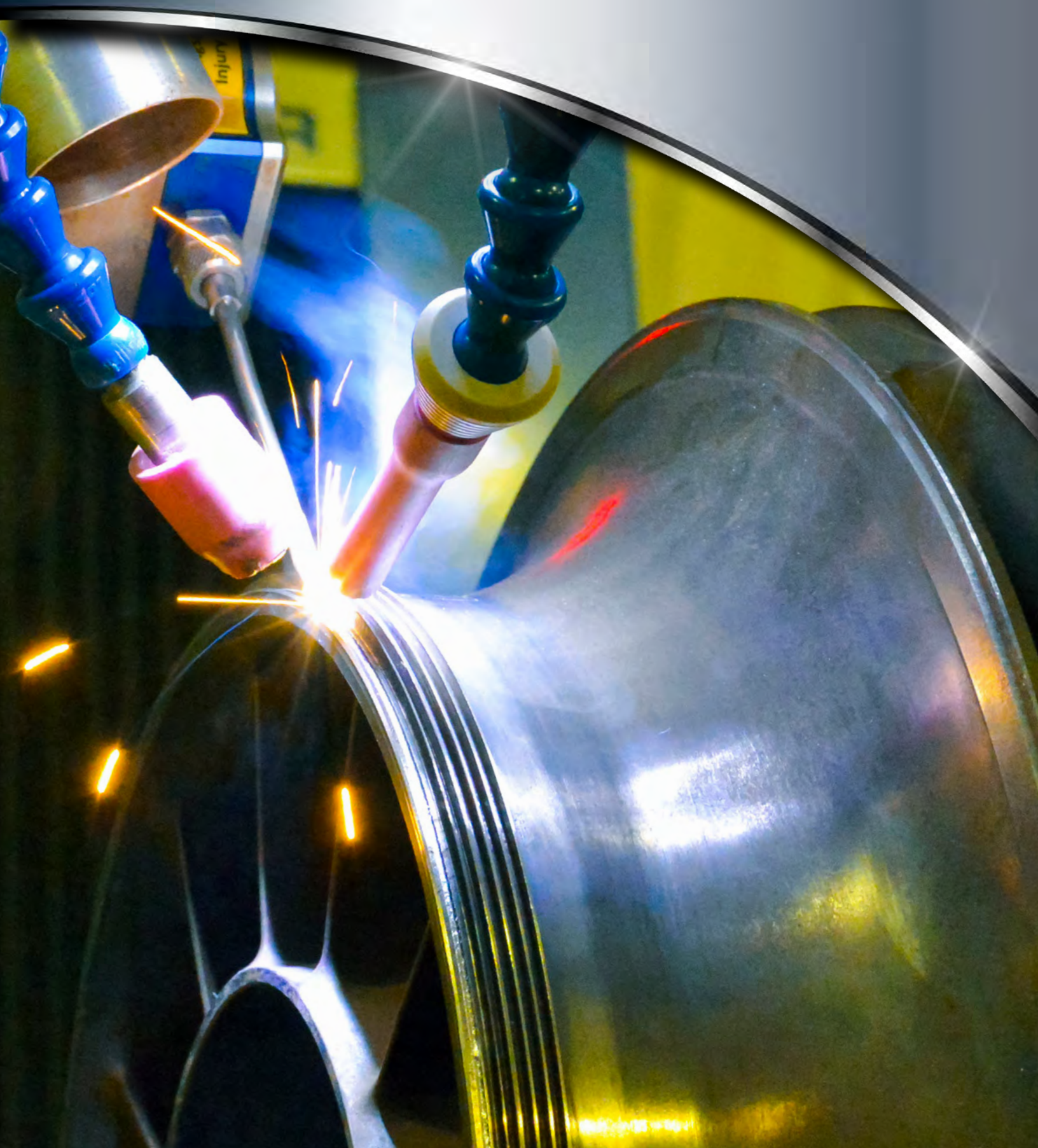


# Elliott Laser Welding

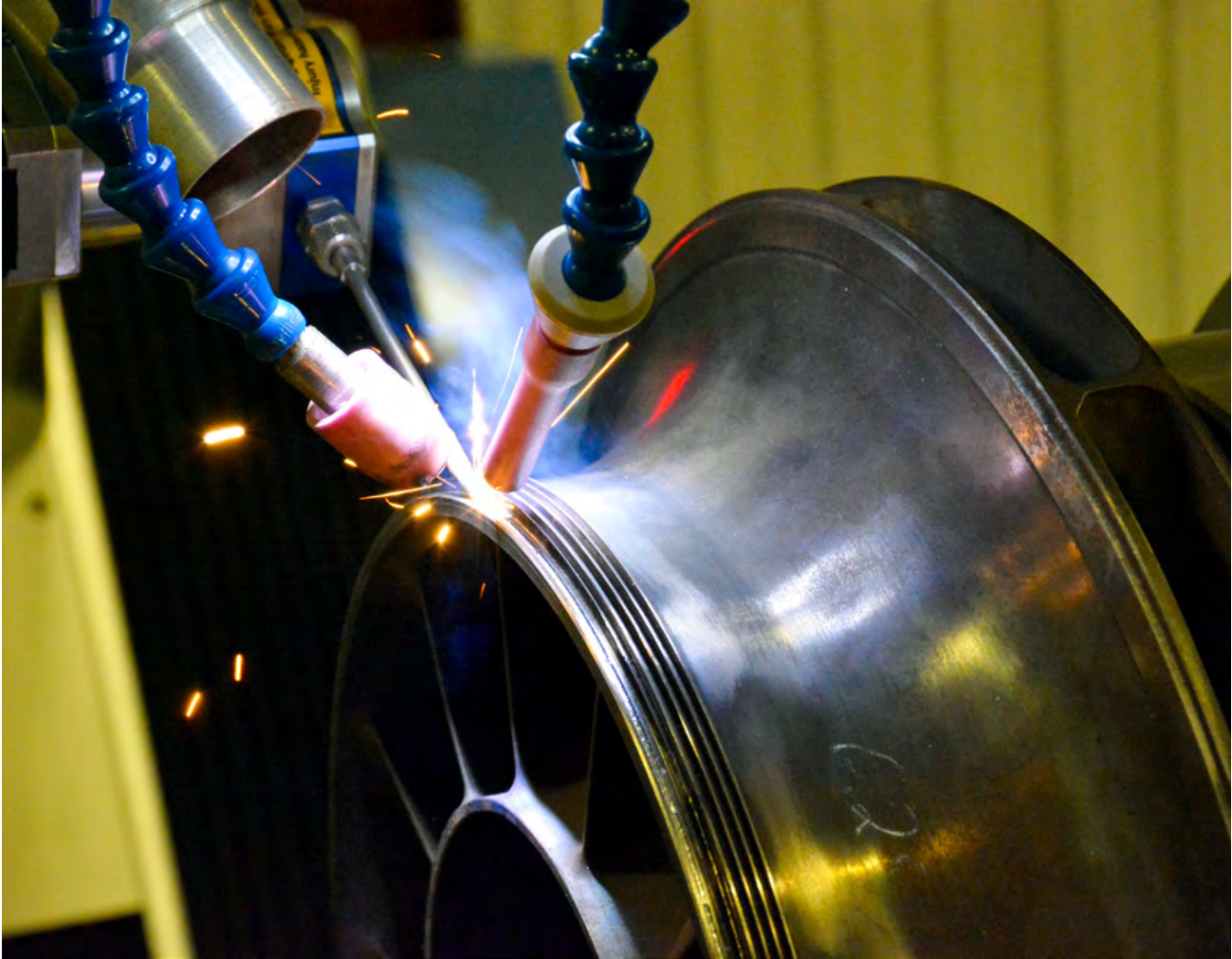




## ■ PRECISION WELDING FOR YOUR TURBOMACHINERY COMPONENTS

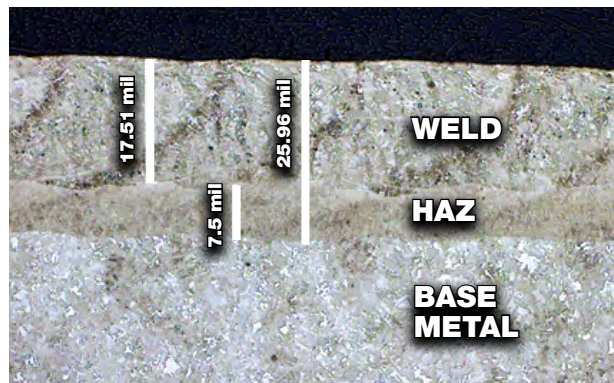
When your turbomachinery components need to be weld repaired, laser welding provides fast, precise, consistent welds for optimum repair results. At Elliott, we specialize in laser weld repairs for all rotating equipment components, regardless of the brand. Our welders have the necessary training, proven processes and techniques, and state-of-the-art equipment to ensure the highest quality repair.

Our advanced laser welding technology allows us to perform all repairs with pinpoint accuracy. Because laser welding is low-heat, there is less thermal stress on the component, and the process will not alter base material.



### *Laser Welding Benefits*

- ♦ Low-heat application with narrow heat-affected zone (HAZ)
- ♦ Precise and accurate welds
- ♦ Reduced processing times for efficient repairs
- ♦ Wire welding material can match chemical composition of base material
- ♦ Metallurgical bond
- ♦ Minimal base metal distortion
- ♦ Minimal to no thermal stress on the component
- ♦ Quicker turnaround than traditional welding methods

