

DYNAFLEX 
PERFORMANCE

Application Matrix

DLN Products & Services



DynaFlex Performance™ is Turbine Technology Services' (TTS) platform that provides operators a wide range of products and services that maximizes gas turbine output and efficiency, optimizes DLN combustor *dynamics* and emissions, and enhances operational *flexibility*.

Before a DynaFlex solution is even proposed, we recommend our engineers carefully review your needs, help you establish goals and then tailor a solution that specifically addresses your unit's operating parameters, plant requirements and business objectives.

DLN Products & Services	Description	7FA DLN-2/2.6	6FA DLN-2/2.6	9FA DLN-2+/2.6+	7EA/ 9E/6B DLN-1
Auto-Tuning System	<p>TTS' Auto-tuning system, adapted to DLN systems on both E-class and F-class turbines continuously monitors and automatically optimizes the performance of DLN combustors as they responds to:</p> <ul style="list-style-type: none"> • Changes in seasonal ambient conditions • Degradation of combustion hardware over its maintenance cycle • Degradation of gas control valve calibrations • Changes in fuel Wobbe index (composition or temperature) within limits specified in GE's gas fuel specification (+/-5%) <p>The specific performance benefits achieved by the auto-tuning system are:</p> <ul style="list-style-type: none"> • Maintaining NOx & CO emissions within design or regulatory compliance limits • Limiting wear and mechanical distress of the combustion hardware caused by combustor dynamic pressures • Preventing lean blow out of the combustor <p>Based on the type of DLN system, the customer's specific requirements, and past operating history, different priority is be given to each of the above factors.</p> <p>7FA DLN-2.6: The auto-tuning system always prioritizes the prevention of Lean Blow Out and minimizing of cold tone dynamics, which can induce flashbacks. Simple-cycle peaking units subject to stringent emissions regulations typically prioritize keeping NOx below 9 ppm ahead of minimizing hot tone dynamics. Combined-cycle sites with SCRs have the option to prioritize minimizing hot tone dynamics over maintaining NOx below 9 ppm.</p> <p>E-class DLN-1: Without the concern of combustion dynamics, auto-tuning on DLN-1 systems maintains the optimal balance of NOx and CO emissions to maximize premixed mode turn down and in response to varying ambient conditions.</p>	●	●	●	●

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<p>DLN Tuning Services</p>	<p>For DLN combustion systems, combustion tuning is required during initial unit start-up and periodically any time after combustion or hot gas path hardware is changed out. Additionally, combustion tuning may be required to help meet your goals for operational flexibility.</p> <p>The objective of DLN tuning is to ensure that the DLN combustion system operates within its regulatory emissions limits, while also minimizing combustion dynamic pressure levels and providing sufficient lean blow out margin over the low NOx operating range. Based on fuel split testing data at various gas turbine loads, adjustments are made to existing fuel split schedules to achieve an optimal combination of emissions, dynamics and lean blow out margin.</p> <p>Our combustion engineers can travel to your site or connect remotely to carry out this tuning exercise. The combustion engineer uses site CEMS emissions data and CDMS combustion dynamics data as necessary to assess the condition of the system and to make changes to optimize emissions and combustion dynamics to minimize combustion hardware stress levels.</p> <p>Where customers do not have permanently installed CDMS system, TTS can rent a portable system for use during the tuning process. TTS also builds portable and permanent systems for sale to customers.</p>	●	●	●	●
<p>Operational Troubleshooting</p>	<p>DLN systems often experience unexpected operational problems over the course of their maintenance interval. These problems can arise for multiple reasons:</p> <ul style="list-style-type: none"> • Non-optimal initial tuning of DLN system • Extreme variation in ambient conditions • Change in fuel properties • Drift in calibration of pressure instrumentation or control valves • Normal or acute hardware degradation <p>The operational problems which can arise include</p> <ul style="list-style-type: none"> • Intermittent or seasonal NOx and CO emissions excursions • High hot or cold tone combustion dynamics (for units with permanent CDMS) • Lean blow out trips • Reduced load turn down • DLN-1 failure to transfer to premixed mode • DLN-1 primary re-ignitions <p>TTS has extensive experience diagnosing the cause of the varied operational issues and determining whether the problem can be corrected through tuning adjustments or involves a hardware or instrumentation issue that must be addressed by the customer's maintenance staff.</p>	●	●	●	●

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CDMS	<p>Dry Low NOx (DLN) combustors operate at very lean fuel-to-air ratios in order to meet single digit NOx emissions regulations. Operation at fuel/air ratios close to the lean flammability limit make DLN combustors prone to dynamic pressure oscillations that can lead to accelerated wear and mechanical distress, flashback of the flame into the pre-mixer, or lean blow out trips. Regular tuning of these systems is required to ensure compliance with emission regulations and long term component integrity.</p> <p>TTS' CMS-1000 Combustor Dynamic Monitoring System is specifically tailored for measuring dynamic pressure pulsations in gas turbine DLN applications. Hardware configuration and setup are simple, and the software is user-friendly and provides data in formats that DLN tuners and operators need to easily optimize DLN operation. This system can be provided in two configurations: Portable and Permanent.</p>	●	●	●	●
DLN-1 High Load Auto- Transfer	<p>Primary-re-ignitions (PRI), which cause the unintended transfer out of premixed mode and an increase in NOx to 100 ppm, can result from momentary system upsets such as gas supply pressure fluctuations, the presence of liquids in the fuel, or IBH or gas control valve fluctuations. The manual recovery process, which involves unloading (to ~30% load) and re-loading of the unit by the operator can take 10-20 minutes. High Load Auto-Transfer logic automatically detects PRIs and transfers the combustor back into premix mode without having to unload the turbine. The recovery process is reduced to approximately 1-2 minutes.</p>				●
DLN Training	<p>TTS provides training on the operation and tuning of all GE DLN combustion systems. This training imparts a basic understanding of the DLN system operating modes and fuel system, the fuel split schedules and control constants used to modulate the splits, the basic tuning methodology and objectives, and the emissions trends and dynamic behavior that can be expected from the specific combustion system.</p>	●	●	●	●