

**CURTISS -
WRIGHT**

C.A.S.E.™ super finishing process

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COMPANY PROFILE

Curtiss-Wright Surface Technologies (CWST) offers a single source solution and point of contact for all your surface treatments. We can reduce your turnaround times and costs through our network of over 75 worldwide facilities.

Our proven surface treatments meet industry demands for lighter materials, improved performance and life extension in key markets such as Aerospace, Automotive, Energy and Medical. We can prevent premature failures due to fatigue, corrosion, wear, galling and fretting.



Surface Technologies is a Division of Curtiss-Wright (NYSE: CW) a global innovative company that delivers highly engineered, critical function products and services to the commercial, industrial, defense and energy markets. Building on the heritage of Glenn Curtiss and the Wright brothers, Curtiss-Wright has a long tradition of providing reliable solutions through trusted customer relationships.

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The technique of C.A.S.E.™ super 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 super finishing to extend a component's surface fatigue life beyond that provided by shot peening alone.

The shot peening process

Shot peening is a cold working process that involves creating an indentation on the surface of a component to a technically defined specification using small high quality spherical media called shot.

The surface yields but it is restrained by the substrate, with the result that a residual compressive stress is introduced which makes the surface resistant to crack initiation and propagation.

The shot media can be steel, stainless steel, glass or ceramic beads and controlling the size, intensity and coverage will result in a residual compressively stressed layer of uniform magnitude and depth.

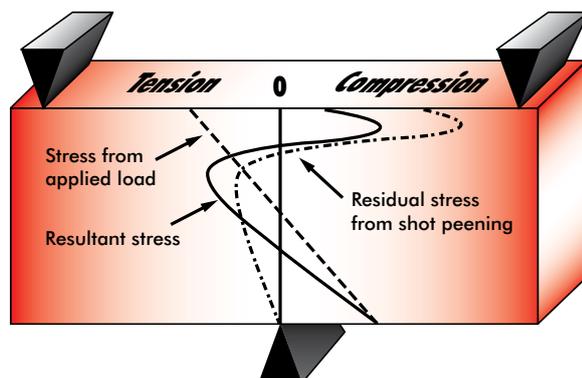
Secondary processing by shot peening (dual peening) at a lower intensity and modified shot size will have the effect of reducing roughness, increasing the surface stress and cold work of the near surface area thus providing additional benefit.

Super finishing

Super 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.

Super finishing is a technique of final machining in a controlled and gentle manner to reduce surface finish using



Shot peening influence on applied stress

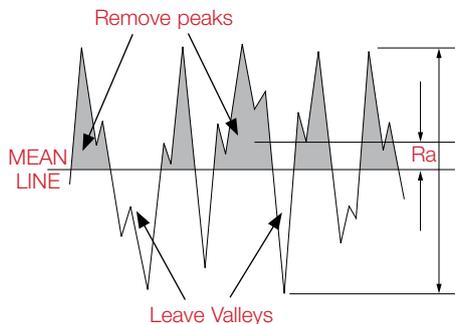
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oxalic acids and non-abrasive finishing stones to remove surface asperities. The oxalic acids oxidise the surface which causes the asperities to be more susceptible to micro honing, with the result that the most positive or peak surface areas are progressively 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.™ super finishing 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.™ super finishing 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.™ super finishing 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.™ super finished gears have shown improvements in life of up to 5 times before the first signs of pitting became evident. Use of this technique in the competitive racing industry has shown a dramatic reduction in micro-pitting and also a reduction in the average oil temperature by 20 degrees C.

- Transmission parts
- Bearings
- Cams and followers
- Journals
- Seal faces
- Any situation involving metal to metal contact



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