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7E Product Line

Recognized throughout the industry for our LEC III™ Ultra low emissions combustion system, PSM has also been supplying Frame 7B, 7E & 7EA hot gas path buckets and shrouds since 1999. In 2014 the hot section was completed with the introduction of the full turbine nozzle range.

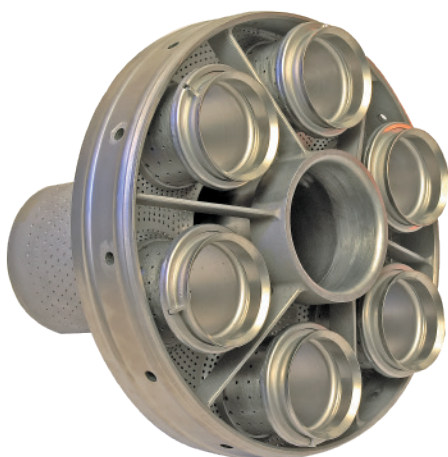
The improved durability, high performance and lower life cycle cost of our product offerings are achieved using PSM's component and system level modeling and data analytic tools to identify issues, failure modes and areas of improvement.

Combining technical expertise, speed to market, flexible solutions, tools, and multiple OEM cross-platform experience, PSM has proven global capability on mature frames such as the 7E.

Looking for plant flexibility? PSM can also install Inlet Bleed Heat Systems, Supplemental Exhaust Cooling and Steam Injection for Power Augmentation.

Design Improvements

- + Interchangeability with OEM hardware
- + < 5 ppm NOx and < 25 ppm CO emissions over normal premix operating load range
- + All parts are designed to deliver 24,000 Factored Hours and 900 Factored Starts inspection intervals or better
- + Gas-only and dual-fuel options



The **Proven** Alternative

DESIGNED TO REDUCE LIFE CYCLE COSTS

Hot Gas Path

All HGP components are compatible with the latest 2055F firing temperature machines (Engine Model 7121), and are backward compatible down to and including 7B engines.

1st Stage Nozzles

- + PSM-adapted design & materials; optional NiCoCrAlY & TBC Coatings

2nd Stage Nozzles

- + PSM-adapted design & materials

3rd Stage Nozzles

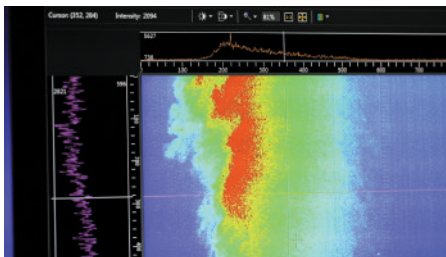
- + PSM-adapted design & materials



Minimum service interval of 24,000 Factored Hours or 1,200 Factored Starts under normal operation, which can be increased based on unit characteristics, with consultation from PSM's experts.

Design Tools and Systems

Creating longer lasting, more dependable parts for your 7EA gas turbine provides better power plant availability and profitability in the marketplace. PSM's line of Frame 7EA compatible parts have redesigned the original parts where necessary to address the life-limiting elements of existing designs. PSM's hot gas path components utilize advanced materials, coatings, cooling schemes, and design features to maximize durability and reliability.



Components are upgraded by PSM 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

Co-locating R&D engineering with the PSM repair workshop, our design engineers collect continuous feedback on the performance of PSM's and competitors' designs and proactively address emerging fleet issues. With these capabilities PSM has introduced designs that can align combustion and hot gas path inspections and reduce repair scopes, providing customers with reduced lifecycle costs.

1st Stage Buckets

- + Improved cooling through 12 radial stem drilled airfoil cooling holes.

2nd Stage Buckets

- + Scalloped tip shroud for improved creep resistance.

- + Increased tip shroud contact face area mitigates shingling.

- + Compatible with and without shroud block honeycomb.

3rd Stage Buckets

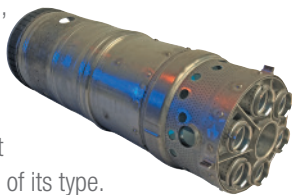
- + Increased tip shroud contact face area mitigates shingling.



