







LOW TEMPERATURE SURFACE HARDENING

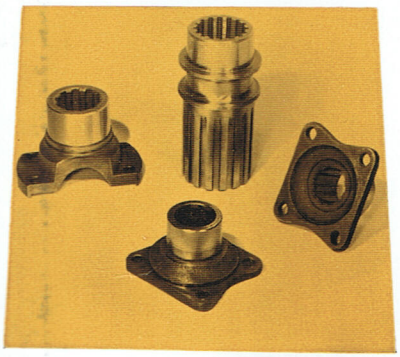
THE HILTON AND TUCK LOW TEMPERATURE ELECTROLYTIC PROCESS

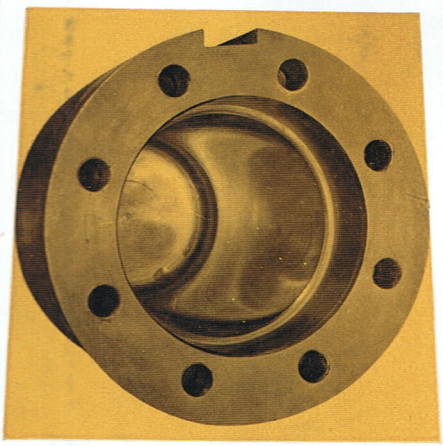
THE LATEST DEVELOPMENT IN PRECISION HARD CHROMIUM DEPOSITION

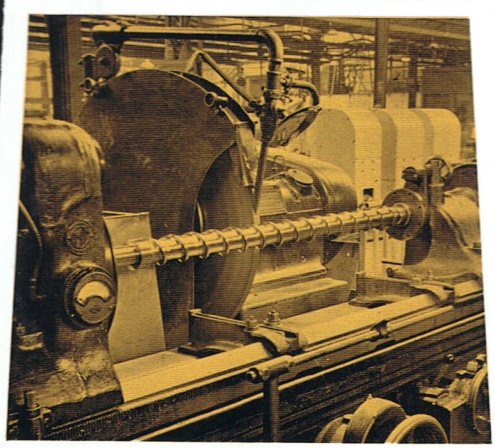
APPROVED BY: M.O.S A.I.D. A.R.B. ADMIRALTY.

THE H.T. PROCESS OF ELECTROLYTICALLY DEPOSITING HARD CHROME









save money
in your designing
production
machining
maintenance
and reclamation

- The HT process deposits chromium direct on to base metals to thickness limits from ·0001″ to ·060″.
- Free from nodular build up.
- For application to most ferrous and non-ferrous metals, including stainless steels where extra hardness and longer life is vital.
- Can be deposited at temperature below boiling point to produce a hardness of 65°–68° Rockwell C. Resistance to abrasive wear is as much as ten times to that of steel of equivalent hardness.
- Very high resistance to corrosion with a low co-efficient of friction.
- High anti-sticking properties.
- Resistance to pressure welding to the point of mechanical disintegration.
- In many cases mild steel can be treated with the HT process where normally stainless steel would be used.
- Affords greater scope to the Design Engineer.
- Gives longer life to components, cutting tools, moulds, etc., with greater efficiency.
- Expensive and irreplaceable components can be re-processed and used again.
- The HT process is quick, inexpensive and completely reliable.

HARD CHROMIUM

A NEW TOOL FOR THE ENGINEER



Photograph showing the Hilton & Tuck new offices and works at Wythenshawe, where the very latest plant for Electrolytic Deposition has been installed.

HILTON & TUCK LIMITED

HARD CHROME PLATING

Hard Chrome Plating

Hard Chromium *can* be deposited economically, evenly, accurately and reliably, and increasing discrimination by users between good and bad deposition is essential if this is to be achieved.

In this leaflet are a few basic data for reference purposes together with a short list of applications and suggestions which it is hoped will be found useful. In addition, we would emphasize the desirability on any project of combining our experience of electro deposition with your knowledge of your product in order to achieve the best results.

Our technical service is at your disposal and we shall consider it a great favour if you will make full and free use of it.

Adhesion

The adhesion of properly deposited hard chrome is such that no lifting whatever should occur at the feather edge when it is ground through to the basis metal at a fine angle; the demarcation line should be the slight colour change only. Heavy deposits however, are brittle and capable of being chipped in the same manner as the edge of a piece of glass.
Difficulty in obtaining good adhesion can occur in the following instances.

