INNOVATORS IN TECHNOLOGY

Metal Improvement Company

Subsidiary of Curtiss-Wright Corporation

NUCLEAR • THERMAL
HYDRO • WIND • SOLAR

Power Generation

Enhancing the performance of metals and materials

www.metalimprovement.co.uk

CURTISS WRIGHT

Power Generation Nuclear, Thermal, Hydro, Wind and Solar

Metal Improvement Company (MIC) is a global organisation specialising in metal and material surface treatments which enhance performance and extend the life of critical components, enabling component designs to achieve their maximum potential.

Established in 1945, MIC has over 60 operating divisions in Europe, USA, Canada and Asia with on-site processing worldwide. We offer a quality controlled and cost effective service, working in partnership to meet our customer's needs.

MIC division approvals, where appropriate, include: FAA, AS9100, NADCAP, ISO 9001:2000, ISO 9001:2008 plus other specific OEM, company and industry approvals as required.

Metal Improvement Company is a subsidiary of the Curtiss-Wright Corporation, a diversified international provider of highly engineered products and services to the Motion Control, Flow Control and Materials Treatment industries.

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CURTISS WRIGHT

The power generation industry including nuclear in particular, demands a higher level of performance and life from components and welded/assembled structures than many other industries.

Metal Improvement Company (MIC) advises and works with power generation OEM's and their subcontractors through the design, manufacture and installation stages as well as specific repair and overhaul periods to achieve optimum performance.

MIC are world leaders in enhancing the performance of metallic and non-metallic materials and components that operate in the critical and harsh environments dictated by the power generation industry.

By extending the life and operating parameters of materials, structures and components not only can long term safety requirements be met or exceeded but also huge cost savings can be achieved with less down time, extended maintenance and service intervals and reduced failures of critical plant.

Premature failure of many components can be directly related to residual tensile stresses, which can be introduced during machining, welding and assembly operations, combined with the problem of unexpected service conditions such as thermal variation, vibration, environment and the action of minute corrosion/wear particles within circulating liquids, steam and gases.

MIC can alter these undesirable manufacturing and operational stresses to life enhancing residual compressive stresses by the processes of controlled shot or laser peening to extend component life.

Through the development and application of dry film lubricants and wet polymer coatings, as well as bespoke and standard coatings (including licensed products), we are able to protect against corrosion and wear, improve part life and reduce maintenance costs.

In some environments such as those within the nuclear industry, replacement and regular maintenance of parts, surfaces and structures is not always possible. Being able to prevent premature failures and extend the life expectancy of materials is key to improved efficiency and lower whole life cost.

In addition to the subcontract processing of components and structures, MIC has specialist teams and equipment which can be mobilised worldwide, at short notice if required, to perform on-site maintenance and repair work.

BENEFITS:

- Increased efficiency and performance
- Reduced whole life costs
- Downtime reduction
- Increased reliability
- Lower operating stresses
- Increased life of critical components
- Improved safety
- Protection of highly stressed design features
- Damage tolerance

PROVIDING SOLUTIONS

Fatigue

Fatigue failure is the result of repeated fluctuations of stress, sometimes below the static design stress of the structure. Shot peening the finished part can significantly reduce the effect of the applied load/stress which can extend the life and strength of the component significantly.

Stress corrosion cracking (SCC)

SCC occurs when a susceptible alloy in contact with a corrosive environment is subjected to a sustained tensile stress which may be well below the elastic limit of the material. SCC can be delayed or avoided by using controlled shot and laser peening to convert these tensile stresses to beneficial residual compressive stresses.

Intergranular corrosion

This type of failure is apparent when localised corrosive attack occurs at the grain boundary areas at the surface of a metallic component. The corrodant reacts more readily with the grain boundary as this is a high energy site. Controlled shot peening disrupts the near surface microstructure, thus removing the pathway for the corrosive agent and so prolongs component life.

