

MAPNA GROUP

TUGA

MAPNA Turbine Engineering and Manufacturing Company

MST-60 Steam Turbines



Introduction

MST-60 steam turbines are used in triple-pressure combined cycles with a maximum power generation capacity of up to 250 MW. In the design of this turbine, which is mainly developed to achieve higher power production and efficiency by harnessing the higher pressure and temperature of the steam entering the turbine, two separate cylinders are used for the high pressure (HP), and intermediate and low pressure (IP-LP) sections. Other prominent features of this series of steam turbines are:

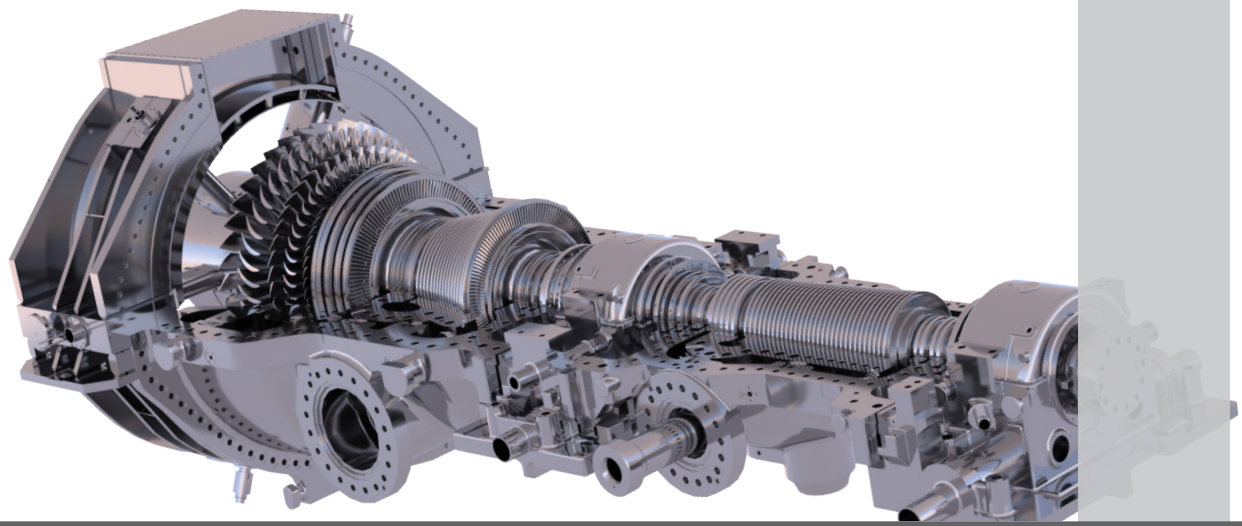
- Achieving the maximum power production and efficiency of the thermal cycle
- Ability to be installed and used in turbine halls with high and low ceilings
- Axial/downwards design of the outlet steam path to achieve maximum efficiency and optimized arrangement

Specifications of MST-60/1000, as an example of turbines designed and manufactured in this range, are as follows:

MST-60/1000 Steam Turbine

In order to increase the combined cycle efficiency of the MGT-75 Gas turbine and to make optimal use of its exhaust energy, MST-60/1000 Steam turbine was introduced to be the first of its kind, three-level pressure turbine with reheating technology that was completely designed by Iranian experts in TUGA. This turbine consists of three sections: High Pressure (HP) section that is placed in a separate casing, as well as intermediate and Low Pressure (IP-LP) sections that are placed jointly in another casing. The last three stages of the LP blades are specifically designed for this application and have the best performance for typical Iranian power plants with relatively high condenser pressures. The rotary blades of this part are of the free-standing design. This means that they are borne on their roots only, and there are no shrouds or lashing wires on the airfoils.

The welded type IP-LP rotor consists of three parts welded at two seams. Remembering the fact that the IP-LP rotor provides a counter-flow steam path, the middle part is exposed to the high-temperature reheated steam and therefore its material has been selected in a way to allow temperatures around 560 °C. On the other hand, the material of the end part is selected to be suitable for high centrifugal forces. Last but not least, the welding design allows modular designing.



Product Specifications

No.	Parameters	Unit	Value
1	Gross Power Output*	MW	105
2	CCPP Efficiency*	%	60 (with 1 x MGT-75)
3	Shaft Speed	rpm	3000
4	Main Steam Flow	kg/s	61.5
5	Main Steam Pressure	bara	114
6	Main Steam Temperature	°C	565
7	Reheat Steam Flow	kg/s	69.5
8	Reheat Steam Pressure	bara	27.1
9	Reheat Steam Temperature	°C	565
10	LP Steam Flow	kg/s	7
11	LP Steam Pressure	bara	3.7
12	LP Steam Temperature	°C	235
13	Back Pressure	bara	0.092
14	Max. Allowable Back Pressure (Trip Alue)	bara	0.5
15	Application	-	Combined Cycle Power Plant
16	Frequency	Hz	50
17	Weight (Core Engine)	tonnes	185
18	Dimensions (Length×Width×Height)	m	10.2 x 4.5 x 4.1

* Standard ISO Conditions

Advantages

The MST-60/1000 has the following advantages:

- A welded IP-LP rotor has been used, making each part suitable for its specific condition.
- The last stage rotary blades are of the free-standing design, allowing easier assembly and disassembly during overhaul or maintenance.
- Using highly efficient profiles for stationary and rotary blades to use as much energy as possible from the flowing steam.
- The IP-LP steam path is counter-flow type, i.e. the steam first enters the IP section at the middle of the IP-LP outer casing and after flowing in the HP section and passing through all the IP blades, it flows in the reverse direction towards the condenser. This eliminates the possibility of steam trapping between the outer and inner casings, hence there is no unallowable temperature difference between the upper and lower half of the outer casing.
- The HP rotor is cylindrical; therefore it is manufactured more easily.

Some more characteristics

- The last stages of the LP section have been sized to have the best performance for typical Iranian sites. Generally, the condenser pressure in Iranian power plants is higher than in European sites, therefore relatively shorter airfoils are required.
- The steam path has been designed based on highly efficient profiles, so the overall efficiency of the turbine is comparable to world-class steam turbines.
- The HP and IP-LP sections are completely assembled in the factory, therefore less effort is required in the power plant.

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