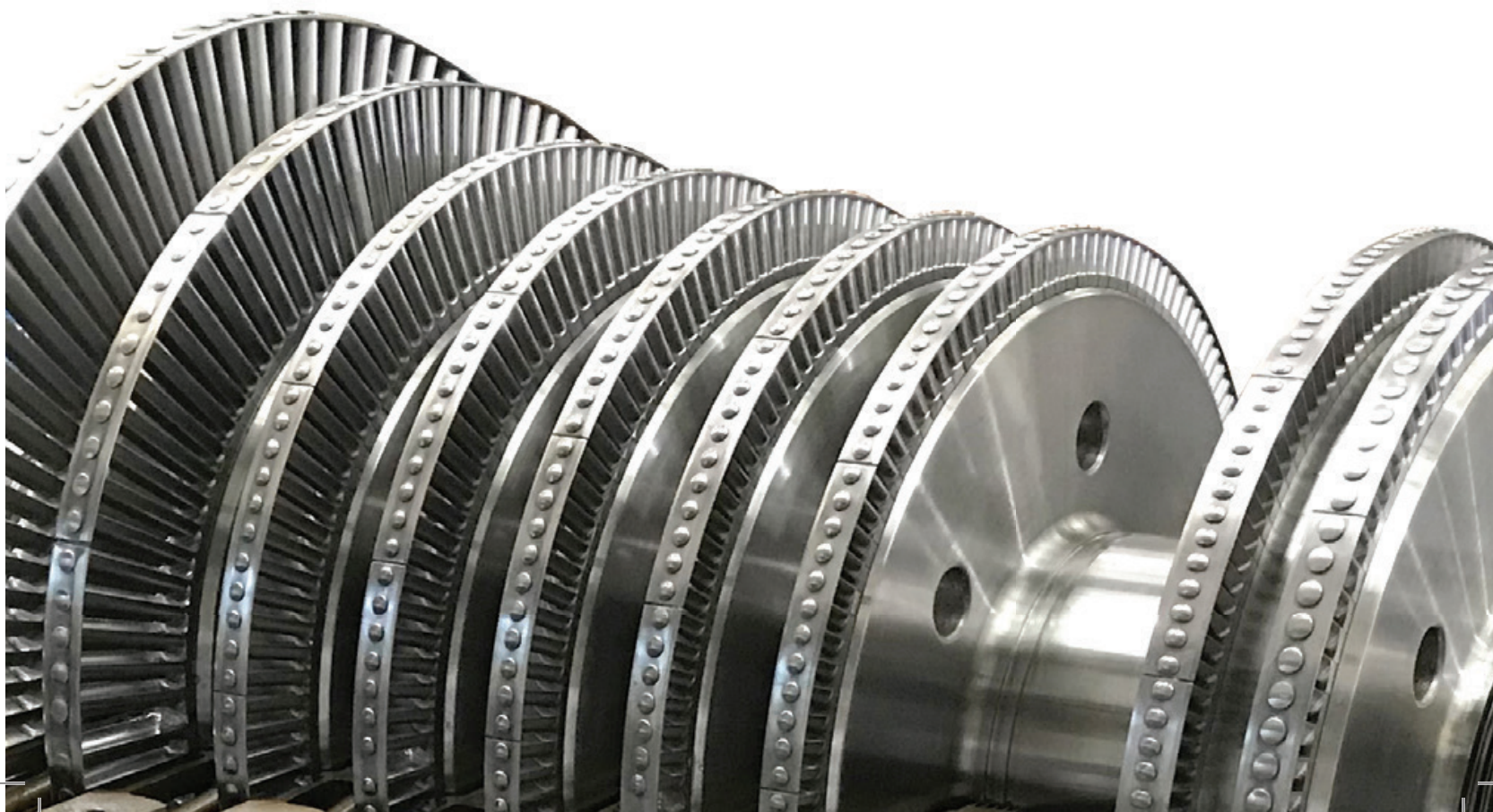
MEGA-CO / MEGA - ECO Series

Condensing turbines, applied when the goal is to maximize the generation of electricity with lower fuel consumption. This series is widely used in Thermal Power Plants and also allows the installation of steam extraction block (model MEGA-ECO), controlled or not controlled (bleed).

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
MEGA300CO	10500	48	480	Cond.	1800
MEGA300ECO	10500	48	480	Cond.	*
MEGA400CO	8000	48	480	Cond.	3000
MEGA400ECO	8000	48	480	Cond.	*
MEGA500CO	7000	48	480	Cond.	5700
MEGA500ECO	7000	48	480	Cond.	*
MEGA600CO	6000	48	480	Cond.	10000
MEGA600ECO	6000	48	480	Cond.	*
MEGA15000CO	6000	48	400	Cond.	15600
MEGA15000ECO	6000	48	480	Cond.	*
MEGA25000CO	6000	70	520	Cond.	23500
MEGA25000ECO	6000	70	520	Cond.	*
MEGA35000CO	6000	70	520	Cond.	33300
MEGA35000ECO	6000	70	520	Cond.	*

*Upon request





API TURBINES

API (American Petroleum Institute) turbines are applied in refineries, chemical and petrochemical plants and have a high degree of operational reliability, being ideal for installation in generator drives, compressors, fans and centrifugal pumps.

API turbines are divided into two segments:

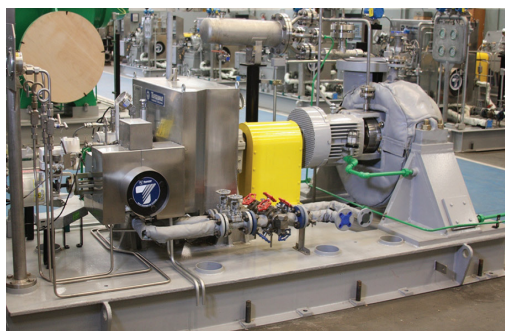
API611 - general purpose turbines, have drive reserve and operate for at least 3 uninterrupted years.

API612 - special use turbines, have no backup drive and have operated for at least 5 years uninterrupted.

The entire manufacturing process of the turbines and their components are executed following strict quality standards, accompanied by qualified inspectors.

