Steam Turbine Modifications and Rerates

Changes in a flow path or in a plant’s overall steam balance can affect the performance of the steam turbine at the heart of many refinery, chemical, and industrial processes. Elliott Engineered Solutions can restore steam turbines and other critical rotating equipment to peak performance with modifications and rerates that increase efficiency, maintain safety and reliability, and improve control, regardless of the original equipment manufacturer (OEM.)

As process plants and turbomachinery mature, efficiency and reliability can decline. Steam turbine upgrades can significantly increase reliability and efficiency, extend time between plant shutdowns, abbreviate turnarounds, and reduce unplanned outages. Elliott Engineered Solutions redesigns steam turbine flow path aerodynamics to meet changing performance needs. Changing journal bearings to tilting-pad bearings can improve reliability. Upgrading diaphragms and resizing gland seal systems also offer reliability improvements. Updating the turbine controls with an overspeed trip system enhances safety. An equipment site audit by an experienced Elliott engineer will identify modifications that can keep your turbomachinery performance high and your maintenance costs low.

Elliott offers complete drop-in replacement turbines for situations where operational needs have changed significantly, and modifications to piping and foundations must be minimized. Elliott Engineered Solutions has years of experience in quickly re-engineering and reapplying out-of-service turbines for critical processes.
Elliott Engineered Solutions

Elliott Engineered Solutions has one focus – to help turbomachinery operators obtain the highest value from their critical rotating equipment. Elliott has more than 100 years of experience in engineering, manufacturing, repairing, and modifying all types of turbomachinery. Elliott Engineered Solutions specializes in the following areas:

- Modifications and rerates of turbomachinery to increase the operational life and value of your investment by optimizing performance and reducing downtime.
- Reverse engineering and comprehensive analytical studies such as lateral and torsional rotor analysis, root-cause failure analysis, mechanical evaluation analysis, finite element analysis (FEA), and aerodynamic analysis.
- Onsite audits to evaluate turbomachinery efficiency and determine potential reliability improvements to maximize your return on existing equipment.
- Reapplication of previously owned equipment for emergency installation or cost-effective replacement.
- Equipment configuration designs to precisely fit existing footprints.

<table>
<thead>
<tr>
<th>Enhancement</th>
<th>Category</th>
<th>Benefit</th>
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<tbody>
<tr>
<td>Add a grounding brush</td>
<td>Reliability</td>
<td>Eliminate bearing deterioration due to static electricity arcing</td>
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<tr>
<td>Add instrumentation wire quick disconnect</td>
<td>Reliability, Safety</td>
<td>Reduce chance of oil leak; Reduce maintenance time</td>
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<tr>
<td>Add manual or automatic hand valves</td>
<td>Efficiency</td>
<td>Improve steam consumption at reduced loads</td>
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<tr>
<td>Add spray nozzles</td>
<td>Reliability</td>
<td>Cool windage heating to prevent damaging exhaust end blading and condenser</td>
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<tr>
<td>Add or upgrade machinery performance, diagnostic, and protective instrumentation</td>
<td>Reliability, Safety</td>
<td>Improve machinery performance, health monitoring, and protective control</td>
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<tr>
<td>Add or upgrade to electronic overspeed trip</td>
<td>Reliability, Safety</td>
<td>Increase trip speed accuracy and dependability</td>
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<tr>
<td>Add turning gear</td>
<td>Reliability</td>
<td>Reduce the possibility of rotor bounces</td>
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<tr>
<td>Coat rotor (for corrosion protection and efficiency)</td>
<td>Reliability, Efficiency</td>
<td>Reduce internal fouling and corrosion effects</td>
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<tr>
<td>Perform site audit</td>
<td>Reliability, Safety, Efficiency</td>
<td>Identify areas to upgrade for peak performance</td>
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<tr>
<td>Upgrade bearing housing oil seals</td>
<td>Reliability, Safety</td>
<td>Reduce oil leaks to atmosphere/Buffed design eliminate leakage</td>
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<tr>
<td>Upgrade control system</td>
<td>Reliability, Safety</td>
<td>Keep turbine operating within a safe range</td>
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<tr>
<td>Upgrade coupling from lubricated to dry-type</td>
<td>Reliability</td>
<td>Eliminate oil requirements and reduce maintenance; Improve rotor dynamics and coupling reliability</td>
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<tr>
<td>Upgrade flow path (nozzles, diaphragms, buckets and seals)</td>
<td>Efficiency, Reliability</td>
<td>Increase performance or capacity; improve reliability with improved materials</td>
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<tr>
<td>Upgrade LP blading moisture protection</td>
<td>Reliability</td>
<td>Reduce blade moisture erosion using plasma Stelliting</td>
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<tr>
<td>Upgrade governor (mechanical or electrical)</td>
<td>Reliability</td>
<td>More precise and reliable speed control</td>
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<tr>
<td>Upgrade journal bearings to directed lube, offset pivot, or chrome copper pads</td>
<td>Reliability</td>
<td>Improve rotor stability at running speeds; Reduce oil requirements, bearing temperature, and bearing heat generation</td>
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<tr>
<td>Upgrade servo motor and actuator</td>
<td>Reliability</td>
<td>Eliminate mechanical wear and improve governor valve position stability</td>
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<tr>
<td>Upgrade rotor gland seals</td>
<td>Reliability, Safety</td>
<td>Reduce steam leakage, increase output, and increase reliability</td>
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<tr>
<td>Upgrade thrust bearings to directed lube, offset pivot, or chrome copper pads</td>
<td>Reliability, Efficiency</td>
<td>Reduce oil requirements, bearing temperature, and bearing heat generation</td>
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<tr>
<td>Upgrade to brush type seals</td>
<td>Reliability</td>
<td>Reduce seal leakage to improve efficiency</td>
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<tr>
<td>Upgrade to cam lift on very high pressure machines</td>
<td>Reliability</td>
<td>Eliminate wear on lift bar</td>
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<tr>
<td>Upgrade to voting logic trip block</td>
<td>Reliability, Safety</td>
<td>Improve reliability; Add redundancy</td>
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<tr>
<td>Upgrade valve and bar design</td>
<td>Reliability</td>
<td>Minimize lift rod, lift bar, and valve wear</td>
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