Appendix II PROBLEMS OF PLASTICS MATERIALS PRICE

1. Elasticity Analysis of Demand for Plastics Products in Japan

On an assumption that the demand for plastics products depends on gross national product (GNP) and real price, an analysis was made using the following econometric model.

$$\log Q = \beta - e_p \log p + e_\theta \log \textcircled{\theta} + \alpha D$$

Where; Q: Amount of demand for plastics products

p: Real price

α, β: Constant

e_p: Price elasticity

e_θ: GNP elasticity

D: Dummy variable

The period from 1968 to 1976 is taken for this study including the year 1974 when a rise in the prices of plastics materials took place because of the Oil Crisis.
A general study was made on 37 items of Japanese plastics products, and 17 items were selected for study in detail. These screened items are those whose elasticity coefficient showed significant level.

Table AII-1-1 shows real GNP and implicit deflator in Japan. The attached Table AII-1-2 shows the sold amounts, sales amounts in value, nominal prices, and real prices. Table AII-1-3 shows price elasticity, and GNP elasticity. The achieved and estimated figures for each item are shown in the attached (Fig. AII-1-1). Concerning the above-mentioned 17 items, achieved figures coincide with the estimated figures, thereby showing a high applicability of the model. Table AII-1-4 shows the actual extent of demand decrease, as the prices of products go up by 5%, 10%, 15%, and 20%.

(1) Considering the fact that the effect of the bottle price portion on the product price is slight, the price elasticity of blow-molded bottles in the table seems to be too high. It seems that the restriction on the use of PVC bottles for food had some influence on the price elasticity. This price elasticity can be lowered approximately to the level of the soft film which is the lowest of all the subject products.

(2) The elasticity of soft film is very low. Some factors such as decreasing of film thickness caused by material price hike or replacement of LDPE by HDPE may have something to do with this fact. Without such factors, the effect of the product prices must have been much greater.

Table AII-1-1 Gross National Expenditure at Constant Prices and Implicit Deflators
(At Constant Price in 1970 Calendar Year)

	Gross National expenditure (billion yen)	Deflator
1968	57,486.1	89.7
1969	63,668.8	93.7
1970	70,634.5	100.1
1971	75,818.4	104.5
1972	82,697.9	109.6
1973	90,829.3	122.2
1974	89,647.1	147.5
1975	91,606.0	158.4
1976	97,540.0	168.6

Sources: 1968~1972:
Economic Statistics Monthly No. 346, National Income Statistics, 1976
The Statistics Department, the Bank of Japan

1973~1976:
Economic Statistics Monthly No. 365, National Income Statistics, 1977
The Statistics Department, the Bank of Japan

Table AII-1-2 Sales Amount and Value, and Nominal and Real Prices of Plastics Products in Japan

(1) Plastics products (Total)

	*** Plastics products (Total) ***			
	Quality (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	1,777,814	532,396,812	299	333
1969	2,064,532	635,984,304	308	328
1970	2,417,160	772,313,469	319	319
1971	2,624,816	837,162,300	318	305
1972	3,216,462	1,002,562,753	311	284
1973	3,784,863	1,322,000,643	349	285
1974	3,084,316	1,539,476,898	499	338
1975	2,772,027	1,361,285,500	491	310
1976	3,125,917	1,669,140,847	533	316

(2) Film (Total)

	*** Film (Total) ***			
	Quality (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	471,034	90,302,393	191	213
1969	551,033	107,488,514	195	208
1970	599,554	126,084,959	210	210
1971	669,839	144,330,318	215	206
1972	819,503	171,085,561	208	190
1973	906,832	223,250,089	246	201
1974	774,072	301,295,974	389	263
1975	701,661	246,634,093	351	221
1976	754,950	287,111,763	380	225

(3) Soft film (Total)

	*** Soft film (Total) ***			
	Quality (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	438,467	82,884,229	189	210
1969	508,531	97,916,460	192	205
1970	553,553	108,006,452	195	194
1971	614,077	125,271,723	204	195
1972	748,071	148,663,984	198	181
1973	850,299	202,803,815	238	195
1974	735,037	283,545,336	385	261
1975	665,795	231,355,950	347	219
1976	714,543	268,447,206	375	222

(4) Soft film (for wrapping)

*** Soft film (for wrapping) ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	250,120	28,825,514	115	128
1969	286,619	50,991,718	177	189
1970	305,111	55,397,652	181	181
1971	346,308	64,952,230	187	179
1972	430,300	76,626,770	178	162
1973	498,564	108,244,968	217	177
1974	416,707	150,195,655	360	244
1975	409,699	127,789,257	311	196
1976	438,896	150,339,512	342	203

(5) Soft film (for laminating)

*** Soft film (for laminating) ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	33,920	13,452,398	396	442
1969	36,330	14,332,732	394	421
1970	46,733	17,942,434	383	383
1971	54,608	21,094,139	386	369
1972	66,993	24,099,566	359	328
1973	77,983	31,519,277	404	330
1974	68,350	38,847,357	568	385
1975	65,826	33,828,040	513	324
1976	76,790	39,351,410	512	303

(6) Sheets

*** Sheets ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	50,986	9,964,525	195	217
1969	53,436	11,824,317	221	236
1970	94,095	20,425,228	217	216
1971	124,619	25,558,300	205	196
1972	153,632	31,359,413	204	186
1973	193,056	43,566,613	225	184
1974	153,817	52,152,242	339	229
1975	155,104	45,205,190	291	183
1976	184,620	59,091,255	320	189

(7) Pipes

*** Pipes ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	220,239	30,552,227	138	154
1969	254,762	34,096,747	133	142
1970	294,970	40,604,368	137	137
1971	332,166	39,798,965	119	114
1972	398,091	48,589,892	122	111
1973	453,848	65,398,431	144	117
1974	402,791	93,014,606	230	156
1975	344,085	73,393,524	213	134
1976	341,255	80,587,049	236	140

(8) Fittings

*** Fittings ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	20,487	7,301,216	356	397
1969	20,604	8,047,037	390	416
1970	18,734	6,800,795	363	362
1971	22,315	7,835,851	351	336
1972	27,826	9,841,966	353	322
1973	40,685	14,048,278	345	282
1974	28,342	16,659,585	587	398
1975	25,509	13,472,560	528	333
1976	34,530	17,936,828	519	308

(9) Parts for machines

*** Parts for machines ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	146,389	88,612,010	605	674
1969	183,296	110,323,264	601	642
1970	250,875	153,756,117	612	612
1971	258,604	165,734,953	640	613
1972	307,352	206,571,487	672	613
1973	383,937	279,517,913	728	595
1974	350,267	318,075,400	908	615
1975	302,245	279,302,000	924	583
1976	381,866	364,229,450	953	565

(10) Commodities

	*** COMMODITIES QUANTITY (TON)	VALUE (1000YEN)	*** NOMINAL UNIT PRICE (YEN/KG)	REAL UNIT PRICE (YEN/KG)
1968	178,976	68,828,290	384	428
1969	203,691	81,053,123	397	424
1970	230,050	103,353,307	449	448
1971	245,773	110,996,869	451	432
1972	293,165	120,386,897	410	374
1973	332,251	157,487,804	474	387
1974	265,373	178,782,102	673	456
1975	251,740	171,462,516	681	429
1976	278,596	199,150,136	714	423

(11) Bottles (Total)

	*** BOTTLES (TOTAL) QUANTITY (TON)	VALUE (1000YEN)	*** NOMINAL UNIT PRICE (YEN/KG)	REAL UNIT PRICE (YEN/KG)
1968	27,245	12,338,126	452	504
1969	31,550	14,057,729	445	475
1970	91,755	35,661,673	388	388
1971	115,579	45,145,830	390	373
1972	162,267	55,582,062	342	312
1973	227,622	77,780,740	341	279
1974	203,904	98,656,193	483	328
1975	148,505	76,288,041	513	324
1976	182,698	98,743,525	540	320

(12) Vacuum forming bottles

	*** VACUUM FOAMING BOTTLES QUANTITY (TON)	VALUE (1000YEN)	*** NOMINAL UNIT PRICE (YEN/KG)	REAL UNIT PRICE (YEN/KG)
1968	27,245	12,338,126	452	504
1969	31,550	14,057,729	445	475
1970	37,118	17,302,844	466	465
1971	48,838	22,550,964	461	441
1972	64,448	28,763,198	446	407
1973	72,523	35,404,512	488	399
1974	75,502	52,913,297	700	475
1975	62,229	42,056,654	675	426
1976	72,383	50,679,229	700	415

(13) Bottles (Others)

*** Bottles (Others) ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	0	0	0	0
1969	0	0	0	0
1970	54,637	18,358,829	336	335
1971	66,741	22,594,866	338	323
1972	97,819	26,818,864	274	250
1973	155,099	42,376,228	273	223
1974	128,402	45,742,896	356	241
1975	86,276	34,231,387	396	250
1976	110,315	48,064,296	435	258

(14) Rain gutter & auxiliarities

*** Rain gutter & auxiliarities ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	33,446	8,561,558	255	285
1969	39,901	10,081,552	252	269
1970	43,949	10,502,597	238	238
1971	43,357	9,855,702	227	217
1972	58,119	13,788,209	237	216
1973	67,076	17,140,366	255	209
1974	48,513	16,025,710	330	223
1975	34,205	14,093,769	412	260
1976	49,364	21,284,262	431	255

(15) Foaming products (Molding)

*** Foaming products (Molding) ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	13,761	6,725,555	488	544
1969	21,963	9,597,769	436	466
1970	26,163	12,549,837	479	479
1971	26,224	13,521,579	515	493
1972	39,878	19,682,752	493	450
1973	57,008	25,138,018	440	360
1974	54,147	30,531,023	563	382
1975	51,188	27,866,329	544	343
1976	57,581	34,246,966	594	352

(16) FRP (Total)

*** FRP (Total) ***

	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	22,726	16,865,178	742	827
1969	26,733	22,897,462	856	914
1970	32,701	25,652,423	784	783
1971	42,689	33,604,876	787	753
1972	90,937	55,381,526	609	555
1973	121,564	87,072,064	716	586
1974	84,527	80,126,148	947	642
1975	73,442	74,648,610	1,016	641
1976	79,515	85,802,501	1,079	640

(17) FRP (Boards)

*** FRP (Boards) ***

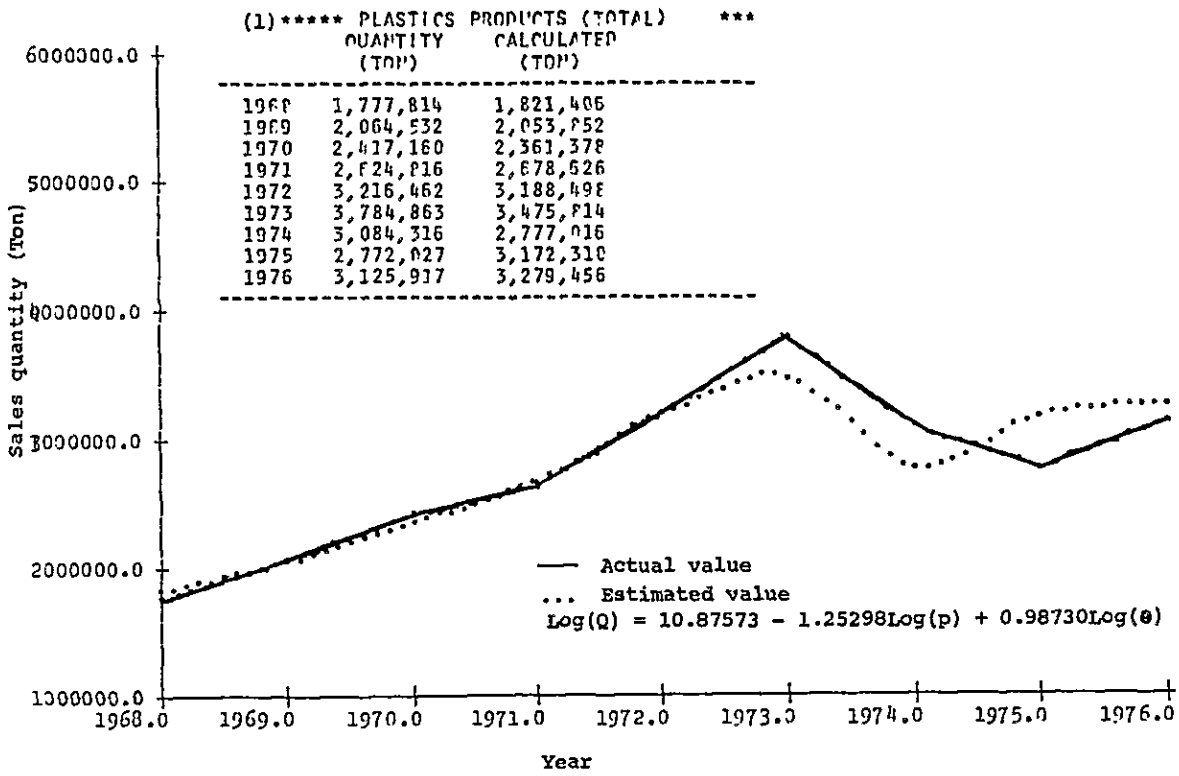
	Quantity (Ton)	Value (1000Yen)	Nominal unit price (Yen/Kg)	Real unit price (Yen/Kg)
1968	4,648	2,402,200	516	576
1969	5,401	2,597,368	480	513
1970	7,733	4,749,171	614	613
1971	7,194	4,717,119	655	627
1972	10,060	5,883,791	584	533
1973	14,483	9,815,055	677	554
1974	10,795	9,824,287	910	617
1975	14,032	11,131,764	793	500
1976	17,217	14,607,181	848	503

Source: Research and Statistics Department, Minister's Secretariant, Ministry of International Trade and Industry

Table AII-1-3 Price Elasticity, GNP Elasticity, and F-value of Plastics Products in Japan

	Elasticity		F-value		Total evaluation		F-value of dummy coefficient
	Price elasticity	GNP elasticity	Price elasticity	GNP elasticity	Correlation coefficient	F-value	
(1) Plastics products (total)	1.25298	0.98730	6.01437*	31.73477***	0.95343	29.980***	
(2) Film (total)	0.58139	1.09458	2.52661°	35.32254***	0.92460	17.674***	
(3) Flexible film (total)	0.41942	1.12589	1.98503°	41.67502***	0.93525	20.943***	
(4) Flexible film (packaging)	(0.18206)	1.31433	1.26352	73.64212***	0.97911	38.641***	5.05195+
(5) Flexible film (laminate)	1.00357	1.07404	1.87720°	5.45554+	0.98269	46.891***	1.53275
(6) Sheet	0.94500	2.34295	2.43420°	50.28176***	0.97386	55.134***	
(7) Pipe	0.55502	0.97314	2.86926°	18.60593***	0.90731	13.970**	
(8) Fitting	(0.73098)	0.77330	1.51075	3.28330°	0.84494	7.486*	
(9) Machine parts	0.49556	1.62866	0.18918+	25.96281***	0.98720	63.880***	7.65521*
(10) Household wares	1.07852	0.82521	6.88208*	32.98272***	0.94201	23.639***	
(11) Container (total)	2.72346	(1.33479)	7.79928*	1.55933	0.98157	43.976***	1.08854
(12) Container (blow molded container)	(0.81712)	1.84906	1.49297	46.17562***	0.98515	54.860***	4.81123+
(13) Container (others)	2.07834	(0.22877)	7.36574+	0.05086	0.93674	14.324*	
(14) Building materials (rain gutter and fitting)	1.50074	(0.20892)	7.32844*	0.38540	0.82494	6.390*	
(15) Foamed products (molded)	0.74892	2.12384	2.53334	23.77731***	0.98693	112.523***	
(16) FRP (total)	2.12695	1.42439	14.58713***	7.75301*	0.97821	66.610***	
(17) FRP (sheet)	0.61371	2.33859	2.08602°	123.56773***	0.97994	72.529***	

Notes: *** 0.6% (Significance level) + 10.0% (Significance level)
** 1.0% (") ° 25.0% (")
* 5.0% (")



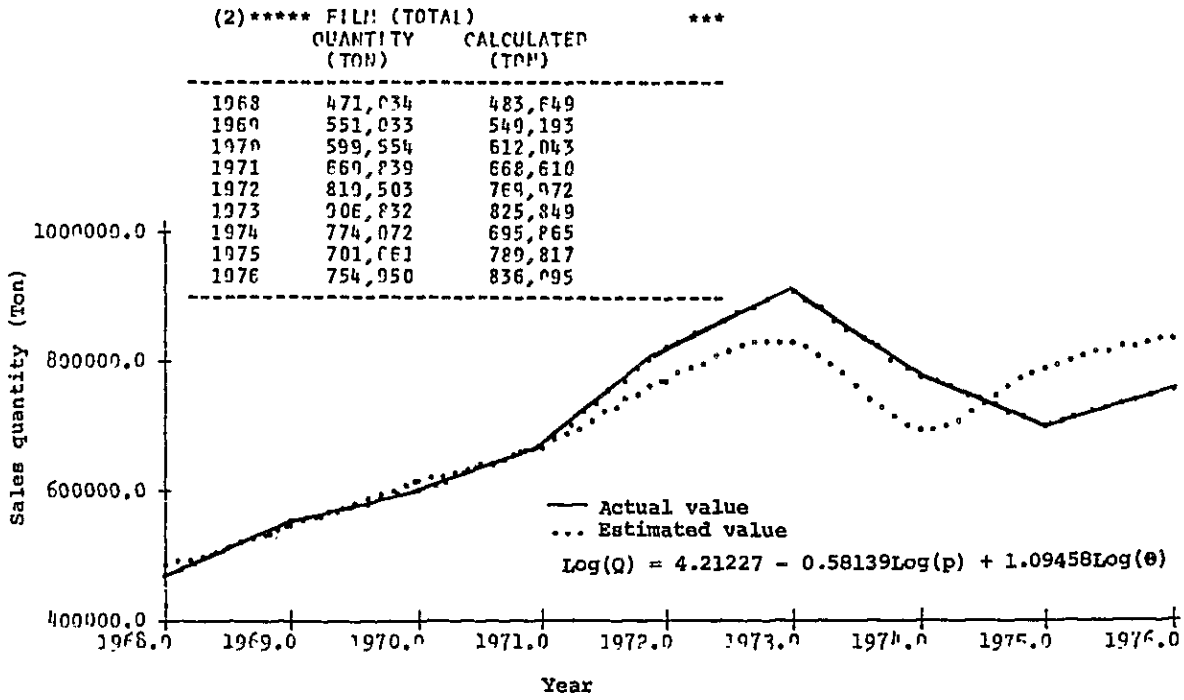
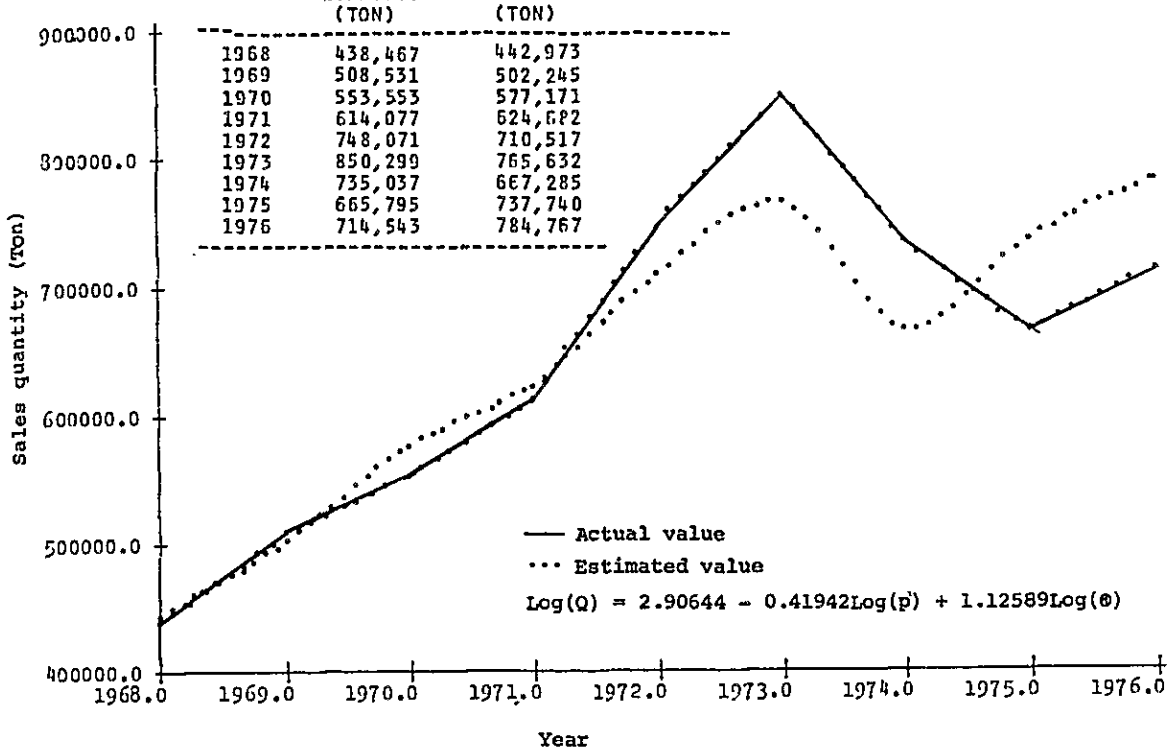