Key Features:

- Single or multiple stage;
- Counterpressure or condensation;
- Pressure or O-ring lubrication system;
- Babbitt metal bearings or bearings;
- Electronic or mechanical speed control system;
- Hydraulic, mechanical or pneumatic actuator;
- Mechanical protection of over speed, incorporated into the turbine shaft;
- Electronic over speed protection (optional);
- Horizontal or vertical;
- Factory tested, with steam





API TURBINES

SE API SERIES - VERTICAL

Technical Data

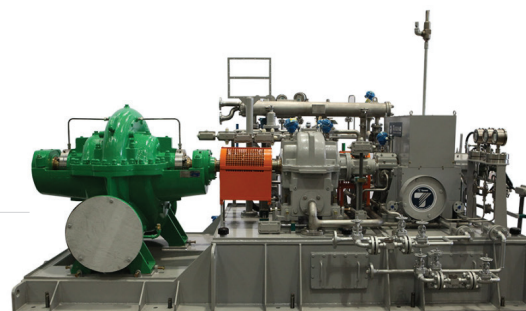
Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
SE300V	4000	42	430	11	80
SE500V	4000	42	430	11	200
SE650V	4000	42	430	11	500



SE API SERIES - COUNTERPRESSURE

Technical Data

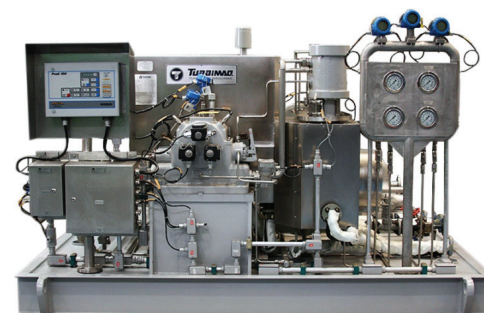
Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
SE200	6000	42	430	11	130
SE350	5000	42	430	11	300
SE500	5000	42	430	11	500
SE650	4000	42	430	11	1100
SE800	4000	42	430	11	2000



MEGA API SERIES - COUNTERPRESSURE

Technical Data

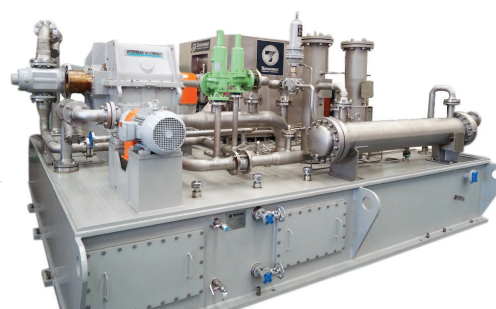
Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
MEGA300	10500	48	480	15	1800
MEGA400	8000	48	480	15	3500
MEGA500	7000	48	480	15	5000
MEGA600	6000	48	480	8	8000



MEGA CO API SERIES - CONDENSATION

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (°C)	Outlet Pressure (bar a)	Power (kW)
MEGA300CO	10500	48	480	Cond.	1800
MEGA400CO	8000	48	480	Cond.	3000
MEGA500CO	7000	48	480	Cond.	5700
MEGA600CO	6000	48	480	Cond.	10000



Regulations

API611 - General Use

Minimum 03 years of operation (stand by drive)

API612 - Special Use

Minimum 05 years of operation (stand by drive)

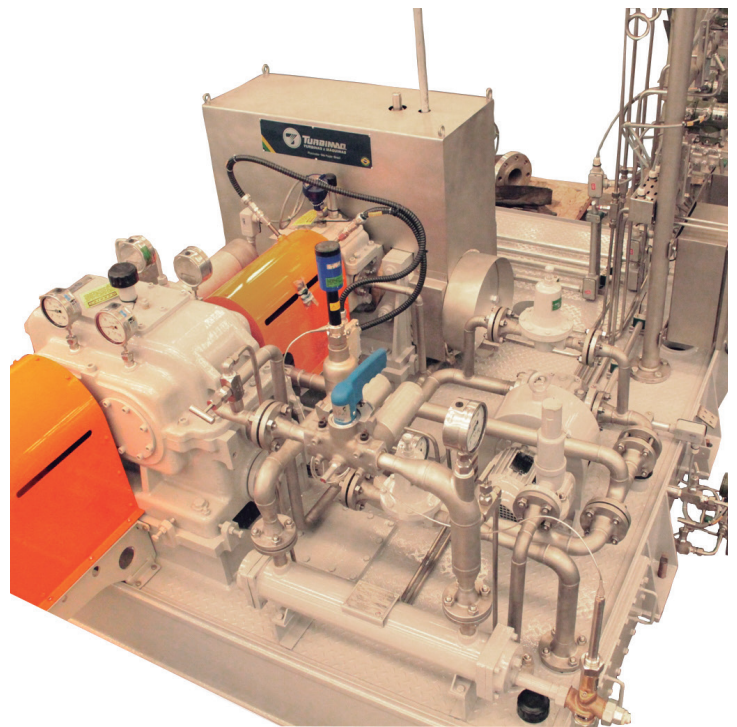


SINGLE STAGE TURBINES

Single-stage turbines are designed for maximum versatility during operation and are ideal for low-power mechanical drives.

