

ABOUT MORGAN ADVANCED MATERIALS



Wesgo metals, a division of Morgan Advanced Materials is a global materials engineering company which designs and manufactures a wide range of high specification products with extraordinary properties, across multiple sectors and geographies, which include pre-sintered preforms (PSP™) for high temperature brazing applications.

From an extensive range of advanced materials we produce components, assemblies and systems that deliver significantly enhanced performance for our customers' products and processes. Our engineered solutions are produced to very high tolerances and many are designed for use in extreme environments.

Morgan Advanced Materials has a global presence with over 9,000 employees across 50 countries serving specialist markets in the energy, transport, healthcare, electronics, security and defence, petrochemical and industrial sectors. It is listed on the London Stock Exchange in the engineering sector.

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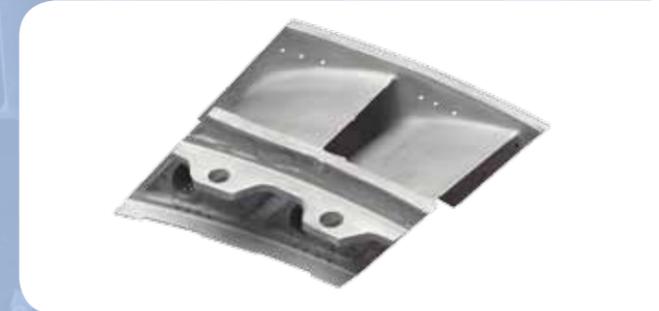
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Turbine Component Restoration
from Morgan Advanced Materials



Reducing Cycle Times, Improving Performance

In order to deliver a lean manufacturing process while offering improved metallurgical bonds strength, Morgan Advanced Materials Wesgo Metals offers the Pre-sintered preforms (PSP) series of products. PSPs are used to dimensionally restore and repair cracks in critical components such as vanes and blades in gas turbine engines through a diffusion braze process. PSPs provide a repair method, proven over 20 years deployment on turbines, that enables quicker turn-around times, lower costs, and proven reliability.

What are PSPs?

Pre-sintered preforms (PSP) are a sintered powder metallurgy product composed of a homogeneous mixture of a superalloy base material and braze alloy powders. Typical superalloy content ranges from 40 to 70% and plate thickness ranges from 0.3mm (.010") to 5mm (.200"). Custom preforms can be cut from a sintered plate, tack welded to a component and vacuum brazed.

Why should I consider repairs using PSPs?

- Enables repair of alloys that cannot be welded
- Reproducibility – well defined process
- PSP is quick process versus a weld repair...multiple components at a time
- Lower labor cost vs welding – less direct labor and less skilled labor
- Better dimensional control reduces or eliminates post processing
- Eliminate post weld heat treatment
- Closer match base alloy (parent metal welding difficult or impossible) higher joint strength
- Eliminate HAZ issues associated with welding (hot cracking)
- Less distortion (uniform heating)

PSP Application on Curved Surfaces

For brazing to concave surfaces, curved PSP's are recommended. Unlike flat preforms, curved PSPs eliminate the need for a second braze cycle on both convex and concave surfaces reducing processing time.



Working In Partnership to Implement a Lean Process

Morgan Advanced Materials engineers utilise their extensive Metallurgy background and industry leading best practise knowledge stemming from 25 years of braze experience to assist customers in understanding the processes involved. Our engineers can then custom design a repair procedure and an alloy to give the best possible results giving significant savings for customers, reducing turn time, labour time and salvaging parts that would have been previously scrapped.

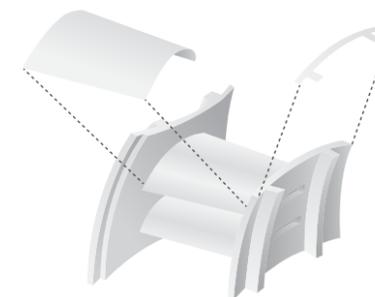
Materials available in Preform, Paste and Powder

Typical superalloys used in presintered preforms

- JInconel 718, 625, 939, 738
- T 800
- Hastalloy X
- Haynes 188, 230
- MarM 247, 509,
- Rene 142, 77, 80
- X-40
- All SNECMA, Rolls Royce, GE, and Pratt & Whitney spec alloys

Typical braze alloys used in presintered preforms

- Amdry 914,
- AMS 4776, 4777, 4778, 4783
- D-15
- BRB
- DF-3,4,4B,5,6A,6B
- Inconel 718 B
- All SNECMA, Rolls Royce, GE, and Pratt & Whitney spec alloys



With Wesgo's PSP versatility, greater alloy matching is made possible

The porosity of custom preforms is less than 2%, so little or no shrinkage occurs—this is a major advantage of Wesgo's presintered preforms over traditional brazing pastes and green tapes. These braze methods present several problems, primarily with uncontrollable shrinkage and multiple rebrazing cycles. Unlike pastes and green tapes, PSP components require minimal post-braze grinding or machining to restore a part to its original dimensions. PSP's are available in a flat plate, cut preforms, tapered and curved preforms and a 3-Dimensional bushing, which is used to restore worn holes or bores.



Aircraft Engine Models Employing Braze Repairs

P&W PWEEngines

- JT3D
- JT4A
- JT8D
- JT9D
- 2000
- PW4000

GE Engines

- CF34-3
- CF34-8
- CF34-10
- CF6
- GE90
- GENx

RR Engines

- RB211
- Trent 500
- Trent 700
- Trent 800
- Trent 1000
- BR710

EA Engines

- GP7200

IAE Engines

- V2500 all models

IAE Engines

- CFM56 all models