BULLETIN

TECHMETALS, INC.
A Family of Precision Metal Finishers
P.O. BOX 665 • DAYTON, OH 45401 • PHONE 513-253-5311

FINISHING OF HARD CHROMED PARTS

GRINDING BEFORE PLATING

If a first class job is envisioned, then a little consideration must be given to the characteristics of the deposit before the grinder sets to work on the preparation of the parts. Hard chrome does not fill, cover, or bridge inperfections, it tends to accentuate them as gas evolves out of these occlusions. It must also be remembered that hard chrome is fragile on sharp edges.

Let us first consider the type of surface finish that is suitable for hard chromium plating. Contrary to the opinion of many engineers, this does not have to be rough to help hold the deposit on ! Neither does it have to be down to 2 micro inch for heavy deposits ! The normal 8-10 micro inch surface is quite satisfactory.

However, while the surface finish is not critical, the way the part is brought to size is. The metal should be removed steadily, by all means taking heavy cuts until the part is within 0.006 inch of size after which the cut should be reduced to 0.0005 inch. This procedure is advocated because it will be found that if a hard chromium deposit comes out rough, it is nearly always due to the grinder taking heavy cuts to within about 0.001 inch of size, and then just glazing the part up to size to make the finish appear satisfactory to a quick glance. If such a surface is examined under a magnifying glass, it will be seen that there are many loose particles embedded in the surface and many more tiny slivers attached to the surface by their ends. If all these are not removed in the sulphuric etch, they will build-up in the plating operation to give roughness to the deposit with the result that, on final grinding, the small nodules so produced will be broken off by the grinding wheel to leave a surface covered in small pits. Not to mention the pits left in the part itself as stock was literally torn off.

SHARP EDGES

Sharp edges present a problem with hard chromium. If possible they should be broken to a small chamfer if chipping of the deposit is to be avoided. If, however, a right angled edge is required on a part, then the edge should be broken and the chromium deposit allowed to overlap on to the adjacent face.

PICKING-UP THE SETTING

One final point concerns the preparation of parts that cannot be set-up for final grinding either by using the centers or by grinding them off a mandrel. It must be remembered that the chromium deposit can be oval and eccentric, so that reference to the chromium cannot be made when setting up the parts for final grinding. If other untreated diameters are not present, it will be vital that a register is ground on a convenient position during initial grinding if no other means is available for picking-up the setting. Failure to do this will result either in the finished chromium having a thickness greater on one side than the other, or worse, the deposit may be completely removed on one side if the part is set off center diametrically, or on one side at one end of a shaft and on the opposite side on the other end if the latter has been set-up off the central datum line. A similar problem exists if the part is warped, bent, or has bad centers.

ADJACENT FLANGES

Where flanges or diameters larger than being plated are adjacent to the treated area, on shafts for instance, there will be an immediate danger of the deposit fading in these areas and not cleaning up on the final grinding. One solution is to put a large radius in the corner as is possible and to deposit up on to this, reducing the radius on final grinding, thus giving a witness of the base metal in the neck.

GRINDING AFTER PLATING

While hard chromium is not perhaps the easiest of metals to grind, it is certainly not the most difficult. When ground, the metal has a bluish white spark, and the overgrowth soon cuts ridges into the wheel. One peculiarity is the effect that heat has on the chromium deposit which is to make the occluded hydrogen in the deposit expand violently and cause the chromium to crack all over the surface, and in many cases blow the hard chrome off of the part. This gives the chrome the appearance of poor adhesion which indeed is not the case. Abusive grinding us usually the culpret when chrome forms mud-like cracks and falls off of the part. This can be easily tested by the plater by stripping the chrome and giving the part a nital etch. The nital etch brings carbon to the surface showing the heat damage done to the part. This being so, heavy cuts should be avoided. Normally, cuts should be in the region of 0.0004-0,0005 inch deep, but in some special cases they may have to be reduced to as little as 0.0002 inch if cracking is to be kept to an absolute minimum.

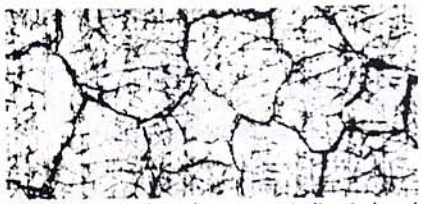

Fig. 3. Equiaxed, abusive grinding-induced crack pattern ("mud-cracks") throughout much finer inherent crack structure in hard chromium plate (0.0025 in. per side per cut chromium removal). Original magnification 80X.

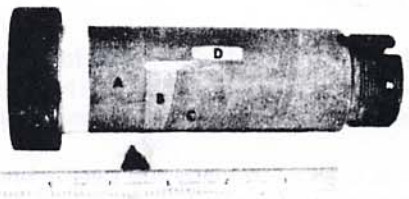

Fig. 5b. Same pin as 5a stripped of chromium and nital etched to show basis metal damage. Note severe damage from traverse spiral (B), chatter (C) and plunge (D).

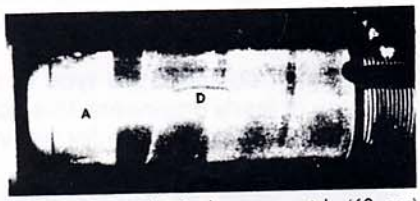

Fig. 5a. Electrochemical reverse etch (60 sec) indications in test landing gear pin showing light etching infeed area (A), severe traverse spiral (B), chatter (C), and plunge (D) damage.

The normal procedure for final grinding a cylindrical hard chromium plated part is to set this up between centers as usual and to measure the build-up on the extremities of the component. Then, assuming the wheel is running true, the worst of the overgrowth is removed using plenty of coolant, traversing by hand and trying to remove the metal by working from the deposit side outwards. This will tend to prevent the chipping of the deposit on any sharp edges that may be present.

It is absolutely imparative that plenty of coolant is applied when grinding hard chrome to keep localized overheating to minimum. Generally a soft wheel is best for grinding hard chrome and the face of the wheel is to be avoided because of the heat. It has been found that Carborundum Aloxite BA 601-L5-VFBLU and Norton A 60-M5-VBE are suitable.

IN CONCLUSION

If there is a special problem write this on your sketch or print as this brings it to the platers attention at the proper time. Always give your plater the finished size. We at Miami Precision Chrome furnish work sheets to our customers. It is our sincere feeling that by our customers filling these out completely, errors are cut by 80%.