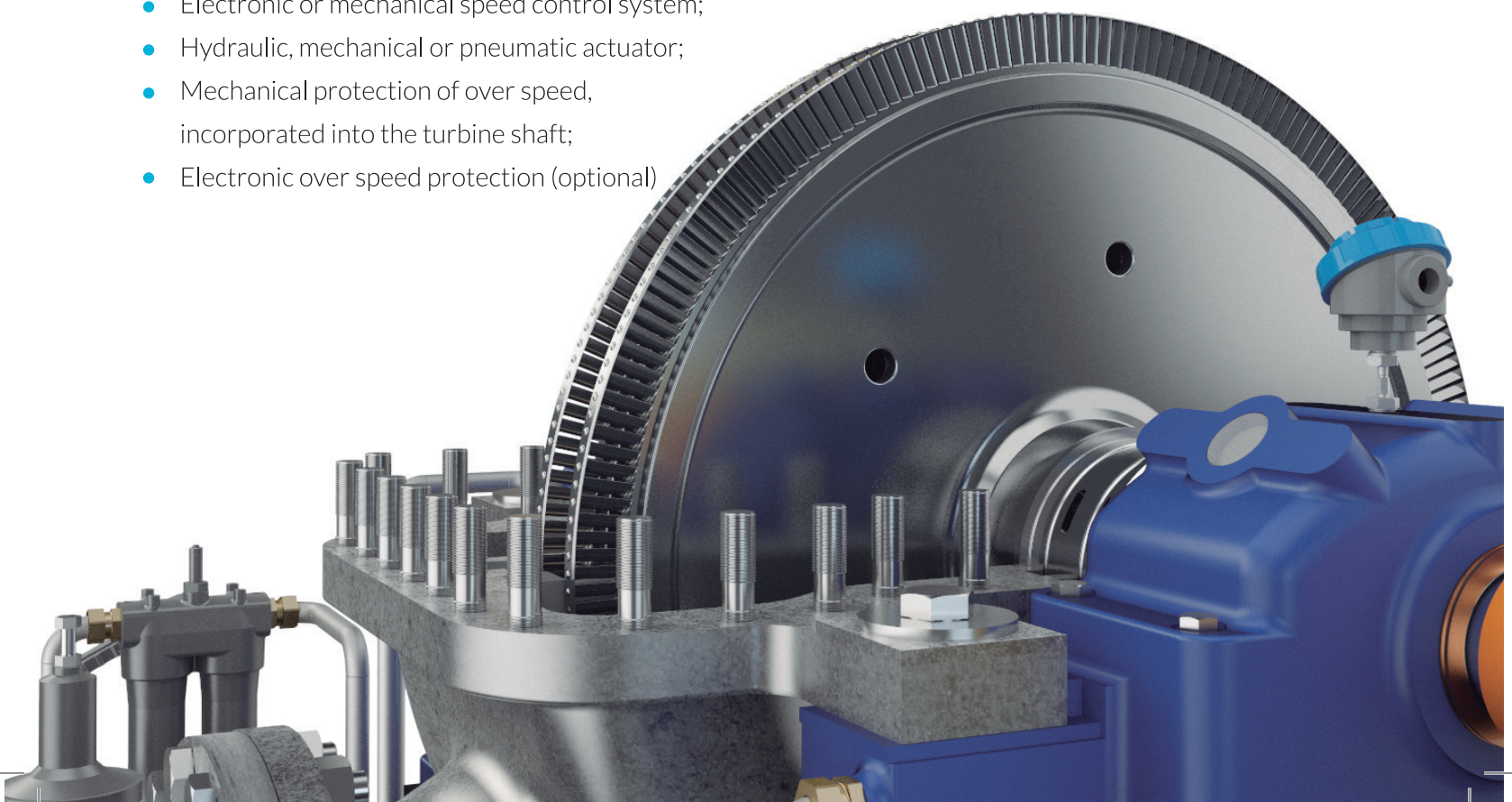
SE and RC Series - Usually applied to boiler feed water pumps, they are widely used in standby operation, because they enable fast and automatic start-up in case of power failure.

TBH Series - They are applied as an alternative to the direct current (DC) motor to drive the emergency oil pump or redundancy of the auxiliary motor pump.



Key Features

- Horizontal or vertical;
- Pressure or O-ring lubrication system;
- Babbitt metal bearings or bearings;
- Vapor sealing by tripartite carbon rings or metal labyrinths;
- Labyrinth-type oil sealing;
- Electronic or mechanical speed control system;
- Hydraulic, mechanical or pneumatic actuator;
- Mechanical protection of over speed, incorporated into the turbine shaft;
- Electronic over speed protection (optional)



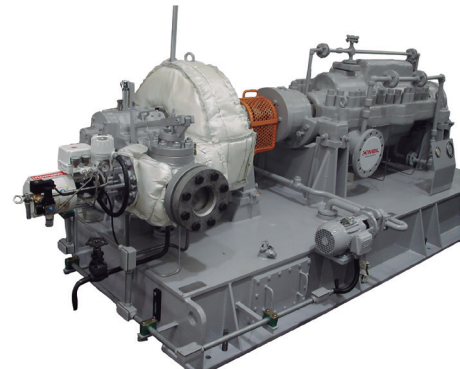


SINGLE STAGE TURBINES

SE SERIES

Technical Data

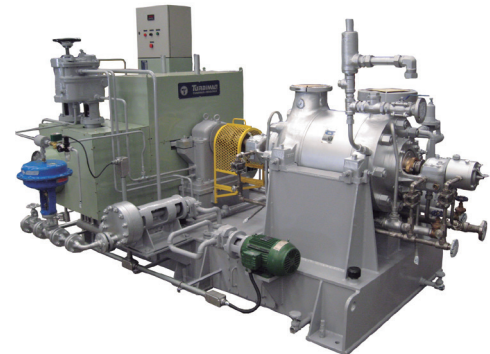
Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (C)	Outlet Pressure (bar a)	Power (kW)
SE200	6000	42	430	11	130
SE350	5000	42	430	11	300
SE500	5000	42	430	11	500
SE650	4000	42	430	11	1100
SE800	4000	42	430	11	2000



RC SERIES

Technical Data

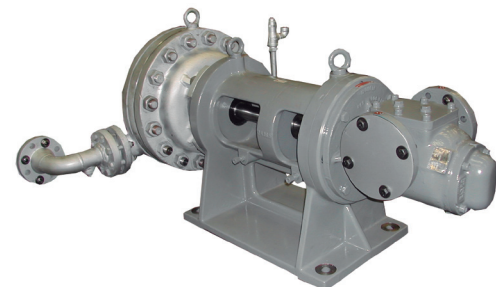
Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (C)	Outlet Pressure (bar a)	Power (kW)
RC400	7000	42	430	6	600
RC550	6000	42	430	6	1000
RC770	5000	42	430	6	1400
RC850	4000	42	430	6	1800



TBH SERIES

Technical Data

Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (C)	Outlet Pressure (bar a)	Power (kW)
TBH150	4000	48	480	6	5
TBH250	4000	48	480	6	20





THERMAL POWER PLANTS TURBIMAQ - TTP's

With consolidated experience in the manufacture of steam turbines and thermal systems, TURBIMAQ has developed a complete line of Thermal Power Plants, enabling sustainable solutions in the use of steam for generation of electric energy and/or industrial processes.

