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Analysis and Treatment of Chromic and Non-Chromic Acid Water

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Abstract: ***This work aims to analyse the chemical processes i.e. anodizing and passivation to reduce water usage and then treatment of chromic and non-chromic water and to provide a feasible and economical solution to the company. The work further finds the detailed study of Aluminium & Brass metals which undergoes certain chemical processes such as Anodizing and Passivation simultaneously, which are carried out in their in-house chemical plant. The study finds the conclusion that in both the processes water is excessively used so it found the solution to install hand showers to reduce the consumption of water.***
Keywords: Anodizing, Passivation, Aluminium, Brass, Nitric acid, Demineralized water (DM water), Chromic, Non-Chromic water.

I. INTRODUCTION

With the rise of new industries and the expansion of older ones, problems of industrial waste tends to grow and impose direct danger to the quality of water. Nagpur is home to many of India's technological innovation companies and has an outstanding source platform with good infrastructure and connectivity. Sandeep Metalcraft Pvt. Ltd.(SMPL) is one of them, it is a production unit located in MIDC Nagpur. SMPL is a crucial supplier in the fast-growing aerospace market worldwide. SMPL is a primary supplier to the Defence market in India and around the world.
The objective of this project is to analyse the treatment process occurring in the company and give a solution for increased water usage and treatment of chromic and non-chromic acid water.

II. HEADING

In the company anodizing plant consists of 14 tanks carrying different chemicals and whereas passivation contains 10 tanks of slightly variable chemicals. The water usage is first observed to be used in an excess quantity for which the study mentions the cut of excess water usage in keeping the required usage of water in the desired quantity. After that, we studied the arrangements of anodizing plants and understood the chemical process which is conducted on a large scale. Thereafter we start working on the anodizing process and also on the working principle of SMPL.Following processes are done.

III. TYPES OF TREATMENT

Mainly two types of treatments are done one is passivation and another is anodizing.

A. Passivation

The passivation process is a method of improving the corrosion resistance of stainless steel parts by removing ferrous contaminants like free iron from their surface, restoring them to their original corrosion specifications.
In company following process is currently used for passivation of the product this method is mainly used for Brass products. Their tanks are filled with a different types of chemicals & water. The product is first dipped in a degreasing tank containing a mixture of 7.5 kg Surfoline SK40 & 150 Lit. DM water which is kept at temperature of 65-80 °C, the pH of the solution is kept at a range of 12-14ph, the product is kept in the solution for about 2-5min so that all the impurities on the product is washed out. After 5mins the product is kept for 10-15 sec in a tank where the water is running. So that the ph is maintained in the range 7.2-8 ph.
After 15 seconds the product is dipped in a tank where 3 Lit. Cleansol-BR & 7 Lit. DM water is mixed & kept at 3.5-5.5 pH at a temp of 25-35°C. Here Again the product is kept for about 3-5 min again the product is dipped in a tank of running water so that the excess. Chemical washes off & the product pH is maintained.
Now the product is dipped in a tank where 4 Lit. Of Nitric acid is mixed with 16 Lit of DM water maintaining about ph of 0.5-1 at 35-40°C temp for about 30-40 Sec. Now after different 40 sec the product is dipped in two different water tanks. After dipping in 2nd running water tank the product is dipped in a tank having 5 kg Chromic acid, 0.380 kg Sodium Sulphate & 20 lit DM maintaining ph 0.5-1 ph at temp. 25-35°C for about 20-30 sec.

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After 30 sec product is dipped in the water tanks 3 different running water tanks. Now as per the product it is dipped in hot water tanks. Some products needs to dip in hot water some do not. At last the products are dried by blowing air at a high pressure.

Anodizing- Anodizing is an electrochemical process that converts the metal surface into a decorative, durable, corrosion-resistant, anodic oxide finish. Aluminium is ideally suited to anodizing, although other nonferrous metals, such as magnesium and titanium, also can be anodised.

