

Performance Improvement Package (PIP) for PGT25+

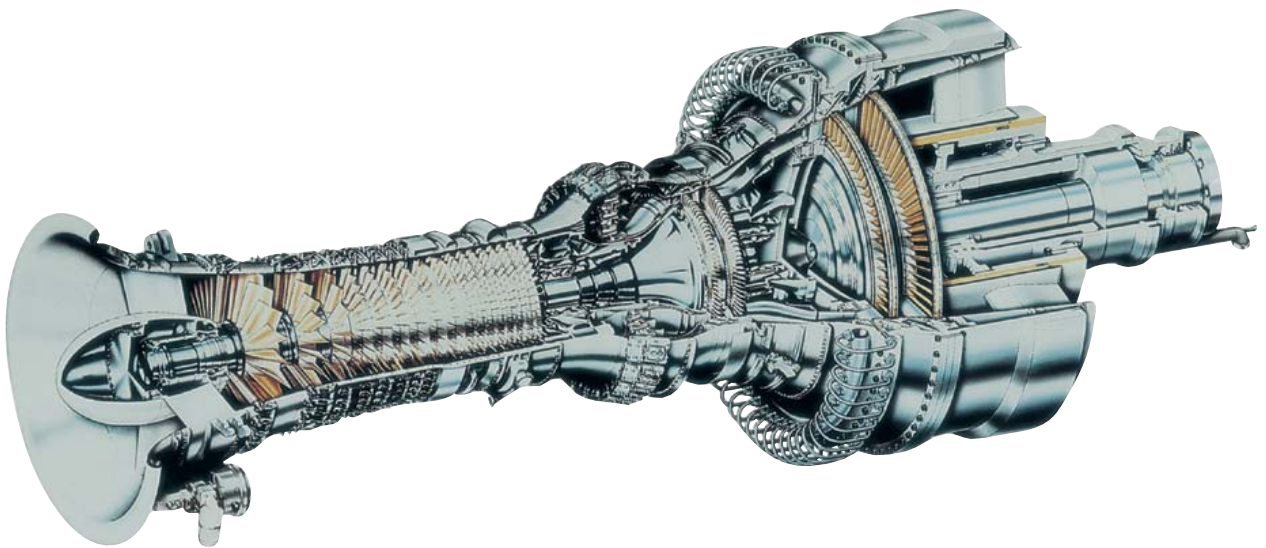
Benefits

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

The benefits also include:

- Power turbine extension of mean-time-between-maintenance from 25k hours to 50k hours
- Cost-effective solution reusing the original equipment and design
- Improved cooling of power turbine for potential life extension

In addition, the installation of this uprate can be done within 1 week outage, with minor impact on downtime



What it is

To improve the mechanical characteristics of the turbine casing, GE Oil & Gas has developed the Product Improvement Program (PIP) kit, which enhances the cooling of the power turbine, thus providing improved unit availability and extending component life.

Field measurements on the PGT25+ fleet have shown above normal temperature values and spreads on the turbine transition casing and 1st stage casing of the High Speed Power Turbine (HSPT).

Inspection after 25,000 operating hours revealed oxidation and deformation of these casings (see Figure 1).

The PGT25+ PIP is an upgrade of the

well-proven PGT25+ technology which consists of a retrofit of the existing PGT25+ package to accept a redesigned Low Pressure Turbine (LPT). This modification does not change the package architecture. The PGT25+ PIP program is fully retrofitable and will improve:

- Reliability and availability
- Maintenance procedures

The retrofit kit can be installed during a hot section inspection with only minor impact on the expected downtime.

Performance

The PIP kit is a step in the process of upgrading the gas generator to the latest version, increasing the ISO power output to 31.3 MW.

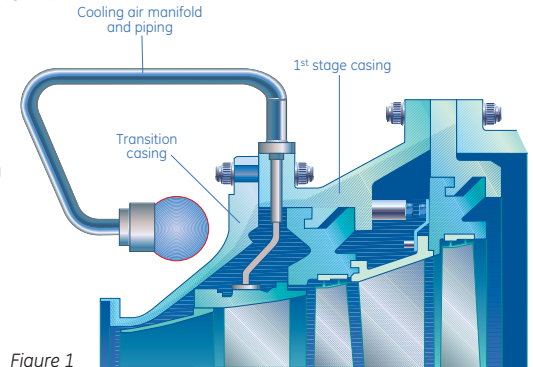


Figure 1

How it works

The fundamental objective of the PIP is improved cooling of the transition and 1st stage casings. This has been accomplished by providing the casing cavities with additional cooling air from the 9th stage of the axial compressor and by adding an internal heat shield designed with a leaf seal.