Fig. AII-1-1 Sales Amount and Calculation Results of Plastics Products in Japan

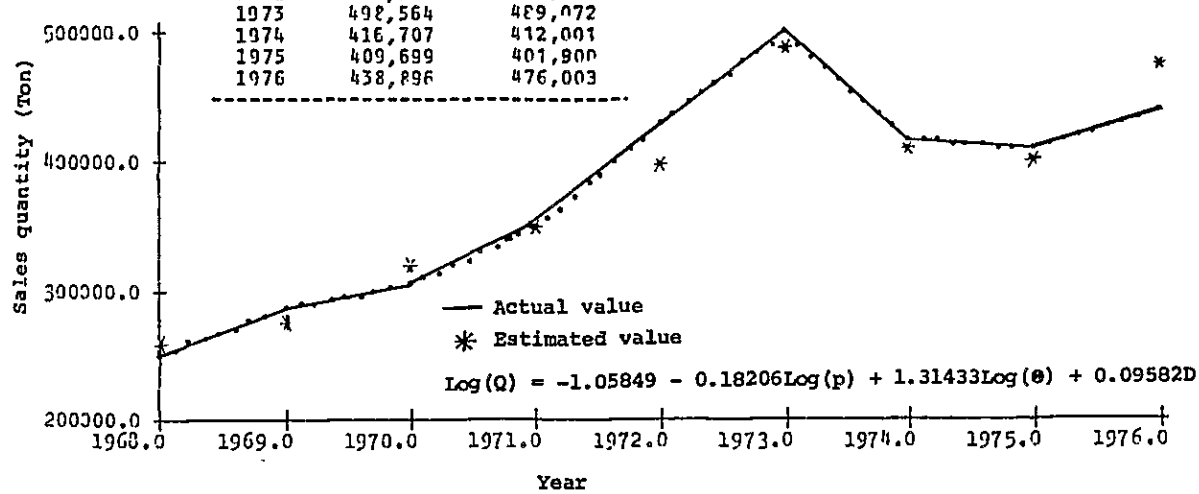
(3)***** SOFT FILM (TOTAL) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	438,467	442,973
1969	508,531	502,245
1970	553,553	577,171
1971	614,077	624,682
1972	748,071	710,517
1973	850,299	765,632
1974	735,037	667,285
1975	665,795	737,740
1976	714,543	784,767



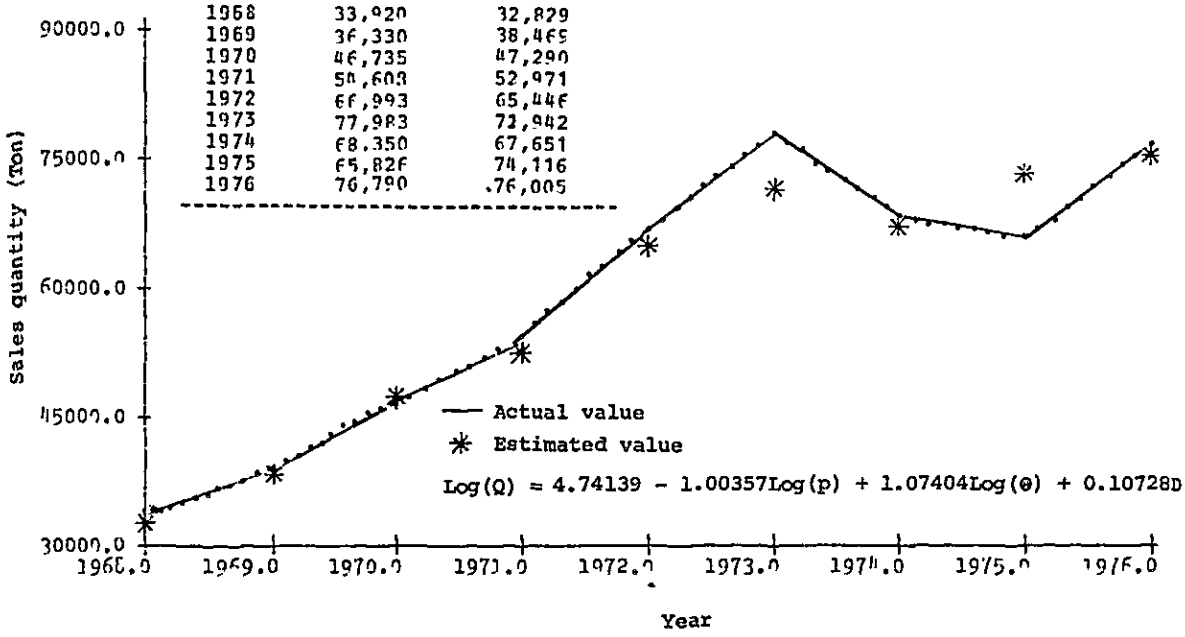
(4) ***** SOFT FILM (FOR WRAPPING) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	250,120	258,392
1969	286,619	275,279
1970	305,111	318,021
1971	346,308	349,752
1972	430,300	399,232
1973	498,564	489,072
1974	416,707	412,001
1975	409,699	401,800
1976	438,896	476,003



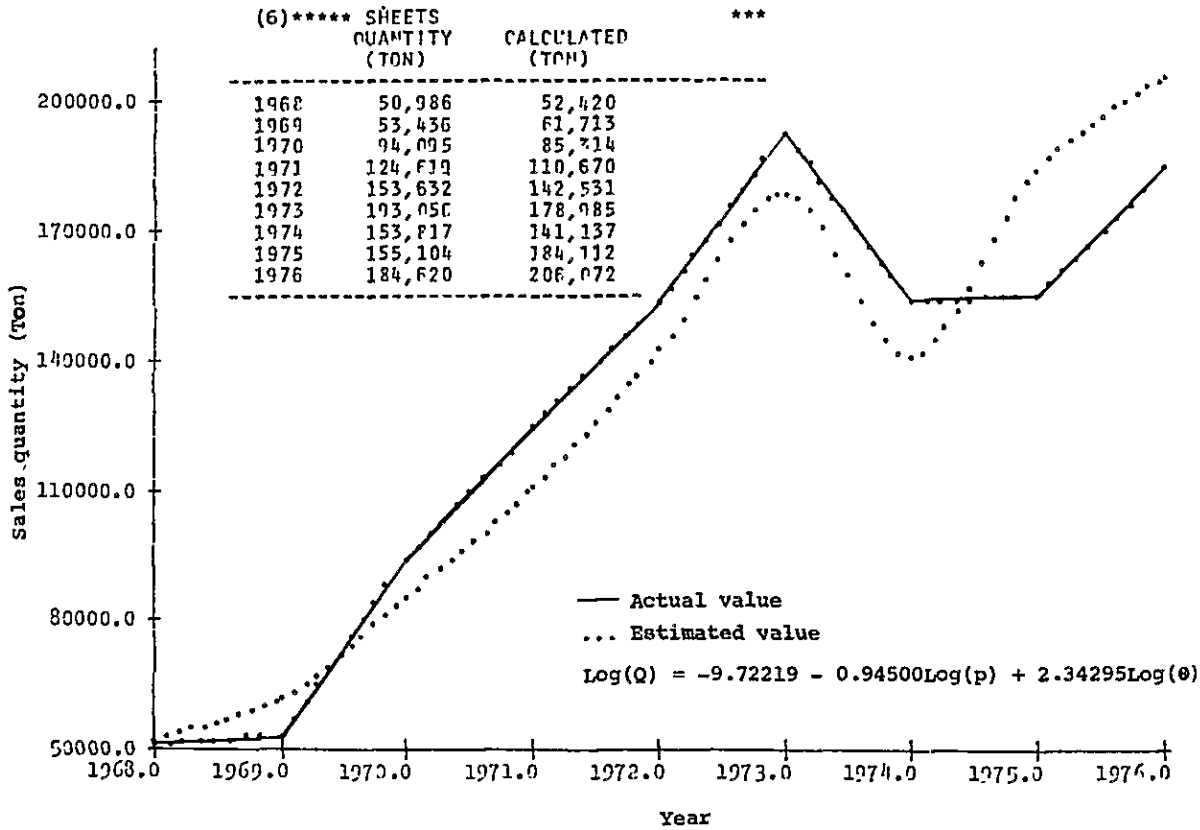
(5)***** SOFT FILM (FOR LAMINATING) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	33,920	32,829
1969	36,330	38,469
1970	46,735	47,290
1971	58,603	52,971
1972	66,993	65,446
1973	77,983	71,942
1974	68,350	67,651
1975	65,826	74,116
1976	76,790	76,005



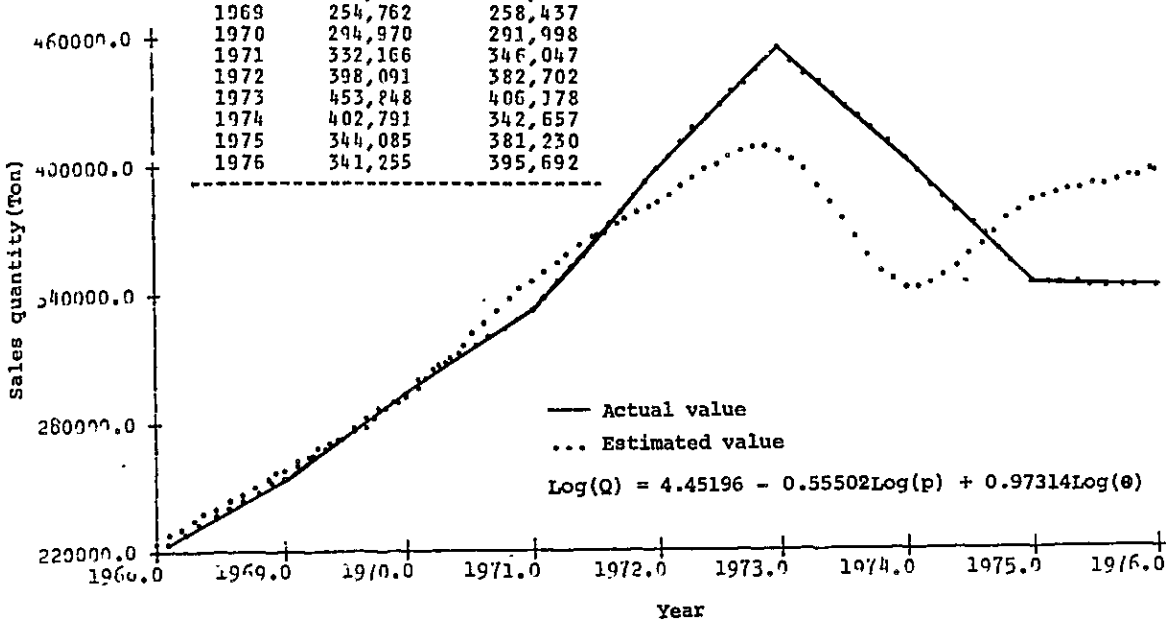
(6)***** SHEETS ***

	QUANTITY (TON)	CALCULATED (TON)
1968	50,986	52,420
1969	53,436	61,713
1970	94,095	85,714
1971	124,819	110,670
1972	153,632	142,531
1973	193,050	178,985
1974	153,817	141,137
1975	155,104	184,112
1976	184,620	206,072



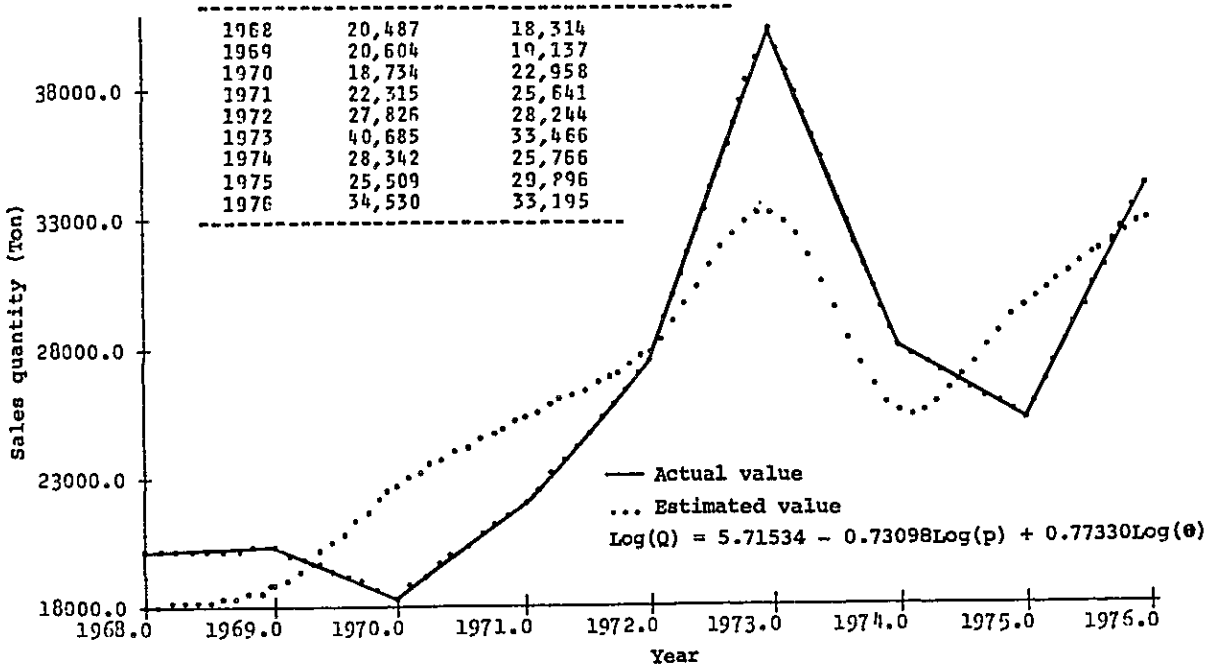
(7)***** PIPES *****

	QUANTITY (TON)	CALCULATED (TON)
1968	220,239	223,885
1969	254,762	258,437
1970	294,970	291,998
1971	332,166	346,047
1972	398,091	382,702
1973	453,848	406,178
1974	402,791	342,657
1975	344,085	381,230
1976	341,255	395,692



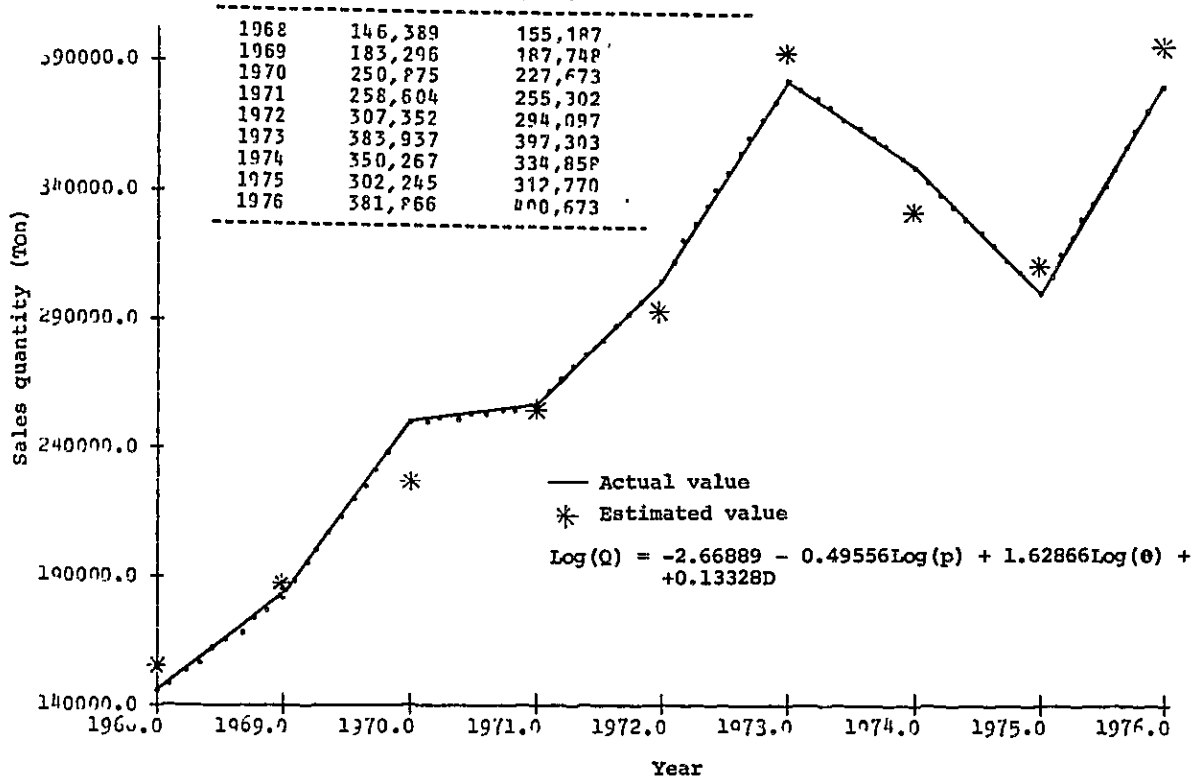
(8)***** FITTINGS *****

	QUANTITY (TON)	CALCULATED (TON)
1968	20,487	18,314
1969	20,604	19,137
1970	18,734	22,958
1971	22,315	25,641
1972	27,826	28,244
1973	40,685	33,466
1974	28,342	25,766
1975	25,509	29,896
1976	34,530	33,195



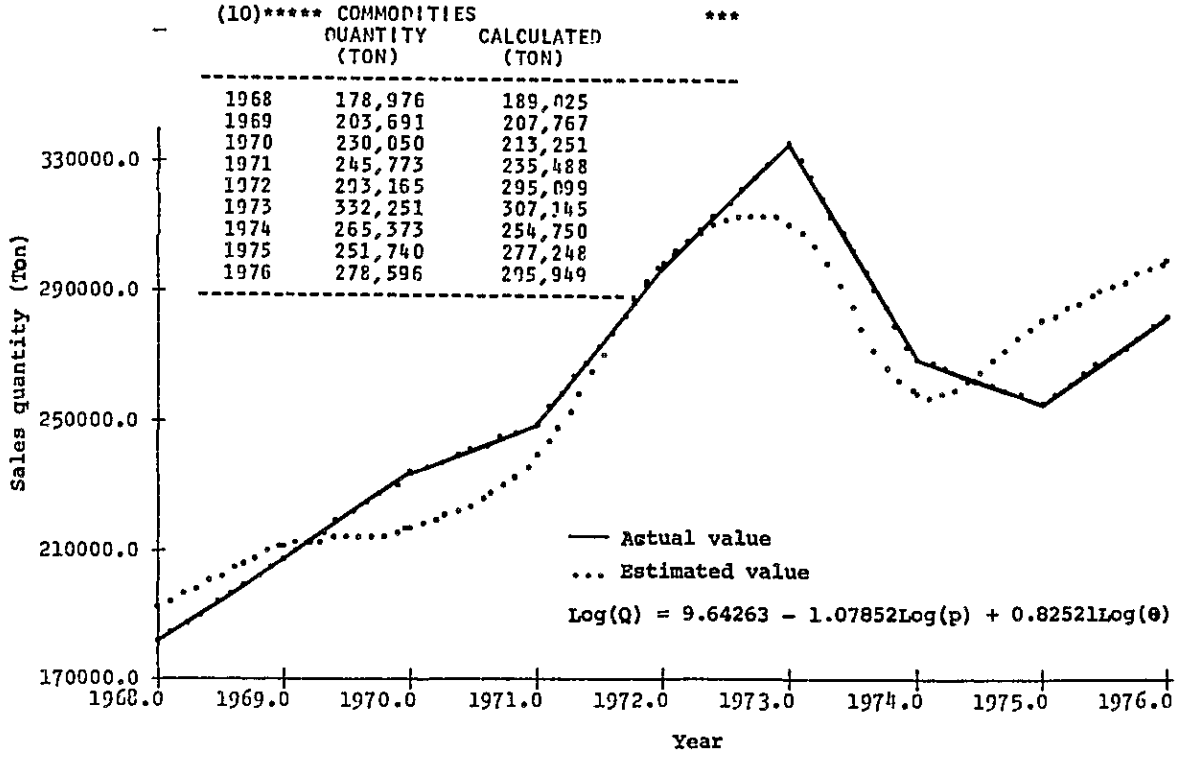
(9)***** PARTS FOR MACHINES *****

	QUANTITY (TON)	CALCULATED (TON)
1968	146,389	155,187
1969	183,296	187,748
1970	250,875	227,673
1971	258,604	255,302
1972	307,352	294,097
1973	383,937	397,303
1974	350,267	334,858
1975	302,245	312,770
1976	381,866	400,673



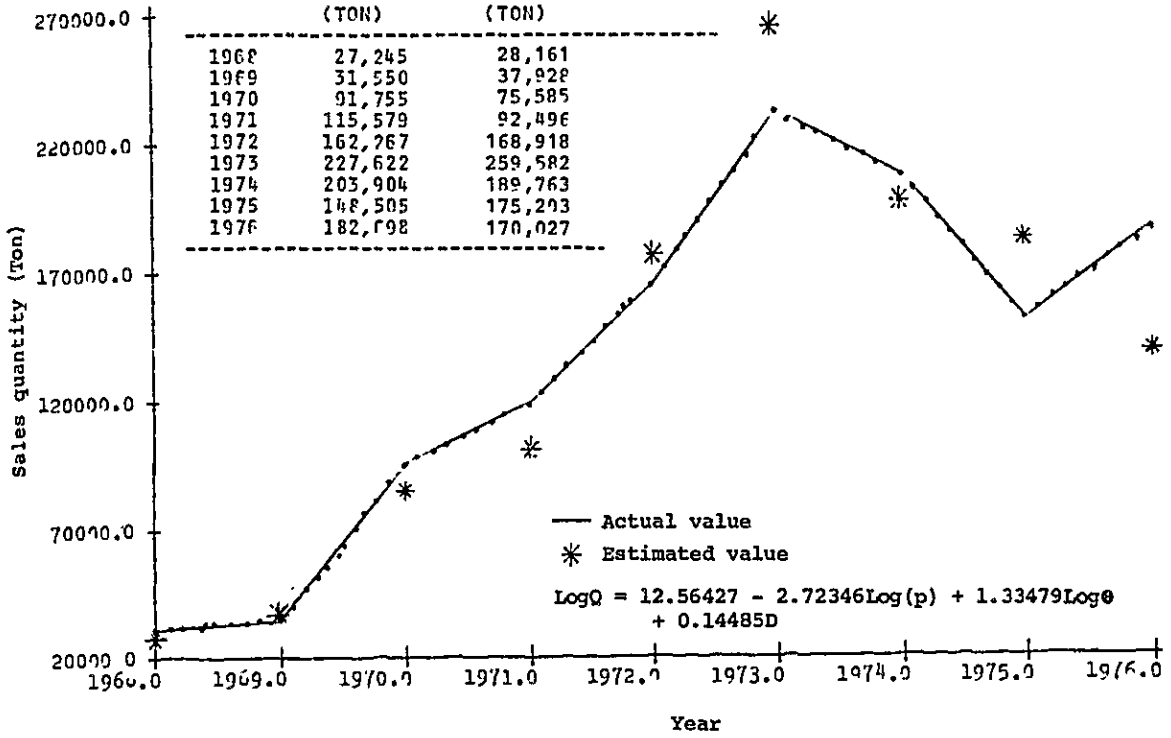
(10)***** COMMODITIES *****

	QUANTITY (TON)	CALCULATED (TON)
1968	178,976	189,025
1969	203,691	207,767
1970	230,050	213,251
1971	245,773	235,488
1972	293,165	295,099
1973	332,251	307,145
1974	265,373	254,750
1975	251,740	277,248
1976	278,596	295,949



