

## **Sustainability in the Water Polluting Plating Industry**

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### **Abstract**

This paper presents a specific case study for controlling water polluting plating industry by using industrial parks. According to the results generated from the case study of Ningbo plating park, the paper argues that industrial parks are effective for controlling plating wastewater and would be a sustainable way for plating industry in the future. This paper can also be a reference for other researches in relation to other wastewater-related industries.

### **Introduction**

One of the necessary directions advocated in improving the economy at both the national and regional level for developing countries is a reliance on the industrial sector and, in particular, the manufacturing industry in order to provide GDP growth rather than solely depending on the agriculture and service sector (Tamura, 2002). One of the possible by-products of national industrialisation is environmental degradation. Indeed, manufacturing industry in developing countries is in a complex system which can be both economically beneficial and environmentally unfriendly. A strategy of win-win between environment and economics is possible via the use of industrial parks (Erkman, 1997).

The concept of industrial parks was introduced to the plating industry by local government in Ningbo, a coastal city in southeast China, since the wastewater generated from their plating industry has already become a serious problem hampering Ningbo's sustainability. This project gathered 51 local plating companies to be involved in a big centralised wastewater treatment plant and other necessary facilities on an experimental basis. The park has been in operation since 2003, but with the passage of time, some differences concerning the efficiency of the park between stakeholders have arisen. In order to clarify the effect of the park and its potential problems, an assessment was carried out in 2005, which started with a field survey involving all 209 plating companies in Ningbo. It was followed by a workshop with local stakeholders. This was arranged so that governors could learn about how to deal with Ningbo's plating pollution and accumulate knowledge which can be shared with other regions where plating wastewater pollution has become a problem.

Many cities in Asia are facing similar problems to that of Ningbo where further economic growth is tied to environmental protection (Craswell, 2005). Geographic and labour market advantages are powerful potential for those cities, especially for their manufacturing industry (Mckendrick, 1997). Therefore, the Ningbo case study provides a helpful guide for other

industrial sectors and zones in Asia so that they too may develop in a more sustainable fashion.

This paper follows up the entire process of the establishment and operation of the plating industrial park in Ningbo, beginning with an evaluation of the park's efficiency. The second section covers the potential problems and solutions which arose during its establishment and operation. The issues related to the implementation of plating industrial parks are analysed in the next section in which a set of indicators are designed to evaluate the basic criteria for establishing a park in one area.

## Lessons from the Case study --- Advantages

### *Data proof:*

An abundance of data collected from the 209 plating companies allows us to statistically prove the importance of the park. The comparison was developed between the 209 companies by separating them into the regions in Ningbo. *Figure 1* shows companies' average size in the different regions and *Figure 2* shows the average amount of wastewater generated from each regions' companies. Integrating the two figures, one important fact can be concluded. The plating companies in Yin Zhou (YZ, one region in Ningbo) plating park have a generally big, but produce a low amount of wastewater.