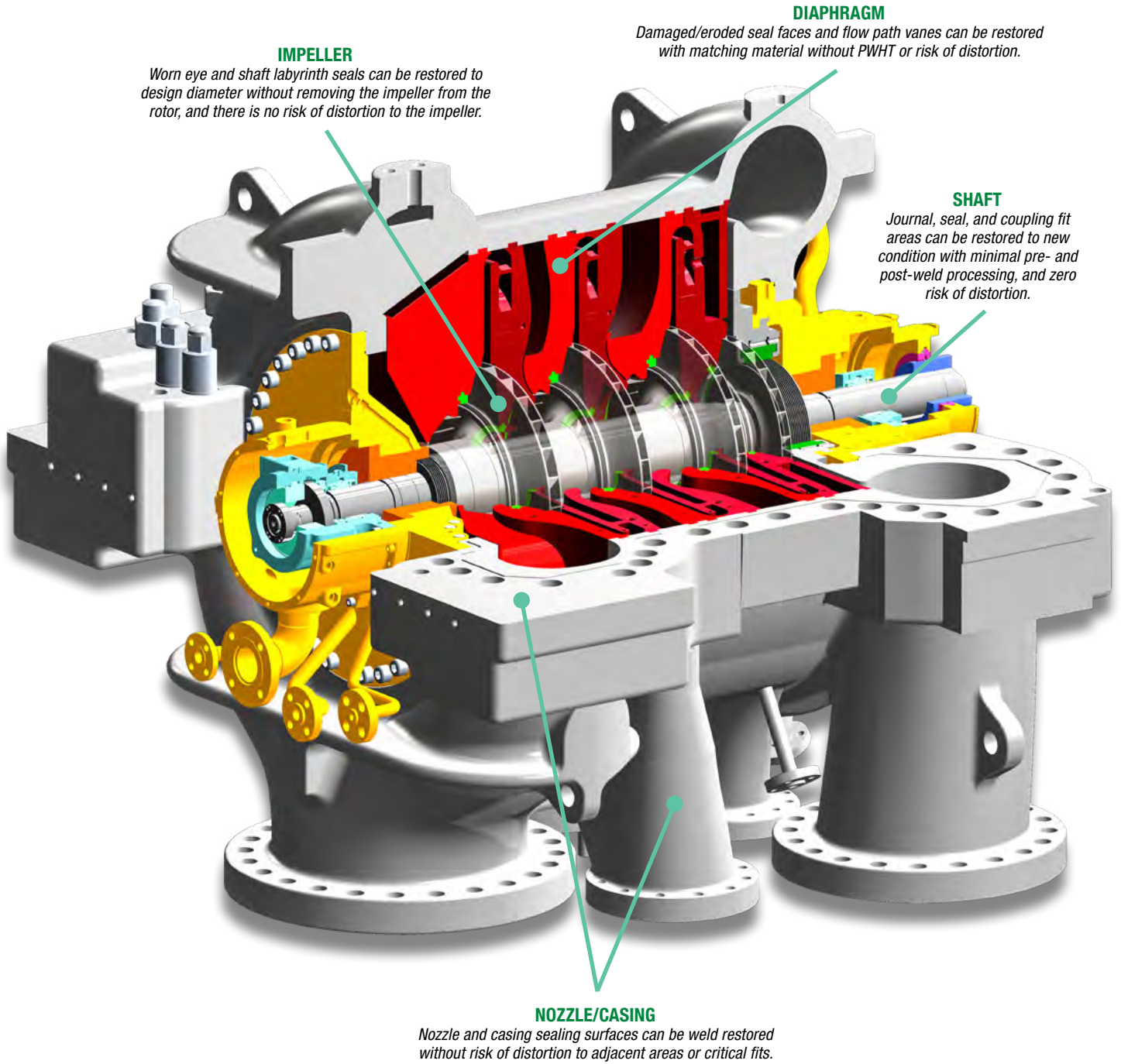


*Cross section of laser-welded overlay.*

## ■ LASER WELDING APPLICATIONS

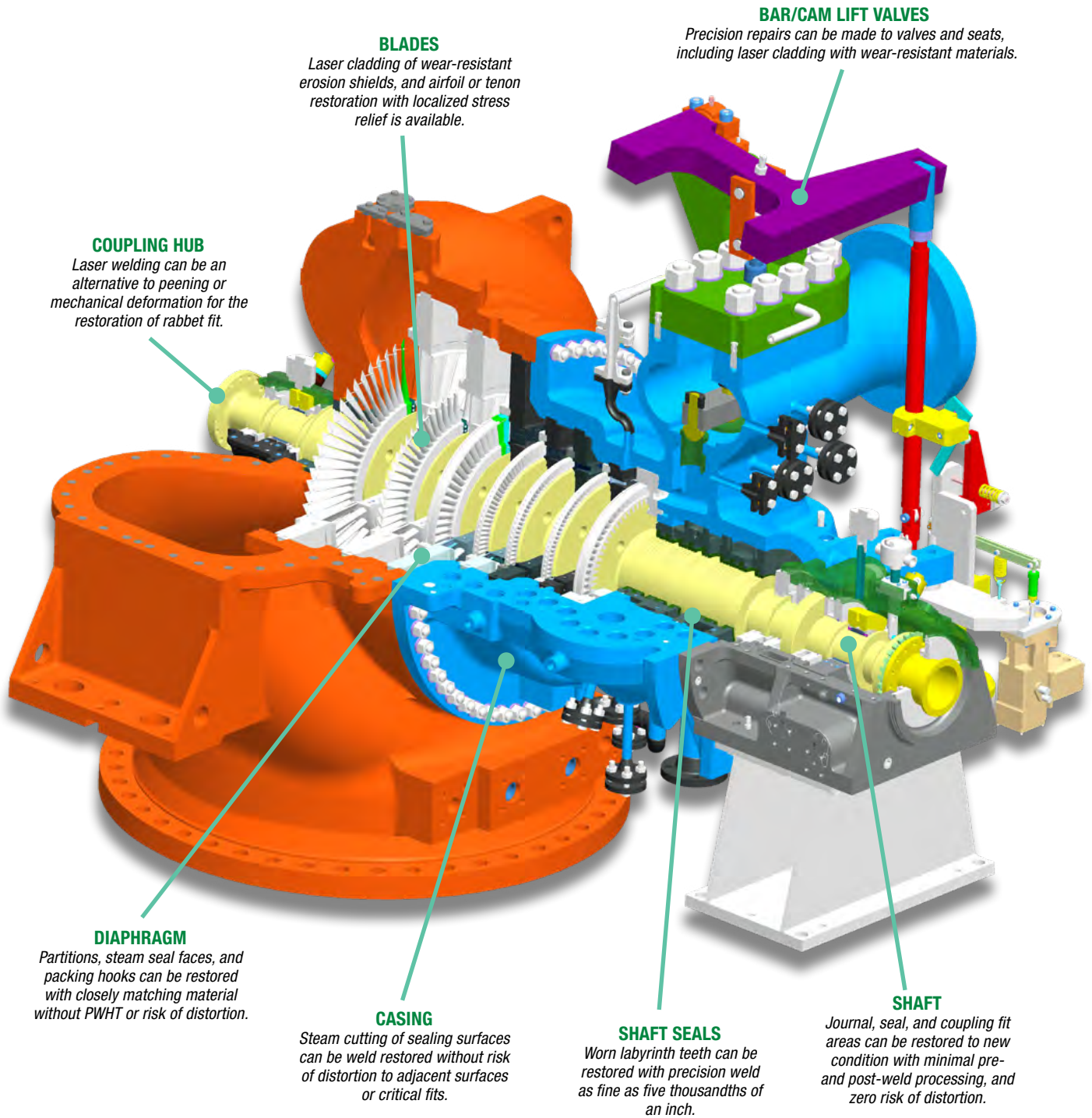
Our laser welding process is designed specifically for turbomachinery repairs. It is a stable, repeatable, and precise process. This allows our welders to efficiently repair all types of turbomachinery component damage – from small repairs to larger surface restorations. Laser welding is a great alternative for localized repairs, and it does not require post-weld heat treatment (PWHT). Here are some key applications for potential laser weld repairs:

### *Compressor Laser Welding Applications*





# Steam Turbine Laser Welding Applications



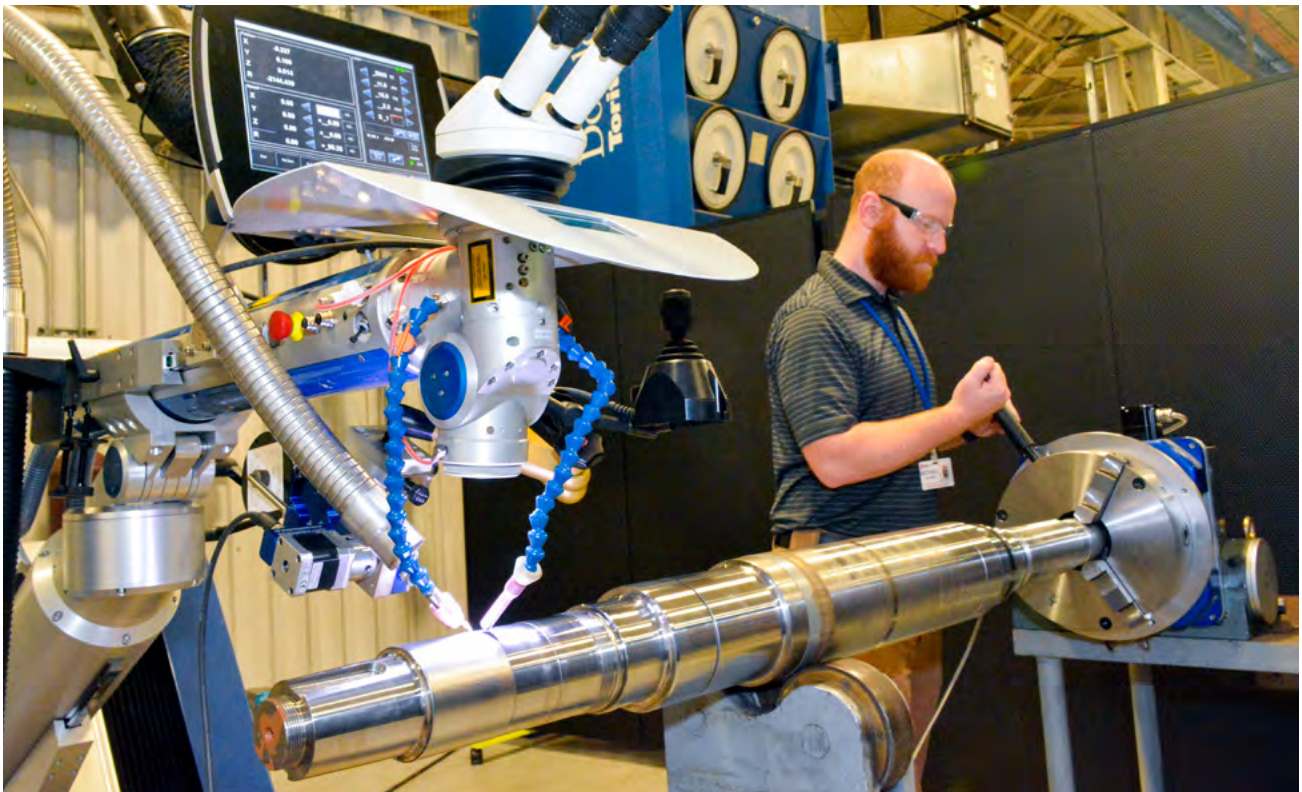
## ■ ROTOR RESTORATION

In many instances, laser welding is a great option for repairing turbomachinery rotors and provides superior results over traditional welding methods. Laser welding enables faster repair turnaround times, while maintaining mechanical integrity.

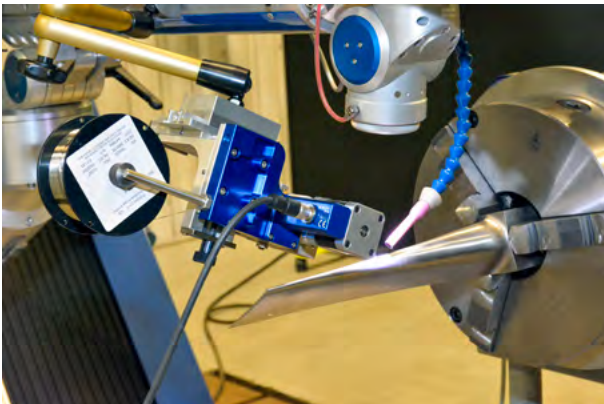
Laser welding provides the precision, accuracy, and control that is required when repairing rotor shafts, impellers, and blades. Rotor restoration benefits include:

- ♦ Low risk of distortion
- ♦ Repairs can be made without removing impellers or blades (in some instances)
- ♦ Minimal pre- and post-weld processing for fastest possible repair
- ♦ Minor defects repaired without weld prep machining
- ♦ PWHT not required for journal, coupling fit, or seal areas

Laser welding also provides all of the benefits of metalizing without any of the associated drawbacks that include poor bonding, distortion, and flaking.



