



MGT-70(3) GAS TURBINE

MAPNA TURBINE ENGINEERING & MANUFACTURING Co. (TUGA)

MGT-70 Gas Turbine

Cost, durability and flexibility are among major challenges in the power generation industry. Quality of manufacturing, long-life service, ability to fire with various types of fuels and applicability in both simple and combined cycles are among the characteristics that MGT-70 gas turbine can offer to tackle those challenges. Large-volume, easy-maintenance combustion chambers besides low NOx burners and high efficiency, lead to lower levels of emissions, which helps alleviate environmental concerns.

Product Specifications

No.	Parameters	Unit	Value
1	Gross Power Output*	MW	185
2	Gross Efficiency*	%	36.4
3	Shaft Speed	rpm	3000
4	Exhaust Gas Temperature	°C	544
5	Exhaust Mass Flow Rate	kg/s	554
6	No. of Compressor Stages	EA	16
7	No. of Turbine Stages	EA	4
8	Pressure Ratio	-	12
9	Type of Combustors	-	Silo Type
10	NOx Emissions	ppmvd@15%O ₂	25
11	CO Emissions	ppmvd@15%O ₂	10
12	Frequency	Hz	50
13	Weight (Core Engine)	tonnes	186
14	Dimensions (Length×Width×Height)	m	10.2 x 3.9 x 3.7

* Nominal Power at ISO Conditions.

Advantages

- Utilized in simple and/or combined cycle applications
- Cold-end generator drive
- Central tie bolt rotor with internal air circulation around
- No direct flame radiation on turbine blades
- Hybrid burners and large combustion chambers
- Easy inspection of burners and turbine blades by means of manholes on combustion chambers
- Replaceable blades
- Ability to use wide variety of fuel compositions



- Enhanced fast start-up
 - Zero-to-Base in 17.5 min with Normal Loading of 13 MW/min
 - Zero-to-base in 9 min with Fast Loading of 35 MW/min
- Hot-start capability
- Improved efficiency in part load
- Low emissions even in part-load condition due to DLN (dry low NOx) technology
- High EOH inspection
- Low maintenance cost
- Grid stabilization
- Improved reliability and availability

Other Features

Flexible Rotor

The low-mass disk rotor of the gas turbine, whose self-centering disks (due to hirth facial serrations) are jointed together with no torsion, has a high critical speed and is internally cooled by extractions from the compressor to avoid deformation caused by thermal stresses during start-up and load changes.

New Efficient Compressor Design

The MGT-70(3) Gas Turbine, utilizes an axial 16-stage compressor with variable inlet guide vanes. At the design point, the compressor rotates at approximately 3000 rpm, and delivers mass flow with total pressure ratio of about 12. Enhancing the mass flow rate and efficiency of the compressor section of the MGT-70 machine involved a 3D re-design and optimization of the first 4 stages of the compressor. That involved both rotary and stationary blades and vanes and resulted in an improvement in total efficiency and net output of the whole machine. Advancements in 3D design have brought about a compressor with higher efficiency and less sensitivity towards environmental changes. The compressor blades can be removed and replaced without needing to dismantle the rotor. Anti-surge system with blow-off pipes, extracts air from equal space intervals, prevents vibration and keeps the flow uniform.

New Turbine Section

Various R&D projects have been carried out in MAPNA Group for continuous improvement of performance, reliability, and availability of MGT-70. An extreme effort has been made for turbine section upgrade in this product. Both aerodynamics, and cooling (mechanism, process, system) of the blades and vanes have been optimized. The first three stages of the turbine were safeguarded against hot gases using cooling extractions from the compressor, as well as oxidation and thermal protection coatings.

Low NOx Combustors

MGT-70 is flexible with fuel and its two large two large silo-type combustion chambers with ceramic heat shields as well as eight hybrid burners per each chamber with dry low NOx technology, result in higher efficiency and less emission. The hybrid burners allow the system to operate on both gas and oil in premix and diffusion modes. Manholes allow personnel to directly inspect the hot-gas path components from burners to turbine blades without the need for lifting the cover.

