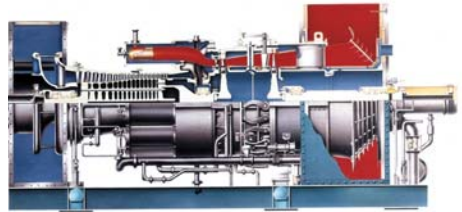


MS5002B Advanced Technology Uprate

Benefits

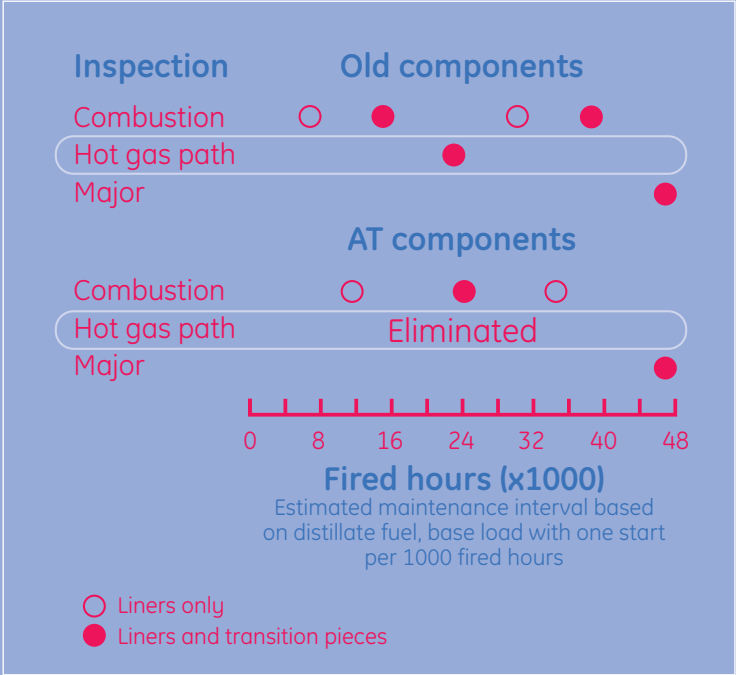
- ■ ■ Increased production
- ■ □ Higher efficiency
- □ □ Compliance with environmental regulations
- ■ ■ Availability and Reliability
- ■ □ Life extension

The MS5002B advanced technology uprate package provides increased output, improved efficiency and an extension in maintenance intervals resulting in a reduction in planned outages. The uprate increases output by approximately 8.6% and efficiency by 0.4%. Based on this uprate, GE can recommend a maintenance plan structured on a 12,000 hours base.



	Output (*)	Heat Rate(*)
MS5002B advanced technology components	+8.60%	-0.40%
MS5002D 1 st stage nozzle	+1.70%	-1.00%

