

Brush plating for the 21st century

Jim Rowbotham of Pexa says that brush plating still has its place for manufacturers



Mention “brush plating” and it conjures up images of a primitive process using plating solution taken from a tank and applied using a powerpack attached to a swab. This is an outdated notion of the process. With modern techniques, selective electroplating on a small scale can be a key weapon in the surface treatment armoury.

Small scale electroplating allows sections of components to be treated without immersion and with minimal masking. That means that threads and inserts can be plated, hanger witness marks eliminated and all manner of repairs accomplished to an original treatment both in oem and maintenance environments. Equipment which has been assembled and contains sensitive components can be treated without risk. In addition selective electroplating can be used to replace metal and build up dimensions on scratches and inside bores and other areas where there is insufficient material, due to over-machining or in service wear.

Practically any deposition can be applied using this method including anodising and metal plating. Some characteristics

can even be improved upon relative to in-tank plating as the high current density achieves a faster result and the cooler temperatures reduce stress. Essentially a small anode is used to apply the plating directly to the object using a wet textile reservoir of the plating solution. The composition of the solution and the voltage and current density are closely controlled to ensure that the plating layer is developed exactly as required.

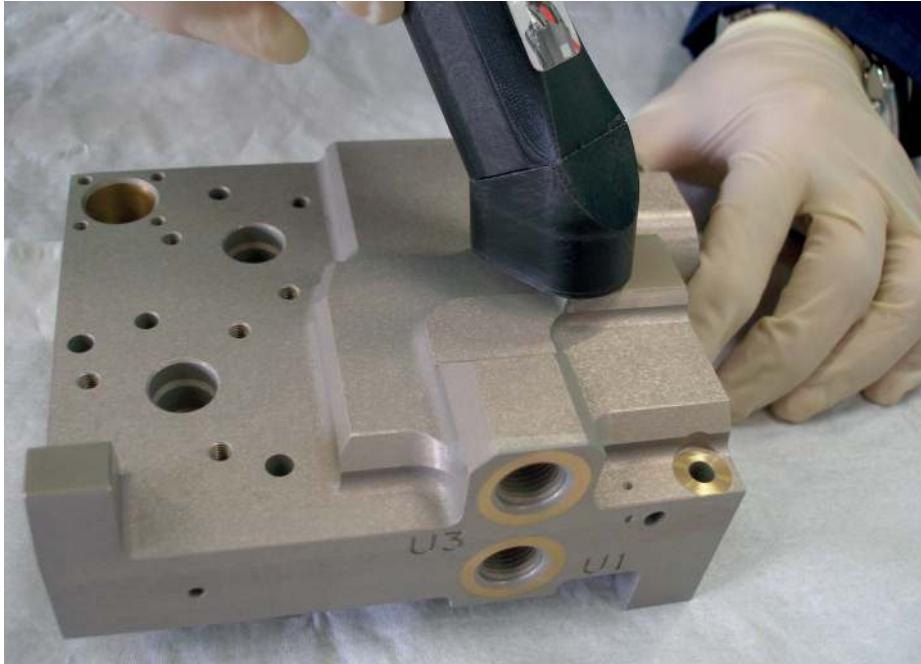
Dalic, the pioneer and leading supplier of selective electroplating solutions is leading the way in developing new technologies both in the chemistry of the materials and in the design of application equipment. Many important aerospace companies have approved Dalic brush plating including Airbus, BAE Systems, Boeing, Agusta-Westland, Dassault, Embraer, SAFRAN and UTC. The operators of this equipment including airlines, MROs and defence organisations are able to use the same processes for maintenance.

Cadmium and Zinidal

Cadmium plating is still frequently applied in the aerospace and defence sectors, this is both for new parts which have been damaged in production and for repair of in-service parts which have suffered damage through operations. The Dalic Cadmium 2023 process is widely used in the industry and each batch of 11028 Cadmium plating solution is tested LHE to ASTM F.519 for hydrogen embrittlement and certified before shipment. On high tensile steels a pre-treatment is not needed but many processes require pre-plating with nickel to give optimal adhesion. Using a rectifier with a graphite anode attached, covered in a fabric bonnet and supplied with 20V and a controlled current, it is possible to deposit up to 6.4µ/min when the contact area is 1/3 of the area to be plated.