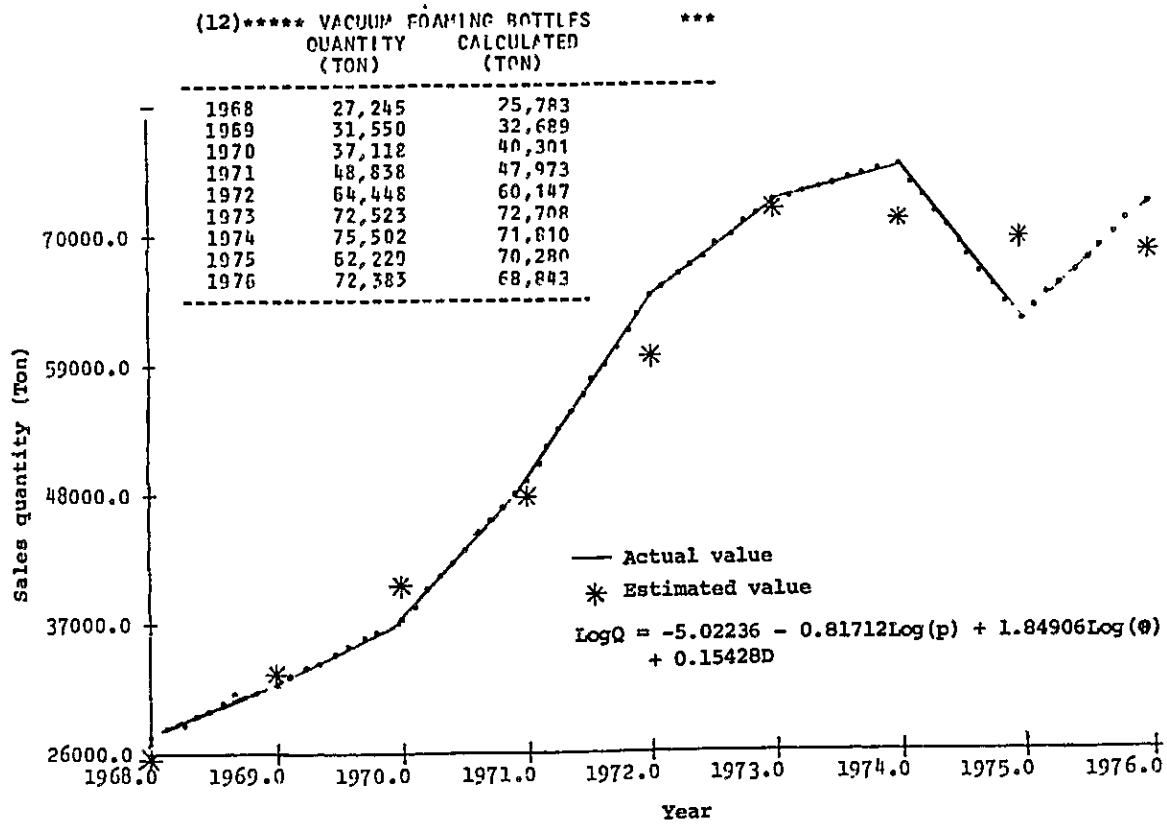
(11)*** BOTTLES (TOTAL) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	27,245	28,161
1969	31,550	37,928
1970	91,755	75,585
1971	115,579	92,496
1972	162,767	168,918
1973	227,622	259,582
1974	203,904	189,763
1975	148,505	175,203
1976	182,698	170,027



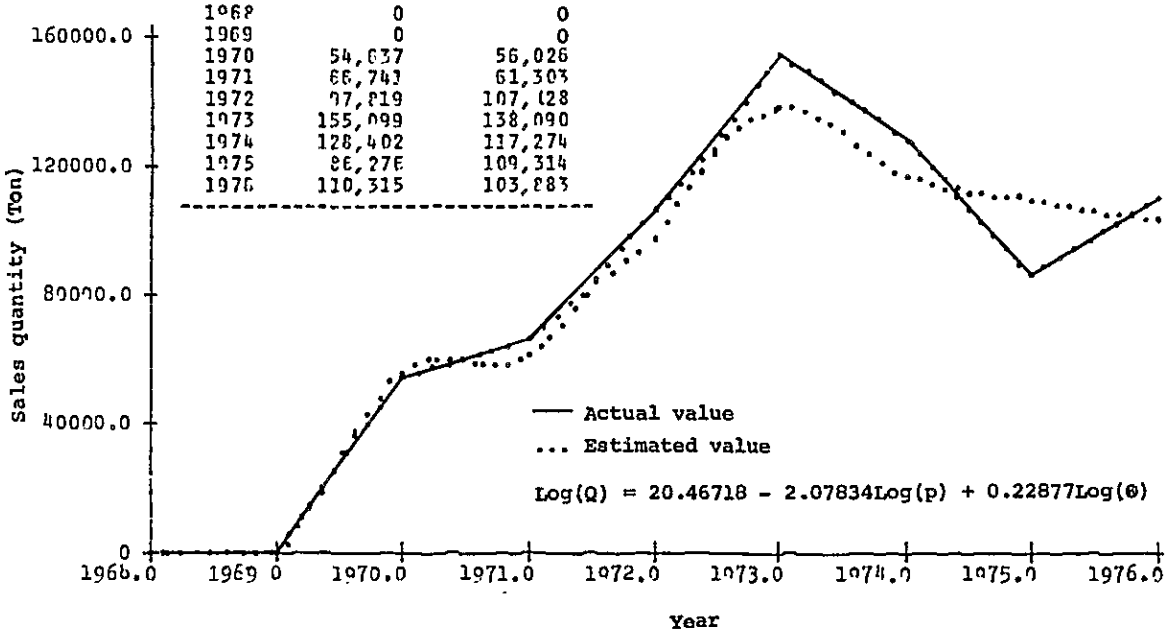
(12)***** VACUUM FOAMING BOTTLES ***

	QUANTITY (TON)	CALCULATED (TON)
1968	27,245	25,783
1969	31,550	32,689
1970	37,118	40,301
1971	48,838	47,973
1972	64,448	60,147
1973	72,523	72,708
1974	75,502	71,810
1975	62,220	70,280
1976	72,383	68,843



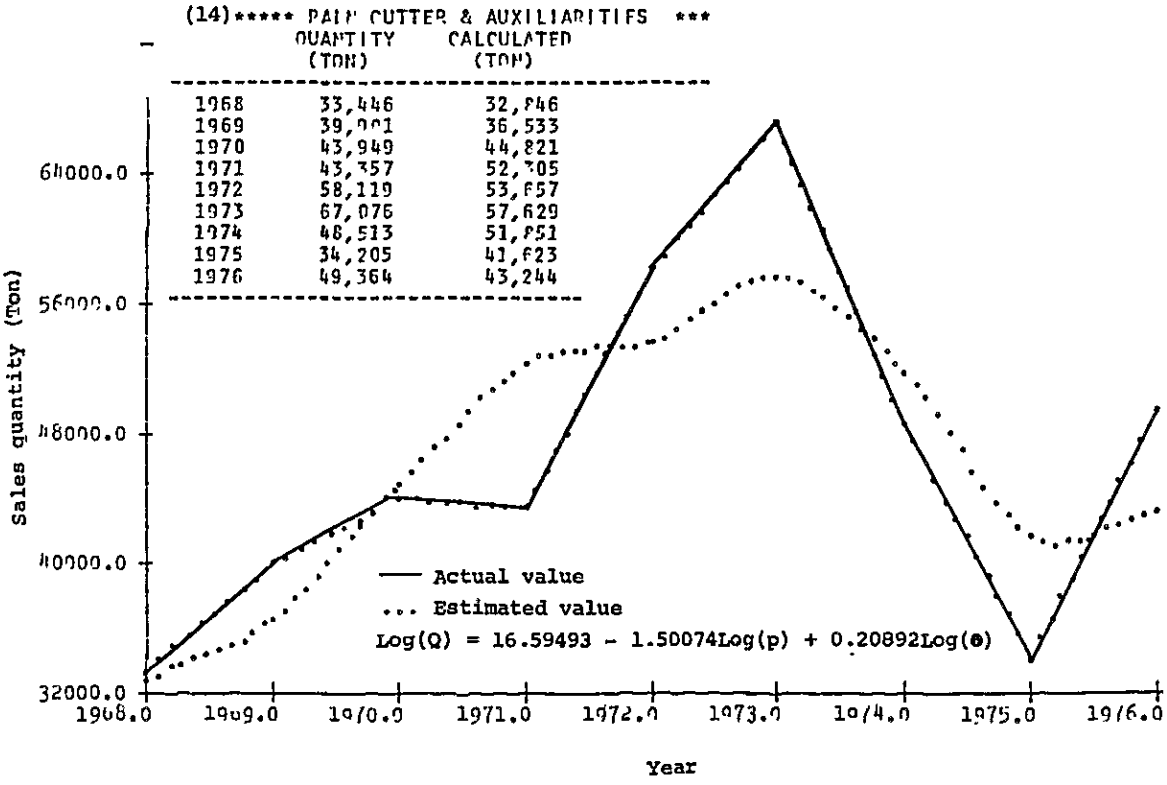
(13)*** BOTTLES (OTHERS) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	0	0
1969	0	0
1970	54,037	56,026
1971	66,743	61,303
1972	97,819	107,128
1973	155,099	138,090
1974	128,402	117,274
1975	86,276	109,314
1976	110,315	103,883



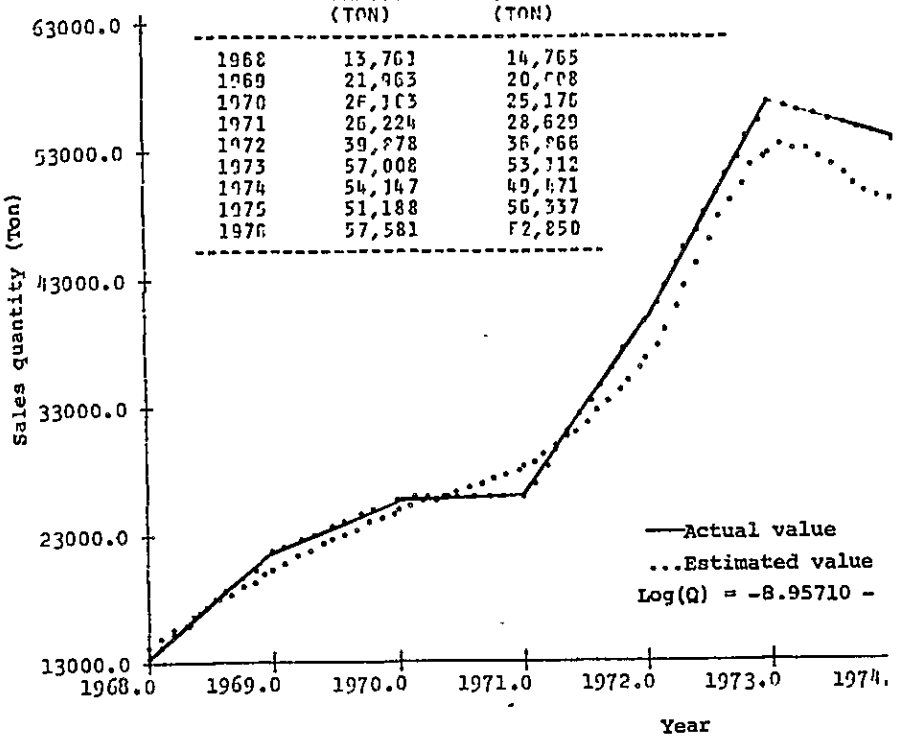
(14)***** PAIL CUTTER & AUXILIARITIES ***

	QUANTITY (TON)	CALCULATED (TON)
1968	33,446	32,846
1969	39,001	36,533
1970	43,949	44,821
1971	43,357	52,705
1972	58,119	53,857
1973	67,076	57,629
1974	48,513	51,851
1975	34,205	41,623
1976	49,364	43,244



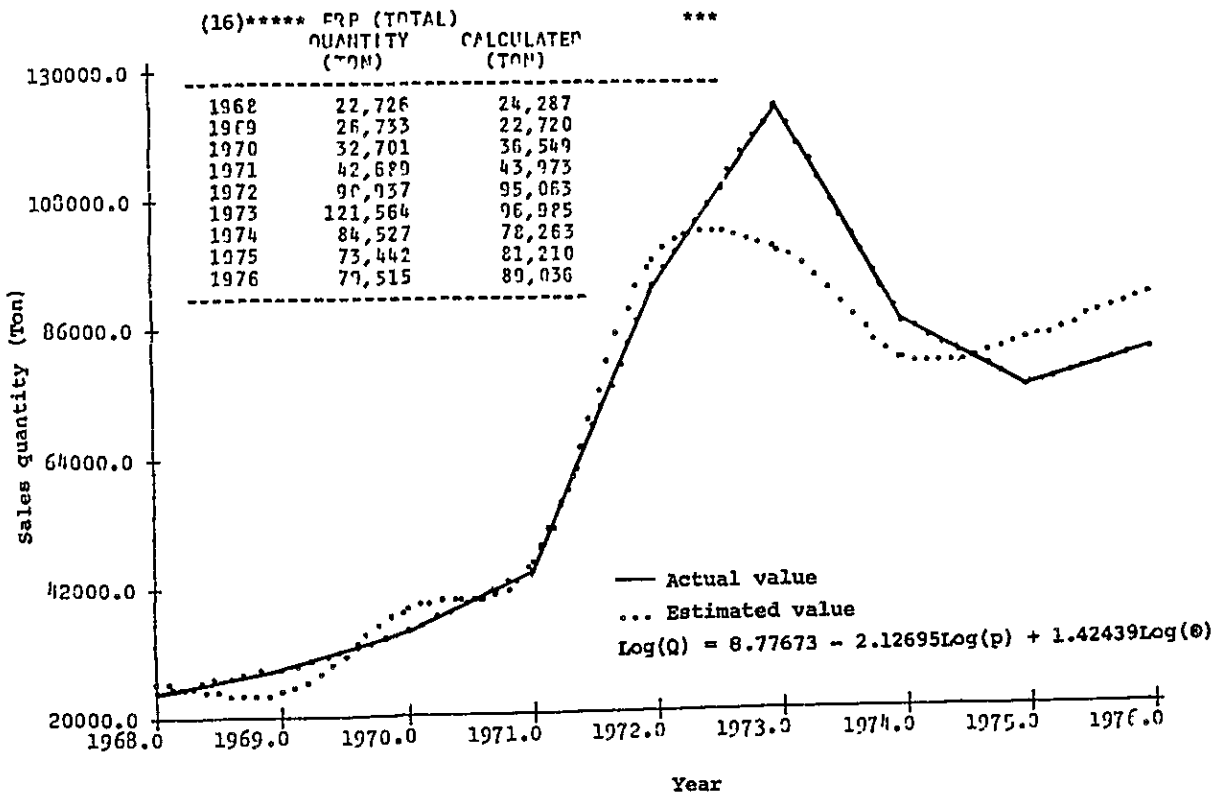
(15)***** FOAMING PRODUCTS (MOLDING) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	13,761	14,765
1969	21,963	20,[illegible]08
1970	2[illegible],103	25,170
1971	26,224	28,629
1972	39,[illegible]78	36,[illegible]66
1973	57,008	53,[illegible]12
1974	54,147	49,[illegible]71
1975	51,188	56,337
1976	57,581	[illegible]2,850



(16)***** FRP (TOTAL) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	22,726	24,287
1969	26,733	22,720
1970	32,701	36,549
1971	42,689	43,973
1972	90,937	95,063
1973	121,564	96,985
1974	84,527	78,263
1975	73,442	81,210
1976	79,515	89,036



(17)***** FRP (BOARDS) ***

	QUANTITY (TON)	CALCULATED (TON)
1968	4,648	4,360
1969	5,401	5,944
1970	7,733	6,792
1971	7,[illegible]04	7,905
1972	10,060	10,698
1973	14,483	13,011
1974	10,795	11,819
1975	14,032	14,198
1976	17,217	16,31[illegible]

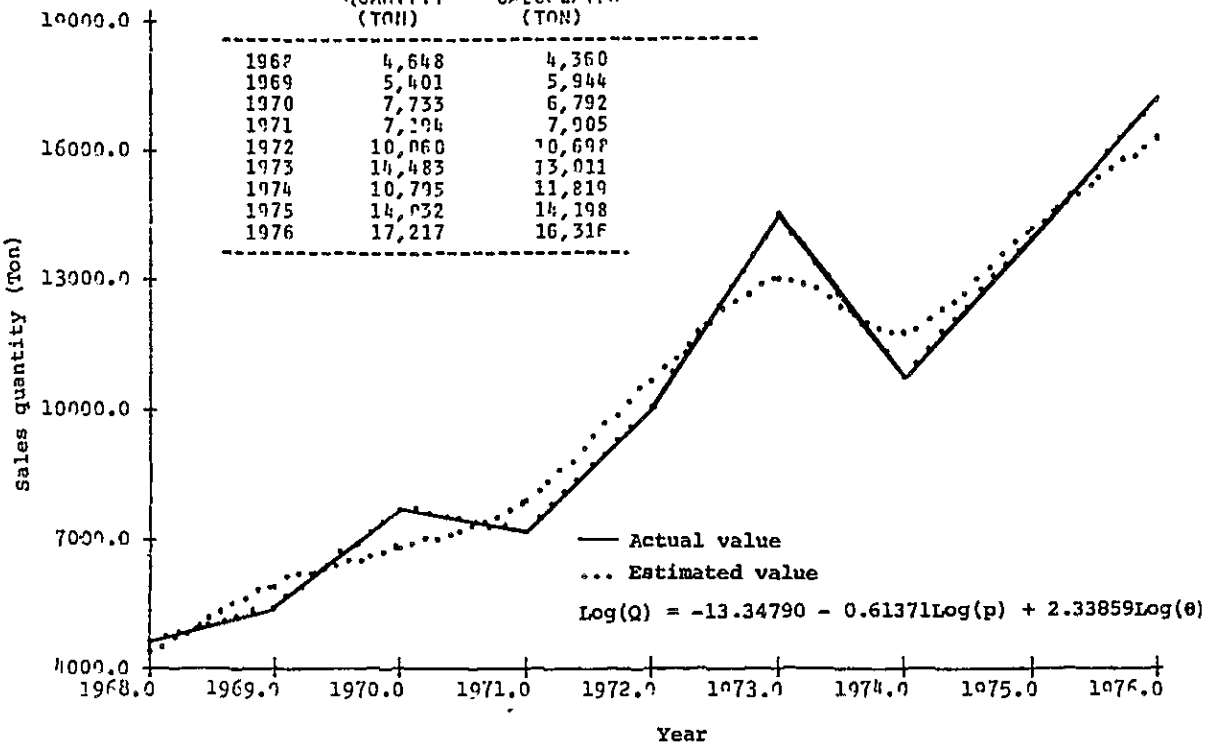


Table AII-1-4 Influence of Price of Plastics Products on Their Market Scale in Japan

		Price Elasticity	Example	Major Competitive Materials	Market demand decrease rate aginst product price increase rate (%)			
					Product price increase rate			
					5%	10%	15%	20%
16	FRP (total)	2.127	Boat, tank, tray	Steel	9	18	26	32
13	Container (other than blow molded container)	2.078	Crate	Wood	10	18	25	32
14	Building Material (rain gutter)	1.501		Zinc	7	13	19	24
10	Household Wares	1.079	Pail etc.	Celamic, metal, wood	5	10	14	18
5	Flexible Film (laminate)	1.004	Packaging of cakes	Water-proof paper, cellophane	5	9	13	17
6	Sheet	0.945	Water-stop board	Rubber	5	9	12	16
12	Container (blow molded container)	(0.817)	Shampoo bottle	Glass	4	7	11	14
15	Foamed Products (molded)	0.749	Fish box packaging	Paper, wood	4	7	10	13
8	Fitting	0.731		Metal	4	7	10	12
17	FRP (sheet)	0.614	Corrugated sheet	PVC, copper	3	6	8	11
7	Pipe	0.555		Copper tube	3	5	7	10
9	Machine Parts	0.496		Steel, alminium	2	5	7	9
4	Flexible Film (packaging)	0.182	LDPE film	Paper	1	2	3	3

2. Production Cost Estimation of Plastics Products in Iran

2-1 Estimation of production cost of major plastics products in Iran

(1) Items to account standard production cost

Standard production costs of plastics products which were produced at the following plastic processing plants as examples:

1) Beer bottle crates manufacturing plant

2) In-plant bottle making and filling plant (2-liter bottle)

3) PVC pipe manufacturing plant

4) Heavy-duty bags

5) PP woven bag manufacturing plant

6) Vinyl asbestos tile manufacturing plant

7) PVC-coated electric wire manufacturing plant

(2) Basic conditions for production cost estimation at each factory

Table AII-2-1 shows basic conditions for the estimation of production cost of plastics products in Iran.