With partners of recognized competence in the market, the TTP's are carefully sized, combining high levels of performance from each piece of equipment used.

The TTP's line was designed for powers up to 5 MW, with the objective to attend mainly the electric energy production market, through the use of biomass, guaranteeing the supply, for own consumption, or for commercialization.

The TTP's foresee the total or partial supply that covers from the reception of the biomass to the delivery of electric power and steam for the process (when applicable) within the specified limits and characteristics, including projects, equipment, accessories, interconnections, transportation, assembly, commissioning, initial start-up and training.

The TURBIMAQ turbines used in TTP's are of Condensation type, of the MEGA CO / ECO series, that allow one or more controlled steam extraction when required by the industrial process.

Technical Data

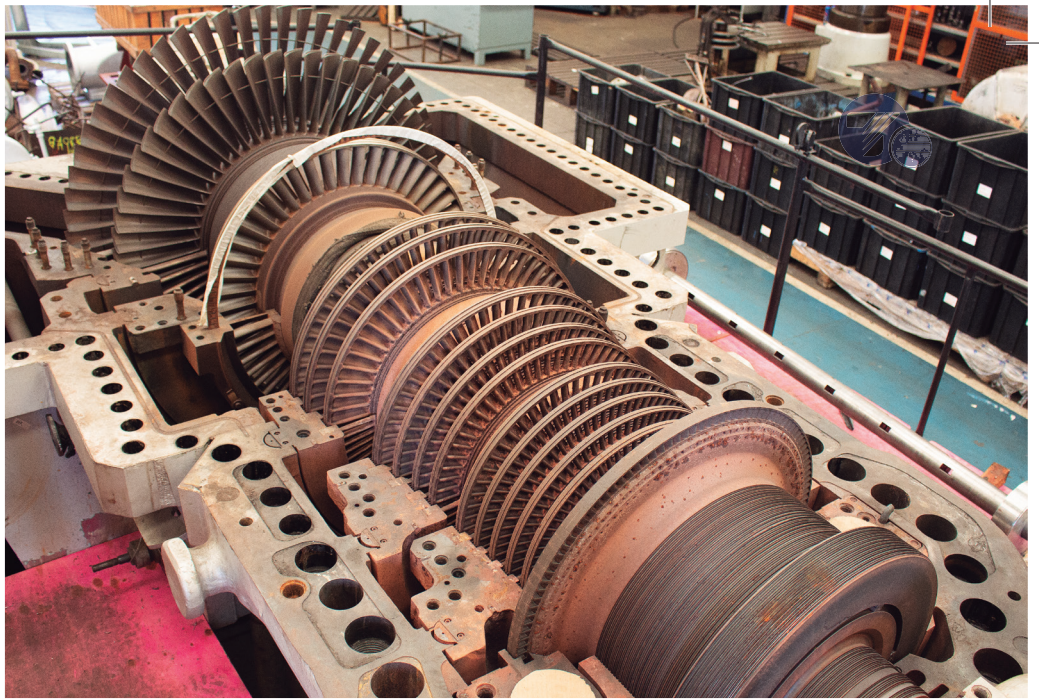
Model	Rotation (rpm)	Inlet Pressure (bar a)	Inlet Temperature (C)	Outlet Pressure (bar a)	Power (kW)
MEGA300CO	10500	48	480	Cond.	1800
MEGA300ECO	10500	48	480	Cond.	*
MEGA400CO	8000	48	480	Cond.	3000
MEGA400ECO	8000	48	480	Cond.	*
MEGA500CO	7000	48	480	Cond.	5700
MEGA500ECO	7000	48	480	Cond.	*

* Upon request



SERVICES

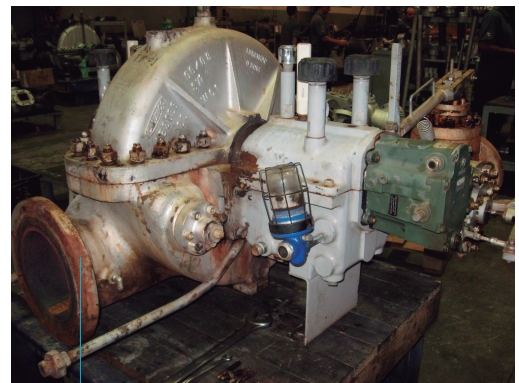
STEAM TURBINES



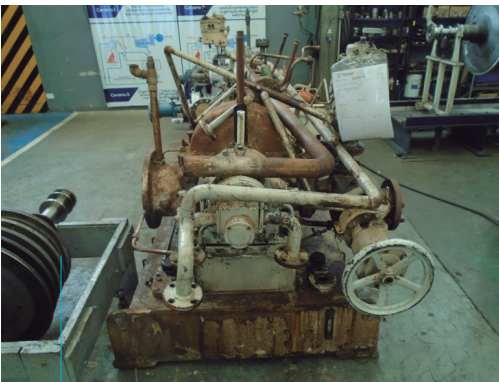
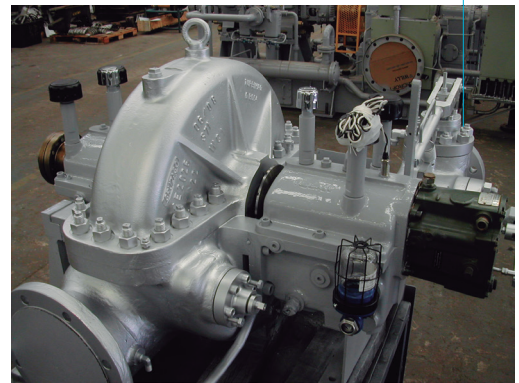
TURBIMAQ was born in the market exclusively to supply the high demand for steam turbine maintenance, considering that the companies at the time did not have conditions to meet the needs of a growing market.

Turbine maintenance consists of disassembly, cleaning, inspection, replacement of components and worn/damaged parts, balancing, geometric corrections of housings, etc., always aiming to restore the turbine to its original operating condition, and can be performed on turbines of all brands and models, domestic or imported.