(*) New and clean expected values obtained with natural gas at ISO condition



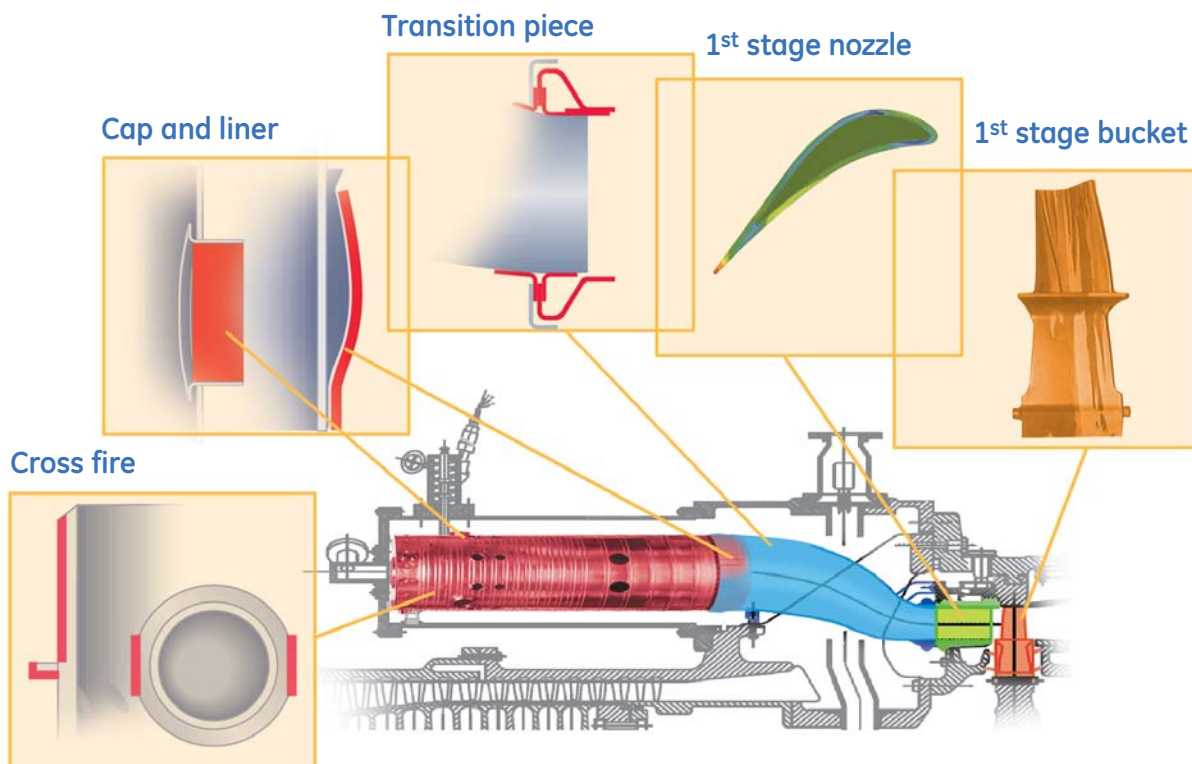
What it is

Our GE gas turbine engineers have developed new technology for advanced machine designs, and applied those improvements to the operating fleet.

The resulting gas turbine uprates have delivered great gains in power output, efficiency and reliability, along with substantial extension of inspection intervals, and reduction of emissions and maintenance cost, all with minimal investment and installation expense. Examples of these developments include: new bucket materials that permit higher firing temperatures and concurrent efficiency/output gains, new coatings and coating techniques, and new combustion components design to lengthen component life. Beginning in 1985 a development program was undertaken to increase the MS5002B rating to 38,000 HP (ISO). This rating was achieved through the use of advanced technology.

The most recent MS5002C performance improvements have been achieved by the application of advanced sealing technology. The parts involved in this uprate are those normally changed during a major inspection.

Model	MS5002A	MS5002B	MS5002C	MS5002D
Compressor stages	15	16	16	17
Pressure ratio	7.4	8.8	8.8	10.75
Firing temperature [°C - °F]	921 - 1,690	927 - 1,700	966 - 1,770	986 - 1,807
Exhaust temperature [°C - °F]	524 - 975	491 - 915	516 - 961	510 - 950
Air flow [103kg/hr] - [103 Lb/hr]	351 - 773	438 - 966	445 - 982	504 - 1,113
Output [kW - hp]	19,575 - 26,250	26,100 - 35,000	28,337 - 38,000	32,066 - 43,000
Heat rate [kJ/kW-h] - [Btu/hp-h]	13,837 - 9,780	12,493 - 8,830	12,309 - 8,700	12,235 - 8,650



How it works

It is possible to retrofit the MS5002D 1st stage nozzle in the MS5002C. The new nozzle developed for the MS5002D gas turbine features a reduced throat area that allows a higher compressor ratio.

The nozzle vane-cooling scheme has been improved to allow more cooling airflow through the individual vanes and to optimize the distribution of the cooling air to improve the cooling of the nozzle vane walls.

The MS5002D 1st stage nozzle can give higher power without any impact on scheduled maintenance intervals. The parts involved in this uprate are those normally changed during a major inspection.

As an option it is possible to install the MS5002D 1st stage nozzle.

The new nozzle, developed for the MS5002D gas turbine, features a reduced throat area allowing a higher compressor ratio capability. The nozzle vane-cooling scheme has been improved to allow more cooling airflow through the individual vanes and to optimize the distribution of the cooling air to improve the cooling of the nozzle vane walls.

MS5002D 1st stage nozzle can give higher power without any impact on scheduled maintenance intervals.

Scope of Supply - Base

The uprate includes the following:

- GTD450 IGV reduced chamber high flow IGV
- 1st stage turbine blade kit
- 1st stage nozzle and support ring
- Turbine case modification
- Cap and liner arrangement with TBC coating
- Floating seal transition pieces
- Cross fire tube set
- N² bearing liner modification
- Thrust bearing (low pressure side)
- Extended thermocouples

Scope of Supply – D nozzle

- GTD450 IGV reduced chamber high flow IGV
- 1st stage turbine blade kit
- MS5002D 1st stage nozzle and support ring can be added
- Turbine case modification
- Cap and liner arrangement with TBC coating
- Floating seal transition pieces
- Cross fire tube set
- N² bearing liner modification
- Thrust bearing (low pressure side)
- Extended thermocouples

	Package 1	Package 2	Additional
PERFORMANCE	AT uprate	AT uprate & D nozzle	
Firing temperature	1,770 °F	1,793 °F	
Output	+ 8.6%	+ 10.3%	
Heat rate	- 0.4%	- 1.40%	
Exhaust temperature	963 °F	966 °F	
Exhaust flow	986 klb/hr	986 klb/hr	
MAINTENANCE			
Reliability/availability	X	X	
SCOPE	<ul style="list-style-type: none"> • GTD450 IGV reduced chamber high flow IGV • 1st stage turbine blade kit • Turbine case modification • Cap and liner arrangement with TBC coating • Floating seal transition pieces • Cross fire tube set • N² bearing liner modification • Thrust bearing (low pressure side) • Extended thermocouples 	<ul style="list-style-type: none"> • Package 1 • Replace AT 1st stage nozzle with MS5002D type 1st stage nozzle 	<ul style="list-style-type: none"> • Compressor reblade • Simple to regenerative cycle conversion • Regenerative to simple cycle conversion • MS5002D conversion • LHE liner • DLN-1 system • Advanced sealing system



GE imagination at work

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