(3) Calculation results

The calculation results of production cost in each plant are as follows:

(a) Beer crate

a) Production basic figure

1) Specification of the product

Size: 430 x 360 x 720 mm

Weight: 1.9 kg

2) Main manufacturing equipment of the plant

Injection molding machine 90/630 1 set

Table AII-2-1 Basic Condition for Production Cost Estimation of Plastics Products

1)	Initial investment	
	(a) Building cost	Steel structure, single floor
	(b) Equipment cost	FOB price in Japan (1977)
	(c) Erection cost	160% to 200% on equipment cost (b) (including transportation cost)
	(d) Contingency	5% on the equipment cost (b)
	(e) Import duty	50% on the equipment cost (b)
	(*) Investment for plant	(a) + (b) + (c) + (d) + (e)
	(f) Interest during construction	10%/year (interest rate) x 0.5 (half of year, construction term) on the investment for plant(*)
	(g) Pre-operational expenses	Material cost for 0.5 months
	(h) Working capital	Material cost for 6 months
2)	Utilities cost	
	(1) Power	US¢2.14/KWH
	(2) Steam	US$5/ton
3)	Fixed cost	
	(A) Plant labor cost	US$2,080/year/person
	(B) Plant overhead	100% on (A)
	(C) Maintenance & supplies	3.5% on the investment for plant(*)
	(D) Insurance & tax	1% on the present value of the investment for plant(*)
	(E) Depreciation	Salvage value 5%, period 8 years on the fixed capital
4)	Interests	
	(a) Interest on fixed capital	10% (interest rate/year) on the present value on the investment for plant(*)
	(b) Interest on working capital	10% on the working capital (h)
5)	Operating conditions	
	(a) Operating hours	7,200 hour/year
	(b) Operational rate	0.833
	(c) Yield	0.9
	(d) Shift	4 groups, 3 shifts
6)	ROI and sales expenses	Not included

3) Molding cycle

50 sec /pc

4) Operation schedule of the plant

25 days per month

Injection molding	24 hours/day
Printing	6 hours/day

5) Operational rate

0.833

6) Yield rate

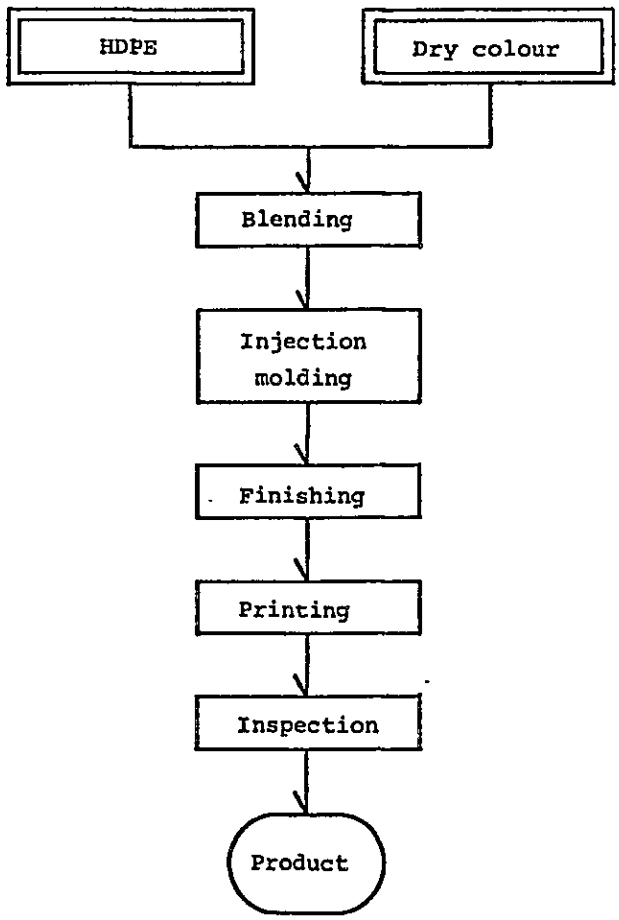
0.9

7) Annual production

388,800,000 pcs/year

b) Production process

1) Flow chart



2) Raw material composition

HDPE:	1.05 kg/kg
Pigment:	0.005 kg/kg

3) Utility

Electricity:	160 KWH

c) Land for factory erection

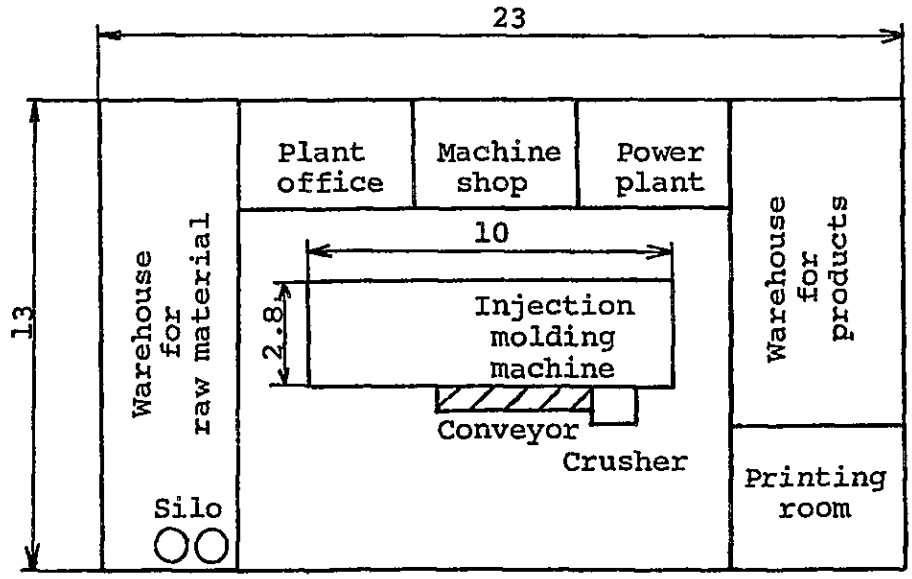
1) Land area

Building

Plant office:	15 m^2
Warehouse for raw material:	52 m^2
Warehouse for products:	45 m^2
Plant area:	187 m^2
TOTAL:	299 m^2
Site:	1,097 m^2 (Incld. 200 m^2 field storage area)

2) Layout of building

(Unit: m)



d) Operational conditions

1) Raw materials

	(US$/KG)	(US$/PC)
HDPE	0.630	1.40
Pigment	5.84	0.067

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 13 persons/day

e) Equipment cost estimation (Japanese basis in January, 1977)

	Name of apparatus	Model and spec.	Manufacturer	Unit	Price (Unit: ¥1,000)
(1)	Main equipment				
	Injection molding machine	IS-630C	Toshiba Machine Co., Ltd.	1	51,500
	Full automatic mixing and coloring equipment	JCR-20F3C	Matsui Seisakusho Co., Ltd.	1	1,300
	Chilling unit	MKC-1000W	Matsui Seisakusho Co., Ltd.	1	1,955
	Material feeding unit	1.2 ton Silo with blower	Matsui Seisakusho Co., Ltd.	2	3,000
	Conveyor			1	25
	Automatic delivery machine	MHY-1700W	Star Seiki Co., Ltd.	1	3,350
	Crusher	Das 72	Daiko Seiki Co., Ltd.	1	3,300
	Fork lift	1 ton			3,000
	Cooling tower	1			600
	TOTAL				68,030
(2)	Inspection equipment				
	A-style container compression testing machine		Toyo Seikiseisaku-sho Co., Ltd.	1	3,110
	Amoler type universal tester		Toyo Seikiseisaku-sho Co., Ltd.	1	3,900
	Plastic cutting instrument		Toyo Seikiseisaku-sho Co., Ltd.	1	630
	Micrometer and slide calipers			1	200
	Spares			1	784
	TOTAL				8,624

f) Production cost

BEER CRATE PLANT CYCLE: 50SEC/PC (1.9KG/PC)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

INJECTION MOLDING MACHINE; 90/630 1SET

	ANNUAL COST (US$1000)	UNIT COST (US$/PC)	COMPOSITION (PER CENT)
MATERIAL COST	570.2	1.47	65.3
UTILITIES COST	24.7	0.06	2.8
VARIABLE COST	594.9	1.53	68.2
LABOUR	27.0	0.07	3.1
OVERHEAD	27.0	0.07	3.1
MAINT. & SUPPLY	30.1	0.08	3.5
INSURANCE & TAX	8.6	0.02	1.0
DEPRECIATION	110.2	0.28	12.6
FIXED COST	203.0	0.52	23.3
INTEREST (LONG)	46.4	0.12	5.3
INTEREST (SHORT)	28.5	0.07	3.3
PRODUCTION COST	872.8	2.24	100.0

CAPACITY (PCS/Y)	432000.00
YIELD RATE	0.90
ANNUAL PROD. (PCS/Y)	388799.94
BUILDING COST	83.10
EQUIPMENT COST	328.60
ERECTION COST	268.66
CONTINGENCY	16.43
IMPORT DUTY	164.30
INVEST. FOR PLANT	861.09
INTEREST D. CONST.	43.05
PRE-OPER. EXRENSES	23.76
FIXED CAPITAL	927.91
WORKING CAPITAL	285.12

(b) 2 ℓ bottle

a) Production basic figure

1) Specification of the product

Size:

Weight: 100 g

2) Main manufactruing equipment of the plant

Blow molding machine ø 65 mm	2 sets
Filling machine	1 set
Capping machine	1 set
Labelling machine	1 set

3) Molding cycle

20 sec/1 shot (2 pcs/ 1 shot)

4) Operation schedule of the plant

25 days/month

Blow molding	24 hours/day
Filling section	8 hours/day

5) Operational rate

0.833

6) Yield rate

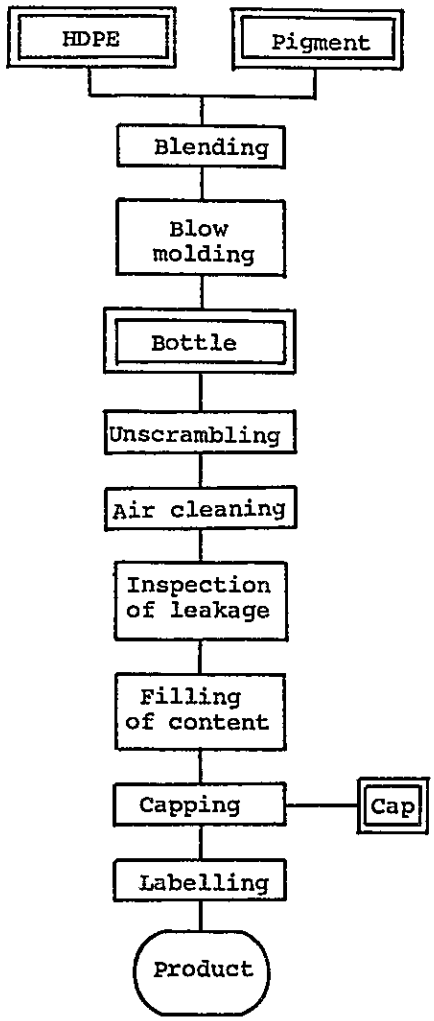
0.9

7) Annual production

1,944,000 pcs/year

b) Production process

1) Flow chart



2) Raw material composition

HDPE:	1.05 kg/kg
Pigment:	0.005 kg/kg

3) Utility

Electricity:	100 KWH

c) Land for factory erection

1) Land area

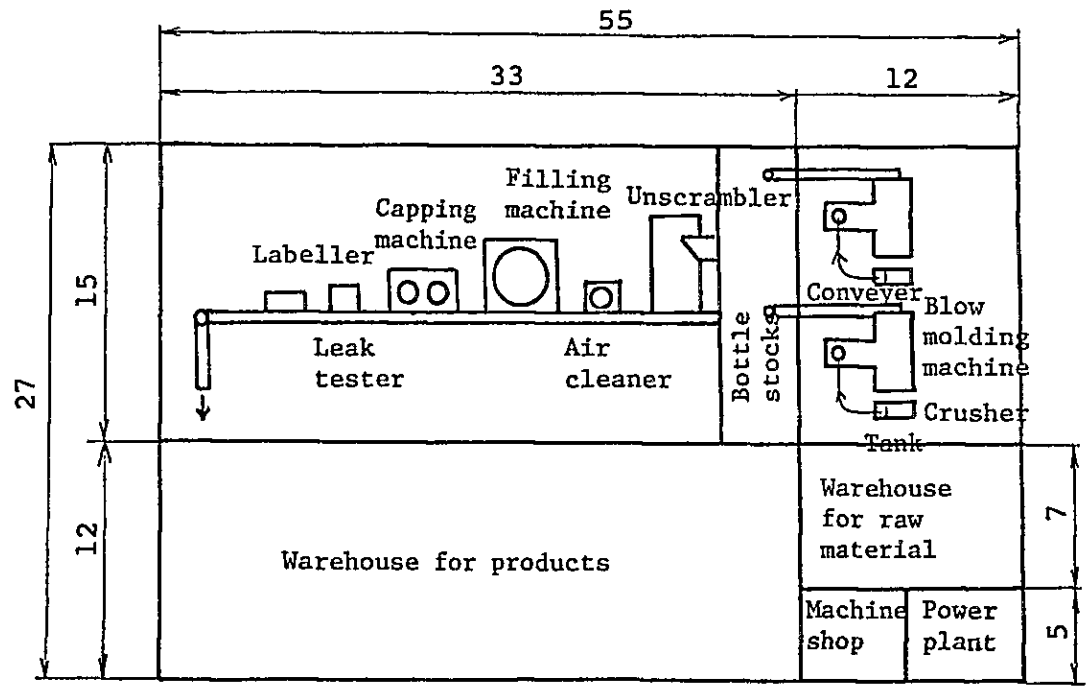
Building

Warehouse for raw material: 45 m^2

Warehouse for product:	396 m^2
Plant area:	825 m^2
Others:	219 m^2
TOTAL:	1,485 m^2
Site:	4,455 m^2

2) Layout of building

(Unit: m)



Plant office & Inspection room on the stocker.

d) Operational conditions

1) Raw material

	(US$/KG)	(US$/PC)
HDPE	0.630	0.073
Chemicals & Label		0.019

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 11 persons/day

e) Equipment cost estimation (Japanese basis in January, 1977)

	Name of apparatus	Model and spec.	Manufacturer	Unit	Unit Price (¥1,000)	Price (¥1,000)
(1)	Blow molding machine	S-65	Placo Co., Ltd.	2	14,000	28,000
	Full automatic and coloring equipment	JCR-15	Matsui Seisaku-sho Co., Ltd.	2	2,000	4,000
	Crusher	JC-5	Matsui Seisaku-sho Co., Ltd.	2	400	800
	Resin tank	ST-1000		2	760	1,520
	Conveyor	9 M		2	600	1,200
	Unscrambler	USO-064	Nippon Kikai Shoji Co., Ltd.	1	7,500	7,500
	Air cleaner		Nippon Kikai Shoji Co., Ltd.	1	7,000	7,000
	Leak tester	TH-12	Nippon Kikai Shoji Co., Ltd.	1	7,500	7,500
	Filling machine	FC-12	Nippon Kikai Shoji Co., Ltd.	1	7,800	7,800
	Plug capper	CRP-04	Nippon Kikai Shoji Co., Ltd.	1	6,500	6,500
	Screw capper	CRS-04	Nippon Kikai Shoji Co., Ltd.	1	6,800	6,800
	Labelling machine	NM-500	Nippon Kikai Shoji Co., Ltd.	1	7,300	7,300
	Compressor for blowing	5 HP		1	500	500
	Compressor for filling			1	1,000	1,000
	Chilling unit	MKC-300W	Matsui Seisaku-sho Co., Ltd.	1	1,170	1,170
	Cooling tower		Hitachi, Ltd.	1	600	600
	Fork lift	1 ton		1	3,000	3,000
	TOTAL					92,190
(2)	Inspection equipment					
	Schopper tensile tester	C	Toyo Seiki Seisaku-sho Co., Ltd.	1	710	710
	Schopper punching quality tester		Toyo Seiki Seisaku sho Co., Ltd.	1	270	270
	Schopper type thickness gauge		Toyo Seiki Seisaku sho Co., Ltd.	1	157	157
	Tearing tester		Toyo Seiki Seisaku sho Co., Ltd.	1	620	620
	Spares		Toyo Seiki Seisaku sho Co., Ltd.		176	176
	TOTAL				1,935	1,935

f) Production cost

2LITER BOTTLE PLANT---20SEC/2PCS(100G/PC)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

BLOW MOLDING MACHINE D65MM: 2SETS

	ANNUAL COST (US$1000)	UNIT COST US$/1000PCS	COMPOSITION (PER CENT)
MATERIAL COST	183.6	94.44	32.0
UTILITIES COST	15.4	7.93	2.7
VARIABLE COST	199.0	102.37	34.6
LABOUR	22.9	11.77	4.0
OVERHEAD	22.9	11.77	4.0
MAINT. & SUPPLY	50.3	25.87	8.8
INSURANCE & TAX	14.4	7.39	2.5
DEPRECIATION	180.1	92.63	31.3
FIXED COST	290.5	149.44	50.6
INTEREST (LONG)	75.8	39.00	13.2
INTEREST (SHORT)	9.2	4.72	1.6
PRODUCTION COST	574.5	295.53	100.0

CAPACITY	2160.00
YIELD RATE	0.90
ANNUAL PROD.	1944.00
BUILDING COST	398.90
EQUIPMENT COST	403.60
ERECTION COST	412.48
CONTINGENCY	20.18
IMPORT DUTY	201.80
INVEST. FOR PLANT	1436.96
INTEREST D. CONST.	71.85
PRE-OPER. EXPENSES	7.65
FIXED CAPITAL	1516.46
WORKING CAPITAL	91.80

(c) PVC pipe

a) Production basic figure

1) Specification of the product

Size: ø75 x 4,000 mm

Weight: 2.202 kg

2) Main manufacturing equipment of the plant

Extruder ø95mm 1 set

3) Production speed

250 kg/hour

4) Operational schedule of the plant

25 days/month

24 hours/day

5) Operational rate

0.833

6) Yield rate

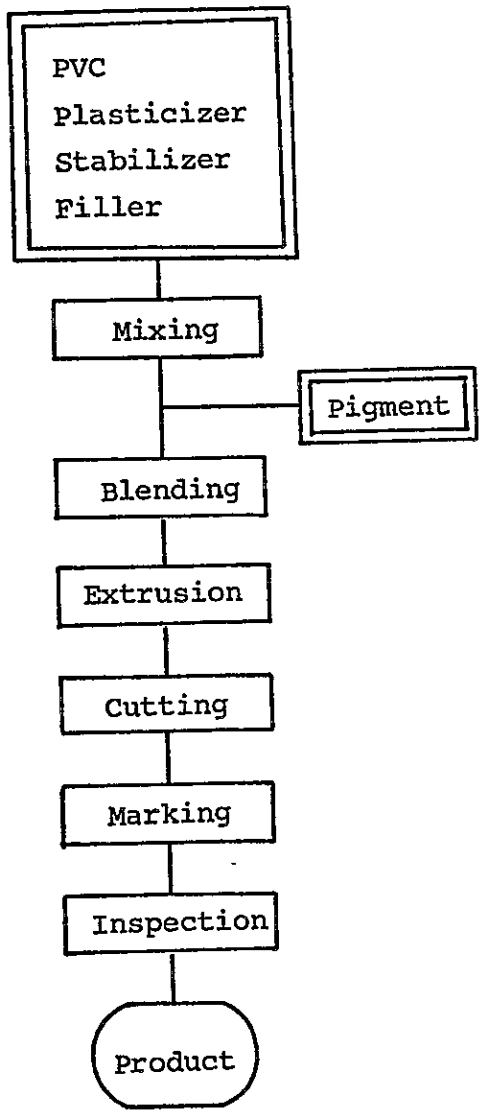
0.9

7) Annual production

564,030 m/year

b) Production process

1) Flow chart



2) Raw material composition

PVC:	0.986 kg/kg
Tribase:	0.030 kg/kg
D.B.L.	0.019 kg/kg
Cd-Ba:	0.047 kg/kg
Wax:	0.005 kg/kg

3) Utility

Electricity	120 KWH

c) Land for factory erection

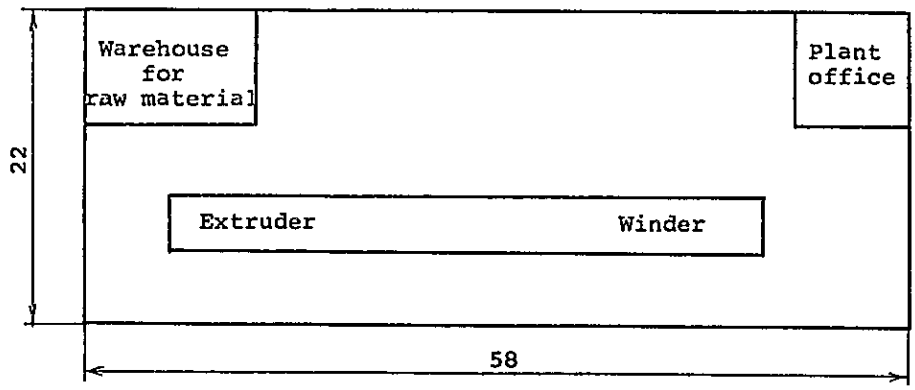
1) Land area

Building

Plant office:	64 m^2
Warehouse for raw material:	96 m^2
Warehouse for products:	112 m^2
Plant area:	1,004 m^2
TOTAL:	1,276 m^2
Site:	4,600 m^2 (Incld. 450 m^2 field storage area)

2) Layout of building

(Unit: m)



d) Operational conditions

1) Raw materials

	(US$/KG)	(US$/PC)
PVC	0.779	1.88
Chemicals		0.26

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 16 persons/day

e) Equipment cost estimation (Japanese basis in January, 1977)

	Name of apparatus	Model and Spec.	Manufacturer	Unit	Price (Unit: ¥1,000)
(1)	Main equipment				
	Extruder	TED-95CV	Toshiba Machine Co., Ltd.	1	54,700
	Cooling, Take-off, Cutting equipment			1	20,160
	Marking unit offset			1	880
	Dies	6 variables	Gifu Die & Mold Engineering Co., Ltd.	1	9,000
	Henschell heater mixer	FM75C	Mitsui Miike Machinery Co., Ltd.	1	3,000
	Henschell cooler mixer	FD150G/K	Mitsui Miike Machinery Co., Ltd.	1	2,200
	Feedenser	FD-50	Matsui Seisaku-sho Co., Ltd.	2	4,000
	Silo	10 ton	Matsui Seisaku-sho Co., Ltd.	2	6,000
	Compressor	11 KW	Hitachi, Ltd.	1	600
	Crusher			1	2,800
	Fork lift	1 ton		1	3,000
	TOTAL				106,340
(2)	Inspection equipment				
	Strograph	R	Toyo Seikiseisaku-sho Co., Ltd.	1	2,900
	Plastic cutting instrument		Toyo Seikiseisaku-sho Co., Ltd.	1	630
	Instruments for Hydraulic pressure test			1	1,000
	Micrometer and slide calipers			1	200
	Instruments for disolution test			1	200
	Spares			1	490
	TOTAL				5,420

f) Production cost

PVC PIPE PLANT---PRODUCT:ø75mm x 4000 mm(2.202KG/M)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