(*a*) In the case of a metal whose surface structure has been strained by grinding burns; even if the evidence of discolouration has been removed by a light pass of the wheel, the influence of a severe burn can effect it to a depth of .005″ or more.

(*b*) Nitride bloom, which apart from steels deliberately nitrided can occur in over-rich salt bath treatment. Nitrided steels from which the bloom has been completely removed are generally satisfactory.

(*c*) Areas of steel components excessively rich in carbon due to faulty pack hardening.

Resistance to Corrosion

Hard Chromium is chemically resistant to most materials commonly met with, the notable exception being hydrochloric acid. Attack can occur by electrolysis in alkali or halide solutions such as may arise for example when chromium and bronze are together immersed in sea water forming an electrolytic cell. It will not normally oxidise below about 400°C in air and can therefore be used as a means of preventing scaling on dies and fixtures constantly subjected to low temperature furnace treatment.

It will be remembered that chromium will not cover existing porosity or non conducting inclusions such as scale or embedded grit which frequently occurs when grinding soft metals. The results of these faults is to allow corrosive materials to attack the basis metal with subsequent blistering of the chromium by the accumulation of corrosion products.

Conditions of deposition

The maximum temperature reached during electrodeposition of Hard Chrome is of the order of 55°C which results in complete freedom from distortion effects.

It can be applied to part or whole of a component, internally or externally, leaving selected areas completely unchanged.

In many applications it can be applied with such precision and surface finish as to make subsequent machining unnecessary.

When the deposit eventually wears below tolerance it can be removed chemically and the component re-treated.

All commonly used metals and alloys can be treated with the present exception of Titanium.

It will not fill holes, reduce porosity, or bridge gaps.

Physical Characteristics

HARDNESS (950—V.P.H.)

An average figure of 65—68 Rockwell C can be taken as normal but the following reservations must be borne in mind.

(*a*) The hardness of thin deposits cannot be checked outside the laboratory and even with thicknesses of .005″ or more the V.P.H. loading should not exceed 1 KG.

(*b*) Hardness figures thus obtained are not necessarily conclusive evidence of resistance to frictional wear, hard chrome deposits have shown to give as much as 10 times the life of steel of equivalent hardness in abrasive conditions.

(*c*) The basis metal must be hard enough to withstand deformation by the applied loading.

(*d*) Temperatures over 400°C progressively reduce the hardness of the deposit until it ultimately becomes fully annealed.

(*e*) 1800°C Melting Point.

(*f*) Coefficient of linear expansion 8×10^{-6} per °C at 0°C or approximately the same as that of cast iron.

(*g*) **Coefficient of Friction.**
For practical purposes this can be taken as approximately half that of steel for any comparable set of conditions.

Design Considerations and preparation of components

(*a*) Surface finish—the best ground and turned finish that can reasonably be produced is most suitable. A roughened surface reduces adhesion and increases deposition difficulties.

Work hardening, especially with high nickel steels (grinding burns, turning with blunt tools etc.) excessive surface stress (caused by extreme hardening) can prevent adhesion.

(*b*) With the exception of journal bearings and press fits, which should always be ground after deposition, the possibility of plating to size should be considered.

In this latter case, a tolerance of 25% of the deposit should be added to the pre-machining tolerance.

(*c*) Contours—It is generally advisable to avoid sharp corners wherever possible, this is even more important with internal than external angles and the heavier the deposit required the greater the radius should be.

(*d*) See overpage for some types of build up and some design suggestions to facilitate the deposition of hard chromium.

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Figure 1 represents the type of rough " build-up " commonly regarded as normal. It should not be tolerated, as properly applied hard chrome can be deposited evenly as in figure 2.
Figure 3 represents another common fault which can be avoided.
Figure 5 shows the effect of attempting to build-up a component having a sharp step. By pre-machining to the contour shown in figure 6 the resulting groove can be prevented.
Figure 7 shows the effect of attempting to deposit into a sharp corner. To overcome this fault is as yet impossible with hard chrome but by leaving a radius or an undercut some compromise is possible.