*Shaft repair.*



*Turbine blade.*



*Compressor impeller.*

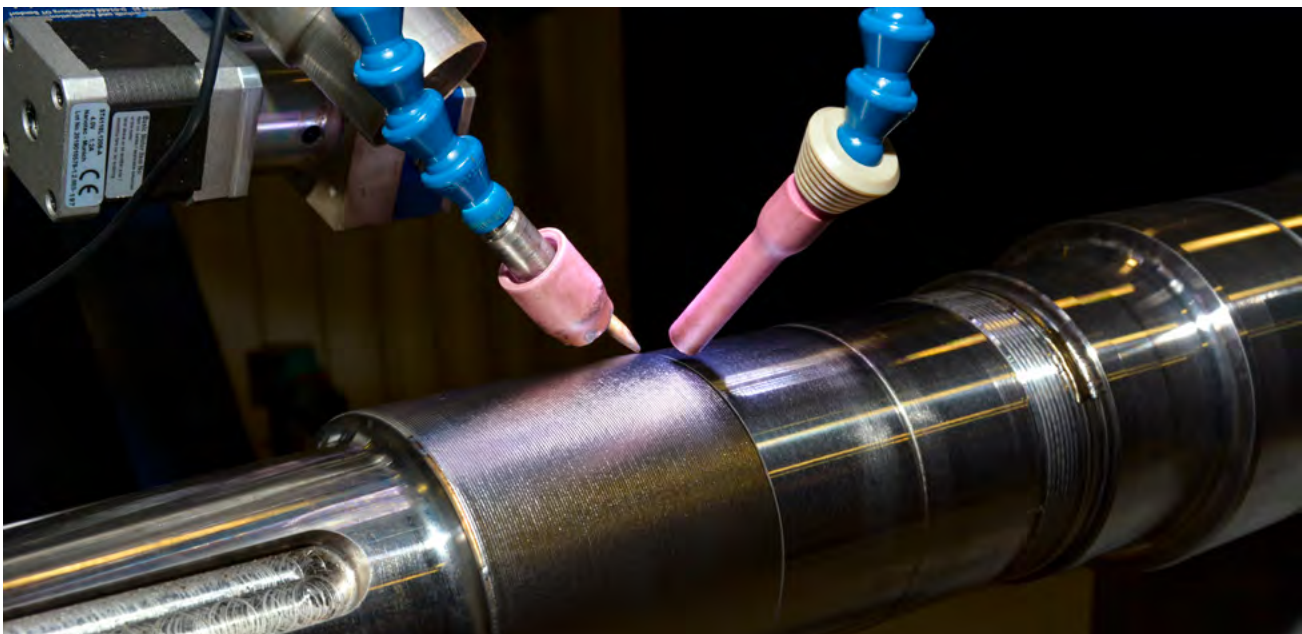


## Shaft Restoration Options – Laser Welding vs. Traditional Welding

	Laser Welding	Sub-Arc and Pulse TIG
Impeller eye and shaft seals	Deposit weld beads with extreme precision (as small as five thousandths of an inch); does not require removal from rotor. Low risk of distortion; does not require significant machining.	Must be removed from rotor. Requires larger weld buildup and heat input. Greater risk of distortion.
Journals, seals, and probe areas	Repair can be performed to specific areas or defects (as small as a scratch in a journal or probe area, or overlay of an entire journal or seal area). Low risk of distortion. Minimal undercut/welding/machining for correction of runout in probe areas.	Requires substantial weld preparation and weld buildup. Typically requires repair of entire shaft end to ensure there is no distortion. Requires full shaft end overlay, PWHT, and remachining.



Sub-arc welding process – weld buildup on rotor prior to machining.