These two additions provide the following advantages:

- More uniform purge air distribution within cavities
- More uniform thermal loading of the transition casing
- Improved reliability
- Avoidance of hot gas ingestion
- Enhanced cooling of casing and increased cooling air flow
- Improved purging of cavities and protection of 1st stage transition casing from excessive temperatures by splitting cooling air into two flow streams
- Reduction of the risk of hot gas injection into the cavity between the transition casing and nozzles

- Reduction of hot gas leaks through 1st stage nozzles and shrouds by means of:
 1. Cloth seals on 1st stage shrouds

2. C-seal on the mating flange between 1st stage nozzles and shrouds
- Upgraded transition duct material

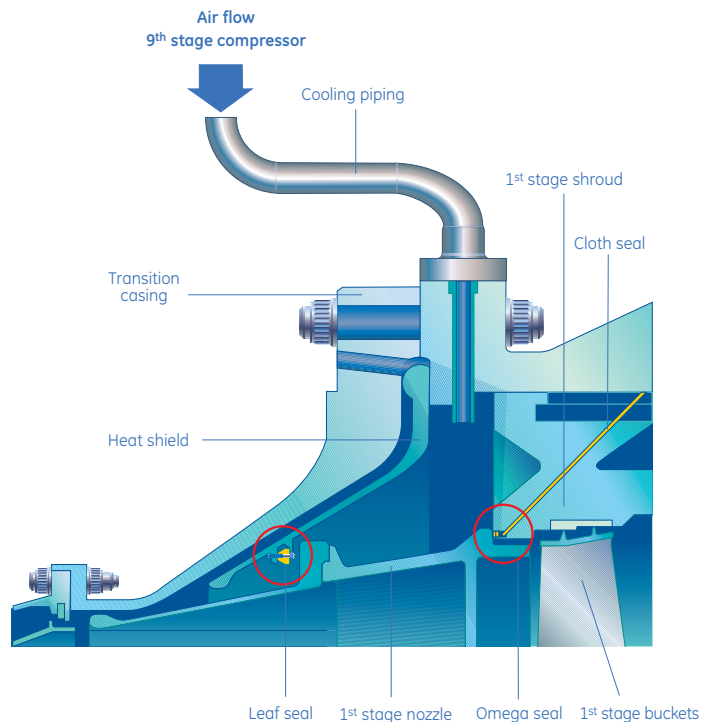


Figure 2

How it works

Maintenance may be conducted on an on-condition basis as for the gas generator. The on-condition maintenance approach provides the potential for the hot section inspection normally conducted at 25,000 operating hours to be skipped.

Scope of Supply

Kit preassembled:

- 1st stage turbine case
- 1st stage nozzle assembly
- 1st stage nozzles support ring
- Gas generator / Power turbine connecting case assembly (transition casing)
- 1st stage shroud
- Elliptical shield
- Elliptical shield insulation
- Gas transition piece outer cone

- Gas transition piece inner cone
- Heat shield assembly
- Air manifold (1st stage nozzle)
- Assembly material

Loose parts:

- Additional cooling pipe (9th stage GG)
- Cooling air pipes
- Assembly material
- Lifting tools
- Wheelspace themocouples

No additional outage time or manpower is required and the only package modification is the addition of cooling air piping between the gas generator 9th stage bleed and the HSPT (Figure 3).

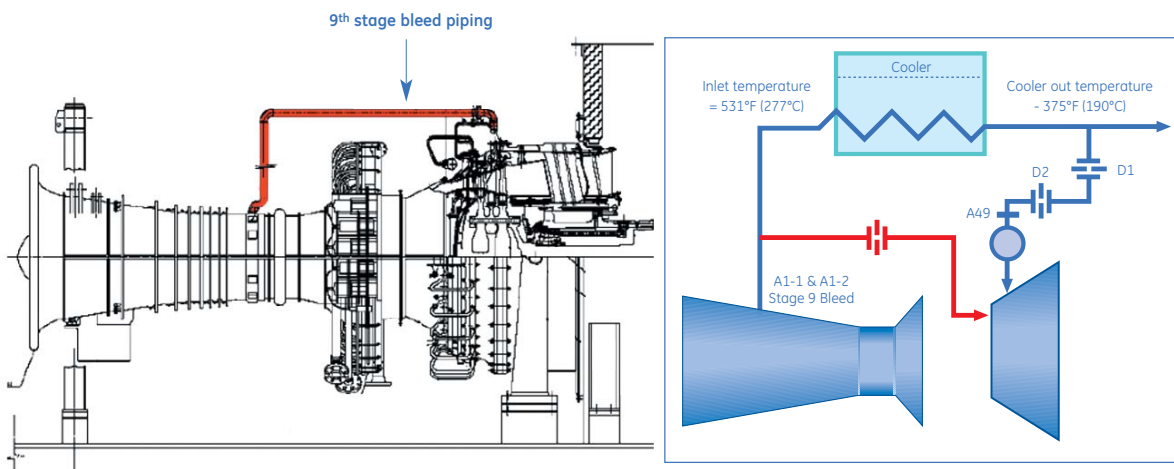


Figure 3 - Package modifications



GE imagination at work

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