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СУМСЬКИЙ ДЕРЖАВНИЙ УНІВЕРСИТЕТ
КАФЕДРА ІНОЗЕМНИХ МОВ
ЛІНГВІСТИЧНИЙ НАВЧАЛЬНО-МЕТОДИЧНИЙ ЦЕНТР

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VIII МІЖВУЗІВСЬКОЇ НАУКОВО-ПРАКТИЧНОЇ

КОНФЕРЕНЦІЇ

ЛІНГВІСТИЧНОГО НАВЧАЛЬНО-МЕТОДИЧНОГО ЦЕНТРУ

КАФЕДРИ ІНОЗЕМНИХ МОВ

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WASTE MINIMISATION AND TREATMENT IN AN ELECTROPLATING PRODUCTION FOR PREVENTION AND CONTROL OF POLLUTION

D.S. Balabuha – Sumy State University, group Ekm-31
L.P .Yarmak – E.I. Adviser

Electroplating generates all three forms of waste – liquid, gaseous and solid. Of these, liquid wastes are predominant. Such liquid wastes include : spent chemicals and solutions such as acids, alkalies, cleaning agents, bath chemicals comprising plating chemicals as well as additives such as brighteners, levellers etc. and rinse waters, which may contain some or all of these depending upon sources, method of plating and housekeeping practices.

Gaseous wastes include solvents and vapours from hot pre-treatment and process baths. They include acid alkali mist, Volatile Organic Compounds (VOCs). In some cases, mists and VOCs may contain metals in addition to process chemicals.

According to one estimate, approximately 30% of the solvents and degreasing agents

used can be released as VOCs when baths are not regenerated.

Solid wastes include, sludges generated from wastewater treatment, sludges from cleaning and bath tanks and various residues like, cleaning powder, buffing compounds, spent anodes and various scraps. Unused chemicals, spent resins from ion-exchange / metal recovery systems also contribute to solid waste. Much of the solid waste contain hazardous and toxic substances.

Waste minimisation therefore occupies the most important position in the control of pollution from electroplating and overall protection of the recipient environment – water, air and land (soil).

Waste minimisation in an Electroplating unit may include any one, combination or all of the following:

1. Minimisation of Wastewater Generation

Numerous studies reported in literature also point out to several approaches, which can be briefly stated as; introduction of rinse water recirculation with automatic benefit of chemical recovery

and reuse;static rinse water recovery; avoiding and controlling spillage – single largest cause of high wastewater generation in the unorganised sector. By using troughs between tanks and using well defined linear configuration in place of barrels and avoiding haphazard rinsing and washing will ensure very significant reduction in quantum of wastewater generated; introduction of cascade and/or counter- current rinsing; use of fogging and spraying on objects (rack plating)

2. Minimisation of Gaseous Emission

Except a few states (e.g., Karnataka and Maharashtra), State Pollution Control Boards do not generally require electroplating units to provide any measure for elimination or control of gaseous emission. As discussed earlier, gaseous emission takes place as vapours from hot baths, normal evaporation from cold baths do not constitute significant source of such emission and VOCs from organic cleaning baths.

Use of collecting hoods and scrubbers can significantly control or eliminate vapours from baths. Collecting arrangements have improved substantially but older plants either have no collecting hoods or only side suction arrangement, which are not effective at all. Completely covered baths are ideal solution but they are useful in completely automated plants as used in Europe and parts of North America. However use of top suction hoods with properly designed scrubber system certainly controls much of the gaseous emission. As far as emission of VOCs are concerned, ideal solution is not to use those with high environmental concerns even if they are used, the best practice is to keep the tanks fully covered at all times and using vapour arresting devices.

3. Minimisation of Solid Waste

Major part of solid waste (that too, hazardous) is sludge from waste water treatment plant. Therefore, if measures are taken to minimisewaste water generation by adopting methods stated in sub-para 1 above, waste water sludge generation is minimised. Other constituents of solid waste are: (I) spent anodes, (ii) tank sludges, spent carbon filters and (iv) empty containers of chemicals etc.. The last-named one is usually sold to scrap dealers. Tank sludges and

spent carbon filters may contain hazardous metal salts. While the quantity depends on production, disposal practices should conform to regulatory requirements pertaining to hazardous substances. Therefore using non-hazardous chemicals will lead to minimisation of hazard in solid waste from process chemicals. Use of Cyanide free process (e.g. Alkaline Cyanide Free Zinc plating), use of trivalent Chromium in place of hexavalent Chromium are examples of such hazard minimisation.

4. Minimisation of Noise Emission

Plating activity by itself does not produce significant noise, except barrel plating of small objects. Major source of noise is operation of air blowers used for blowing air in plating (for Nickel Plating) and in pre-cleaning operations . Such noise is minimised by putting the air blower in a separate room with noise muffling arrangements. In many plants and factories, it was observed that high ambient noise level in plating areas is caused by activities other than electroplating such as machining, stamping, metal forming, forging, etc. etc. Noise reduction in such activities is however, outside the purview of this study.

The Best Available Technique (BAT) means the most effective and advanced stage in the development of activities and their methods of operation, which indicate the practical suitability of particular techniques for providing in principle the basis for minimum emission values designed to prevent and, where it is not practicable, generally to reduce emissions and the impact on the environment as a whole. Ideas to implement some specific BAT measures are summarized herewith under the heading of: pre-treatment activity; plating activity.

Note : In view of the availability of different designs and systems, the details of costs can vary. The industry is encouraged to acquire the latest cost information from the equipment supplier if any cleaner production initiative in the above is taken up.