Built on our successful products for the Frame 7F, PSM and Ansaldo Thomassen offer combustor and turbine components for Frame 9F. Design improvements developed for the 7F and validated in multiple applications are the basis for PSM and ATH's collective 9F portfolio. Improved durability and lower life cycle cost are achieved using our component and system level product modeling and data evaluation tools, to identify the issues and failure modes in current OEM designs.

Combining technical expertise, speed to market, flexible solutions, tools, and multi-OEM gas turbine platform experience, PSM and ATH are the industry leading F-Class alternative products and services suppliers.

**Design Improvements**

- Interchangeability with OEM hardware
- \( \leq 9 \) ppm NOx & CO emissions over normal premix operating load range
- All parts are designed to deliver 32,000 Factored Hours (FH) and 900 Factored Starts (FS) inspection intervals or better
Creating longer lasting, more dependable parts for your 9F gas turbine provides better power plant availability and profitability in the marketplace. Our collective line of Frame 9F compatible parts have been redesigned and improved from the original OEM parts where necessary to address the life-limiting elements of existing designs. Our hot gas path components utilize advanced materials, coatings, cooling schemes, and design features to maximize durability and reliability.

Components are upgraded by following a proven design approach:

+ Identify the current component issues/failures
+ Use state-of-the-art analytical tools, metallurgical evaluations, and engine test data where possible to determine the root cause of the issues/failures
+ Use this data to design and fabricate new hardware with design features that better maximize durability and reliability

**Hot Gas Path**

**1st Stage Nozzles**
Upgraded with Full Surface Thermal Barrier Coating

+ Alloy upgrade to PSM 109 (Nickel base)
+ Enhanced Platform cooling

**1st Stage Buckets**
+ Alloy upgrade with improved Low Cycle Fatigue (LCF) and Creep Capability
+ Cast in Tip Plate facilitates lower repair cost
+ Improved Platform and Tip cooling

**2nd Stage Nozzle**
+ Alloy upgrade with improved LCF and Creep Capability

**2nd Stage Buckets**
+ Alloy upgrade with improved LCF and Creep Capability
+ Improved cooling design reducing shroud metal temperature
+ Optimized shroud to reduce creep load and improve durability

**3rd Stage Nozzle and Buckets**
+ Alloy upgrade with improved LCF and Creep Capability

**Rotor Overhaul**

Complete Rotor Life Time Extension (LTE) Program

+ Full volumetric NDE Inspection
+ De-stack/re-stack capability
+ Complete compressor blading
+ Replacement parts for Compressor / Turbine Wheels, stub shafts etc.
+ Spare rotor available

DESIGNED TO REDUCE LIFE CYCLE COSTS
Combustion System

Transition Piece
Complete drop in systems available, with know how and expertise on both standard DLN2.0+ as well as advanced DLN2.6+ systems.

+ Improved durability through our enhanced design features
+ Patented cooling features reduce metal temperature
+ Thermally free mount to 1st stage nozzle

Liner
+ Improved durability with conical design and upgraded material
+ Improved impingement cooling for enhanced durability
+ Improved assembly and sealing with double-ply, forward facing hula seal design

Liner Cap
+ Improved durability through our enhanced design features
+ Upgraded Effusion plate material to Haynes 282 for increased LCF capability

AutoTune

Our AutoTune digital solution enables automated combustion tuning to maintain emissions and combustion dynamics within specified limits under varying ambient conditions (temperature and humidity), engine deterioration or while using a range of natural gas or liquefied natural gas.

Optimize Unit Operation
The AutoTune system incorporates features which result in optimal operation from a power and heat rate standpoint, as well as maximizing operability such as lowering turn down and transient tuning under Automatic Grid Control (AGC). The result is improved emissions control, hardware life, reliability and operability.

Optional Software Components
Fuel gas temperature optimization, Power+ for maximum power, and optimization for LNG are all options to achieve the ideal power output and increase hardware life.

Global Service Network with local Presence
Local project management, service engineering, field service and execution resources at key locations around the world to support the Fr9F fleet.
Additional Services and Product Offerings:
GE 7FA, 7EA, SW 501F, MHI 501F, GE 6B, 9E, 9FA

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Services &amp; Outage Management</td>
<td>Including on-staff bladers and supply of labor for gas turbines, steam turbines and generators worldwide for GE B,E &amp; F-class, SW &amp; MHI F-class.</td>
</tr>
<tr>
<td>Reconditioning &amp; Repair</td>
<td>Of all turbine airfoils and combustion system components, including fuel nozzle overhaul for GE 9F.</td>
</tr>
<tr>
<td>Combustion System Engine Tuning including Monitoring &amp; Diagnostics</td>
<td>Support for all rotating equipment (e.g. remote monitoring) of gas turbines worldwide.</td>
</tr>
<tr>
<td>Rotor Rebuild &amp; Inspection</td>
<td>Including disk repairs, low speed or high speed vacuum balance and rotor life extension/assessment.</td>
</tr>
<tr>
<td>R&amp;D, Engineering Assessments, Root Cause Analysis and system technical</td>
<td>Support for gas turbines.</td>
</tr>
<tr>
<td>Flexible Long-Term Parts and Service Agreements (LTSA)</td>
<td>Combine all of your products and services for a custom solution that meets your needs.</td>
</tr>
<tr>
<td>Power Plant Solutions</td>
<td>Provide integrated services and upgrades for all your critical power plant components and systems. We provide a single point of contact for maximizing your plant’s performance potential, increasing operational flexibility, and outage management.</td>
</tr>
<tr>
<td>AutoTune</td>
<td>Offers autonomous, real-time combustion system control tuning packages for optimizing combustion dynamics/pulsations, emissions and output on GE 9F gas turbines.</td>
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Contact us for more information.