In the company following procedure is used for anodizing the products. Different tanks are filled with different type of chemicals, dm water & water. The process starts with loading of parts. A structure is made of wire on which parts are loaded. After loading the parts are sent for alkaline cleaning. A tank of 180 lit. is filled with water and I-FIN AL SC 53 at concentration of 15-45 g/l, maintaining 12-15 pH at 50-65^{0}C. Here the parts are dipped for 1-5 minutes, so that all the impurities are washed off. After alkaline cleaning the parts are sent for water rinse where a tank is filled with water having 10-12 pH at ambient temperature. Here the parts are dipped for 1-2 minutes.

Again, the parts are sent for water rinse but this time the pH of the water is kept at 7.2-9 pH at ambient temperature. Here the part is dipped for 1-2 minutes.

Now since the part is cleaned thoroughly the part is sent for deoxidising. A tank of 180 lit. is filled with nitric acid having concentration of 22-25% v/v maintained at 0.5-1 pH with ambient temperature. Here the part is dipped for almost 1-3 minutes. After deoxidising the parts are sent for water rinse. The tank is filled with water having 2-5 pH at ambient temperature, and parts are kept for 1-2 minutes.

The parts are again sent for water rinse but this time the pH of water is kept at 7.2-8 pH at ambient temperature. Here the part is dipped for 1-2 minutes. After water rinse parts are dipped in DM water having 6.8-7.5 pH at ambient temperature for some time. Now, after removing from DM water the part is sent for chromic acid anodizing where the part is anodised in chromic acid. Here part is kept for almost 1 hour.

After one hour the parts are sent for water rinse. The parts are rinsed two times, first the water pH is kept at 1-2 pH and second time the pH is kept at 6.8-7.5 pH. After water rinse the parts are sent for hot sealing. A tank is filled with water and ANO SEAL MX 601 having concentration 7-8 g/l maintained at 5.3-5.8 pH at 85-90^{0}C, then the part is dipped for 5-10 minutes. At last after hot sealing the parts are dried with hot air drier.

During the process we observed that excess amount of water is used and getting wasted, and the waste water is chromic water which is hazardous and cannot be treated easily.

IV. ANALYSIS

Analysis of usage of water

During the study of the project we observed that a huge amount of water was considerably being wasted. To carry out the chemicals processes such as anodizing and passivation. The company basically uses two types of water for successful conduction of both the chemical process. The water used are

A. Chromic Acidic Water

This water contains a slightly high content chrome which makes it more vulnerable towards the mother. Nature as it can destroy the soil and other natural habitats. The company's major problem is how to handle this chromic acidic water and transport to its destination as the there are certain rules set by the Govt. of Maharashtra regarding the decomposition of various chemicals products. It is also necessary for the company to use chromic acidic water as it gives better results resulting in less time consumption and considerably good finish for the Metals used.

B. Non Chromic acidic Water

The content of this water are basically nitric acid. Nitric acid helps the process to flow in a good speed as it. Acts as a catalyser in the chemicals process. The used Non chromic acidic water i.e water containing nitric acid is then treated in the company itself for the reuse in other processes which is economically good for the Company. This water is treated by the use of ammonia and other chemicals in the boiler present in the company.

We found that there is major loss of water being carried out during both processes i.e Anodizing and passivation. We mutually came to a solution for the same. The company officials acknowledged our solution for the excess usage of the water and the solution was implemented on a trial basis.

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V. CONCLUSION

We observed that in both the process water is excessively used so we found the solution to install hand showers so that the water is not used excessively.

The sole purpose is to install a water shower same as we use in our washrooms (used for residential purpose). The logic behind using a water shower is only to save water. The labor incharge at the site uses the water rinse tank to dip the product inside tank which definitely uses water at a very high quantity because they also maintain ph of water rinse tank at 7.5 to 8. (approx.). The shower uses less water and more force which definitely complete the cleaning process and requirement of the job.

