

INDUSTRIAL STATUS OF DRY PLATING AS AN ALTERNATIVE TO WET PLATING PROCESS IN KOREAN SURFACE FINISHING INDUSTRY

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Abstract

Wet plating has been initiated and developed as a major surface finishing technology as of the long customized and highly productive process until now. As the external compression by virtue of the environmental preservation becomes stricter, there has been new move to adapt dry plating line instead of conventional wet plating one in domestic surface finishing industry. Dry plating, so-called, plasma surface technology has been developed in semiconducting industry and becomes a key technology to be useful as an alternative to wet plating in surface finishing industry.

The historical progress of domestic surface finishing industry was outlined with the background on the adaptation of three dry plating processes—plasma spraying, plasma nitriding and ion plating. The present status of domestic industrial activity was covered on major alternative to wet plating.

Key words :

1. Introduction

The electroplating was initiated as jobshops in Korean peninsula just before the liberation from Japanese imperialism. All the chemicals and materials used in jobshops were mostly supplied from Japan. Until the Korean war, less than 10 jobshops had opened for electroplating with zinc on bolts and nuts, nickel and chromium on rim of repair parts of used bicycles. In the late 1960's, domestic industries demanded for sur-

face finishing jobs on many products in home appliance according to industrialization. Thus, the electroplating jobshops began to increase in number to 21 and it has continuously grown to 75 by the 1970's, to 332 by the 1980's and 580 by the 1990's as depicted in Fig. 1¹⁾ Statistics of surface finishing jobshops in 1986 revealed that majority of jobshops had conducted electroplating processes and few involved in dry plating.²⁾

From the early '90s, many electroplating jobshops were fined for hazardous waste as they

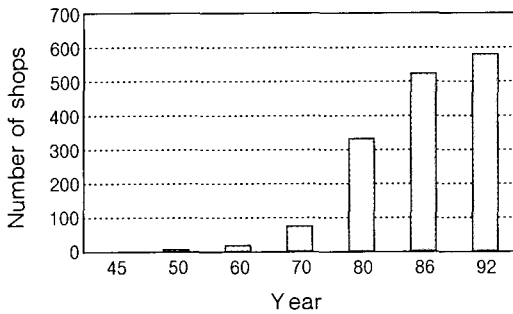


Fig. 1 Number of surface finish shop in ROK

violated to follow the stringent environmental preservation law.³⁾ Even though most of small surface finishing jobshops had found their place in limited areas equipped with continuous waste treatment system before final discharge, they were liable to violate the regulations independent of their intention.

The pioneering company has imported foreign facility to make a hard-phase coating on steel surface by plasma treatment called as ion-nitriding and plasma spraying in 1971 and 1975 respectively, and to copy a gold-color hard coating by ion plating in 1980. Since 1980's, the dry plating became known to surface finishers in Korea as one of useful process as alternative to wet plating in electroplating jobshops of hard chromium and decorative gold.

The status of main dry plating processes—plasma spraying, plasma nitriding and ion plating were reviewed as they were shown to surface finishers as potential processes as wet-plating replacement in the surface finishing market.

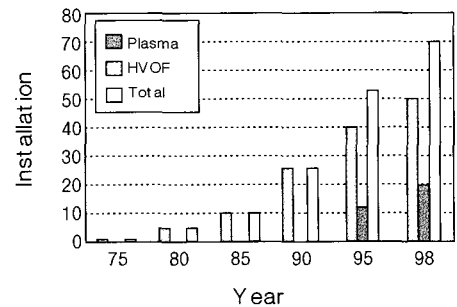
2. Status of Major Dry Plating

A dry plating has been mainly led in Korea by plasma spraying, plasma nitriding and ion

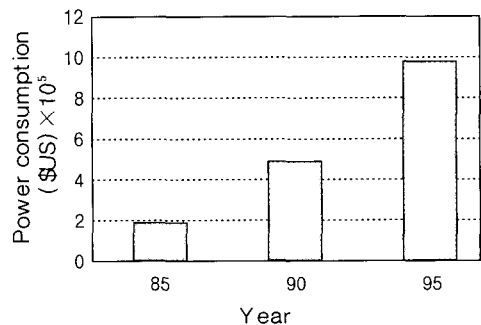
plating. The status of jobshop in the industry of each process will be described.

