MECHANICAL PLATING

Tony van der Spuy reports on a visit to Team Plating Works

Whilst mechanical plating may sound like an outdated concept from yesteryear, nothing could be further from the truth. It is regarded as an environmentally friendly process that is big in the USA and in Australia with demand continuing to grow.

Given all of its advantages, it is odd that there is not more discussion about mechanical plating, or more companies that are offering the service. After all, a zinc coating that does not contribute to hydrogen embrittlement, that coats far more evenly than electroplating and that can produce attractive coatings from 10 μm up to 75 μm thick certainly deserves some consideration.

The process is known by various names. Peen plating is one of the more common alternatives, but impact plating is yet another description. The term mechanical galvanizing is also used when the coatings are in excess of 25 μm.

So far the only company providing this method of coating that has come to SAMFA's attention is commercial jobbing shop Team Plating Works situated in Germiston, Gauteng. Managed by Father and Son, Tony and Gary Joseph, this business joined SAMFA's ranks as a member in May 2010. Their predominant line is barrel zinc plating.

Members who attended the AGMs in Gauteng or KZN will recall that Tony Joseph addressed the audience at these events. He is currently the vice chairman of the South African Electroplating Association, a SEIFSA aligned body established specifically to represent the interests of metal finishers at the Metal Industries Bargaining Council.

Tony Joseph (left) in discussion with KZN Chairperson, Mark Wright, at the AGM in Westville, Durban on September 7, 2010.

During a visit to the factory in July this year, the writer was taken on a plant tour by Gary Joseph who demonstrated the mechanical plating equipment and process, explaining a bit more about the advantages and disadvantages.

Mechanical Plating tumbler unit at Team Plating Works

On the surface of it, the procedure does not appear to be complicated, but Gary assured me that there are many complexities and that it was only after a long learning curve with much trial and error that they been able to achieve the level of proficiency at which they operate now.

The heart of the process is the motor driven rubber-lined octagonal drum. The parts and a volume of water are introduced into this vessel and tumbled together with spherical glass beads and a proprietary copper compound that causes a fine conditioning layer of copper to be deposited onto the steel.

After this step zinc powder as well as more proprietary chemical products that accelerate and promote zinc deposition are added to the tumbler.

The combined action of the tumbling parts and media peens the zinc powder onto the steel parts as a homogenous coating - this process is sometimes referred to as “cold welding”.

Gary Joseph manages the production

Back in the late 1940's Erith Clayton of the Tainton Company started to develop a mechanical plating process using steel balls as the media. Although a good idea, his process was slow and cumbersome and he was short on capital to do further research. He licensed the idea to 3M where John Cutcliffe had the brilliant idea of using glass beads as the impact media. The energy in the beads is key to accelerating the process to the approximately 90 minutes per cycle that is common today.*

The duration of the tumbling cycle, the amount of zinc powder introduced into the tumbler and a couple of other variables will determine the thickness of the coating. To ensure even coverage, the spherical glass beads used are of various diameters and mixed together. As a result, the zinc is peened evenly into threads, and other critical areas of smaller dimension. Determining the optimum ratio of beads, parts and chemicals to achieve a satisfactory coating

* *[http://mechanicalplating.com/glass_be.htm]*

is where one has to rely on experience gained over time.

Because a major aim of this process is to avoid hydrogen embrittlement such as that arising from aggressive acid pickling, a milder descaling process must be employed, which can be achieved in the tumbler itself or in an independent cleaning operation.

Much of the input costs of this process revolve around the specialised chemistry that includes the accelerators and promoters as well as the glass beads which degrade during the process and have to be replaced regularly. All of these materials are imported.

There are several advantages that mechanical plating has over electroplating. For a start, there are no fumes like those aerosols over plating baths that are generated through hydrogen evolution. As a result there is an absence of noxious odours around the plant.

Trivalent passivation is available and both green and yellow finishes are offered. All of the chemistry used at Team Plating Works emanates from America and a variety of additional dyes are available for different coloured passivation films.

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Examples of mechanically plated metal fabrications (above) and Allen cap screws (below) processed at Team Plating Works

At Team Plating large quantities of fender washers, and standard washers as well as bolts and nuts and brackets are processed regularly.

Around the world mechanical plating is used in the marine, aviation, automotive, construction, manufacturing and mining industry. Apart from the coating of fasteners it finds use in the plating of sintered metal components, springs, clips, nails, stamped components and more. Like most other processes, mechanical plating has its downside and cannot be used on everything.

As with zinc barrel plating, some parts are simply too heavy or too big to process this way and tangling and nesting of certain components will also be a problem. One also has to be careful of processing components where small glass beads can be forced into apertures from which they cannot readily be extracted again.

Apart from this, what is most remarkable to someone uninitiated is that the components come out with an attractive sheen that compares relatively favourably with any standard electroplated barrel job, and a coating thickness of up to 75 microns without the danger of chipping or flaking.

Another significant advantage is that for smaller brackets and fittings this is an excellent alternative to hot dip galvanizing offering a far more classy, uniform, smoother appearance with similar thickness and presumably corrosion resistance and without the possibility of “clumping”. (sticking together)

Mechanical plating is not restricted to zinc coatings. It is may also used to deposit tin, copper and aluminium. Cadmium has also been mentioned, although this must be restricted due to legislation.