EXTRUDER D95MM: 1SET

	ANNUAL COST (US$1000)	UNIT COST (US$/M)	COMPOSITION (PER CENT)
MATERIAL COST	1203.3	2.13	71.9
UTILITIES COST	18.5	0.03	1.1
VARIABLE COST	1221.8	2.17	73.0
LABOUR	33.3	0.06	2.0
OVERHEAD	33.3	0.06	2.0
MAINT. & SUPPLY	49.9	0.09	3.0
INSURANCE & TAX	14.3	0.03	0.9
DEPRECIATION	183.7	0.33	11.0
FIXED COST	314.4	0.56	18.8
INTEREST (LONG)	77.3	0.14	4.6
INTEREST (SHORT)	60.2	0.11	3.6
PRODUCTION COST	1673.6	2.97	100.0

CAPACITY (M/Y)	626700.00
YIELD RATE	0.90
ANNUAL PROD. (M/Y)	564029.94
BUILDING COST	339.70
EQUIPMENT COST	479.20
ERECTION COST	342.82
CONTINGENCY	23.96
IMPORT DUTY	239.60
INVEST. FOR PLANT	1425.28
INTEREST D. CONST.	71.26
PRE-OPER. EXPENSES	50.14
FIXED CAPITAL	1546.68
WORKING CAPITAL	601.63

(d) Heavy duty bag

a) Production basic figure

1) Specification of the product

Size: 0.25 x 500 x 850 mm

Weight: 200 g

2) Main manufacturing equipment of the plant

Brown film extrusion machine ø 100 mm	1 set
Bag making machine	1 set

3) Production speed

8 m/minute

1.88 kg/minute

4) Operation schedule of the plant

25 days/month

24 hours/day

5) Operational rate

0.833

6) Yield rate

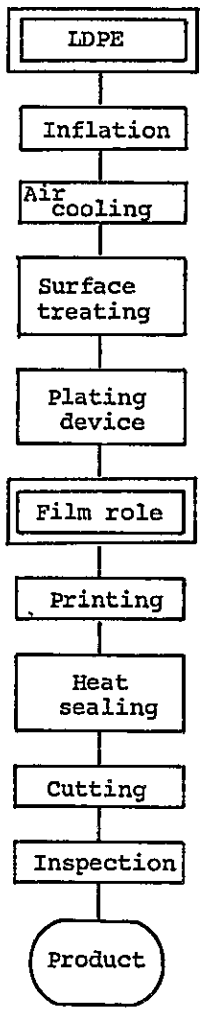
0.9

7) Annual production

6,750,000 bags/year

b) Production process

1) Flow chart



2) Raw material composition

LDPE: 1.05 kg/kg

3) Utility

Electricity 100 KWH

c) Land for factory erection

1) Land area

Building

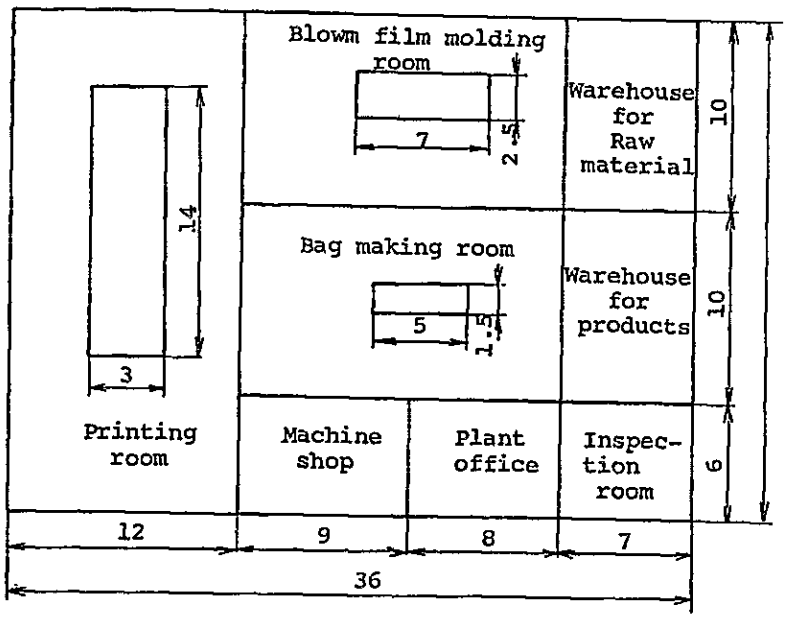
Plant office: 48 m^2

Warehouse for raw material: 70 m^2

Warehouse for products:	70 m^2
Blown film molding room:	170 m^2
Printing room:	312 m^2
Bag making room:	170 m^2
Inspection room:	42 m^2
Machine shop:	54 m^2
TOTAL:	936 m^2
Site:	2,808 m^2

2) Layout of building

(Unit: m)



d) Operational conditions

1) Raw materials

	(US$/KG)	(US$/PC)
LDPE	0.565	0.1319

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 10 persons/day

e) Equipment cost estimation (Japanese basis in January, 1977)

Name of apparatus	Model and spec.	Manufacturer	Unit	Price (Unit: ¥1,000)
(1) Main equipment				
Brown film extrusion machine	LH-120	Placo Co., Ltd.	1	8,000
Bag making machine	OHD-600	Taiyo Bag Making Co., Ltd.	1	6,000
Silo with Blower	2 tons	Matsui Seisaku-sho Co., Ltd.		5,000
Pringing machine	GF65-1	Toshiba Machine Co., Ltd.	1	4,000
Fork lift	1 ton		1	3,000
Crusher		Horai Co., Ltd.	1	600
Tambler	MT-100	Matsui Seisaku-sho Co., Ltd.	1	350
TOTAL				53,950
(2) Inspection equipment				
Shopper tensile tester	C model	Toyo Seikiseisaku-sho Co., Ltd.	1	710
Elmendorf tearing tester		Toyo Seikiseisaku-sho Co., Ltd.	1	254
Shopper punching quality test		Toyo Seikiseisaku-sho Co., Ltd.	1	270
Shopper type thickness gauge		Toyo Seikiseisaku-sho Co., Ltd.	1	159
Spares			1	139
TOTAL				1,532

f) Production cost

HEAVY DUTY BAG PLANT-----PRODUCT: 500X850X0.25MM (2000/BAG)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

FILM EXTRUSION MACHINE D100 MM: 1SET

	ANNUAL COST (US$1000)	UNIT COST US$/1000BAG	COMPOSITION (PER CENT)
MATERIAL COST	890.2	131.69	73.2
UTILITIES COST	15.4	2.28	1.3
VARIABLE COST	905.7	134.17	74.4
LABOUR	20.8	3.08	1.7
OVERHEAD	20.8	3.08	1.7
MAINT. & SUPPLY	34.5	5.10	2.8
INSURANCE & TAX	9.8	1.46	0.8
DEPRECIATION	127.2	18.84	10.4
FIXED COST	213.0	31.56	17.5
INTEREST (LONG)	53.5	7.93	4.4
INTEREST (SHORT)	44.5	6.59	3.7
PRODUCTION COST	1216.8	180.26	100.0

CAPACITY (1000bags/year)	7500.00
YIELD RATE	0.90
ANNUAL PROD.	6750.00
BUILDING COST	248.10
EQUIPMENT COST	311.00
ERECTION COST	254.27
CONTINGENCY	15.55
IMPORT DUTY	155.50
INVEST. FOR PLANT	984.42
INTEREST D. CONST.	49.22
PRE-OPER. EXPENSES	37.09
FIXED CAPITAL	1070.74
WORKING CAPITAL	445.12

(e) PP woven bag

a) Production basic figure

1) Specification of the product

Raw material:	Melt flow index = 5(ASTM D 1238)
PP flat yarn:	1,000 denier, 6 mm width
Bag size:	500 x 820 mm
Bag weight:	80 g/bag
Density:	10 warps/inch x 10 wefts/inch
Printing:	Two colours printing (both sides)
Cloth width:	500 mm x 2 = 1,000 mm
Cloth length:	820 + 30 mm (for bootom sewing)
Cloth required for bag:	1,000 x 850 mm =).85 m^2

2) Main manufacturing equipment of the plant

Extruder	2 sets
Circular loom	88 sets

3) Production speed

180 kg/hour

2,250 bags/hour

4) Operation schedule of the plant

25 days per month

Flat yarn section	24 hrs/day
Weft winding & beaming section	8 hrs/day
Weaving section	16 hrs/day
Printing section	16 hrs/day
Cutting section	8 hrs/day

5) Operational rate

0.833

6) Yield rate

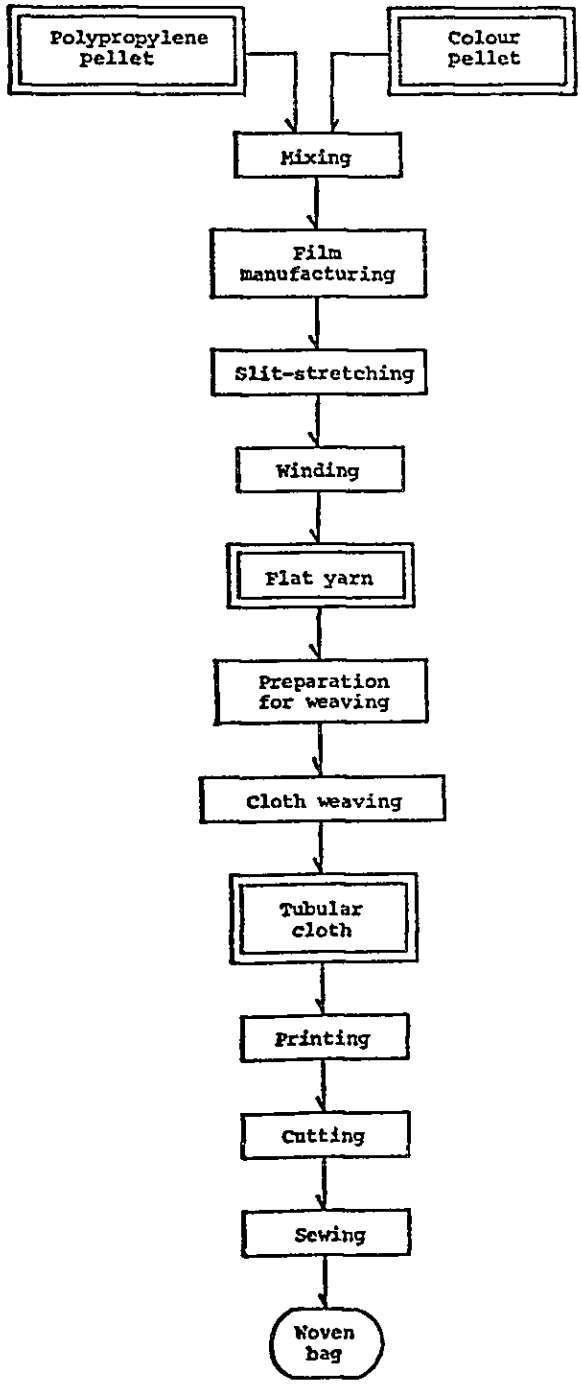
0.9

7) Annual production

12,150,000 bags/year

b) Production process

1) Flow chart



2) Raw material composition

PP: 1.2 kg/kg

3) Utility

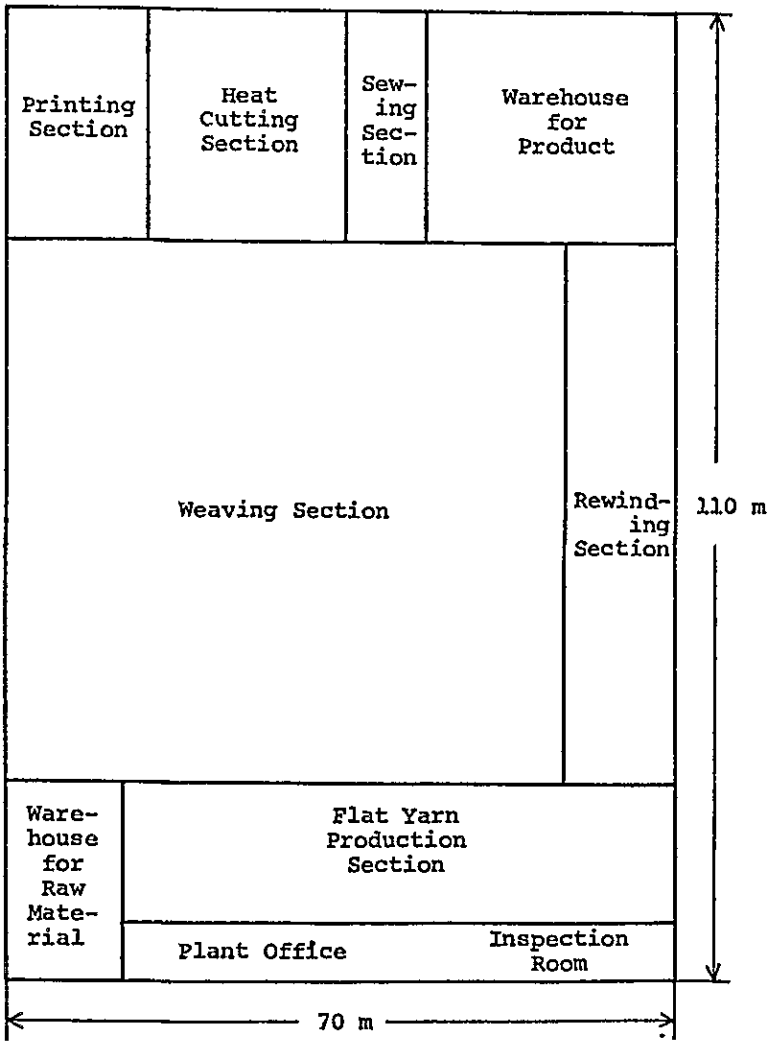
Electricity: 1,400 KWH/ton-PP bag

c) Land for factory erection

1) Land area

Building:	7,700 m^2
Warehouse for raw material:	225 m^2
Flat yarn production section:	675 m^2
Warehouse for flat yarn:	225 m^2
Rewinding section:	625 m^2
Weaving section:	3,675 m^2
Printing section:	260 m^2
Heat cutting section:	480 m^2
Sewing section:	110 m^2
Warehouse for product:	750 m^2
Inspection room:	130 m^2
Others:	545 m^2
Site: (three times building area)	23,100 m^2

2) Layout of building



d) Operational conditions

1) Raw material

	(US$/KG)	(US$/PC)
PP	0.575	0.0613

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 114 persons/day

e) Equipment cost estimation

1) Main equipment

Flat yarn production

Extrusion	Req. No.
(1) Super mixer	1 set
(2) Extruder	2 sets
Drawing and take-up equipment	
(1) Film take-up machine	2 sets
(2) Slitter and 1st roller stand	2 sets
(3) Stretching bath	2 sets
(4) 2nd roller stand	2 sets
(5) Waste air sucker	2 sets
(6) Winder	2 sets

Woven bag production

Weaving equipment	
(1) Rewinder	27 sets
(2) Circular loom	88 sets
Finishing equipment	
(1) Printing machine	2 sets
(2) Heat cutter	7 sets
(3) Sewing machine	11 sets

Equipment cost (FOB): US$2,720,850

(Japanese basis in January, 1977)

f) Production cost

PP WOVEN BAG PLANT----PRODUCT: 500X820MM (8UG/BAG)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

EXTRUDER D90MM: 2SETS, CIRCULAR LOOM: 88SETS

	ANNUAL COST (US$1000)	UNIT COST US$/1000BAG	COMPOSITION (PER CENT)
MATERIAL COST	745.2	61.33	21.2
UTILITIES COST	47.2	3.89	1.3
VARIABLE COST	792.4	65.22	22.5
LABOUR	237.1	19.52	6.7
OVERHEAD	237.1	19.52	6.7
MAINT. & SUPPLY	348.1	28.65	9.9
INSURANCE & TAX	99.4	8.18	2.8
DEPRECIATION	1243.6	102.36	35.3
FIXED COST	2165.4	178.22	61.5
INTEREST (LONG)	523.6	43.10	14.9
INTEREST (SHORT)	37.3	3.07	1.1
PRODUCTION COST	3518.7	289.61	100.0

CAPACITY(1000BAGS/Y)	13500.00
YIELD RATE	0.90
ANNUAL PROD.	12150.00
BUILDING COST	3065.10
EQUIPMENT COST	3654.50
ERECTION COST	1214.81
CONTINGENCY	182.72
IMPORT DUTY	1827.25
INVEST. FOR PLANT	9944.39
INTEREST D. CONST.	497.22
PRE-OPER. EXPENSES	31.05
FIXED CAPITAL	10472.66
WORKING CAPITAL	372.60

(f) Vinyl asbestos tile

a) Production basic figure

1) Specification of the product

Size: 304.8 x 304.8 x 2 mm

Weight: 370 to 380 g

2) Main manufacturing equipment of the plant

Banbury mixer	160 liter	1 set
Mixing role	ø24" x 60"	2 sets
Calender role:	ø24" x 60"	3 sets

3) Production sreed

10 m/min

4) Operation schedule of the plant

25 days/month

24 hours/day

5) Operational rate

0.833

6) Yield rate

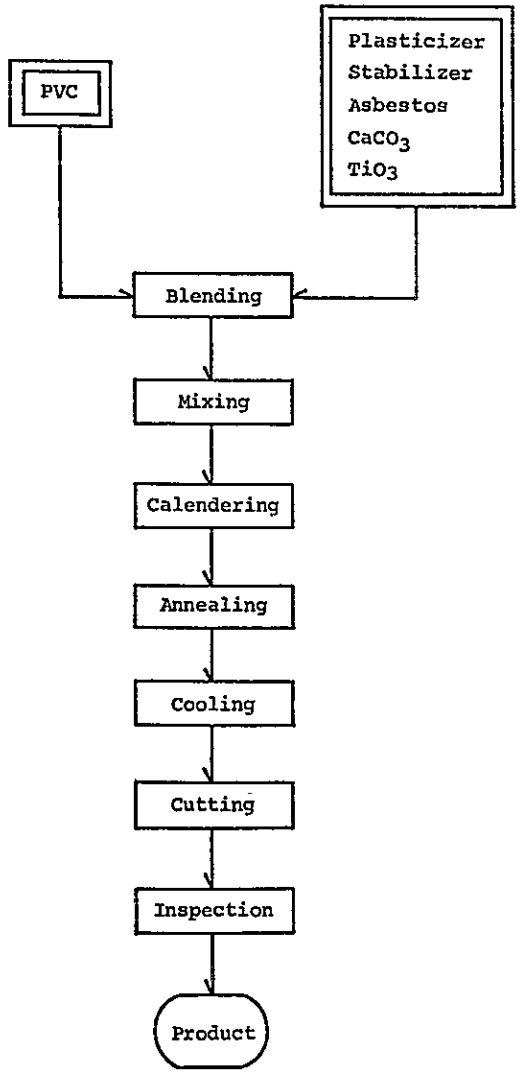
0.9

7) Annual production

984,960 m^2/year

b) Production process

1) Flow chart



2) Raw material composition

PVC:	0.220 kg/kg
Plasticizer:	0.100 kg/kg
Stabilizer:	0.020 kg/kg
Asbestos:	0.260 kg/kg
$CaCO_3$:	0.420 kg/kg
TiO_3:	0.025 kg/kg
Pigment:	0.005 kg/kg

3) Utility

Electricity	270 KWH
Steam	2 tons/hour

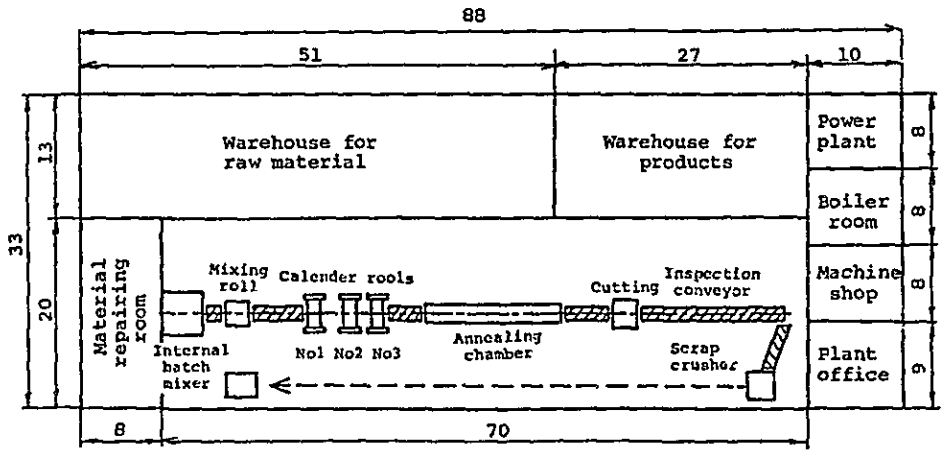
c) Land for factory erection

1) Land area

Building

Warehouse for raw material:	650 m^2
Warehouse for products:	364 m^2
Plant area:	1,560 m^2
Others:	330 m^2
TOTAL:	2,904 m^2
Site:	8,712 m^2

2) Layout of building



d) Operational conditions

1) Raw material

	(US$/KG)	(US$/PC)
PVC	0.779	0.77
Plasticizer	0.900	0.41
Asbestos	0.156	0.18
$CaCO_3$	0.058	0.11
Others		0.42

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 80 persons/day

e) Equipment cost estimation (Japanese basis in January, 1977)