Combustion System

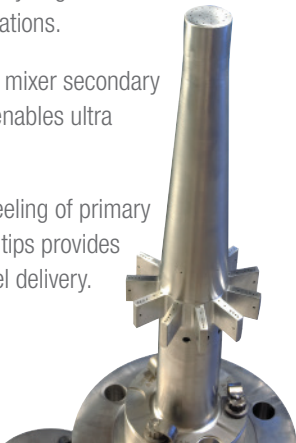
LEC III™: Ultra Low Emissions *Need to achieve NOx reductions for CSAPR?*

Launched in 2001, over 70 sets of the LEC III™ have been sold globally, making it the most successful system of its type.



The patented reverse flow liner body enables sub 4ppm NOx as a drop-in equivalent to a DLN1.0, with any engine hardware or fuel supply modifications.

- + Patented fin mixer secondary fuel nozzle enables ultra low NOx.
- + Tailored wheeling of primary fuel nozzles tips provides optimum fuel delivery.

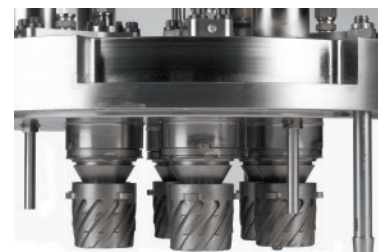


LEC-NextGen: Proven Durability *Need a durable and flexible low emission system?*

Listening to our customers needs for increased durability, PSM has launched our 9ppm NOx NextGen liner, with Dual Fuel capability and an increased load range.



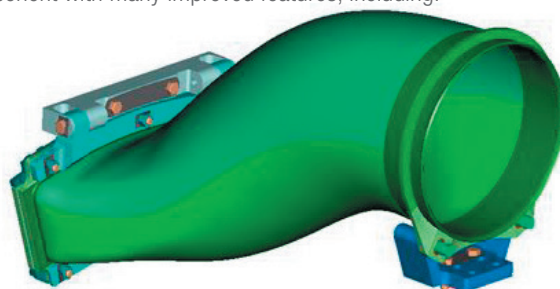
- + As with the LEC III™, the NextGen is drop-in compatible with OEM DLN1.
- + The system boasts tight airflow control and quality construction during manufacturing.



Transition Piece: Ultimate Durability

Designed to provide ultra low emissions combined with at least 24k operating hours intervals, PSM's LEC TP is a highly durable component with many improved features, including:

- + F-Class Thermally free aft mount
- + Effusion cooling
- + Twin pin bullhorn support
- + Thick inlet support ring



AutoTune

Originally implemented on F-Class units, PSM's AutoTune system has been running on 7E's since 2016. The system 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.



Additional Services and Product Offerings:

GE 7FA, 7EA, SW 501F, MHI 501F, GE 6B, 9E, 9FA

Field Services & Outage Management including on-staff bladers and supply of labor for gas turbines, steam turbines and generators worldwide for GE B,E & F-class, SW & MHI F-class.

Reconditioning & Repair of all turbine airfoils and combustion system components, including fuel nozzle overhaul for GE 7F, 9F, SW/MHI 501F, GE 6B & 7B/EA.

Combustion System Engine Tuning including Monitoring & Diagnostics
Support for all rotating equipment (e.g. remote monitoring) of gas turbines worldwide.

Rotor Rebuild & Inspection including disk repairs, low speed or high speed vacuum balance and rotor life extension/assessment.

R&D, Engineering Assessments, Root Cause Analysis and system technical support for gas turbines.

Flexible Long-Term Parts and Service Agreements (LTSA) combine all of your products and services for a custom solution that meets your needs.

Power Plant Solutions 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.

AutoTune offers autonomous, real-time combustion system control tuning packages for optimizing combustion dynamics/pulsations, emissions and output on GE 7FA+e, GE & SW 501F and Mature Frame gas turbines.

Contact your PSM Sales Representative for more information.
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