Island Mode Operation

High flexibility in taking up step loads in addition to high ramp rates of up to 10 MW/s make the MGT-70 (3) gas turbine a perfect fit for islanding operation of distribution networks. The control system of the MGT-70(3) gas turbine has been modified so as to deliver a proven islanding mode performance generally needed in the oil and gas industry.

Main Auxiliaries

Fuel System

The main parts of the fuel gas system are strainers and stop and control valves, while those of the fuel oil system are the injection pump and duplex filters as well as stop and control valves. A hydraulic oil system provides high-pressure hydraulic oil to operate the control and emergency stop valves of the fuel systems. A purge water system is used to prevent coking of fuel oil in the burners.

Air Intake

Air filtration provides a pollutant-free air with a suitable temperature at the engine inlet and basically consists of anti-icing and three stages of filtration, as well as silencers.

Exhaust

The exhaust duct vacates the flue gas to the environment or the entry of the steam cycle. The main parts are the stack, silencer, pollutant measuring instruments, damping system and its hydraulic actuator as well as the guillotine, which is used to separate the HRSG from the exhaust system.

Lube and Lifting Oil System

The system performs heat dissipation and lubrication of the turbine and generator bearings. It consists of an oil tank, pumps, pipes, flanges, filters, valves and cooler.



Instrumentation and Control

Important features of the turbine instrumentation and control are:

- Output power response to frequency variations in both primary and secondary (limits) according to Droop.
- Automatic calculation of the turbine EOH in different conditions to determine the proper maintenance/service regimen.
- Predictive control of IGV blades for providing a quick action to load variations during frequency response and sudden load fluctuations, minimizing thermal stresses on gas turbine hot parts.
- Automatic operation of start-up, stop, loading, fuel changeovers (gas to oil and vice versa) and combustion mode transfer (diffusion to premix and vice versa).
- Provision of all required protective systems for the gas turbine and its auxiliaries.
- Provision of additional controllers that avoid approaching the axial compressor to instability regions.
- Options for partial load efficiency, fast loading/unloading, and hot start-up.

Services Offered After Sales

The hot gas path sections are the most likely to be damaged. However, the MGT-70 (3) large combustion chamber avoids this as the long path of the hot gas to the first blades prevents direct flame radiation. Moreover, such geometry enables the user to inspect and easily clean combustion ashes from the turbine. In addition, the manholes are of great importance within the inspection process. Hot gas path and major inspections are normally performed at 33000 and 66000 EOH. The maintenance intervals may even be extended depending on the order. The MAPNA power GT is indeed an easily maintained, tough and rugged machine during operation. With a proper maintenance regime, it can demonstrate a high level of reliability and availability. MAPNA Turbine Company offers the following services to clients.

Provision of spare parts for the turbine and auxiliaries

Our own manufacture, as well as reliable network of spare parts suppliers enables us to satisfy individual client demands, including capital spares, as per order.

Fast-track supply of spares

Our spacious warehouses and continuous production of the machine allow us to supply spare parts at short notice. In addition, by providing consumable materials and strategic components from our production line, we can quickly assist clients in case of unpredicted or sudden outages and overhauls.



Long-term supply and support agreements

We offer long-term contracts for various types of support and service.

Supervision with installation and commissioning

Installation and commissioning of the turbine and auxiliaries are performed by skilled personnel under our direct supervision. Personnel can also be made readily available on and off the client site until the end of the guarantee period of the last unit in the power plant.

Technical consultation services for end users

Our experienced and knowledgeable technical and engineering team is available for consultation at any time.

Training of end-user staff

We offer several training courses for new staff on site, such as general power plant knowledge, operation, maintenance, and even special training, such as firefighting.

Performing inspections and overhauls

Our experienced maintenance personnel can perform turbine inspections and overhauls thoroughly.

Fabrication and repair of turbine special parts

Thanks to our state-of-the-art machineries and skilled manufacturing personnel, we can provide fabrication and repair of special parts for our MGT-70 machines.

Execution of performance test

We have Conducted and assisted in performance tests for more than 250 units as of the end of 2021.

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