	Name of apparatus	Specification and notes	Unit	Price (Unit: ¥1,000)
(1)	Main equipment			
	Material carry in system	Operation deck, 300ℓ tank	1	13,000
	Ribbon blender	2,000ℓ incl. 25 HP motor	2	10,000
	Hopper scale	75 kg	1	3,000
	Hopper scale	150 kg	1	3,500
	Banbary mixer	168ℓ incl. 300 HP motor	1	38,000
	Mixing role	24"ϕ x 60" incl. 150 HP motor	2	34,000
	Calender role	24"ϕ x 60" L, excl. 50 HP D.C. motor	3	96,000
	Annealing chamber		1	18,000
	Cooling chamber		1	6,000
	Cutter		1	13,500
	Crusher	1,000 kg/h 2 sets, 500 kg/h 1 set	1	6,750
	Scrap recycling unit		1	5,000
	D.C. motor for calender roll and speed control unit	50 HP motor 3 sets.	1	9,000
	Marbling machine		1	900
	Ribbon blender for marbling	500ℓ, incl. 10 HP motor	1	2,000
	Intermediate product conveyor			8,490
	TOTAL			285,150
(2)	Inspection equipment			
	Plastic cutting instrument	Toyo Seisaku-sho Co., Ltd.	1	630
	Micrometer and slide calipers	Toyo Seisaku-sho Co., Ltd.	1	200
	Chemical balance	Shimadzu Seisakusho Ltd.	1	380
	Gear type aging tester	Shimadzu Seisakusho Ltd.	1	718
	Elemendurf tearing tester	Shimadzu Seisakusho Ltd.	1	525
	Spares		1	245
	TOTAL			2,698

f) Production cost

VINYL ASBESTOS TILE PLNT----PRODUCT:304.8X304.8X2MM (375G)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

CALENDER ROLE D24INCH X 60 INCH : 3SETS

	ANNUAL COST (US$1000)	UNIT COST (US$/SQ.M)	COMPOSITION (PER CENT)
MATERIAL COST	1860.5	1.89	57.7
UTILITIES COST	131.3	0.13	4.1
VARIABLE COST	1991.8	2.02	61.7
LABOUR	166.4	0.17	5.2
OVERHEAD	166.4	0.17	5.2
MAINT. & SUPPLY	125.3	0.13	3.9
INSURANCE & TAX	35.8	0.04	1.1
DEPRECIATION	455.6	0.46	14.1
FIXED COST	949.5	0.96	29.4
INTEREST (LONG)	191.8	0.19	5.9
INTEREST (SHORT)	93.0	0.09	2.9
PRODUCTION COST	3226.1	3.28	100.0

CAPACITY (SQ.M /Y)	1094400.00
YIELD RATE	0.90
ANNUAL PROD.(PER YEA	984959.94
BUILDING COST	784.00
EQUIPMENT COST	1234.20
ERECTION COST	882.95
CONTINGENCY	61.71
IMPORT DUTY	617.10
INVEST. FOR PLANT	3579.96
INTEREST D. CONST.	179.00
PRE-OPER. EXPENSES	77.52
FIXED CAPITAL	3836.47
WORKING CAPITAL	930.24

(g) PVC wire

a) Production basic figure

1) Specification of the product

Size: Outside D. ø2.4 mm, Cupper D. ø1.2 mm

2) Main manufacturing equipment of the plant

Extruder 150 kg/hour 3 sets

3) Production speed

1,500 m/minute

4) Operation schedule of the plant

25 days per month

24 hours per day

5) Operational rate

0.833

6) Yield rate

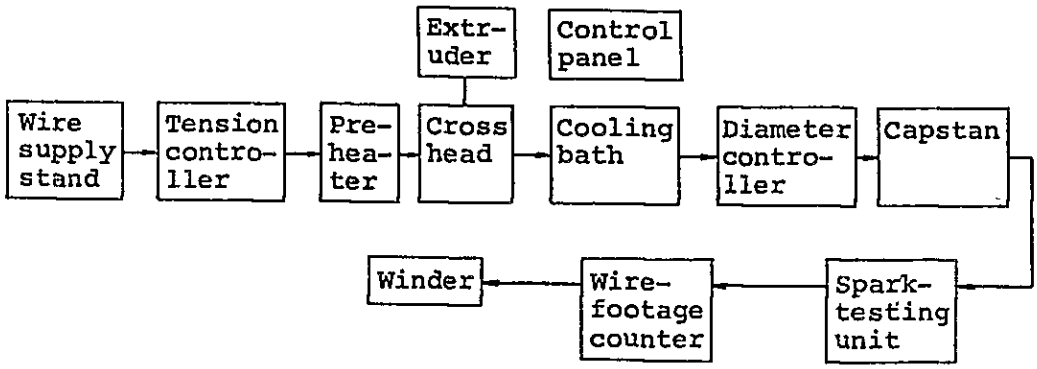
0.9

7) Annual production

360,000,000 m/year

b) Production process

1) Flow chart



2) Raw material composition

PVC:	0.6363 kg/kg
DOP:	0.2870 kg/kg
Tribasic lead sulphate:	0.0315 kg/kg
Dibasic lead phosphate:	0.0126 kg/kg
Dibasic lead stearate:	0.0063 kg/kg
Clay:	0.0641 kg/kg
Antimony oxide:	0.0127 kg/kg

3) Utility

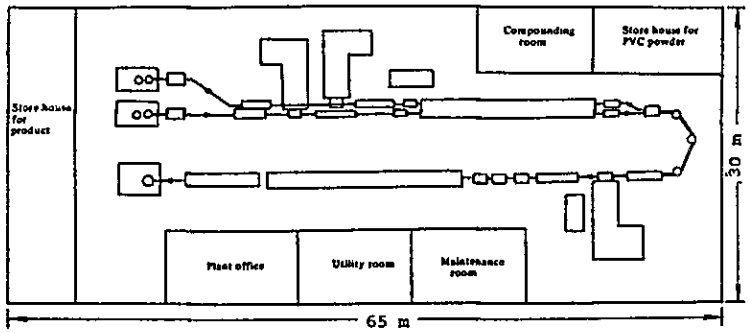
Electricity: 11,790,000 KWH

c) Land for factory erection

1) Land area

Building	2,000 m^2
Plant office:	90 m^2
Warehouse for core wire:	60 m^2
Warehouse for raw material:	50 m^2
Maintenance room:	40 m^2
Utility room:	40 m^2
Wire coating plant:	1,390 m^2
Compounding plant:	30 m^2
Power plant:	200 m^2
Site:	6,000 m^2

2) Layout of building



d) Operational conditions

1) Raw material

	(US$/KG)	(US$/PC)
PVC:	0.779	4.33
Cupper:	7.07	39.33
Others:		1.01

2) Labour

4 groups 3 shifts 24 hours round-the-clock

Total: 200 persons/day

e) Equipment cost estimation

	Unit	Price (US$)
Extruder	3	427,400
PVC compounding eq.	1	75,100
Wire supply stand	3	67,600
Take up unit	3	78,900
Winder and packer	3	56,400
Controller and tester	1	27,000
Electric panel	3	71,900
Conveyance	1	150,300
Others		248,900
Total:		US$1,203,500

(Iran basis in 1977)

f) Production cost

PVC WIRE PLANT---PRODUCT:OUTSIDE D.:2.4MM,CUPPER D.:1.2MM

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

EXTRUDER: 150 KG/HOUR 3 SETS

	ANNUAL COST (US$1000)	UNIT COST (US$/1000M)	COMPOSITION (PER CENT)
MATERIAL COST	14465.4	44.65	85.3
UTILITIES COST	252.3	0.78	1.5
VARIABLE COST	14717.7	45.43	86.8
LABOUR	416.0	1.28	2.5
OVERHEAD	416.0	1.28	2.5
MAINT. & SUPPLY	91.1	0.28	0.5
INSURANCE & TAX	26.0	0.08	0.2
DEPRECIATION	396.1	1.22	2.3
FIXED COST	1345.2	4.15	7.9
INTEREST (LONG)	166.8	0.51	1.0
INTEREST (SHORT)	723.3	2.23	4.3
PRODUCTION COST	16952.9	52.32	100.0

CAPACITY (1000M/Y)	360000.00
YIELD RATE	0.90
ANNUAL PROD.	323999.94
BUILDING COST	429.40
EQUIPMENT COST	1203.50
ERECTION COST	307.49
CONTINGENCY	60.17
IMPORT DUTY	601.75
INVEST.FOR PLANT	2602.32
INTEREST D. CONST.	130.12
PRE-OPER. EXRENSES	602.73
FIXED CAPITAL	3335.16
WORKING CAPITAL	7232.70

2-2 Sensitivity analysis for the cost estimation of major plastics products

(1) Conditions of the sensitivity

(a) Factors to be observed in sensitivity analysis

1) Increase of resin price

2) Extension of depreciation term

3) Reduction of interest

4) Shortening of raw material storing term

5) Reduction of import duties

(b) Purpose of estimating sensitivity

As the resin price goes up, production cost goes up, 1). The above-mentioned countermeasures{ 2) - 5)} against the cost rising are observed and estimated that how much they influence the cost.

(c) Fluctuation of factors to be observed

1) Increase of resin price

Rate of increase is assumed to be within 50%.

2) Extension of depreciation

Though standard term is eight years, it can be extended up to 12 years (maximum).

3) Reduction of interest

10% of standard interest can be reduced down to 50%.

4) Storing term

Six months of standard storing terms is assumed to be shortened to one month.

5) Import duties

50% of the standard import duties can be reduced down to 0%.

These five variables are changed independently to observe the effect on the standard cost (ref. 2-1 of this chapter).

(2) Result of the sensitivity analysis

(a) Beer bottle crates

Proportion of material cost in manufacturing cost is high. As material price goes up by 10%, manufacturing price goes up by 7%. Concerning 2) through 5), reducing effect is 4% at the most.

(b) 2-liter bottle

As the proportion of equipment cost is high, extension of depreciation term, reduction of import duties, reduction of interest influence the cost much. Reduction rate of cost is 6.3% for depreciation term of 10 years and 10.5% for 12 years. As import duties decreases by 10%, cost decreases by 1.6%. If import duties become to be 0%, cost decreases by 7.8%. As interest rate decreases by 1%, cost decreases by about 1.7% (same effect as that of import duties). The 10% increase of material cost has effect of 3.4%.

(c) PVC pipes

As the proportion of material cost is high like crates, effects of variables are almost the same as those in the case of crates.

(d) Heavy-duty bags

Almost the same effects as those in the cases of crates, and PVC pipes.

(e) PP woven bags

Like 2-liter bottles, equipment cost is high. So, term of depreciation, import duties, and rate of interest influence cost much. Depreciation of 12 years reduces cost by 12%. Reduction of import duties reduces cost by 2.3%. On the other hand, increase of material cost by 10% pushes the cost only by 2.2%.

(f) Asbestos tiles

Proportion of PVC resin in material is 41%. So, the increase of resin price by 10% influences production cost by about 2.4%. However, as cost of equipment influences the price in this case less than in the case of PP woven bags, influences of items 2) through 5) are not so much. The depreciation term of 12 years reduces the price by 4.8%, reduction of interest by 1% reduces the price by

1%, reduction of the import duties by 10% reduces the price by 1%.

(g) PVC coated wires

Proportion of material cost in production cost is 85%. The material cost consists of copper of 90%, and resin of 10%. Here, the increase of resin cost of 10% influences the production cost only by 1.1%. The fact that the proportion of material cost is great in standard cost influences the term of storing. Shortening of storing term by one month reduces the price by about 0.7%. The reduction of interest by 1% reduces the cost by about 0.5%.

All the results were summarized in Table AII-2-2, and each result was shown in Fig. AII-2-1.

(3) Study of sensitivity analysis

Results of sensitivity analysis are shown in Fig. AII-2-1. Items of 2) through 5), which are pointed out as variables with reducing effect on manufacturing cost, are in fact, not in a linear relation with the cost. However, a linear relation between them is assumed here. Concerning crates, pipes, heavy-duty bags in which the proportion of material cost is great, the 2) extension of term of depreciation, 3) reduction of interest, 4) shortening of storing term, and 5) reduction of import duties can be put to the limit. However, the material cost of crates and pipes can be increased by up to approximately 20%, and of heavy-duty bag about 17% (otherwise they become unprofitable). Concerning 2-liter bottle, the standard price can be maintained by taking the countermeasures of 2) through 5) within their limits, if material cost goes up by 50% at most. If the material cost goes up by 10%, the standard price can almost be maintained by reducing interest by 1% and reducing the import duties by 10%.

Concerning PP woven bags, the standard cost can be maintained by reducing the effect of increase of material cost through combination of effects of items 2) through 5). Effects of cost increase of material on the production cost in case of asbestos teiles is as much as in case of PP woven bags; however, effects of items 2) through 5) are less. However, the standard cost can be maintained by combining the effects of the items (within their limits), if material cost goes up by 50% at most. Concerning the PVC coated electric wires, effects of material cost on the cost is little, so that the standard price can be maintained by combining effects of items 2) through 5).

Table AII-2-2 Increase/Decrease Rates to Standard Production Cost by the Changes of Various Factors

(Unit: %)

		Plant	Crate	2-liter Bottle	Pipe	Heavy-duty Bag	PP Woven Bag	Asbestos Tile	PVC Electric Wire
Raw Material Cost	(Base) (100%)	110%	7.1	3.4	7.4	7.7	2.2	2.4	1.1
		120%	13.8	6.76	15.2	15.5	4.5	4.9	2.2
		130%	21.0	10.13	22.6	23.2	6.7	7.3	3.2
		140%	28.1	13.51	30.3	30.9	9.0	9.8	4.3
Depreciation Period	(8-year)	10-year	-2.2	-6.3	-2.4	-2.1	-7.1	-2.8	-0.5
		12-year	-4.0	-10.5	-3.7	-3.5	-11.8	-4.8	-0.78
Interest Rate	(10%)	9%	-0.9	-1.7	-1.0	-1.0	-1.8	-1.0	-0.5
		8%	-1.8	-3.4	-2.0	-1.7	-3.6	-2.0	-1.1
		7%	-2.7	-5.0	-2.7	-2.6	-5.4	-3.0	-1.6
		6%	-3.6	-6.7	-3.7	-3.5	-7.2	-4.0	-2.15
		5%	-4.5	-8.3	-4.5	-4.3	-9.0	-5.0	-2.75
Inventory Period	(6-month)	4-month	-0.9	-0.5	-1.3	-1.2	-0.4	-1.0	-1.4
		3-month	-1.3	-0.8	-2.0	-1.8	-0.5	-1.5	-2.1
		2-month	-1.8	-1.1	-2.4	-2.4	-0.7	-2.0	-2.8
Rate of Import Duty	(50%)	40%	-0.6	-1.6	-0.7	-0.6	-2.3	-1.0	0.2
		30%	-1.3	-3.1	-1.3	-1.1	-4.7	-1.7	0.3
		20%	-2.2	-4.7	-2.0	-1.7	-7.9	-2.6	0.47
		10%	-3.1	-6.2	-2.7	-2.3	-9.3	-3.4	0.63
		0%	-4.0	-7.8	-3.4	-2.8	-11.5	-4.2	0.79