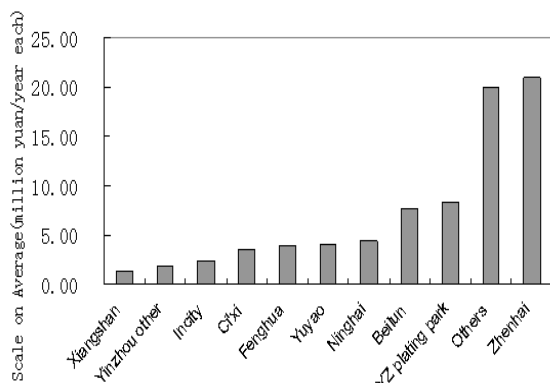


Figure 1 Companies' scale on average in different regions

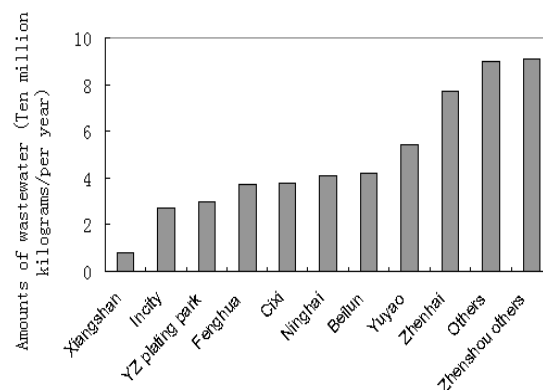


Figure 2 Average amount of wastewater in different regions

In terms of the wastewater quantity per 100 Yuan\* production value (Value A), a general decreasing trend can be seen in *Figure 3* between 2000 (before the park was established) and 2004. In particular, the biggest drop happened in YZ plating park where the wastewater quantity was reduced. *Figure 4* is a value (Value B) calculated by using the ratio of increased production value divided by the ratio of increased wastewater quantity. The result also informs the significance of the plating park.

### *Practical proof:*

Some extended advantages divided in three sections are discussed in this sector based on our field survey and stakeholders' interviews.

- a. ways in which to gain benefits from mass production for environmental protection;

- b. ways in which to gain benefits from mass production for the whole plating industry; and,
- c. ways in which to gain benefits from mass production for the plating companies

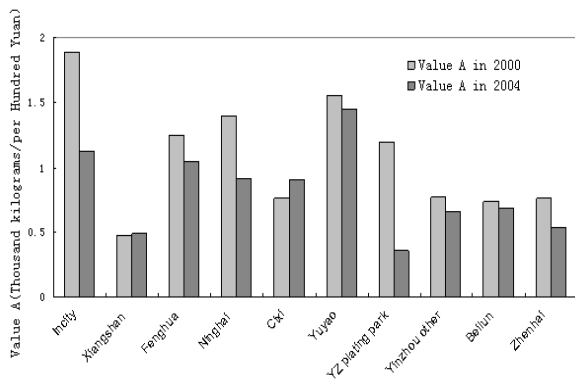


Figure 3 Changes in wastewater quantity per Hundred Yuan production value (Value A)

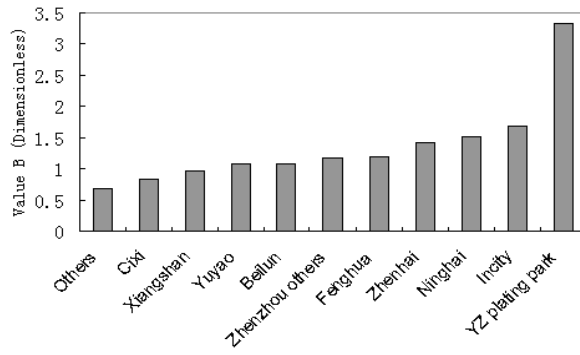


Figure 4 Value B in different regions

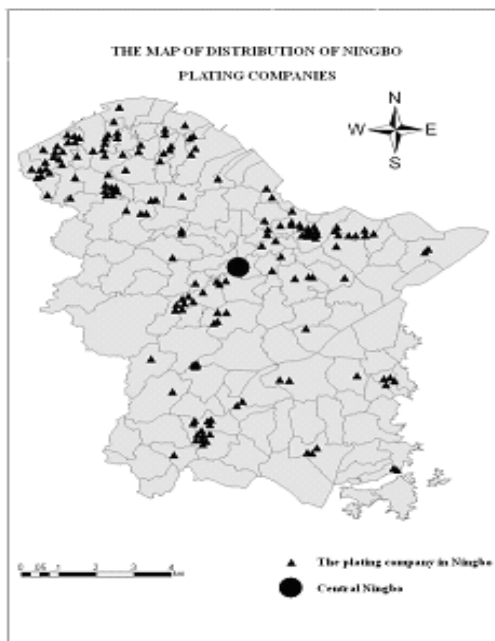


Figure 5: Distribution map of Ningbo plating companies

Benefits for environmental protection are the original reason for establishing the plating industrial park. A big centralised wastewater treatment facility can effectively control the effluent quality and also reduce the source number of wastewater pollution. These two points result in governmental supervision for plating companies becomes easier and more effective (see Figure 5). A plating market that consisted of professional plating providers and skilled plating labourers was formed and plating skills and new findings were incorporated into working practice. Plating companies are also beneficiaries as the reputation and competitiveness of those park-internal companies were obviously improved.

