TUGA
MAPNA GROUP

MST-70 STEAM TURBINE

MAPNA TURBINE ENGINEERING & MANUFACTURING Co. (TUGA)

MST-70 Steam Turbine

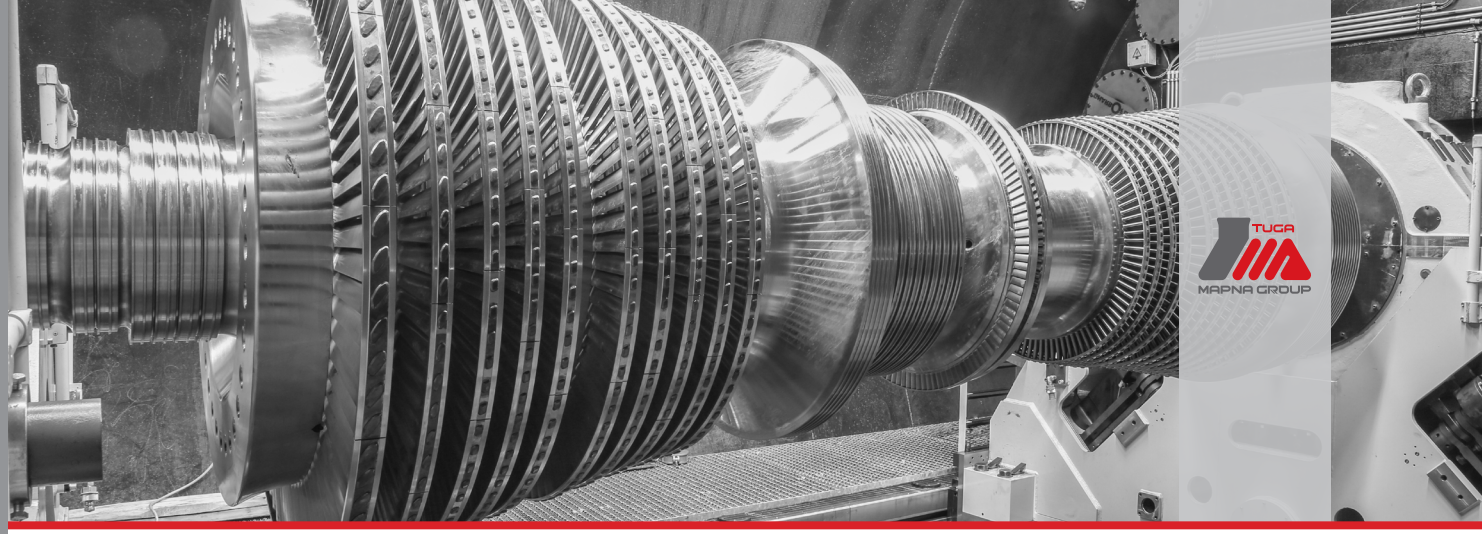
With efficiency of more than 43% in simple cycles and power production of 320 MW, MST-70 has been designed for heavy-duty power plants. This machine incorporates two separate cylinders; i.e. HP-IP and LP. Steam enters the HP section through two throttle valves each having four throttle valves of their own. Afterwards, the steam returns to the boiler to be re-heated to the HP inlet temperature. It is now ready to enter the IP section through two interceptor valves and from there to the LP section which includes double back-to-back sub-sections.

The exhaust is of side type and the condenser is located under the LP section. In order not to transmit any thermal expansion to the condenser, an expansion joint is embedded between the LP casing exhaust and the condenser inlet.

The IP exhaust steam is routed to the LP casing via two cross over pipes. These pipes are equipped with expansion joints, so that no thermal expansion is transmitted between the HP-IP and LP casings. Considering the location of the condenser, the axial fixed point of the stationary parts is at the middle of the LP casing. However, the thermal expansion of the HP-IP and LP rotors is tolerated by a thrust bearing at the IP section end. This bearing connects the coupled rotors to the IP casing, which is in turn, connected to the LP casing and the ground.

Product Specifications

No.	Parameters	Unit	Value
1	Gross Power Output*	MW	320
2	Gross Efficiency*	%	44.3
3	Main Steam Flow	kg/s	289.7
4	Main Steam Pressure	bar	166.7
5	Main Steam Temperature	°C	538
6	Reheat Steam Flow	kg/s	221.8
7	Reheat Steam Pressure	bar	33.8
8	Reheat Steam Temperature	°C	538
9	Shaft Speed	rpm	3000
10	Back Pressure	bara	0.095
11	Heat Rate	(kJ/kWh)	8117
12	Application	-	Conventional Steam Power Plant
13	Frequency	Hz	50
14	Max. Allowed Back Pressure [Trip Value]	bar	0.28
15	Weight (Core Engine)	tonnes	350
16	Dimensions (Length×Width×Height)	m	16.9 x 7.1 x 7.5



Advantages

- Separate HP-IP and LP cylinders
- Tilting pad bearings with no need for lifting oil
- Long last stage blade appropriate for high vacuums
- Stellite strip on the last stage rotary blades to strengthen against water erosion
- Partial arc admission appropriate for fixed pressure operation
- Curtis stage at the HP section inlet

Other Features

Long LP blades

Connected together with two lashing wires welded in packets of eight, the last stage blades are designed to have minimum exhaust loss which gives rise to higher power output. These blades originally fit high vacuums. However they can be customized for different condenser pressures according to customer requirements. The last rotary blades are partially shielded with Stellite strip at the suction side of the leading edge to have higher resistance against corrosion due to water droplets impact.

Seven Extractions

This turbine is equipped with seven extraction lines which lead steam to heaters in order to heat the condensate on its way to the boiler. These extractions are:

- within the HP section
- at the end of HP section
- within the IP section
- at the end of IP section
- within the LP section (3 extractions)

Tilting Pad Bearings

The bearings are of tilting pad type, thus there is no need for lifting oil in low speeds. However the Generator might need lifting oil which does not pose any problem for the rotor train alignment.

Low Thermal Stress in HP Inner Casing

Different sections are arranged in a manner that the HP section is located between the IP and LP sections. This gives rise to the fact that the IP exhaust steam has to flow backwards on the outer surface of the HP-IP inner casing in order to exit the HP-IP casing and flow to the LP one. Consequently, there will be less temperature difference between the inside and outside of the HP-IP casing. Hence less thermal stress particularly in startups.

Separate Materials for HP-IP and LP Rotors

Choosing different materials for each of the HP-IP and LP rotors allows higher main steam temperature of the HP-IP rotor as well as more corrosion resistance in the LP rotor compared to when both are made of the same material.

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