Cadmium is a harmful substance and there is a high level of interest from industry in reducing the amount of Cadmium used and in qualifying viable alternatives. Zinc Nickel (Zi-Ni) is a very high performing plating which is being qualified in the aerospace

Process	Substance	Measured	Maximum authorised
Cadmium plating	Cadmium	0.0001 mg/m ³	0.05 mg/m ³
CAA Anodising	Chromic Acid	0.0005 mg/m ³	0.05 mg/m ³
Zinc-Nickel plating	Nickel sulphate	0.0008 mg/m ³	0.1 mg/m ³



industry as an alternative to Cadmium. Dalic's Zinidal is a class leading process for localised application and satisfies EN2486 (adapted for touch-up application) on steels and aluminium alloys, including corrosion, thickness of deposition and adhesion.

Other metal plating

Practically every form of metal plating can be applied using the small scale selective plating approach. Dalic solutions are designed to drop into the process with minimal pre-treatment and clearly defined electrical requirements provided in the product data and through regular on-site training courses.

Some very interesting localised plating solutions are possible. For example, gold and silver plating for both technical (such as electrical conductivity) and aesthetic purposes. Dalic gold plating produces a layer of 99.9% pure gold and with a simple 6V powerpack a layer of up to 3.2µ/min can be built up over small areas.

Other metals including copper, tin, cobalt, nickel, indium and zinc can be applied. Dalic's zinc plating solution is approved and recommended by Peugeot at its repair centres to restore the original galvanising and ensure that the corrosion warranty is maintained. This simple local zinc plating set-up is suitable for repairs to original zinc plating on all types of vehicle and installed equipment.

Selective nickel plating is an excellent way to resize worn or over-machined mechanical parts or to improve electrical conductivity, many major engineering companies use Dalic Nickel for these activities including Thales, MBDA, MAN, Alstom and GE Power. It can also be used for small repairs to electroless nickel plating in the oem situation, this includes the removal of witness marks where parts have been suspended by wires to immerse them in the treatment tanks. Parts can also be repaired further along the

production line after assembly.

Anodising

The selective plating process can be extended to anodising and an excellent quality anodised layer can be realised for both CAA, SAA and PAA (chromic, sulphuric and phosphoric acid anodising). A higher voltage is required and the process is improved by the use of a cooling system and recirculation of the solution. The layer thickness can be from 1µ for PAA before structural bonding up to 12µ for CAA & SAA anodising to prevent corrosion and up to 100µ for CAA or SAA hard anodising to restore tolerance of a bore or to improve wear resistance. The Panta gel process allows anodising on larger surfaces without any additional equipment and this is often used in the restoration of aerospace treatments in the field when bonding or other repairs are carried out.

Chromium trioxide and sodium dichromate are both identified as SVHCs under REACH and Dalic is a member of the CTAC consortium applying for authorisation for their continued use. If the substances are authorised

then Dalic's downstream users will be permitted to carry out selective CAA within the authorisation.

Most aerospace manufacturers including Airbus are seeking chromate free alternatives to CAA. Both SAA and TSA (tartaric sulphuric anodising) are approved to various specifications. Dalic's SAA solution is well proven and widely used, TSA is now also available and work is in progress to fine tune the colour of the TSA to provide an invisible repair to the original treatment.

Dalystick station

A combination of factors drove Dalic to design and patent the Dalystick station. Where hazardous metals such as cadmium, chrome and nickel are used, then the work should be carried out in an area with adequate air extraction. This reduces the concentration of metal in the air but is not always feasible in a real life situation.

For anodising processes both cooling and recirculation of the solutions is advantageous.

The Dalystick station is a mobile workstation containing a high voltage rectifier, recirculation pumps and a cooler to deliver a self-contained electroplating "mini factory" right where it is needed. This is combined with the Dalystick, which is an application tool with suction applied at the surface. The suction is greater than the feed and all the plating solution is returned to the reservoir without any drips or droplets forming in the air. This results in a very safe and clean application environment.

Tests carried out using "on worker" sampling by the French government's APAVE agency showed very low amounts of metal, well below the exposure limits over a 2 hour application period without any extraction.

Selective "brush" electroplating is now a high tech solution which can form a vital part of an efficient surface treatment portfolio, reducing process time and permitting localised application without expensive infrastructure.

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