For the treatment of Non-Chromic water we have suggested two methods i.e.,

1) Urea and Ammonia

2) Carbonate Rocks and Metal Oxides

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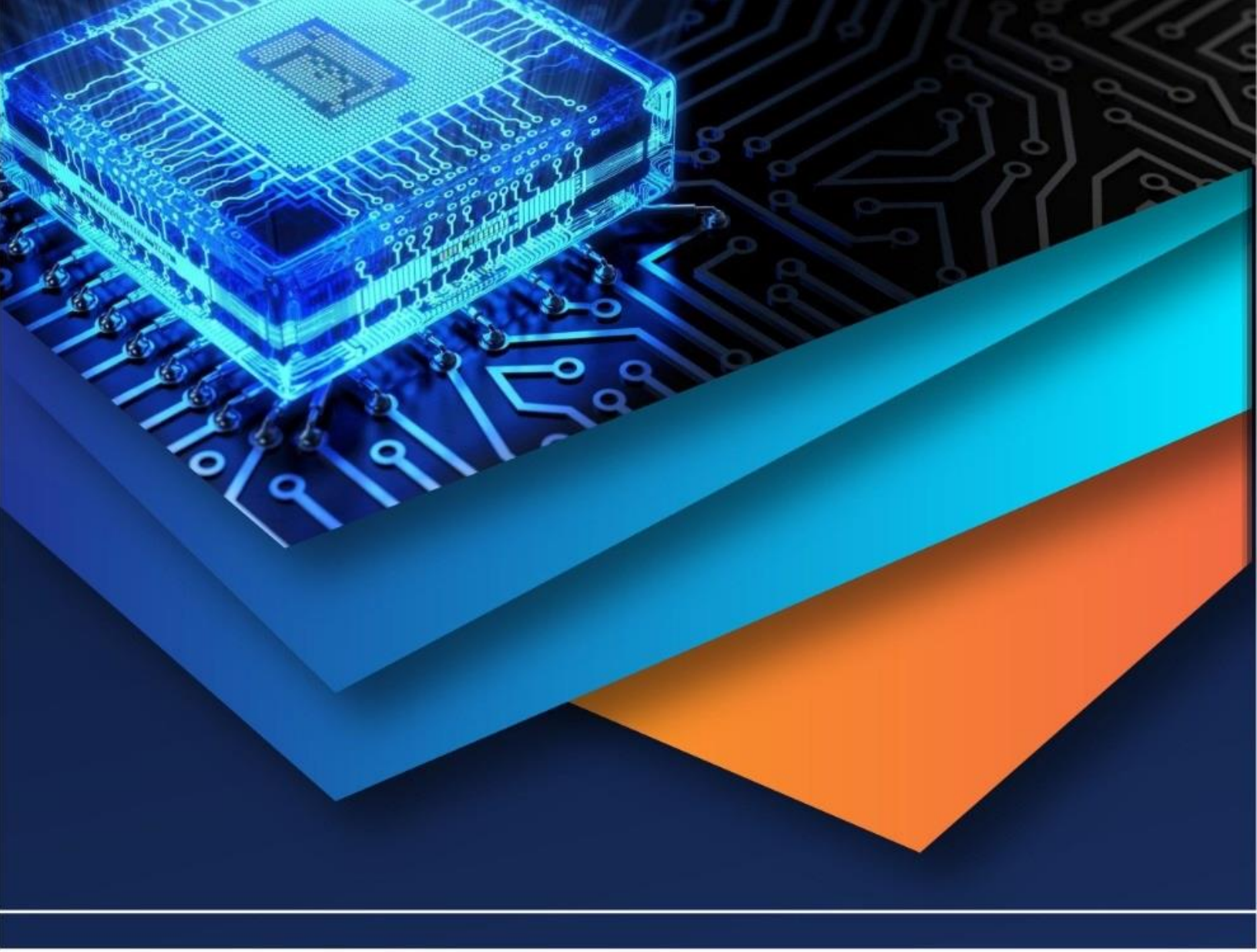

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