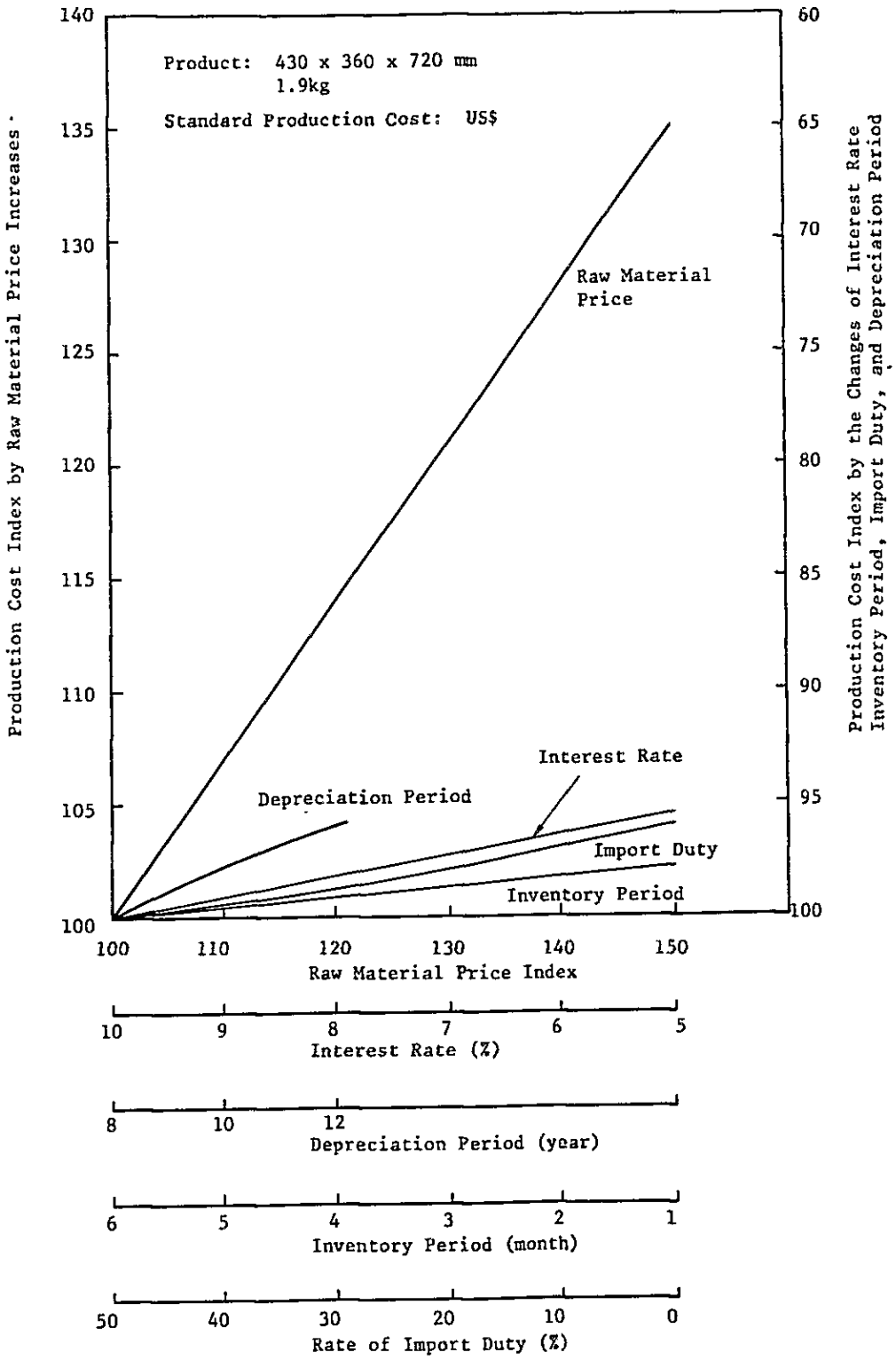


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(1) Beer crates

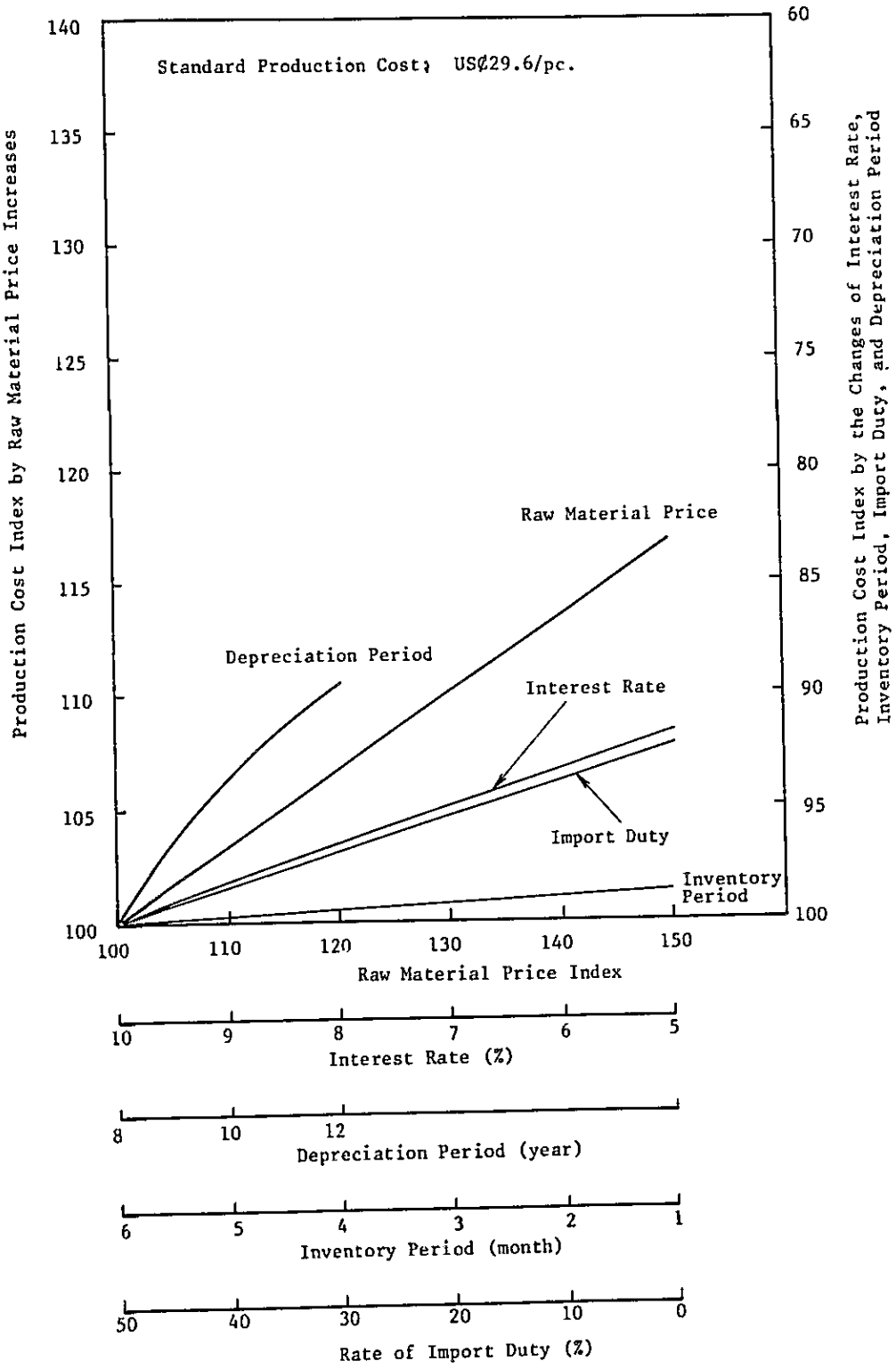


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(2) 2-liter Bottles

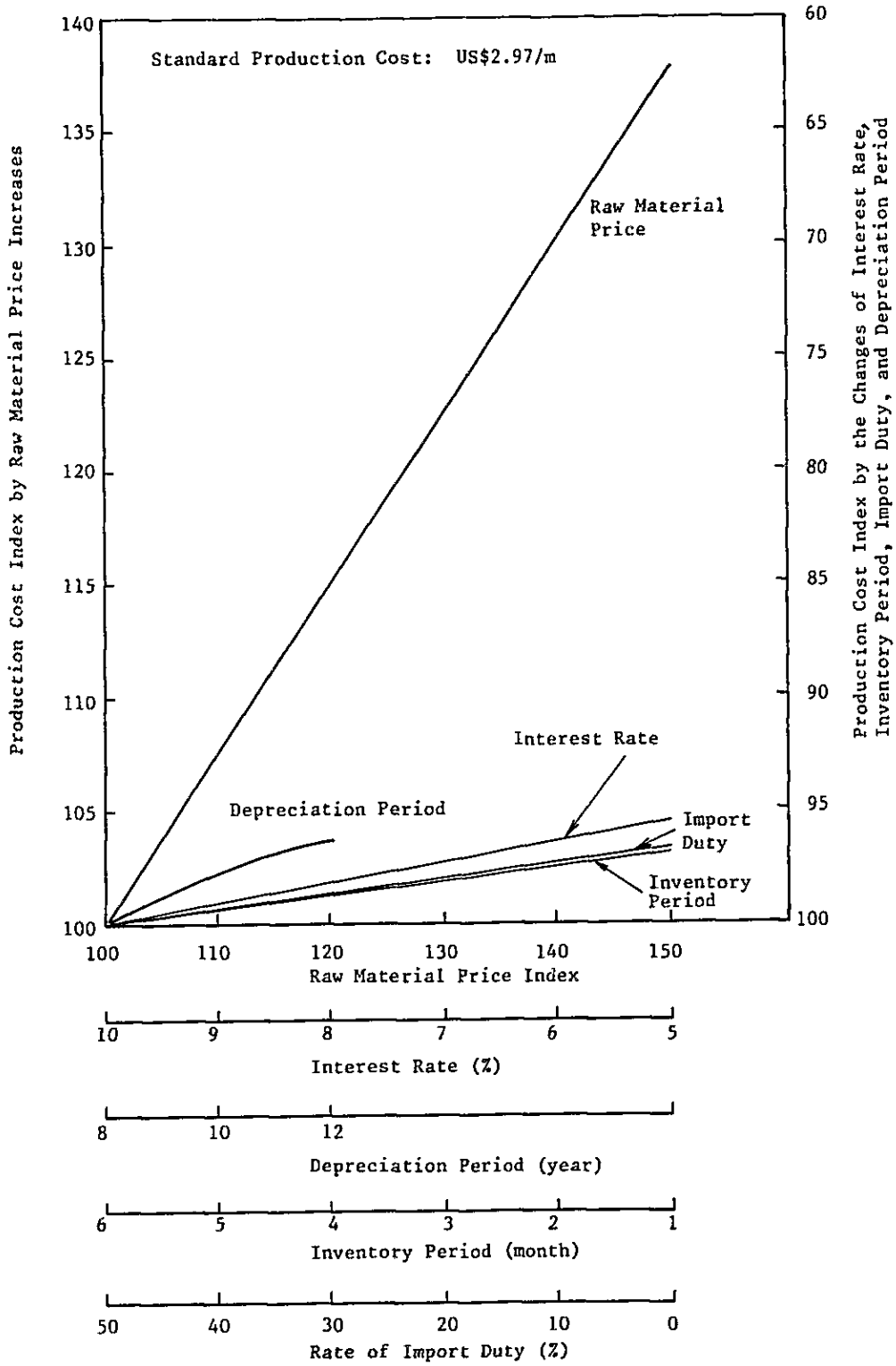


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(3) PVC Bipes

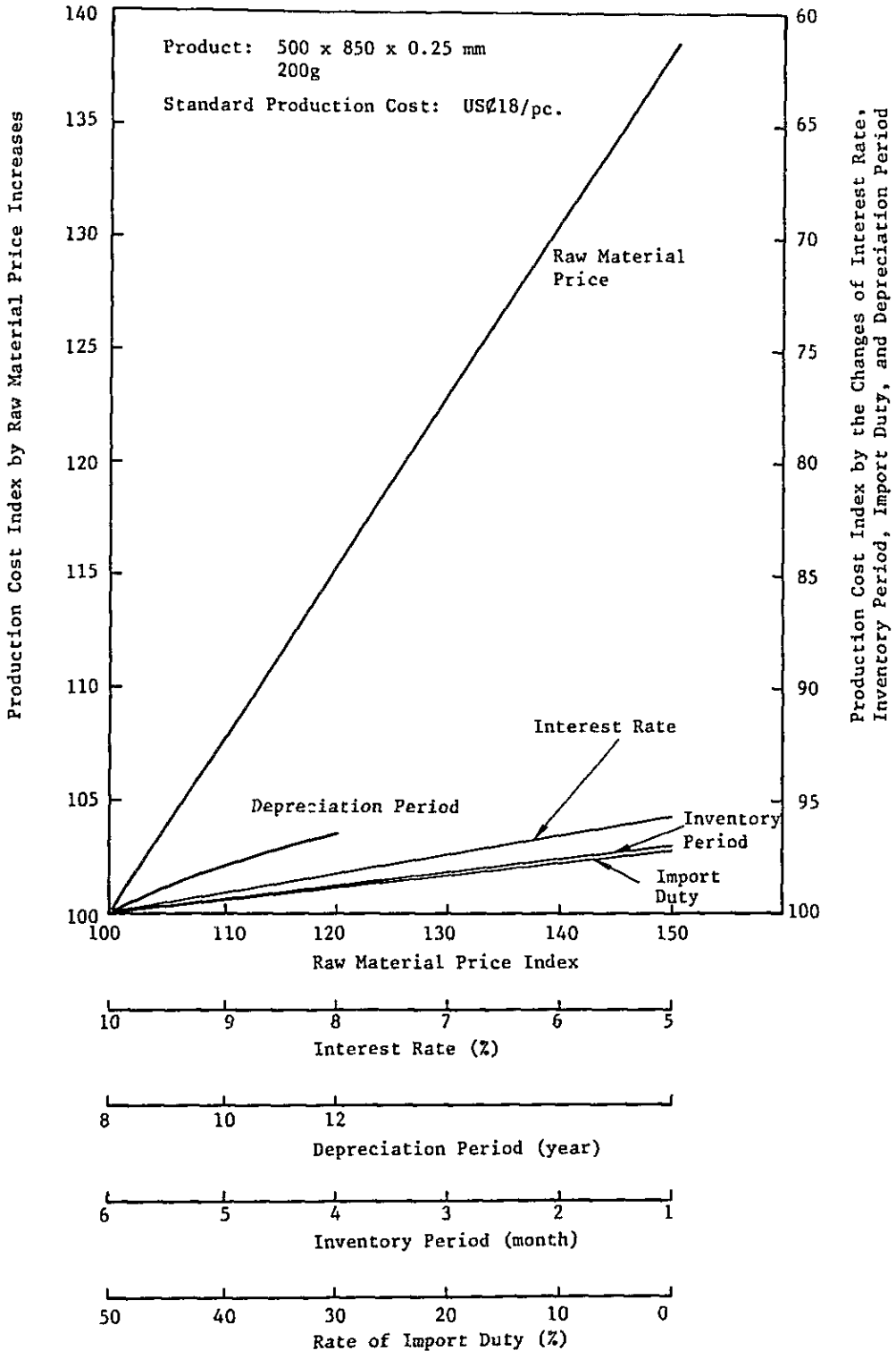


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(4) Heavy-duty Bags

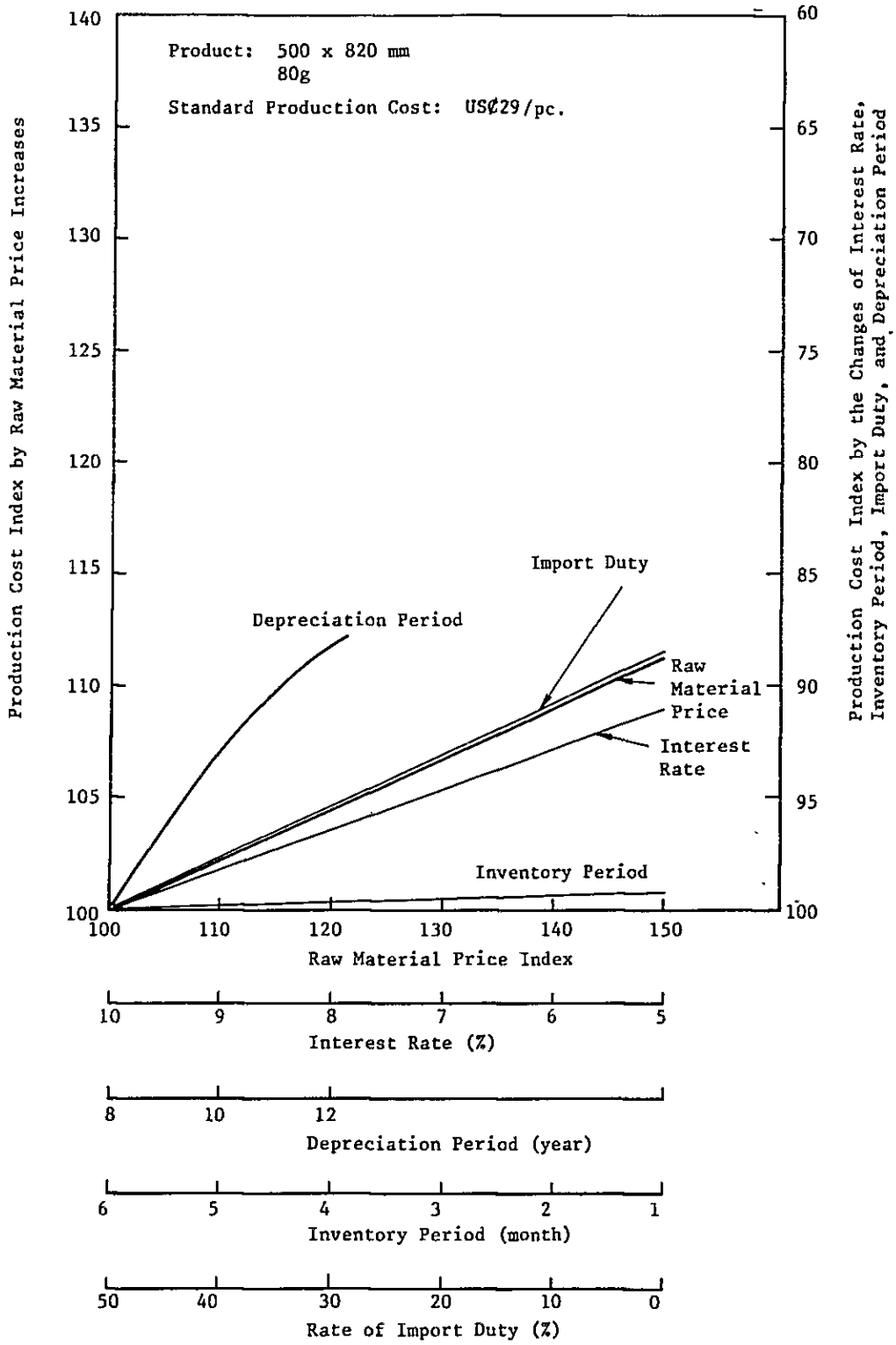


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(5) PP Woven Bags

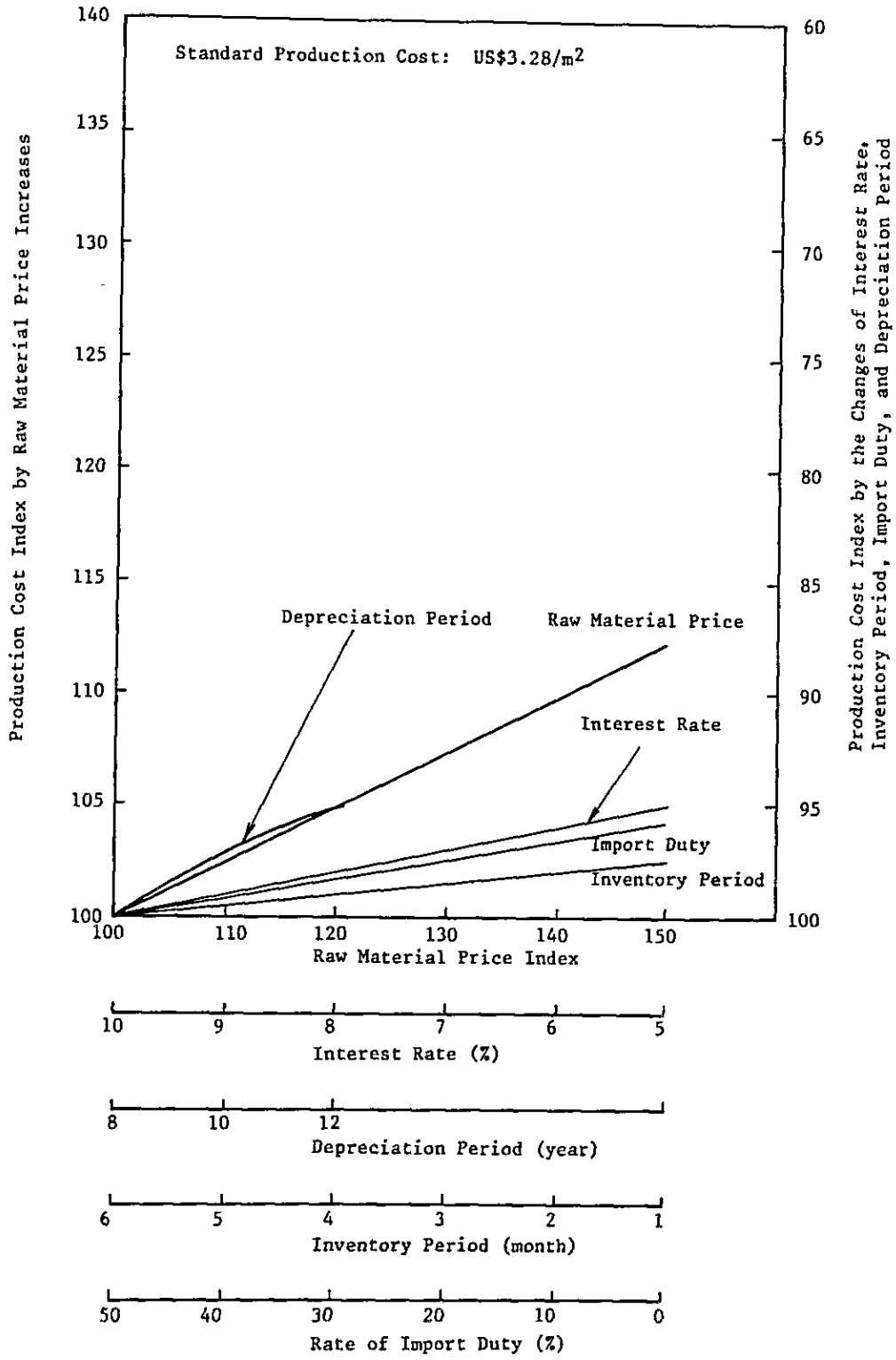


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(6) Asbestos iles

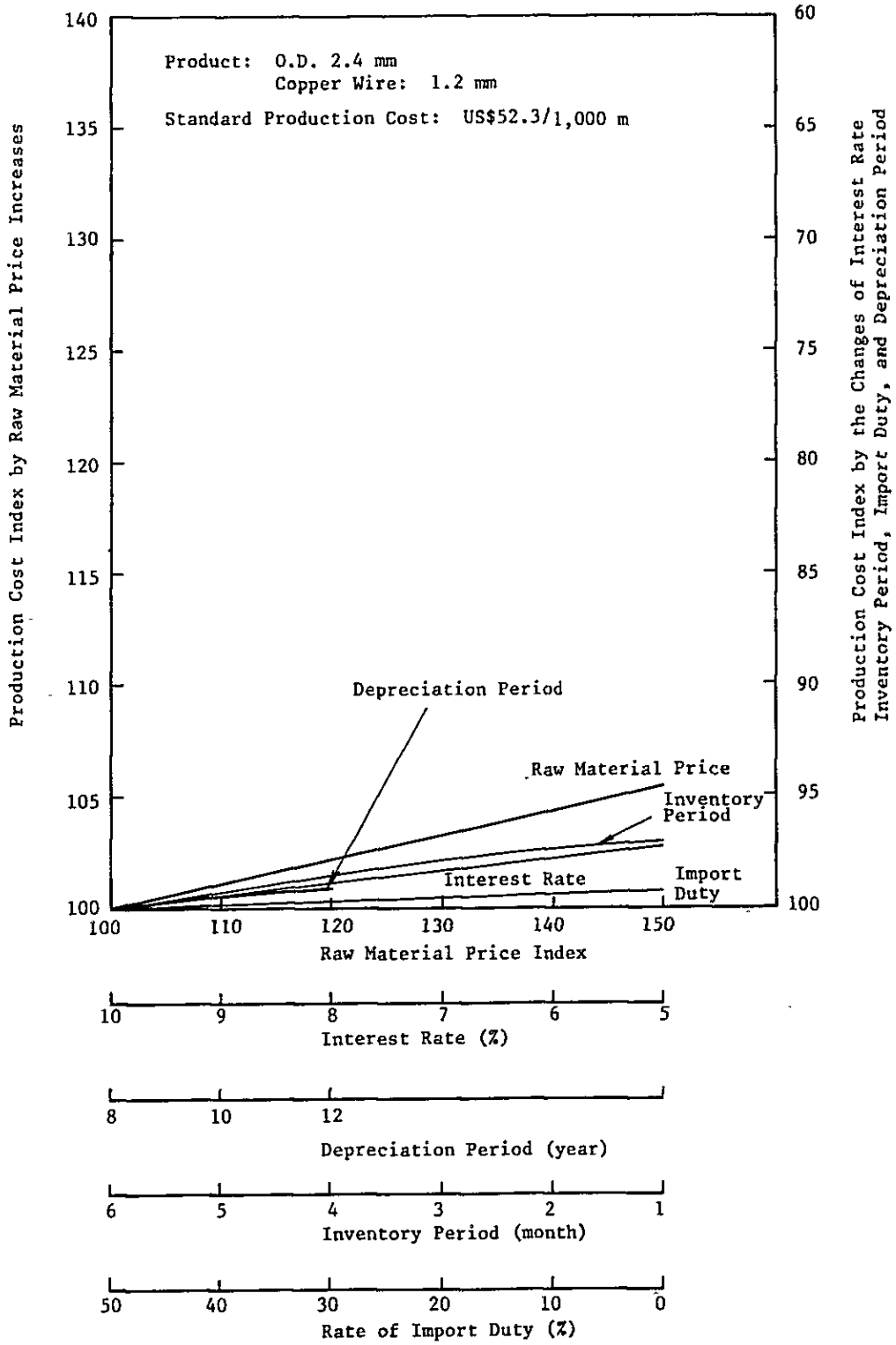


Fig. AII-2-1 Sensitivity Analyses of Production Cost of Plastics Products

(7) PVC Electric Wires

(4) Rationalization by introducing equipments

Example 1: Crate manufacturing plant

Rationalization of crate manufacturing plant is carried out by the introduction of supplementary equipments for labour saving and high-speed manufacturing. When the price index of injection molding machine is assumed to be 100, the price index of equipment for labour saving (weighing and coloring equipment of material, automatic conveying equipment of material, conveyor, automatic machine for product handling is 16 ~ 20, price index of equipment for high-speed manufacturing (cooling apparatus) is 3 ~ 4.

With the introduction of equipment for labour saving equipment, two workers are saved, namely one in the process of material supply and the other in that of product handling. With the introduction of equipment for high-speed cooling, cycle is increased by about 20%. Thus effect of rationalization by equipment investment is shown below:

	Existing plant	Rationalized plant
Equipment cost index	100	120
Worker (person/day)	21	13 (4 groups in 3 shifts)
Molding cycle	62.5 sec./ piece	50 sec./piece
Output index	100	120

By making cost account of crates on the basis of these representative figures, following results as is shown in Table AII-2-3. The manufacturing cost at rationalized plant will be decreased by about 6.7%, for direct and indirect labour cost in the fixed cost will be decreased by half, and output will be increased.

Example 2: PVC pipe manufacturing plant

Rationalization is to be made for PVC pipe manufacturing plant by introducing supplementary equipments for labour saving, and high speed extruder. When the price index of extruder is 100, that of equipments for labour saving (silo, automatic material feeding devices) is about 10. It is assumed that a larger extruder of 135mm dia. with output of 750 kg/hour is introduced and existing extruder of 95mm dia. is replaced. The price of extruder of 135mm dia. is two times as high as that of extruder of 95mm dia.