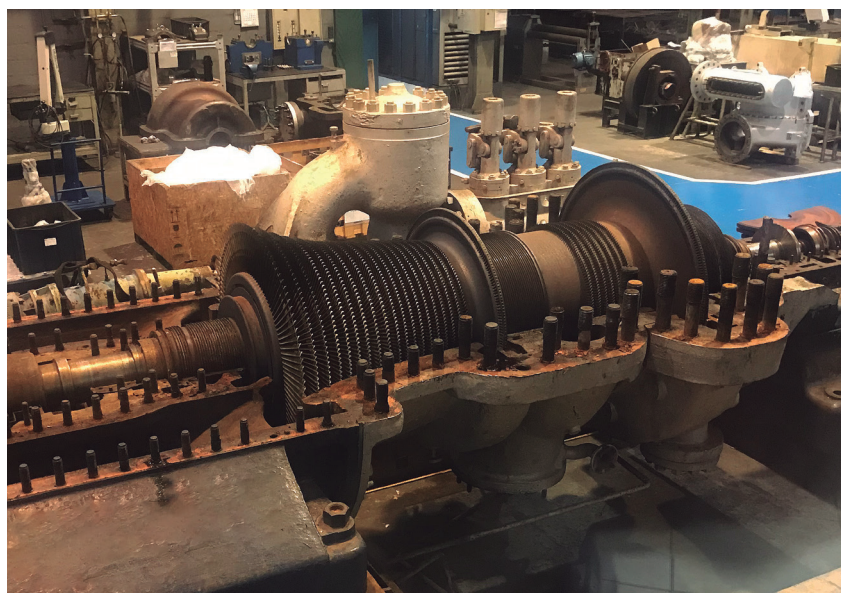
Our know-how in turbo machinery maintenance enables us to technically perform predictive, preventive, and/or corrective interventions, in programmed or emergency shutdowns.



Before / After



Before / After

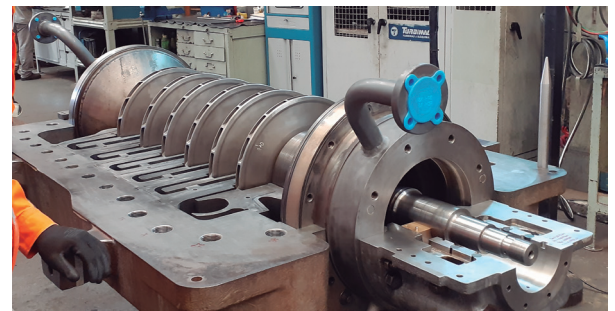




GEARBOXES AND ROTARY MACHINES

The experience acquired with the maintenance of steam turbines has technically qualified us to perform preventive and/or corrective interventions in speed multiplier reducers, compressors, pumps, rotary shears, boosters, among others.

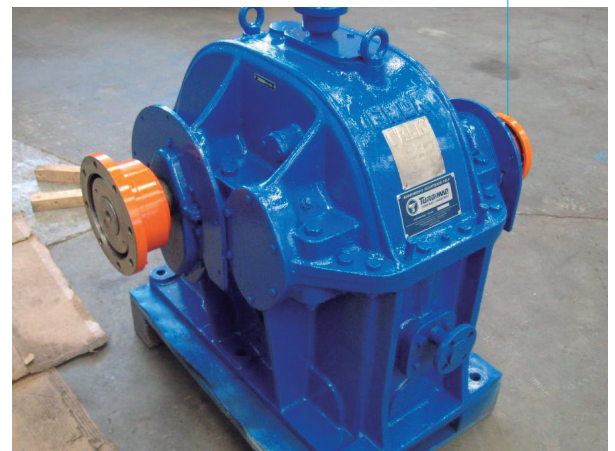
The maintenance of this equipment consists of disassembly, cleaning, inspection, replacement of components and wearing/damaged parts, balancing, geometric corrections of housings, non-destructive tests (PM/LP) etc., always with the objective to restore the equipment to its original operating condition, and can be performed in equipment from the most diverse segments such as several segments such as Steel, Mining, Sugar-Energy, Chemical, Oil and Gas, Naval, Pulp Paper, among others.