### Lessons from Case study --- Potential problem with solutions

An uncertain investment mode was the first issue that impeded the project's progress and this uncertainty did delay the initial timetable of the park. The study concluded that individual companies are largely responsible for the investment of industrial parks (production property) while the centralised treatment facility could be operated under BOT mode. Moreover, governmental loans should be made available for companies' as they are needed. There are obvious limitations involved in operating BOT with industrial wastewater; an unstable wastewater amount is one potential problem (one which discourages potential investors). A binominal distribution formula was used involving the number of park-internal companies and their failure probability. The size of the park can be designed based on the probability calculation. At the end of this section, the feasibility of the park's investment was evaluated

by using a self-matrix analysis.

Plating equipment selection is the key means of controlling wastewater pollution from the source, but it is subject to the financial capacity of a given company (greater hi-tech is more expensive). A decision-making tree was developed in order to specify the optimal equipments' categories (see Figure 6). The discussion of management issues started with the clarification of who should be the operator and supervisor of the park. This was followed by consideration of detailed management methods, such as changing the management mode from "total amount control of wastewater" to "slope control" between production value and wastewater amount. A high risk, pipe-leakage problem was discovered in the Ningbo park, which highlighted one drawback of a centralised treatment facility. Several management suggestions regarding the risk, as well as the park's service updates, were presented. Moreover, staff training for production safety was also mentioned, in terms of the park's sustainability.

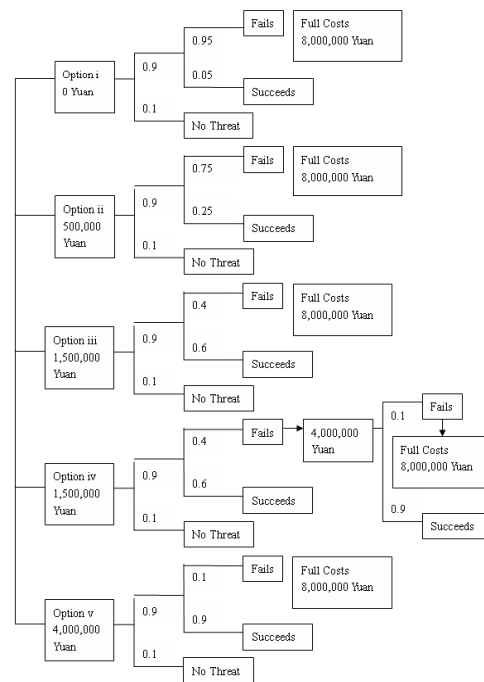


Figure 6 Decision-making tree of equipment selection

### Implementation of industrial park

The study also considered the establishment of future industrial parks. A self-judgment system was designed. Five aspects (weight, competitiveness, potential, stability and ratio of small plating companies in a given area) regarding regional plating industry were picked as indicators to evaluate a given region's eligibility. A case study – the Ningbo's plating park - was developed by using these five indicators. SWOT analysis involved with regional strategies was discussed at the end of the study. Further development of industrial parks should be in accordance with regional sustainable development strategies.

### Conclusion

Industrial parks are efficient. Although some problems and potential risks have been detected in the study, they can be tackled with careful and innovative management. There is no doubt, with manufacturing industry moving out of developed countries, developing countries have to play a role bearing its weight in the context of both economic development and the environment, and therefore both the study and the mode of industrial park will appear in a more obvious sense.

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*Notes: \* Yuan (Chinese Currency), 1 US Dollars is roughly equal to Yuan.*

*\* The website is accessed in April, 2007.*