

## CHAPTER III

### RESEARCH METHODOLOGY

This research comprises two part of work: (1) Interview of parties directly involved in Plastic Recycling Industry, and (2) Experimental.

#### **3.1 Interview of Parties Directly Involved in Plastic Recycling Industry**

To obtain a perspective on the local plastic recycling industry a number of field visit and interview were conducted as part of this study. Interviews were conducted with 8 waste dealers, 17 recycled resin producers, 11 plastic product fabricators, and 12 plastic waste grinders. Partial list of those interviewed is presented in Appendix A.

Prior to plant visit, two forms of questionnaire were prepared: one for the plastic waste processing factories and the other for plastic product fabricators. Copies of questionnaire can be found in the Appendix B

#### **3.2 Experimental**

##### **3.2.1 Materials**

Plastic used to make testing specimen may be classified into three groups: virgin resin, recycled plastic pellet, and ground waste plastic. Their code number, sources, description and date of collection are summerized in Tables 3.1, 3.2, and 3.3. Since permission is not granted by the plant owners to

reveal data of their products. Plant number is used instead of actual plant name.

### **3.2.2 Equipment**

#### **3.2.2.1 Differential Scanning Calorimetry**

910 Du Pont

#### **3.2.2.2 Equipment for making test specimen**

##### **a. Hydraulic Compression Moulding Machine**

Labtech, LP20, 20 MT

##### **b. Notching Machine**

Yasuda Seiki 189-PAL

##### **c. Grinding Machine**

Retech GmbH 5657 HAAN 1100 Watt,  
220 Volt, 50 Hz

#### **3.2.2.3 Mechanical properties Testing Machine**

##### **a. Universal Testing Machine**

Instron, 4206-006, 100 KN

##### **b. Universal Testing Machine**

Instron, 4301

##### **c. Impact Testing Machine**

Zwick/Materialprufung

##### **d. Impact Testing Machine**

Yasuda Seilei Seisakusho Ltd.



Table 3.1 Virgin resin's code number, source, description, and date of collection

Item	Description	Plant No.	Date of Collection
PE15-001	Blow molding TPI, G2855	5	27-11-92
PE25-001	Blow molding TPI, GG2745	5	27-11-92
PE35-001	Blow molding TPI, GM2860	5	27-11-92
PE110-001	Blow molding TPI, GM2860	5	25-08-93
PE19-001	Blow molding TPE, H6430B	9	17-06-93
PP15-001	Blow molding TPI, 2502H	5	27-11-92
PP25-001	Blow molding TPI, 1102H	5	27-11-92
PS15-001	Tape Cassette TPI, 101H	5	25-08-93
PS25-001	Tape Cassette TPI, offgrade	5	25-08-93
LDPE15-001	Film extrusion TPI, JJ4324	5	01-12-92
LDPE25-001	Injection molding TPI, ST1018	5	01-12-92

Table 3.2 Recycled Plastic pellet' s code number source description and date of collection

Item	Description	Plant No.	Date of Collection
<b>PE</b>	<b>Bottle</b>		
PE13-001	- mostly	3	17-07-92
PE13-002	drinking	3	18-03-92
PE14-001	water	4	29-07-92
PE14-002	bottles	4	16-04-93
PE14-003		4	11-05-93
PE43-001	- mixed	3	17-07-92
PE53-001	bottles	3	17-07-92
PE63-001		3	17-07-92
PE73-001		3	17-07-92
PE17-001		7	29-04-93
PE17-002		7	09-08-93
PE23-001	<b>Nonbottle</b>	3	17-07-92
PE12-001		2	03-06-92
PE22-001		2	03-06-92

Table 3.2 Continued

Item	Description	Plant No.	Date of Collection
<b><u>PP</u></b>			
PP13-001	<b>Nonbottle</b>	3	17-07-92
PP16-001		6	29-04-93
PP16-002		6	23-08-93
PP17-001		7	09-08-93
PP17-002		7	09-08-93
<b><u>PS</u></b>			
PS11-001	<b>Bottle</b>	1	03-06-92
PS21-001	<b>Bottle and nonbottle</b>	1	03-06-92
PS18-001	<b>Nonbottle</b>	8	25-05-93
PS18-002		8	11-08-93

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Table 3.3 Ground waste plastic's code number source description and date of collection

Item	Description	Plant No.	Date of Collection
<b><u>PE</u></b>			
PE19-101	- drinking	9	17-06-93
PE110-101	water bottles	10	25-08-93
PE13-102		3	18-03-92
PE14-102		4	16-04-93
PE14-103		4	11-05-93
PE17-101	- mixed	7	29-04-93
PE17-102	bottles	7	09-08-93
<b><u>PP</u></b>			
PP16-101	- nonbottle	6	29-04-93
PP16-102		6	23-08-93
PP17-101		7	09-08-93
PP17-102		7	09-08-93
<b><u>PS</u></b>			
PS18-101	- nonbottle	8	25-05-93
PS18-102		8	11-08-93

### 3.2.3 Experiment Procedure

#### 3.2.3.1 Differential Scanning Calorimetry

Analytical procedure was carried out following those in the accompanying manual. The operating condition was as follows:

Starting temperature	:	30 °C
Heating rate	:	10 °C/min
Final temperature	:	300 °C

#### 3.2.3.2 Hydraulic Compression Molding Machine

Procedure was carried out following those in the accompanying manual. Operating condition for each type of plastic was summerized in Table 3.4

#### 3.2.3.3 Mechanical Properties Testing

Tensiles trength and related properties were obtain in accordance with ASTM D 638M with specimen of type IV.(see Appendix C). Operating condition was as follows:

Crosshead Speed (mm/min)	:	50
Distance Between Grips (mm)	:	64
Guage Length (mm)	:	25
Temperature (°C)	:	25
Humidity (%)	:	50

The data of width and thickness of each tested specimens were shown in Appendix D

Impact strength was obtained in accordance with ASTM D 256; Izod Type ( see Appendix C ). Operating condition was as follows:

Pendulum Capacity (J) : 2.7

Depth of Specimen (mm) : 10.16

The data of width and thickness of each tested specimens were shown in Appendix E

Table 3.4 Operating condition of Hydraulic Compression Molding Machine for each type of plastic

Type of Plastic	Temperature (°C)	HeatingTime (min)	CoolingTime (min)	Pressure (psi)
HDPE	175	18	10	2000
PP	200	18	10	2000
PS	200	20	10	2000

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