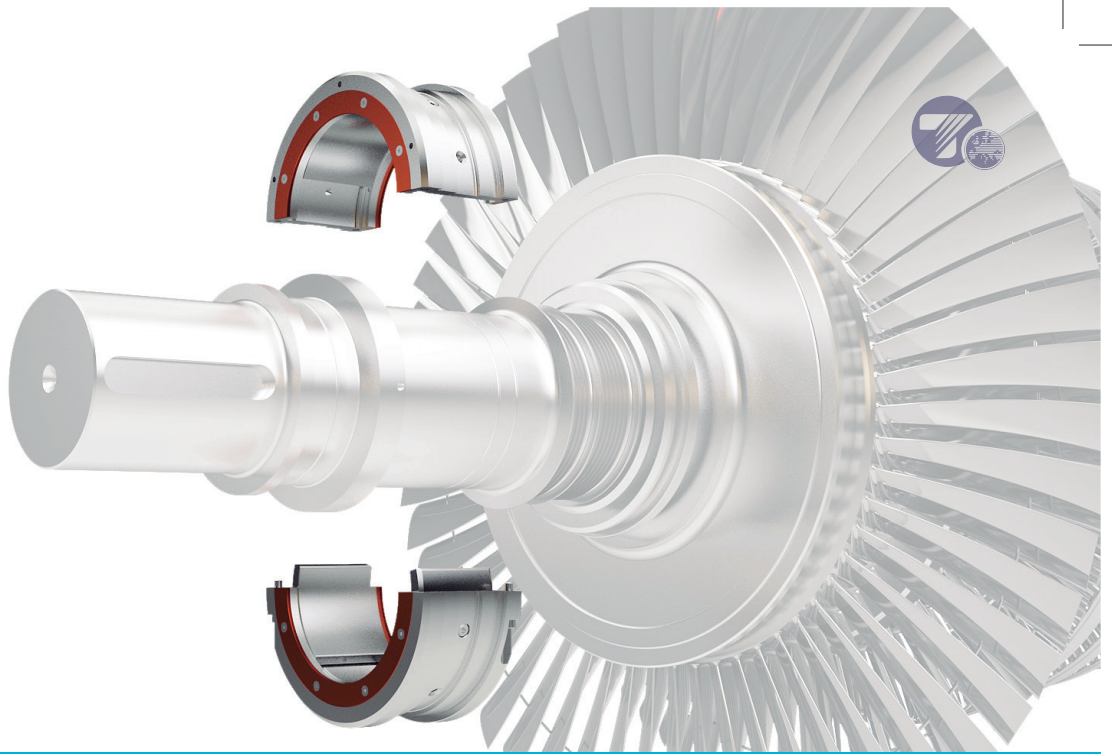


Before / After



Before / After





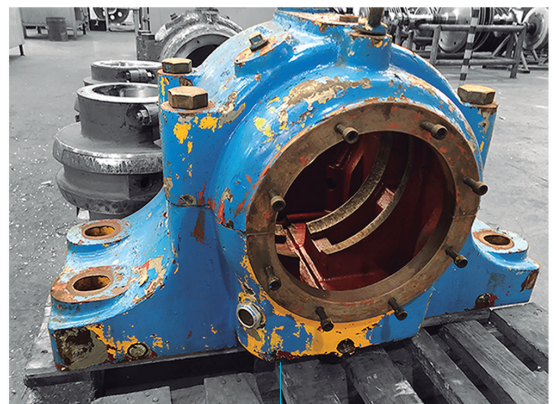
BEARINGS

Bearings are very important components for the appropriate functioning of rotary equipment, since they are the ones that support the dynamic loads of the equipment's rotating assembly.

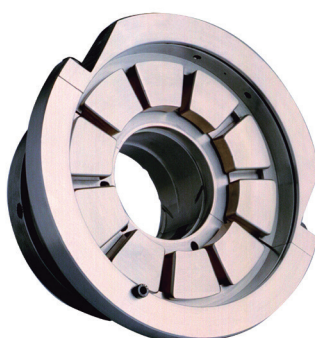
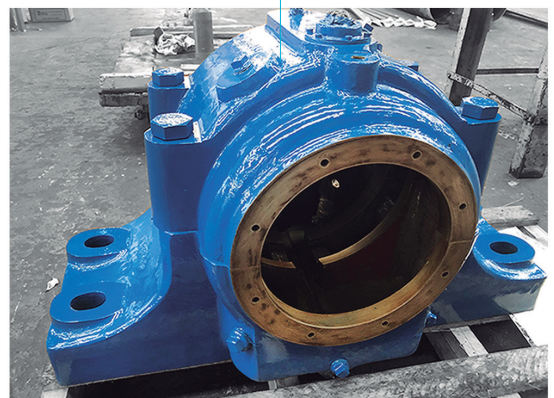
More than 40 years of experience assure us the know-how to design, manufacture and recover bearings of the most diverse sizes and shapes, which can be sliding type, axial, tilting pad, lemon-shape, and quadrilobed bearing, among others.

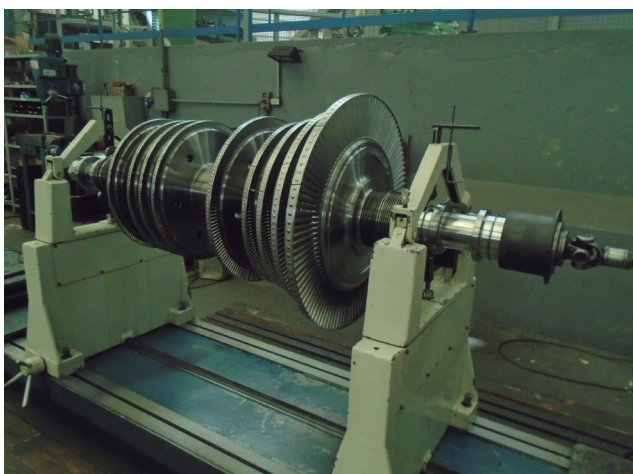
The experience in the application of white metal/babbitt in sliding bearings makes possible to recover also other components that require babbitt metal like for example shoes, cross head, seals, among others, with the application of the babbitt metal by centrifugal or gravity process, according to the geometry and complexity of the part.

The bearing manufacturing and recovery process includes ultrasonic and penetrant liquid inspection to check the adherence of the babbitt metal, visual and dimensional inspection after its conclusion with the issuance of reports of all tests and inspections carried out.



Before / After





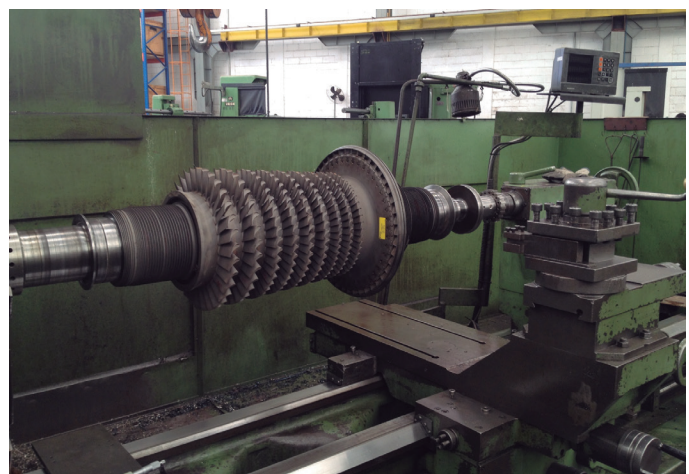
BALANCING

The rotor is the main component of rotary machines, and therefore requires special care during its maintenance, whether planned or emergency.

Dynamic balancing aims to ensure the proper operation of the equipment, reducing production losses and/or operational unavailability, and mitigating risks to the integrity of the machine.

It is recommended that the rotor balancing be checked whenever the machine is stopped for general maintenance, and it must necessarily be performed whenever any of its components are replaced.

After the balancing, the record of the results is evaluated by specialists, based on current international standards, to ensure that the unbalance has been corrected and will not affect the performance of the equipment.



