

INNOVATORS IN TECHNOLOGY



**Metal Improvement  
Company**

Subsidiary of Curtiss-Wright Corporation

# C.A.S.E.<sup>TM</sup>

(isotropic finishing) process



Enhancing the performance  
of metals and materials

[www.metalimprovement.co.uk](http://www.metalimprovement.co.uk)



# C.A.S.E.™ (isotropic finishing) process



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.

[www.curtisswright.com](http://www.curtisswright.com)



**The technique of C.A.S.E.™ finishing has been developed for surfaces that require both excellent bending and contact fatigue strength with enhanced surface properties to resist high loading.**

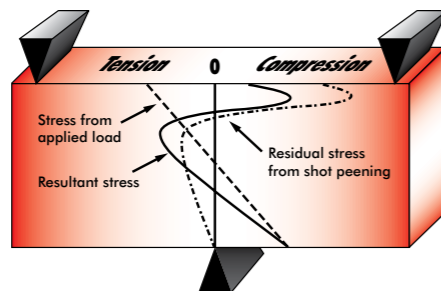
The process consists of controlled shot peening followed by isotropic finishing to extend a component's surface fatigue life beyond that provided by shot peening alone.

## The shot peening process

Controlled shot peening is the bombardment of a surface with small high quality spherical media called shot in a technically defined and controlled way. The shot can be steel, stainless steel, glass or ceramic.

Each piece of shot striking the metal acts as a tiny peening hammer imparting a small indentation into the surface. The action of impinging the surface yields the material at the surface and a surface/sub-surface residual compressive stress results. The magnitude of the compressive stress is directly related to the yield strength of the base material and is approximately equal to 80% of that value in compression, thus removing any prior manufacturing stress and so prolonging fatigue life.

Secondary processing by shot peening (dual peening) at a lower intensity and modified shot size will have the effect of reducing roughness, increasing the surface stress and cold work of the near surface area thus providing additional benefit.



Shot peening influence on applied stress - algebraic reductions

## Isotropic finishing

Isotropic finishing removes surface asperities whilst maintaining the integrity of the residual compressive layer. The process is also designed to leave some of the valleys from the peened or machined finish for vital lubricant retention.

Improvements in surface finish allow for the lubricant film to remain coherent, thus reducing friction, lubricant temperature and ultimately resulting in reduced power loss and enhanced performance and life from the transmission.

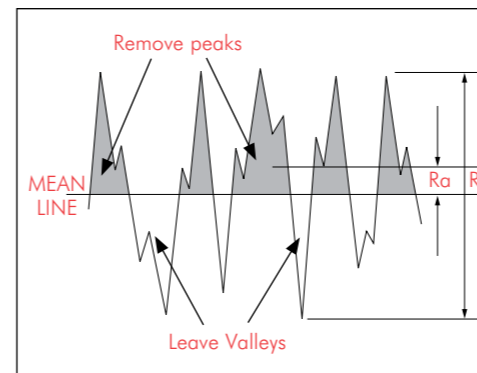
Isotropic finishing is a technique of final machining in a controlled and gentle manner to reduce surface finish using oxalic acids and non-abrasive finishing stones to remove surface asperities. The oxalic acids oxidise the surface which causes the asperities to be more susceptible to micro honing, with the result that the most positive or peak surface areas are progressively removed.



After a predetermined time the chemical phase ceases as the final flushing and burnishing phase gradually halts the oxide formation and produces a bright mirror like smooth surface. The specially formulated chemical solution does not etch, erode the surface or attack the grain structure of the material. It does however, reduce processing time making it feasible for high production volume components.

The isotropic finishing stones are selected to span machine lay and therefore cutting of the negative (valleys) surface areas are avoided enabling beneficial lubricant retention.

Many gear designs are limited by pitting fatigue as the critical factor for load considerations. The C.A.S.E.™ process has proved effective in improving resistance to macro-pitting and micro-pitting of gears because the improved surface finish allows contact loading to be distributed over more surface area reducing contact stress and extending pitting fatigue life.



## KEY FEATURES

- Surface reduction to mirror like finishes
- Reduced manufacturing times and production costs
- Finishes suitable for microbiological cleansing and sterilisation
- Optimum surface roughness and stress characteristics
- Reduced contact/surface fatigue
- Increased lubrication retention and heat transfer
- Good rounding ability to sharp edges for ease of handling and assembly
- Reduction in lubricant temperature
- Reduced transmission noise

## Applications

Applying the C.A.S.E.™ process to gear teeth after heat treatment, machining or final grind can achieve optimum lubrication retention and heat transfer at the flank contact area with asperity removal reducing oil film penetration.

Transmission and valve train gears utilised in aerospace, automotive,

off-road and earth moving equipment are ideal for the C.A.S.E.™ process and have proven successful in all these applications. Once treated these gears are expected to run for many years under high root bending loads and tooth flank contact loads.

This process is suited to all components where both sliding and rolling of metals in contact occurs. Transmission gears and shafts of virtually any size can be treated.

Experience in the field using C.A.S.E.™ finished gears have shown improvements in life of up to 5 times before the first signs of pitting became evident. A user in the competitive racing industry advised that even after 3 races no evidence of micro-pitting was evident.

- Transmission Parts
- Bearings
- Cams and Followers
- Journals
- Seal faces
- Any situation involving metal to metal contact



INNOVATORS IN TECHNOLOGY



## 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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