LAPURAN PROJEK TAHUN AKHIR

KURSUS DIPLOMA LANJUTAN KEJURUTERAAN JENTERA,

KAJIAN KEJURUTERAAN, ITH, SHAH ALAM

TO MAKE A STUDY
AND
TO SET UP AN EXPERIMENTAL
ELECTROPLATING UNIT

BY

NORULHUDA BIN MOHAMAD ADAM

NOVEMBER 1981.

PREFACE

At present, there are many different types of finishing process available, each having its own advantages and disadvantages. One of the most widely known process is electroplating. Today, electroplating is not only used for decoratives purposes but finds its way into industries, both heavy and electronics industries.

The main objective of this project is not to discover or to invent a new type of electroplating but to give a more practical approach towards the present type of electroplating especially those practise by small shop owners. The process sequence, per treatments, actual plating process and after treatments were studied carefully in this project.

In order to prove the study, a small experimental electroplating unit was set up, with which we can perform experiments and also predict the actual plating conditions before the plating is done on a larger scale. The main objectives of these experiments is to determine the most favourable factors for electroplating. The factors considered in these experiments are:

1. Current density.
2. Temperature.
3. pH value.
4. Composition of chemicals.
5. Thickness of plating.

Only nickel and copper plating experimental units were set up as an initial phase. The set up can only plate objects with surface area up to 300 dm^2 only.

Acknowledgement.

The writer wishes to express his sincere gratitute to Dr. Mohd Nawi Salleh, head of the Engineering School who also acts as the writer's project advisor, En. Abdullah Suhaimi the project supervisor and also En. Hassan Ibrahim, Course Tutor, Mechanical Department, for their guidance.

The writer also wishes to acknowledge En. Abdul Rahim Fakeh of the Malaysian Railway and En. Abdul Aziz Hanan, the head MITEC, SIRIM, for giving their permissions to the writer to carry out research work at the Malaysian Railway Electroplating Workshop in Sentul, Kuala Lumpur and at MITEC Electroplating Workshop in Shah Alam respectively. The writer also wishes to thank En. Mustaffar Sudin and En. Muntaza, both MITEC Reseach officers, including their technicians for their guidance and cooperation.

The writer also wishes to thank Cik Azizah for typing this report and lastly to all those who have directly or indirectly help in ensuring the success of the project.

Thank You.

TABLE OF CONTENT

			PAGES
PREFACE			i
ACKNOWLEDGEMENT			ii
TABLE OF CONTENTS			iii
ABSTRACT			v
PART ONE	-	THE STUDY	
CHAPTER 1	-	FUNDEMENTAL INFORMATION	
1.1		Electrolysis and Ionization	1
1.2		Faraday's Law of Electrolysis	2
1.3		Current Efficiency	4
1.4		Current Density	7
1.5		The electrochemical Series	8
1.6		pH (ionic concentration of hydrogen)	12
CHAPTER 2	-	PREPARING THE BASE METAL	13
2.1		Polishing	14
2.2		Buffing	18
2.3		Stripping of plated metal layer	21
CHAPTER 3	-	PLATING OPERATION	27
3.1		Pre-treatment	28
3.2		Metal Cleaning	29
3.3		Pre-Cleaning	32
3.4		Final - Cleaners	35
3.5		Pickling	38
3.6		Electrolytic Degreasing	44
3.7		Operation Steps	47
CHAPTER 4	-	TYPES OF PLATING	
4.1		Copper Plating	56
4.2		Zinc Plating	63
4.3		Tin Plating	71
4.4		Nickel Plating	73
4.5		Chromium Plating	75

Abstract

General: As an initial phase, only the pre-treatment process (degreasing, electrolytic degreasing and acid pickling), copper plating and nickel plating experimental units were set-up. Copper plating was used only as an undercoating process prior to nickel plating.

Conclusion: The project has been a sucess to a certain extend in obtaining the right plating conditions although the equipments used were not fully equiped. However, it is hoped that furthur analysis could be made by student attending future projects on electroplating, based on the study conducted in this report.

It is hoped that a complete electroplating set will be constructed in the school of Engineering in the near future.

Recomendations:

1. For future experiments, adequate and constant supply of chemicals should be made available so as to have a more flexibility in the conditions of plating.

2. A specially built power supply and a built-in heating system should be employed.

3. A titanium or stainless steel basket is recomended to replace the convectional anode hanger so that small pieces of the anode metal can be used in production. Moreover, more surface area will be present.