RETROFIT / MODERNIZATION

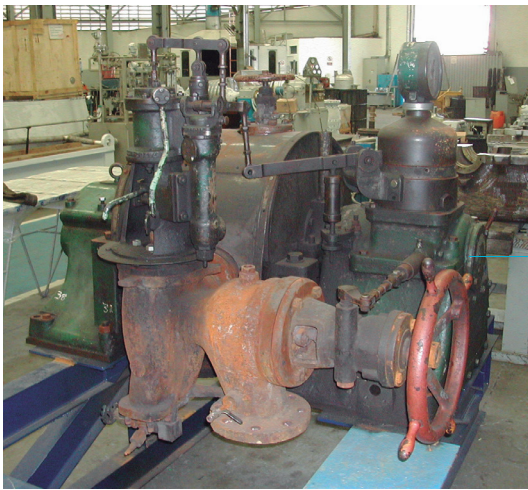


Considering the large installed machines park and the current technological development, TURBOMAQ performs effectively the Retrofit/Modernization of these equipments.

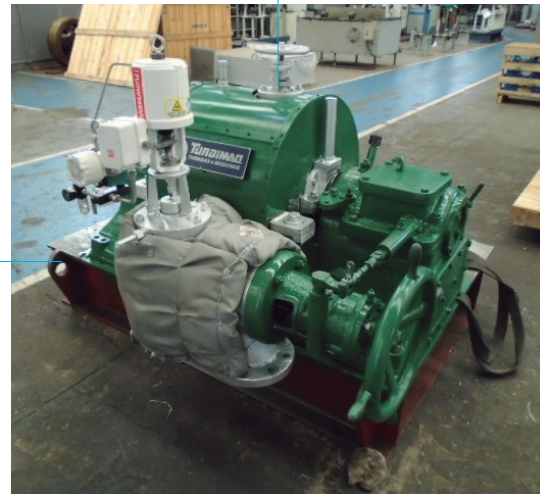
The Retrofit/Modernization consists in updating steam turbine control and safety systems, considered obsolete, for more modern systems, with innovative technologies, which gives the equipment higher reliability and operational safety.

Many of the turbines in operation have mechanical speed controllers that act on the control valves using levers. These turbines can be upgraded by an electronic control system which acts on the control valves by means of hydraulic or pneumatic actuators, making the installation more simplified and providing more precision and faster response speed in the turbine control.

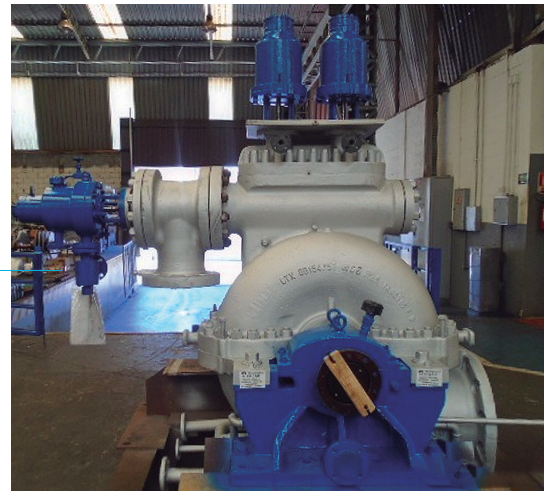
In relation to security systems, there are currently several technologies that allow redundancy to be incorporated into the system, which increases operational security.



Before / After



Before / After



THERMODYNAMIC IMPROVEMENT TRANSFORMATION



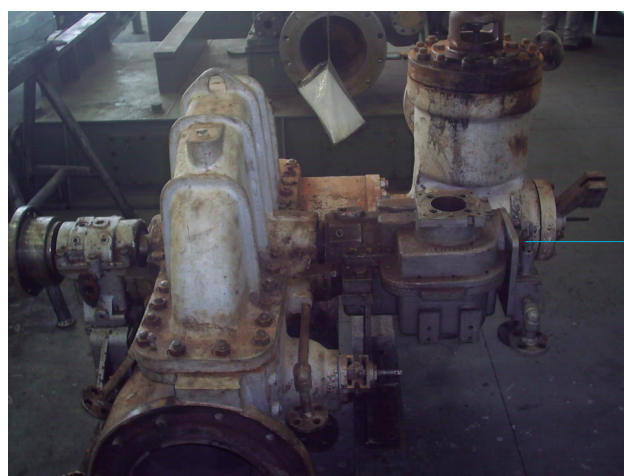
The ongoing search for cost reduction, increase of thermodynamic efficiency and operational availability made TURBIMAQ one of the pioneers in the development of projects to transform single-stage turbines into multi-stage turbines.

This solution foresees the total or partial replacement of the turbine housing, complete replacement of the rotating assembly, full replacement of the nozzle plates among other parts.

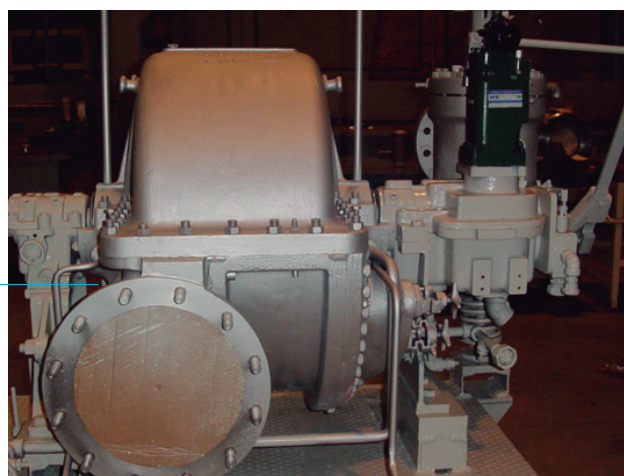
This service consists in the complete reengineering of the turbine, using tools that make it possible to develop blades with high yield profiles, thus resulting in a 30% reduction in steam consumption.



Before
After



Before
After





24-HOUR TECHNICAL ASSISTANCE

With more than 40 years of experience in the market, TURBIMAQ has a specialized team for technical assistance, composed of: representatives, engineers, supervisors, planners, mechanical technicians, inspectors, instrumentalists, electricians, safety technicians and others, specialized in rotating equipment of the most diverse brands/models.

In order to solve any problems in programmed and/or emergency shutdowns, our team is available 24 hours a day, 7 days a week, for service in national and international territory.



OVERHAUL

Through the know-how acquired during the more than 40 years of experience in maintenance of turbo machines, TURBIMAQ has specialized in maintenance of machines in scheduled stops in the most varied industry sectors.

Our external maintenance team has professionals such as in charge, engineers, supervisors, planners, mechanics, inspectors, instrumentalists, electricians, safety technicians and others, all specialized in rotating equipment of the most diverse brands/models.

