**LPM® Liburdi Powder Metallurgy Process**

**High Strength Alternative for Superalloy Additive Repairs**

Patented process only available from Liburdi Turbine Services

- 25 year track record – over 1,000 component sets repaired
- Used extensively on Industrial components Heavy Duty IGT and Aeroderivatives
- FAA approved and used for aircraft component repairs

**The LPM® Advantage**

- Higher strength repair compared to welds for nickel and cobalt alloys – without heat affected zone cracking typically associated with welding.
- Avoids distortion created by localized intense welding.
- Exceeds limitations of diffusion braze by more than 10 times – structural repairs of crack openings up to 0.500” (braze is limited to .004” - .040”)

Liburdi Powder Metallurgy, LPM®, is a patented high strength process used in both the manufacture and repair of gas turbine superalloy components.

LPM® offers superior performance and is available in a range of formulations to match most applications for Nickel and Cobalt alloys plus hard-face and abrasive versions. LPM® is proven in gas turbines from Heavy Duty Frame to F and G class, Aeroderivative, and commercial flight engines.

**Blade Repairs**

- Repair limitations can now be extended to higher stressed areas which were not previously repairable by conventional welding.
- For the latest advanced engines, the LPM® process has been used for new-part manufacture, including single crystal components.
- Specialized LPM® compositions are being used as engineered blade tips with superior oxidation and wear resistance.
- LPM® is a solid state, high strength, crack free, alternative to welding crack sensitive alloys which cannot be reliably welded due to HAZ cracking.

**Vane Repairs**

- Structural areas can now be repaired with LPM® alloys exceeding strength of conventional weld repairs and without the distortion caused by welding, to ensure proper fit-up.
- In the case of cobalt alloy nozzles/vanes the LPM® MarM247 repair alloy is stronger than the original casting material – resulting in reinforced, stronger sections after repair.
- LPM® is used to build-up and restore thin airfoil trailing edges, and restore the first stage vane throat area which is critical to re-establishing the original power and efficiency.
- Full reconstruction of dimensional loss due to wear, oxidation, erosion can be accomplished.
- Used extensively to fill and then re-machine abutment seal slots to original location and dimension.
25 Years Service Experience and Evolution

- Authorized for use by the FAA for aircraft components, and by selected major OEMs for Aeroderivative components and industrial components.
- LPM® has proven track record of cost-effective repairs in industrial engine service since 1990.
- Process evolution has broadened alloy options, increased strength, and improved ease of application.
- Now FAA approved and used to recover flight engine components previously retired as “not repairable” by conventional technologies.
- In comparative tests by three engine OEMs, the LPM® repairs outperformed conventional welding and braze repairs and exhibited service lives comparable to the new components.

Superior Strength and Metallurgical Structure

The patented unique LPM® powder metallurgy process produces a dense deposit and a metallurgical bond with the substrate. The microstructure is typical of fine grained powder metallurgy alloys and exhibits excellent strength and fatigue properties.

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