

MERITS OF INVESTMENTS ON ENVIRONMENTAL IMPROVEMENT IN HOT-DIP GALVANIZING BUSINESS AND MEASURES FOR THE IMPROVEMENT

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Introduction

Denro Corporation (hereinafter called “Denro”) is a manufacturer having 73-year history and its main business is to develop, design, manufacture and sell metal-processing equipment for various applications.

Denro is unique because it has established new businesses with utilizing advanced equipment that had been internally developed and manufactured by its Plant Division. Collaboration of the Plant Division and other divisions will create the synergy effect for improvements of their equipment and operation technologies.

Typical examples of this collaboration are seen at the Steel Structure Division that designs, manufactures and sells steel towers as well as the Job Galvanizing Division. The Steel Structure Division started in 1951 and now (as of 2018) is the largest player in the industry with more than 46% market share in the total supply of power transmission and telecommunication towers in Japan.

The job galvanizing business was launched in 1953 and temporarily suspended from 1964 till 1976, then has resumed in 1977.

In 2002 Denro developed ELSE (pronounced as “Elsie”) type hot-dip galvanizing systems, which will be precisely described later. Denro has become one of the leading companies in the Japan’s galvanizing industry. Additionally, in May 2014 Denro has opened Denro (Changzhou) Precision Machinery Co., Ltd. as the 100% owned subsidiary in Changzhou, Jiangsu, China in order to manufacture and sell production systems, which are characterized by their labor-saving, energy-saving and eco-friendliness, for steel tower manufacturers and hot-dip galvanizers.

Recently, many industries have been highly concerned with energy-saving, labor-saving (including automation), safety and environmental protection, and have been positively working on the issues. Contrary to this trend, the workplaces in hot-dip galvanizing plants have been regarded as a typical unwanted one because they are 3D; Dirty, Dangerous and Demanding. The galvanizing industry is

experiencing higher pressures for environmental improvements as social concerns toward environment have increased. However, investments on them are considered cost-increase factors by many galvanizers. And, positive actions scarcely seem to have been taken, or incorrect measures might have been placed even by a few far-sighted galvanizers.

Denro is a production system provider who has raised a new business style internally by using its self-developed equipment and has improved them through the own operations. This style enables Denro to provide its customers with a wide range of information and to design products from users' view points. This is why Denro would like to show, to job galvanizers and manufacturers who have galvanizing plants for their own products with the experiences and the actual operational data obtained, that proper investments for workplace environmental improvement could be profitable from long-term and overall business points of view.

The topics are as follows;

- A. Obtainable benefits to hot-dip galvanizers through environment improvements
- B. Features of ELSE type galvanizing system that meets all requirements mentioned above and its advantages

A. Obtainable benefits to hot-dip galvanizers through environment improvements

We would like to mention significant profits obtained by the environmental improvements of hot dip galvanizing workplaces from three different viewpoints; 1) labor problem, 2) cost-reduction for corrosion prevention in facility maintenance, 3) social pressures to seek environmental improvements.

1. Retention of younger workforce

Such a difficult situation have gradually prevailed that capable and reliable workers would not enter into the hot dip galvanizing industry for the average compensations as it is notorious for 3D (Dirty, Dangerous, Demanding) work environment. Improvements of the unfavorable workplace environment must be countermeasures against this tough situation.

- Fundamental existence condition for business enterprises = To employ valuable workers and maintain them
- Secure corporate fundamental conditions for vitality and development
- Secure progressive accumulation of know-how by committed employees
- Comparison of Denro's Tohoku Galva Center and other companies

2. Cost reduction for maintaining equipment and buildings to avoid corrosion

- A comparison between an environmentally improved workplace (pretreatment area) and a conventional one
- Rust-prevention and life-prolonging effect of plant buildings
- Maintenance cost reduction in electric facilities and mechanical devices
- An example of a comparison between Denro's Tohoku Galva Center (with ELSE type galvanizing system) and Tohoku Plant (with Conventional galvanizing system) in terms of increase of building corrosion and maintenance expenses

3. Dealing with social pressures for improvement

Sooner or later, your plants will be required to make environmental improvements because of growing social concerns on the environment, regulations imposed by the government and globally widening environment conservation awareness. Even if you go against this situation, you will still have the problem. Your corporate images could be damaged by being branded as a polluter. And, if your company remains negligent in pollution, there would be a risk for it to be excluded from the society by the tide of the times. If so, it would be more suitable to take positive measures to improve the environment, cut the costs and gain returns from it.

There will be many benefits as follows when you change your viewpoint to actively keep up with the times.

- Profits explained above in the Items #1 and #2.
- Favorable reputations and supports from neighborhood, citizens and governments.
- Business expansion into a highly environmentally regulated area to realize an oligopolistic market

We have developed an environmentally harmonizing hot dip galvanizing system, and built Tohoku Galva Center in 2002 in Hanamaki, which is located at the north-east district of Japan and is a well-known sightseeing city for hot springs and beautiful natural landscapes. As 17 years have passed since the plant construction, we have been able to obtain actual operational records to verify our original prospect. Denro is able to positively state that **an investment on hot-dip galvanizing plant for environmental conservation will bring you profits.**

If you have any interests in having more detailed explanation, proof of the results, discussions with us or a visit to the plant-in-operation, it would be greatly

welcome. Please feel free to contact us.