Corrosion fatigue

Components in corrosive environments can fail due to corrosion fatigue associated with cyclic applied loading. The failure mechanism is similar to that of SCC but is driven by the cyclic application of tensile stress rather than by a sustained tensile stress. The application of controlled shot or laser peening can extend component life considerably.

Water droplet erosion

Steam turbine blades in particular are affected by water droplet erosion which is caused by abrasive water droplets, carrying minute exfoliation/wear/corrosion pick-up materials, continually impacting and eroding the surface of the blade which can lead to crack initiation, propagation and growth. MIC can improve the life of the component by inducing residual beneficial compressive stresses either through the application of controlled shot peening or by laser peening.

Extending the life of welded components

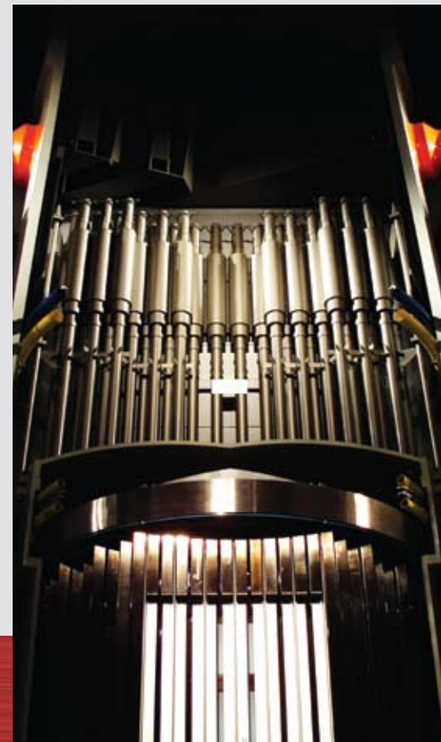
The residual tensile stress from welding is created as the weld cools rapidly. It is unable to shrink because it has already bonded to the cooler, stronger base material resulting in a weld that is being "stretched" by the base material. Welded structures such as pressure and storage vessels, whether new or repaired are an ideal example of the success of controlled shot and laser peening where tensile stresses are converted to beneficial compressive stresses thus extending the life of the structure. SCC in these situations has been prevented in many harsh and corrosive environments.

Engineered coatings

MIC is a leading developer and applicator of engineered coatings to solve problems caused by the aggressive environments in which pumps and valves operate. Coatings can be applied that address service conditions, including wear, corrosion, erosion, seizing, steam and extreme temperatures (-420°F to 1800°F or -251°C to 982°C), as well as applicable aesthetic standards.

Applications include

- Turbine blades, discheads, discs and shafts
- Support welds
- Screws, bolts and studs
- Heat exchangers
- Metal tubing
- Pumps, shafts, blocks and valves
- Gear systems and springs
- Welded structures/compactors
- Pressure and storage vessels
- Coil and leaf springs
- All other components subject to High Cycle Fatigue (HCF) and SCC



MIC MARKETS INCLUDE:

- **Aerospace**
- **Architectural**
- **Automotive**
- **Chemical & food processing**
- **General & structural engineering**
- **Marine**
- **Medical**
- **Military**
- **Off-road & earth moving equipment**
- **Oil, gas & petrochemical**
- **Power generation**
- **Railways**

MIC SERVICES INCLUDE:

- **Controlled shot peening**
  induces engineered residual compressive stresses
- **Shot peen forming**
  creates curvature and corrects distortion
- **Laser peening**
  induces deeper residual compressive stresses
- **Engineered coatings**
  improves performance, prevents corrosion and aids lubricity
- **C.A.S.E. (isotropic finishing)**
  removes surface asperities reducing friction
- **On-site processing**
  provides services on customers' own premises
- **Peentex (architectural finishing)**
  creates decorative and aesthetic texturing
- **Surface texturing**
  applies a textured engineered finish
- **Peenflex mouldings**
  protects against processing and handling damage

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