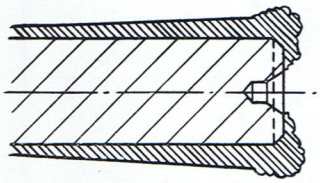


Fig. 1

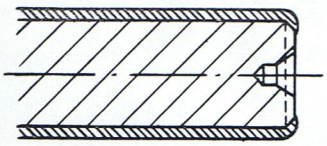


Fig. 2

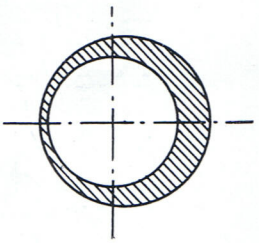


Fig. 3

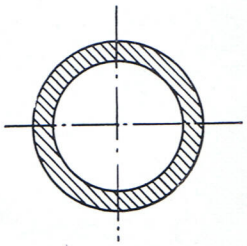


Fig. 4

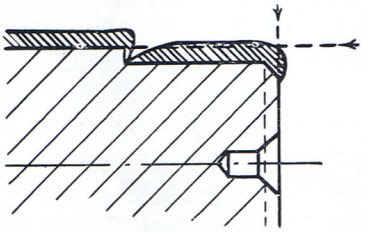


Fig. 5

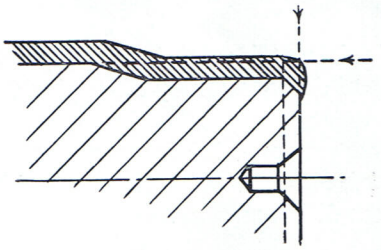


Fig. 6

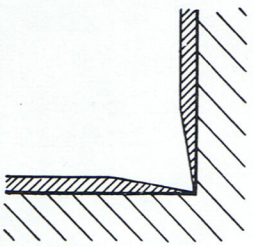


Fig. 7

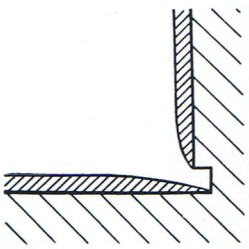


Fig. 8

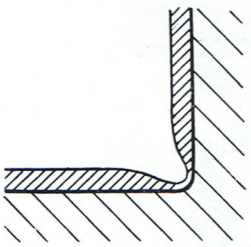


Fig. 9

THE EXCLUSIVE HT PROCESS OF COLD SURFACE HARDENING

Since the inception of Cold Surface Hardening, the Hilton and Tuck Group have pioneered and perfected the hard chrome deposition process and have kept abreast of the rapid development in ever increasing fields in modern engineering. Many years of research and 'know-how' in what is a specialist application have resulted in a chromium deposition process which is second to none and has been proved in continued use by progressive Companies in almost every branch of engineering.

The HT Hard Chrome Process provides the answer to foreign competition in terms of cost and performance where the reliability and speed of production, plus continued efficiency, is essential in component parts. The process which can be applied to most ferrous and non-ferrous metals can also be used on almost every component from those of pin-head dimensions to those of the largest conception. The main advantages are clearly shown on page two of this brochure, and the purpose of this publication is to offer to you the outstanding facilities provided by the Hilton & Tuck Group of Companies in this specialised field of Cold Surface Hardening.

Obviously the hard chrome process cannot be applied 'willy-nilly' to this, that, or the other component and we feel that the pros and cons of any cold surface hardening project should be the subject of a preliminary discussion. To this end, we are very happy to place the comprehensive experience of our Organisation at your service, and if you have a problem concerning the treatment of your components, or if you feel that you are producing components which could probably benefit from the HT process, our technical staff will be pleased to talk the matter over with you. A telephone call or letter will bring the promptest attention.

THE HILTON AND TUCK GROUP

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Below are shown some of the many industries and applications in which the Hilton and Tuck Hard Chrome Process has and is being successfully used.

AGRICULTURAL INDUSTRY.

LIFTING AND HANDLING MACHINERY.

AIRCRAFT INDUSTRY.

ARMAMENT INDUSTRY.

TOOLS.

METAL WORKING.

STEAM, AIR AND HYDRAULIC MACHINERY.

CHEMICAL INDUSTRY.

MOTOR INDUSTRY.

LEATHER AND FOOTWEAR INDUSTRY.

MINING INDUSTRY.

DIESEL ENGINES.

OIL INDUSTRY.

PHOTOGRAPHY, FILMS, MUSIC.

PRINTING INDUSTRY.

RAILWAYS.

TEXTILE INDUSTRY.

MISCELLANEOUS.