TURBIMAQ has a complete factory structure, prepared for repair, reengineering, machining and manufacturing of parts to support the needs of the field team during the Overhaul.



MAINTENANCE CONTRACT

TURBIMAQ's service portfolio also includes the long-term maintenance contract modality, which significantly contributes to the reduction of maintenance costs and increase in the equipments operational availability.

This product offers periodic visits (weekly, monthly, bimonthly etc.) of specialized technician to monitor the equipment during its operation, monitoring its behavior over time, offering subsidies for programming small interventions in order to avoid unscheduled stops and/or emergency, which generate increased maintenance costs.



SPIN TEST



**This service can also be performed on existing equipment and / or from other manufacturers, and can be witnessed by inspectors/customer representatives.*

In order to offer a market differential, we have a bench for conducting steam spin tests in turbines, with the aim to deliver, when contracted, our tested equipment, reducing time required for commissioning.

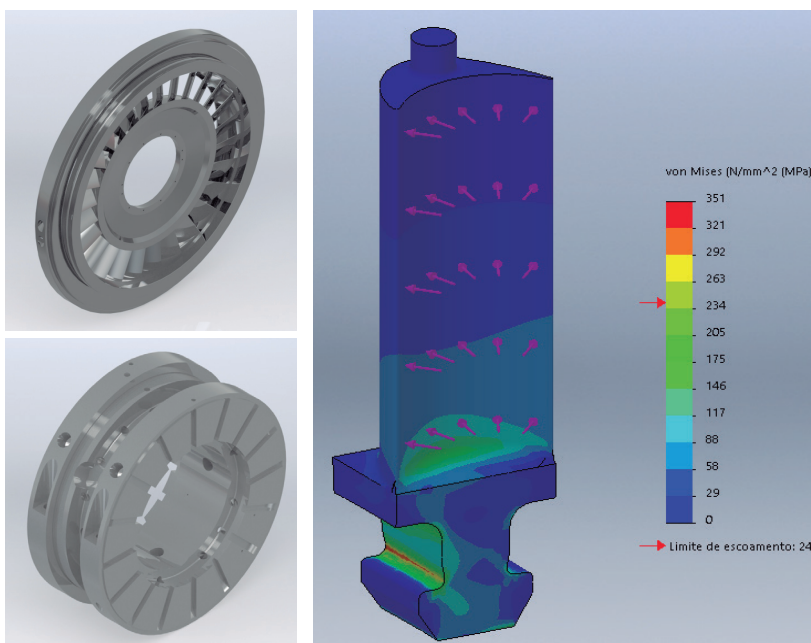
During the spin test, several checks are performed on the equipment, such as: bushing temperature, vibration and noise level, adjustment/test of the safety system, adjustments of the control system, among others. The measurements taken during the test are recorded in a report.



REVERSE ENGINEER 3D MODELING

Reverse Engineering enables problem solving, improvement needs; assists in performing repair, retrofit, modernization, overhaul, etc. of turbines and equipment of other brands/models, giving subsidies to manufacture components in accordance with the original characteristics.

Considering the complex geometry of parts for steam turbines and other rotating equipment, we have state-of-the-art equipment for 3D sizing and modeling, offering greater precision and quality for project design, Reverse Engineering as well as manufacturing processes.

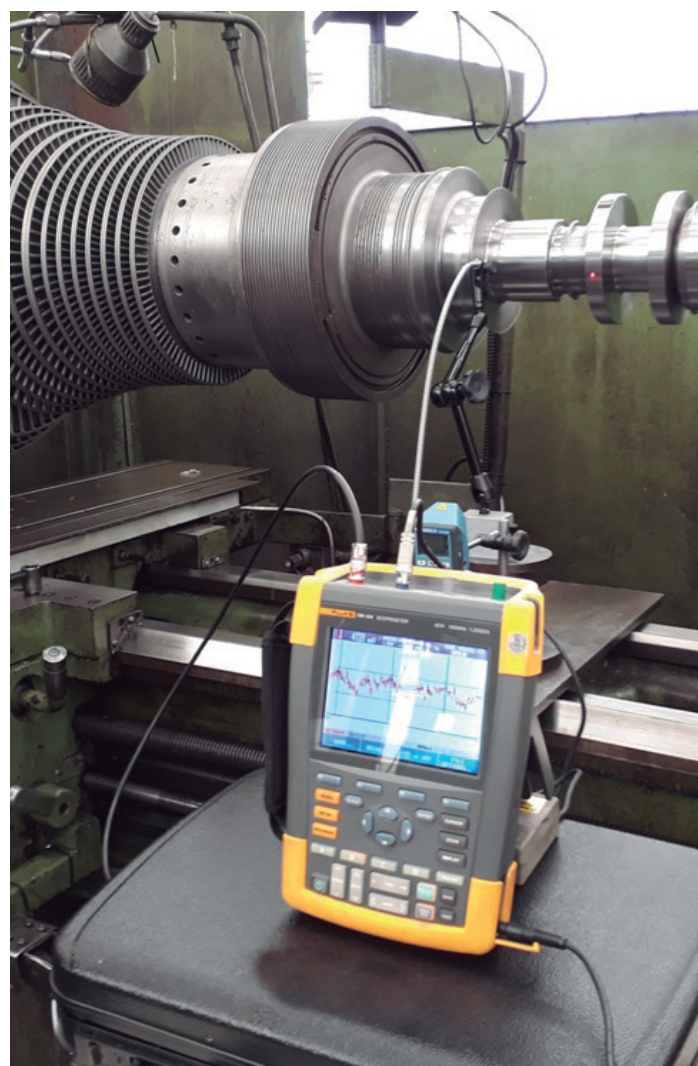


ELECTRIC RUNOUT

In order to attend the increasing search for operational safety of rotating machines, TURBIMAQ has specialized in shaft preparation (electrical runout/burnishing) for vibration monitoring, both in new equipments and also in the modernization of existing equipments.

The shaft preparation service (electrical runout/burnishing) consists of the execution of the tracks, with surface finishing (roughness) adequate according to applicable standards, ensuring the quality of the surface for reading the vibration sensors (Probes).

This service can be performed at our plant or at the client's facilities "in loco".





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