



## CHAPTER 1 INTRODUCTION

### Background

Waste exchange concept is one concept in recycling methodology. Wastes that are not reused or recycled in-house can be used through services from waste exchange. The concept of waste exchange is to try to promote the use of one's company waste as another's raw material. This concept was established since 1942 in Europe. Now many countries use this concept to reduce their waste prior to treatment or disposal.

Waste exchange can be waste information exchange or waste material exchange. Waste information exchange will provide the list of waste available or unneeded material and material wanted. It can be passive waste information exchange or active waste information exchange. The difference of these two types is passive waste exchange does not find the potential waste users like active waste exchange does. Waste exchange concept can reduce the amount of waste that will go to disposal or treatment, cost of waste treatment, and use of raw material.

In Thailand, there are some industries which use the concept of waste exchange to reduce the amount of their waste but it is informal and nonsystematic. Some industries sell by-product, off-spec material or their waste to other companies. Some industries buy waste from scavengers or brokers. There are some wastes that have the potential of being used as a raw material or used in process but they are abandoned from potential users, scavengers or brokers.

Before waste exchange concept will be promoted in a formal way, the feasibility study should be conducted. In this study the Bangpoo Industrial Estate was used as case study.

Bangpoo Industrial Estate, one of industrial complexes of Industrial Estate Authority of Thailand (IEAT), is located on Km 34 of Sukhumvit Road Bangpoo Mai Praksa Subdistrict Maung District Samutprakarn. It comprises of 3,827 rais of General Industrial Zone (GIZ), 270 rais of Export Processing Zone (EPZ), 250 rais of Commercial Area, and 710 rais of the others. It is the first industrial estate with a joint investment between the Industrial Estate Authority of Thailand and Industrial Real Estate Development Co., Ltd. Now 303 factories operate in GIZ and 40 factories operate in EPZ.

At present, liquid waste generated from all industries in Bangpoo Industrial Estate are sent to a central wastewater treatment plant. General garbage is collected and disposed by municipality and hazardous waste will be kept in storage area in Bangpoo Industrial Estate prior to treatment or disposal by other agencies.

Amount of waste generated from all industries is increasing every year. In order to reduce treatment or disposal cost of waste, amount of waste before sending to central facilities should be reduced. Waste exchange concept can be used to meet this requirement.

One important factor that may be hinder this concept is cost of transportation. Since there are many industries located not too far from each other in Bangpoo Industrial Estate, there is a possibility to reduce this effect when waste is exchanged.

### Statement of the problem

As explained earlier, cost for treatment or disposal of waste will be increased every year due to increasing amount of waste and difficulties in finding the disposal or treatment area. Each industry have to find out the way to reduce his waste. From this reason reducing waste at source and recycling methodologies will be more acceptable in the future. This study will use Bangpoo Industrial Estate as a case study to find the possibility of waste exchange, one concept of recycling method, in this area.

Bangpoo Industrial Estate, comprising of 343 industries, has a problem of handling waste that are generated from all industries. Reduction of waste at sources, modified the process or recycling will be used more in the future. For companies which produce a small amount of waste, process modification, waste reduction at source or in-house recycle is not appropriate due to economic reason. Even companies who produce a large amount of waste may not find it possible to apply these methodologies. Concept of waste exchange will be the answer for this problems.

PCD have studied compositions of solid waste in Bangpoo Industrial Estate in June 1992 (PCD, 1992). This information concern the analysis of wastes generated from three different zones in Bangpoo Industrial Estate. The details of it is summarised in the Table 1-1.

Table 1-2 shows the quantities of wastes generated in Bangpoo Industrial Estate recorded by officers of Industrial Estate Authority of Thailand (IEAT) in this industrial estate.

It can be concluded from those two tables that there is a possibility to reuse wastes in this industrial estate. From the study of PCD (1992) appealed that there are some waste exchange in Bangkok and surrounding provinces but this is an informal system. To promote waste exchange and establish database of generated waste in Bangpoo Industrial Estate, a feasibility study of waste exchange for example demand and supply of wastes, relevant cost was conducted to find the possibility in more details.

Table 1-1 Percent compositions of solid waste in Bangpoo Industrial Estate

Compositions (% dry weight basis)	Percentage
1. Vegetable	-
2. Paper	24.38
3. Plastic	20.55
4. Rubber	9.59
5. Leather	8.49
6. Fabric, cloth	28.77
7. Wood	-
8. Glass	-
9. Metal	-
10. Stone, ceramic	-
11. Foam	8.22
12. Others	-

Source : PCD, 1992

Table 1-2 Quantities of generated waste from factories in Bangpoo Industrial Estate in 1996

Type of waste	Quantity (tonnes/day)
Recyclable waste	6.314
Non-recyclable waste	5.104
Hazardous waste	2.198
Total	13.616

Source : Industrial Estate Authority of Thailand, 1997

### Objectives

There are two objectives to meet in this thesis as follows:

1. To study the feasibility of waste exchange from industries in Bangpoo Industrial Estate.
2. To provide data base system of waste generated and waste exchange from industries in Bangpoo Industrial Estate.

### Scope of study

The area of this study will be limited only in feasibility of exchange industrial waste in GIZ and EPZ of Bangpoo Industrial Estate. Industrial waste is in form of solid or liquid. Waste gas and municipal waste that generated from office building such as paper, garbage are excluded from this study.

### Research Method

The followings describe the research methods of this study.

1. Review literature that related to project evaluation, project feasibility study, technologies of reuse waste, waste exchange, and other relevant topics.
2. Collect the data of quantities, quality and types of raw materials, finished products, and industrial wastes, number of employee, production processes, attitude of waste generators and potential users of waste regarding the concept of waste exchange by using questionnaire.
3. Collect secondary data regarding production processes, quantities and types of raw materials, finished products, and waste materials, number of employees from Pollution Control Department (PCD), Department of Industrial Work (DIW) and Industrial Estate Authority of Thailand (IEAT).
4. Interview sampled factories who have possibilities to exchange wastes.
5. Estimate quantities of wastes which cannot get data from using questionnaire, secondary data collection, and sampling interview but are possible to exchange among factories in Bangpoo Industrial Estate by using waste unit generation rate of relevant factory.
6. Store all collected and estimated data in Microsoft Access 97 file for further using.
7. Study constrains for exchange waste, demand and supply of waste, relevant cost of exchange waste such as logistics costs, capital costs.
8. Study feasibility of waste exchange by
  - 8.1. evaluate technical aspect of how potential users can use other wastes as raw materials.
  - 8.2. economical analysis of waste exchange by using benefit-cost analysis.
  - 8.3. financial analysis of waste exchange by consideration of profits contribution.
9. Study laws and regulations in Thailand that related waste exchange, compare them with laws and regulations of other countries like the United State of America.
10. Preliminary study the possibility of exchange wastes from factories in Bangpoo Industrial Estate with factories in other industrial estates.

*Expected benefits*

1. Use of this information for a feasibility study of establishment waste exchange centre in Bangpoo Industrial Estate.
2. Record of quantities, quality, and types of industrial waste in Bangpoo Industrial Estate for other planning and management waste projects in the future.
3. Reduced quantities of industrial waste to be treated or disposed in Bangpoo Industrial Estate by waste exchange.
4. Reduced cost of industrial waste treatment by central treatment facilities by waste exchange.
5. Reduced cost of production of factories in Bangpoo Industrial Estate by using waste from other factories as raw material.