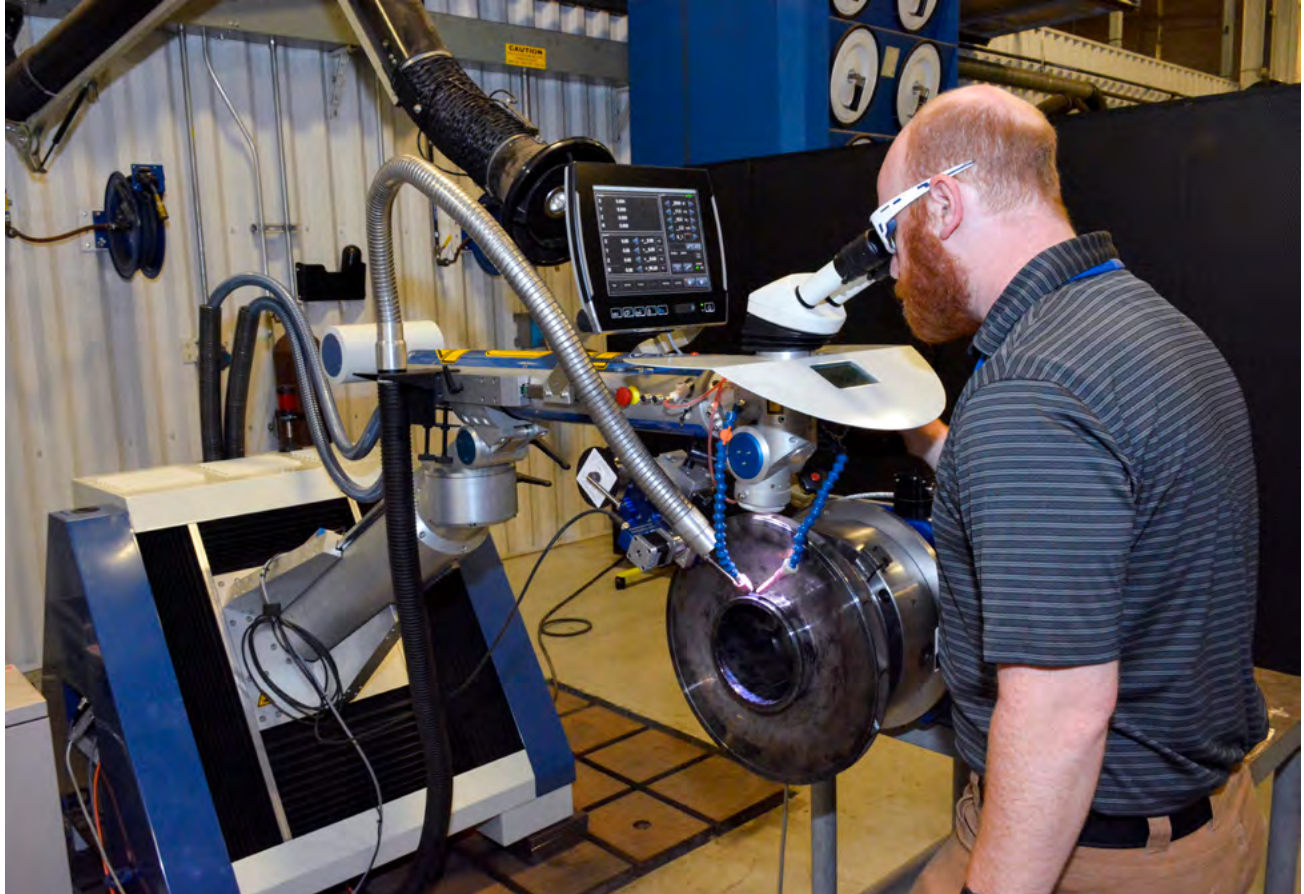


Laser welding process – weld beads deposited on rotor during weld repair.

## ■ PROVEN LASER WELD REPAIR PROCESS

The strength and quality of a weld repair depends on the weld material selected for the repair and the welding process that is used to complete the repair. Before we move forward with any repair, we inspect each component, assess the damage, and perform comprehensive tests on the properties of the base metal to ensure optimal repair results.

Our advanced laser welding technology enables us to perform weld repairs using wire or powder filler material. Although both wire and powder create strong bonds and are extremely effective, we use wire whenever possible because we can more closely match the chemical composition of the base metal in low alloy steels without the risk of micro-porosity that can be experienced with the powder application.



All of our welders are specially trained on our state-of-the-art laser welding equipment to ensure the highest quality repair. Our laser welding process is versatile, controllable, and repeatable. This allows us to handle complex weld requirements, control the layer thickness of the weld, and weld the smallest of areas. The process generates a fraction of the heat input of other welding techniques and, in most cases, requires no heat treatment. The resulting heat-affected zone (HAZ) is extremely narrow and free of coarse grain structure. Laser welding results in minimal-to-no distortion or residual stresses, reducing the common risks associated with conventional weld repairs.

Turn to us for all of your laser welding repairs for your turbomachinery components. Laser welding provides remarkable results. We have the equipment, expertise, and processes in place to perform the highest quality and most reliable repairs to get your equipment back online as quickly as possible.

Contact us today to learn more. Complete our online form to request more information:

<https://www.elliott-turbo.com/AftermarketServices>



Elliott Group is a global leader in the design, manufacture, and service of technically advanced centrifugal compressors, steam turbines, power recovery expanders, cryogenic pumps and expanders, and axial compressors used in the petrochemical, refining, oil & gas, liquefied gas, and process industries, as well as in power applications.

Elliott Group is a wholly owned subsidiary of Ebara Corporation, a major industrial conglomerate headquartered in Tokyo, Japan.



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