2.1 Plasma Spraying

The number of plasma spraying system installed up to now was depicted in Fig. 2. The spraying was first introduced and operated by Korean Airline Co. in 1975 to repair and maintain the aircraft components. The research institutes and job shops followed to install the coating system for research and coating services on textile machinery components as alternative to hard chromium and hard anodizing. From 1990's, the coating service by high velocity oxy-fuel (HVOF) was introduced and was expanded to



(a)



(b)

Fig. 2 Growth of spray coating in ROK
(a) Number of spray coating system
(b) Powder consumption for spray coating

heavy machinery components. Thus the system installations were doubled in number and the powder consumption was also doubled as shown in Fig. 2. All the coating systems were imported from foreign manufacturers except one installation in university.

2. 2 Plasma Nitriding

Plasma nitriding has been developed and industrialized in Europe since 1960's as an innovative surface treatment as alternative to the conventional salt-bath nitriding.⁴⁾ The first set of plasma nitriding in Korea was imported from Japan and placed by small jobshop of hydraulic system manufacturer, Hyundaeyuap Co. in 1971. It was not successful as the process was sophisticated in operation without a sufficient understanding of the plasma processing. The plasma nitriding became common to heat-treater in domestic market after 15 years later as evidenced by the increased installations as in Fig. 3. Most of plasma nitriding system were supplied by foreign manufacturers until 1990 but 4 sets of domestic product were installed by nowadays. After the plasma nitriding has replaced

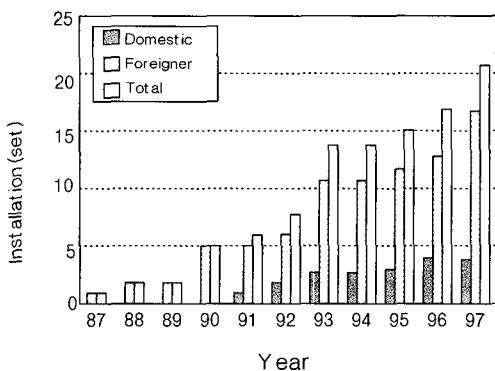


Fig. 3 Number of installation of plasma nitriding system in ROK

the salt bath nitriding, it became a strong candidate competing with electroplating of hard chromium on cylinder in hydraulic system. Especially, the well known plasma-nitriding combining with subsequent oxidizing would be alternative to hard chromium on cylinder as it showed superior properties under tribological and dynamic load⁵⁾.

2. 3 Ion-plating

Ion-plating system of Japanese manufacturer, NDK was first set at a jobshop of Kyunggi-hwankyung Co. and was employed to make TiN coating as alternative to gold electroplating on watch case in 1980. Fig. 4 showed the increasing number of ion-plating installations until now. Most of the coating systems had been im-

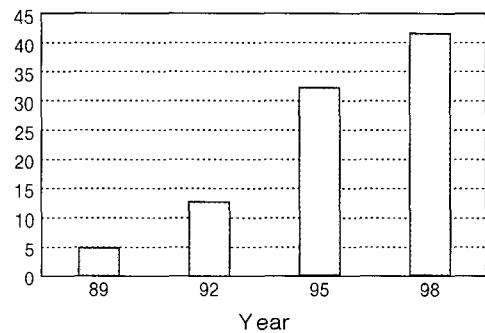


Fig. 4 Number of installation of ion plating system in ROK

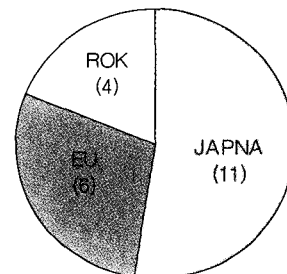


Fig.5 Plasma nitriding manufacture by country

ported from Japan, EU, Russian and PRC while one quarter of those was supplied by domestic manufacturers as denoted in Fig. 5.

3. Concluding Remark

The dry plating processes have been introduced to Korean surface finishing industry a quarter century ago and led mainly by plasma spraying, plasma nitriding and ion-plating. The application of those dry processes has been feasible as alternative to wet plating of hard chromium, hard anodizing and decorative gold. It is expected that dry plating will be increasingly adapted to domestic surface finishing industry as environmental regulations become stricter for electroplaters and surface finishers.

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