B. Features of our ELSE type galvanizing system that meets all requirements mentioned above and its advantages

ELSE is the trade name for our environment-conscious hot-dip galvanizing system and ELSE stands for the following words:

- Energy saving
- Labor saving
- Safety
- Eco-friendly

The environmental pollution problems brought about by the hot dip galvanizing operations consist mainly of “acid-related issues in the pretreatment area” and “zinc dusts (white fume) evolved from the galvanizing kettles”.

Countermeasures against the former problem are to catch acidic substances from acid-pickling tanks and neutralize them, and those against the latter one are to trap the fine particles securely and remove them by filtering. The both countermeasures are theoretically simple, but they are practically difficult.

Here we show and explain the specific problems for the equipment.

1. Acid-related problems at the pretreatment area

(1) Neutralization of waste rinsing water after acid-pickling

Acidic water from the pickling process is rendered harmless through neutralization and sludge removal. Recently, as a general trend, these processes run automatically. We omit explanations of this issue because the currently used method has been developed long time ago and its equipment has no particular difficulty.

(2) Making acidic fume harmless

We could still see that the acidic fume evolved from pickling tanks and pickled work is emitted into the air in and around the galvanizing plants without being properly treated. However, in recent years and at many places, it has become to be seen that safening facilities are installed especially according to governmental directions.

What we have employed to make acidic fume harmless is called “Housing & Scrubber (H&S)” method, with which the area evolving acidic fume is encapsulated, and the fume is exhausted from the housing, and acid in the fume is absorbed by absorbent liquid in the scrubber, then the harmless air is emitted to the atmosphere.

In spite of its simple principle, as a matter of fact, there are various difficult

issues such as initial equipment costs, lifetime of equipment, maintenance costs, running costs including electricity and water if you seek the best comprehensive answer. We would like to point out some elements that could clearly differentiate manufacturers' competency.

①Importance of housing design

In the H&S method, considering equipment and running costs to be minimized, it is important to look for easiness of construction, robustness and air-tightness of the housing. One of the commonly observed failures is that an insufficient investment on the housing made it a castle in the air. We have adopted the materials and the structure, shown in the separate table, after long trials-and-errors.

②Air pressure control in the housing

It is necessary to keep the inner atmospheric pressure lower than the outer one in order not to emit the contaminated air from the housing though, the inner pressure will widely fluctuate every moment depending on comings/goings of work and operators, quitting/suspending time, etc. When outside air flows into the housing through openings, it exhausts more air than incoming air. And, when there is no air-flow through the housing, it operates with minimum air-intake to save electricity consumption. This is the way to maintain the running costs low.

③Keeping air-tightness of the housing as much as possible

It is important to separate inner and outer of the housing with the housing structural system and the pressure control arrangement. Meantime, materials have to be transported according to the hot dip galvanizing process in the housing. The transportation is carried out by transporting units externally installed over the housing, with which materials are lifted and moved therein.

The lifting wires penetrate ceilings of the housing and materials are lifted by the wires and transported in longitudinal directions along slits made in the housing ceilings.

Repetitive movements of the wires may damage sealing parts of the slit. And, we have observed such many cases that the sealing parts were removed to stop their endless and annoying repair work.

④Importance of proper evacuation capacity and selection of air-outlet hole locations

It is necessary to evacuate the contaminated air in housing throughout and thoroughly for minimizing the equipment and running costs. To realize these requirements, it is also necessary to optimize various factors such as maximum/minimum evacuation volume, size/quantity/location of outlets,

scrubber capacity. We, therefore, have exploited various knowhow accumulated by our engineers through our own accustomed operations with lots of experiments and experiences

2. Treatment of zinc dusts (white fume) evolved from the galvanizing kettles

① If no action is taken to white fume, it would pollute workplace environment as dust and, ultimately, it might cause air pollution exteriorly.

② As countermeasures against this zinc dust problem, the following so-called “edge evacuating systems” have been adopted:

- To pull white fume through outlets located along both shorter kettle edges at a height of slightly higher or several tens of centimeters above the molten zinc level.

- To pull white fume from either shorter kettle edge and simultaneously push by blowoff from another shorter kettle edge (transverse push/pull)

- To pull white fume from either longer kettle edge and simultaneously push by blowoff from another longer kettle edge (longitudinal push/pull)

However, these systems should be improved by more studying because their dust-collecting rate is low, their collecting fans need large power, outlets are easily clogged with molten zinc splashes.

③ Our ELSE-A type hot-dip galvanizing system has a fixed housing for zinc dust collection since it has better dust collection efficiency and requires less power to run fans.

And in our ELSE-B type equipment, the housing is situated transversely against the work flowing direction, where its exit sidewall would be an obstacle to transport work to the quenching bath, which might cause gray spots on galvanized surfaces. We have been able to overcome this difficulty.

④ Electricity consumption for dust collection cannot be disregarded even if the housing system is adopted. Therefore, mechanisms, such as a sophisticated adjustment system for fan motor power in accordance with galvanizing cycle, for running cost reduction are definitely needed.

We have touched on the benefits derived from investments for workplace environment improvement at the chapter A and some of the major features of our ELSE type galvanizing system that can be used for this purpose at the chapter B.

In order to fully explain why “**the environmental improving investments**

are profitable", we have to describe not only "Eco-friendly" but also "Energy-saving", "Labor-saving", "Safety". We look forward to having another occasion to explain the remaining advantages of ELSE in the near future.