Table AII-2-3 Comparison of Production Cost of Beer Crates Concerning Existing Plant and Rationarized Plant

Existing Plant

PVC PIPE PLANT----PRODUCT: D754MX4000MM (2.202KG/M)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

EXTRUDER D95MM: 1SET

	ANNUAL COST (US$1000)	UNIT COST (US$/M)	COMPOSITION (PER CENT)
MATERIAL COST	1203.3	2.13	72.1
UTILITIES COST	18.5	0.03	1.1
VARIABLE COST	1221.8	2.17	73.2
LABOUR	41.6	0.07	2.5
OVERHEAD	41.6	0.07	2.5
MAINT. & SUPPLY	46.4	0.08	2.8
INSURANCE & TAX	13.3	0.02	0.8
DEPRECIATION	171.4	0.30	10.3
FIXED COST	314.2	0.56	18.8
INTEREST (LONG)	72.1	0.13	4.3
INTEREST (SHORT)	60.2	0.11	3.6
PRODUCTION COST	1668.3	2.96	100.0

CAPACITY (M/Y)	626700.00
YIELD RATE	0.90
ANNUAL PROD. (M/Y)	564029.94
BUILDING COST	339.70
EQUIPMENT COST	435.60
ERECTION COST	311.63
CONTINGENCY	21.78
IMPORT DUTY	217.80
INVEST. FOR PLANT	1326.51
INTEREST D. CONST.	66.33
PRE-OPER. EXPENSES	50.14
FIXED CAPITAL	1442.97
WORKING CAPITAL	601.63

Rationalized Plant

PVC PIPE PLANT---PRODUCT: ø75mm x 4000 mm (2.202KG/M)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

EXTRUDER D95MM: ø135mm: 1/3set

	ANNUAL COST (US$1000)	UNIT COST (US$/M)	COMPOSITION (PER CENT)
MATERIAL COST	1443.9	2.13	78.0
UTILITIES COST	18.5	0.03	1.0
VARIABLE COST	1462.4	2.16	79.0
LABOUR	11.0	0.02	0.6
OVERHEAD	11.0	0.02	0.6
MAINT. & SUPPLY	44.9	0.07	2.4
INSURANCE & TAX	12.8	0.02	0.7
DEPRECIATION	167.3	0.25	9.0
FIXED COST	247.1	0.37	13.3
INTEREST (LONG)	70.4	0.10	3.8
INTEREST (SHORT)	72.2	0.11	3.9
PRODUCTION COST	1852.1	2.74	100.0

CAPACITY (M/Y)	752040.00
YIELD RATE	0.90
ANNUAL PROD. (M/Y)	676835.94
BUILDING COST	339.70
EQUIPMENT COST	416.90
ERECTION COST	298.25
CONTINGENCY	20.84
IMPORT DUTY	208.45
INVEST. FOR PLANT	1284.15
INTEREST D. CONST.	64.21
PRE-OPER. EXPENSES	60.16
FIXED CAPITAL	1408.52
WORKING CAPITAL	721.96

With the introduction of equipment for labour saving, one worker is saved per one extruder, in process of material handling. With the introduction of larter output extruder, relative cost of equipment and labour is decreased as shown below:

	Existing plant	Rationalized plant
Equipment cost index	100	87
Workers (person/day)	20	53 (4 groups in 3 shifts)
Output (kg/hour)	250	300
Output index	100	120

By making cost account of pipes on the basis of these figures, Table AII-2-4 is obtained. With equipment for rationalization fixed cost was decreased by 34% and interest on fixed capital by 23%, through which manufacturing cost is decreased by 7.4%.

Table AII-2-4 Comparison of Production Costs of Pipes Concerning Existing Plant and Rationarized Plant

Existing Plant

BEER CRATE PLANT CYCLE:62.5SEC/PC(1.9KG/PC)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

INJECTION MOLDING MACHINE: 90/630 1SET

	ANNUAL COST (US$1000)	UNIT COST (US$/PC)	COMPOSITION (PER CENT)
MATERIAL COST	475.2	1.47	61.2
UTILITIES COST	24.7	0.08	3.2
VARIABLE COST	499.9	1.54	64.3
LABOUR	43.7	0.13	5.6
OVERHEAD	43.7	0.13	5.6
MAINT. & SUPPLY	25.6	0.08	3.3
INSURANCE & TAX	7.3	0.02	0.9
DEPRECIATION	93.5	0.29	12.0
FIXED COST	213.8	0.66	27.5
INTEREST (LONG)	39.4	0.12	5.1
INTEREST (SHORT)	23.8	0.07	3.1
PRODUCTION COST	776.8	2.40	100.0

CAPACITY (PCS/Y)	360000.00
YIELD RATE	0.90
ANNUAL PROD. (PCS/Y)	323999.94
BUILDING COST	83.10
EQUIPMENT COST	273.80
ERECTION COST	223.86
CONTINGENCY	13.69
IMPORT DUTY	136.90
INVEST. FOR PLANT	731.35
INTEREST D. CONST.	36.57
PRE-OPER. EXPENSES	19.80
FIXED CAPITAL	787.72
WORKING CAPITAL	237.60

Rationalized Plant

BEER CRATE PLANT CYCLE: 50SEC/PC (1.9KG/PC)

OPERATION: 7200 HRS/YEAR, OPERATION RATE: 0.833

INJECTION MOLDING MACHINE: 90/630 1SET

	ANNUAL COST (US$1000)	UNIT COST (US$/PC)	COMPOSITION (PER CENT)
MATERIAL COST	570.2	1.47	65.3
UTILITIES COST	24.7	0.06	2.8
VARIABLE COST	594.9	1.53	68.2
LABOUR	27.0	0.07	3.1
OVERHEAD	27.0	0.07	3.1
MAINT. & SUPPLY	30.1	0.08	3.5
INSURANCE & TAX	8.6	0.02	1.0
DEPRECIATION	110.2	0.28	12.6
FIXED COST	203.0	0.52	23.3
INTEREST (LONG)	46.4	0.12	5.3
INTEREST (SHORT)	28.5	0.07	3.3
PRODUCTION COST	872.8	2.24	100.0

CAPACITY (PCS/Y)	432000.00
YIELD RATE	0.90
ANNUAL PROD. (PCS/Y)	388799.94
BUILDING COST	83.10
EQUIPMENT COST	328.60
ERECTION COST	268.66
CONTINGENCY	16.43
IMPORT DUTY	164.30
INVEST. FOR PLANT	861.09
INTEREST D. CONST.	43.05
PRE-OPER. EXPENSES	23.76
FIXED CAPITAL	927.91
WORKING CAPITAL	285.12

3. A Forecast on the IJPC's Plastics Materials Cost

In this part, the IJPC's plastics materials cost will be compared with the international resin prices after estimating the international price of resin (an average of PE and PP) on the bases of forecasting the supply and demand of plastics materials in the world as well as on the basis preliminary calculations of the costs in Europe.

3-1 A forecast of supply and demand of plastic resins in the world

Naturally, the international resin price is influenced by the supply/demand balance of the plastics materials in the world.

A demand forecast of major plastics materials, i.e., PE, PP, and PVC, was made for two cases as follows:

	Case 1	Case 2
Presumed annual growth rate of the average world real GDP	6%	3%

Rates of yearly expansion of the demand for plastics materials in the world are as shown below:

(Unit: %/year)

		1975 - 1980	1980 - 1985
PE	Case 1	11.2	7.0
	Case 2	5.8	4.1
PP	Case 1	13.0	8.4
	Case 2	6.5	4.2
PVC	Case 1	10.4	6.7
	Case 2	5.4	3.4

Table AII-3-1 shows estimated amounts of demand in 1980 and 1985. On the other hand, possible amount of supply of plastics materials in the world was estimated by multiplying the production capacity by the technical operational rate of the plants in each country.

Table AII-3-1 shows the supply/demand balance of PE, PP, and PVC in the world. Concerning the supply/demand balance of PE in the world, Case 1 indicates a slight supply shortage,

Table AII-3-1 Forecast on Supply/Demand Balance of World's Plastics Products

(Unit: 1,000 ton)

		1980	1985	Production Capacity (1975)
PE	Possible Supply Amount			
	Existing	12,900	12,900	14,447
	Under Construction	4,600	4,600	5,154
	Under Planning	0	3,600	4,197
	Total	17,500	21,100	23,798
	Demand			
	Case 1	17,400	24,400	
	Case 2	13,600	16,600	
	Supply/Demand Balance			
	Case 1	100	-3,300	
	Case 2	3,900	4,500	
PP	Possible Supply Amount			
	Existing	3,300	3,300	3,694
	Under Construction	2,300	2,300	2,588
	Under Planning	0	1,200	1,374
	Total	5,600	6,800	7,656
	Demand			
	Case 1	4,200	6,300	
	Case 2	3,100	3,800	
	Supply/Demand Balance			
	Case 1	1,400	500	
	Case 2	2,500	3,000	
PVC	Possible Supply Amount			
	Existing	9,600	9,600	10,718
	Under Construction	2,000	2,000	2,253
	Under Planning	0	2,100	2,403
	Total	11,600	13,700	15,374
	Demand			
	Case 1	12,700	17,500	
	Case 2	10,100	11,900	
	Supply/Demand Balance			
	Case 1	-1,100	-3,800	
	Case 2	1,500	1,800	

Note: Existing production capacity is based on the plants which were completed in 1975. The under-construction plant includes those which were completed after 1975 and those which were still under construction as of October, 1977. These are all assumed to be on-stream by 1980. The under-planning plant are those which were under contemplation as of October, 1977. The completion of these plants are assumed to be after 1981.

while Case 2 and excess of supply. It is difficult to predict which case will come true. However, it seems possible to assume as a probable growth rate of real GDP in the world at about 4% as a fair level which lies between 6% in Case 1 and 3% in Case 2. Then, it will be possible to predict that worldwide supply excess of PE will persist until about 1980, and that the supply and demand will then come to a balance in 1985. Concerning PP, the production capacity will continue to expand in the world and the excess of supply will therefore persist until 1985.

Concerning PVC, the relation between supply and demand in Case 1 is a reverse of Case 2. When a rate of real GDP is taken at 4% as mentioned above, it seems that there will be a supply shortage of PVC than that of PE or PP.

Accordingly, it can be predicted that concerning petrochemical products in the world, there will be an excess of supply up till about 1980, and that the supply and demand will come to a balance in 1985. Therefore, the future international price will, similar to the present situation, remain at a price level below the production costs until about 1980. However, by about 1985, the price will go up to a higher level at which the production costs will be covered.

3-2 Estimation of the international price of plastics materials

In order to estimate the future international price, a preliminary estimation of production costs in West Europe (1977 constant price) concerning a plant which was ordered in 1970 (hereafter, it is called the "existing plant") and a plant which was ordered in 1977 (new plant). It is assumed here that European plants will have the greatest influence upon the Iranean market.

Prerequisite conditions for the production cost estimation are shown in Table AII-3-2.

Table AII-3-3 indicates European resin prices (production cost 1977 constant price plus ROE plus sales expenses) based on the above-mentioned prerequisite conditions.

3-3 Estimation of IJPC resin cost

By estimating the resin cost (production cost + ROE + sales expenses) of IJPC, the following two subjects were studied in this chapter:

(1) The future trend of the competitive relationship between the resins and other of natural materials (paper, wood, metal, etc.)

(2) The competitive relationship between the resins and the imported resins (international prices)

As has been discussed, most of the cost factors were based on

Table AII-3-2 Prerequisite Conditions for the Production Cost Estimation of Plastics Materials

(1) Production capacity and construction cost[1)]

	Capacity (1,000 ton)	Plant cost (US$1,000)	
		Existing plant	New plant
Ethylene	300	60,780	112,300
LDPE	80	27,780	51,340
HDPE	80	30,560	56,480
PP	50	23,150	42,790
VCM	200	20,260	37,440
PVC	96	11,580	21,390

Note: 1) Excludes pre-operational expenses and interest during construction

(2) Operational rate: 90%

(3) Raw material price: Naphtha, US$100/Kl

(4) Utility unit price

Electricity: Purchased from external sources at 43¢/KWH

Steam: The amount of energy necessary for producing the required steam was calculated, and the energy amount was then converted into fuel oil price.

Fuel oil: The price of fuel oil containing 0.1% sulphur was taken as the figure, US$2.81/MMBTU

(5) By-product prices: (the ethylene plant)

C_4 fraction: Divided into butadiene and fuel oil for the purpose of calculation.

Butadiene price: US$222/ton

Pyrolysis gasoline: Assessed as being equivalent to naphtha price

Fuel oil: Assessed as being equivalent to utility fuel oil price

Off-gas: Assessed as being equivalent to utility fuel oil price

(6) Labour cost: US$13,640/person/year (on the basis of the UN Statistics on the Wages of Manufacturing Industry Workers)

(7) Own capital rate: 30%

(8) Interest on long-term borrowings: 10% p.a., interest rate applicable to construction cost, pre-operational expenses, and interest during construction.

Interest on short-term borrowings: 9% p.a. interest rate applicable to operating capital

(9) Depreciation:

Process facilities: 10-year straightline

Utility facilities and other facilities: 30-year straight line

Both with no salvage value at the completion of depreciation

(10) ROE: 20% on the own capital

(11) Sales expenses: 5% on "Production cost + ROE"

(12) Allotment of prices for ethylene and propylene: Alloted on an assumption that the price difference between ethylene and propylene is US$100/ton.

Table AII-3-3 Calculation Results of Resin Prices of West European Countries in 1977

(Unit: US$/ton)

	Existing Plant	New Plant
Ethylene		
Facility-related Cost	30.3	59.9
Others	292.5	298.8
Total	322.8	358.1
Propylene		
Facility-related Cost	20.7	41.9
Others	199.3	210.8
Total	220.0	252.7
PE		
Facility-related Cost	104.7	206.4
Others	577.9	615.2
Total	682.6	821.6
PP		
Facility-related Cost	115.9	230.5
Others	518.5	560.4
Total	634.4	790.9
PVC		
Facility-related Cost	60.2	119.2
Others	476.0	497.2
Total	536.2	616.4

Note: The facility-related cost consists of depreciation, insurance premium, taxes, and interest on long-term debt.

the estimation by the Survey Team. It should therefore be noted that these price estimations were made on a preliminary basis, and are meant merely to indicate future course of events in Iran. At first, the production cost was estimated under condition of operation in 1977 (based on the price of 1977 concerning raw materials and others) as the basis. Then, the effects of inflation was added on this basic cost to obtain the IJPC's sales costs of resins in 1980 and 1985.

The effects of the operational rate have also been taken into consideration here.

(1) Premises for a preliminary estimation of basic costs

In order to clarify the effects of inflation, the basic production costs under operation in 1977 should be estimated. This estimation is carried out on the basis of the following premises:

The process flow chart of IJPC is shown in Fig. AII-3-1 and the scope of the preliminary estimation of the costs is indicated by dotted lines.

The price of feedstock (ethylene plant feed gas) is estimated for six cases; US$0/MMBTU, US$0.5/MMBTU, US$1.0/MMBTU, US$1.5/MMBTU, US$2.0/MMBTU, and US$2.5/MMBTU. Fuel prices were established in accordance with the feedstock gas price. When the feedstock gas price remains at US$0/MMBTU, US$0.5/MMBTU, and US$1.0/MMBTU, the corresponding fuel gas price shall remain on the same level as the feedstock gas prices. When the feedstock gas price remains on US$1.5/MMBTU, US$2.0/MMBTU, and US$2.5/MMBTU, the corresponding fuel gas prices shall respectively be US$50/ton, and US$150/ton.

Construction costs are estimated according to the announced figure of ¥550 billion as the total investment for the IJPC project. The employed estimation method is as follows:

At first, construction cost for each process in Japan on the basis of orders placed in 1976 was calculated. Then, the construction cost on the Iranian basis was calculated by multiplying the obtained Japanese cost by the local factors (which are estimated from the difference in price, labour cost, etc., when the machines and materials are imported from Japan to Iran). Then, the difference between the construction costs on the Iranian basis and the total investment of ¥550 billion was allotted, according to the rate of construction costs of each process. Thus, the obtained price of the equipment (process equipment, utilities, and auxiliary equipment) within the scope indicated by dotted lines in Fig. AII-3-1 (ethylene, butadiene extraction, LDPE, HDPE, PP) amounts to US$809.1 million, and the sum of the initial equipment investment (which is the obtained price of equipment plus interest

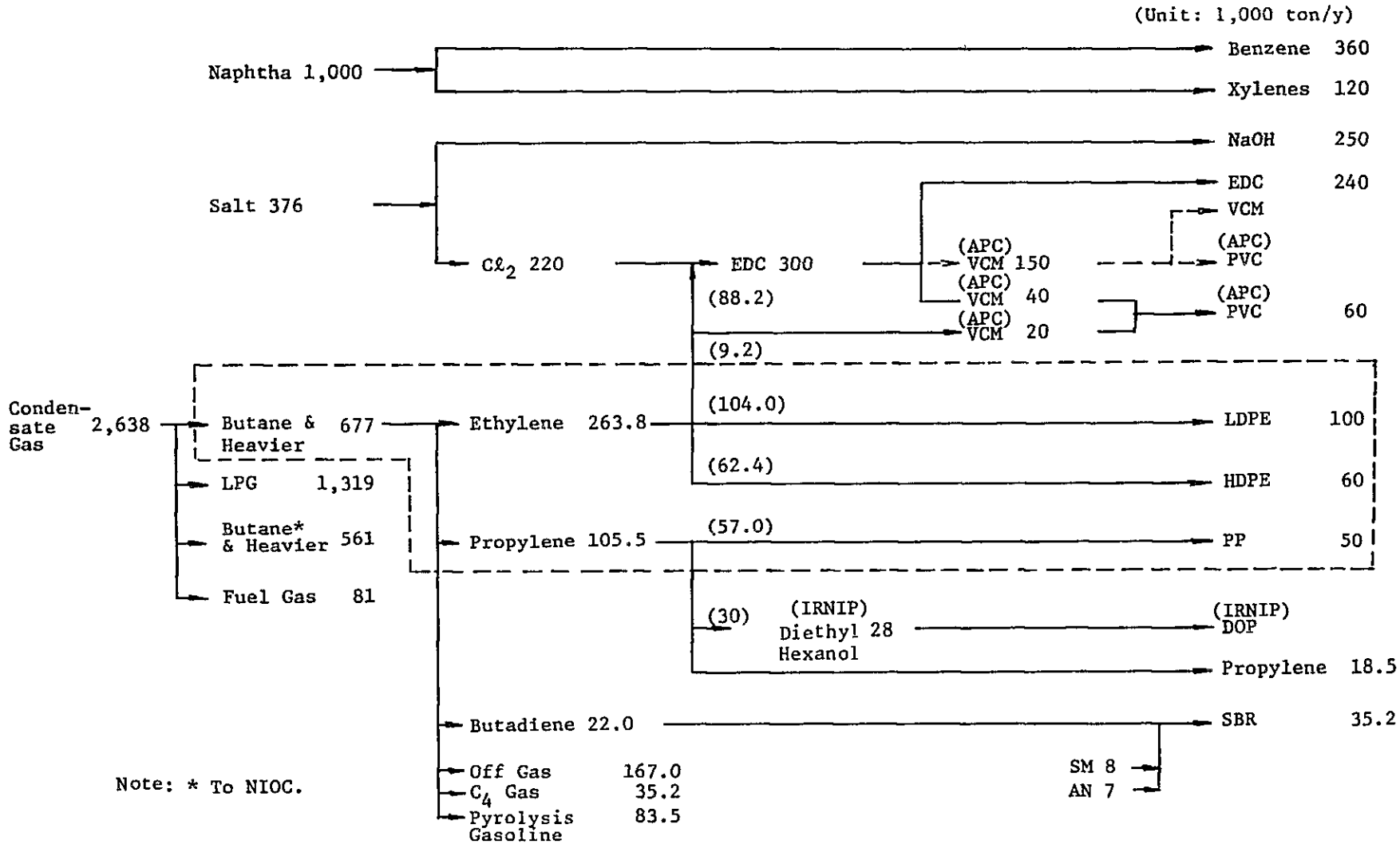


Fig. AII-3-1 IJPC Process Flow Chart

during construction and preparational expenses amount to US$1,082.3 million.

Working capital is estimated to be US$105.0 million. Here, the costs of the products (LDPE, HDPE, PP) are preliminarily estimated to be US$500/ton, and the term of inventory of the products including semi-finished products to be 12 months.

Deduction of the by-products was assumed as shown in Table AII-3-4.

Labour cost: Number of persons required is shown in Table AII-3-5. Unit of labour cost is R400/day for 1977 (US$2,067/year on a foreign exchange rate of 70.62 Rial/Dollar).

Maintenance costs are estimted to be 3.0% per year of acquisition cost of equipment.

Insurance and tax are estimated to be 2% p.a. of average acquisition cost of the equipment.

Depreciation is on without the salvage value, 10 years for processing facilities, 30 years for utility facilities and auxiliary equipment, and 10 years for interest during construction and pre-operational expenses.

Rate of interest on the equipment: 5%/year

Rate of interest on working capital: 5%/year

ROE is estimated on US$318.7 million (authorized capital) which is assumed as the own capital, US$183.6 million as the allotment for LDPE, HDPE, and PP, and 10% as ROE rate.

Operational rate was obtained from the material balance shown in Figure AII-3-1, 100% for plants of LDPE, HDPE, and PP; while 88% for the ethylene plant, as production of ethylene for styrene monomer will be decreased by an extent corresponding to the styrene monomer production deficiency due to delay in plant construction.

Sales expenses are 5% of production costs when the price of ethylene plant feed gas is US$0.5/MMBTU including interest on products on inventory, inland transportation charges, and ROE.

(2) Estimation of standard cost of polyolefins by IJPC (1977)

At first, the production cost of polyolefins produced by IJPC on the basis of 1977 price was estimated. On the basis of this standard cost, the resin prices are expressed in terms of; (production cost + ROE + sales expenses). The estimated figures under the above-mentioned premises are

Table AII-3-4 By-product Prices in Iran (1977)

	Unit Price (US$/ton)	Prerequisite Conditions and Others
Off Gas (C_4 Gas, Fuel Gas)	The same as the feed gas price of ethylene plant	However, in the case that the ethylene plant feed gas prices are 1.5, 2.0, and 2.5 US$/ton, the off gas prices are assumed to be 50, 100, and 150 US$/ton respectively by the recommendation of NPC.
Pyrolysis Gasoline	108.4	Estimated to be the same as the valued price for naphtha. The FOB price of naphtha in Iran (in April, 1977) is estimated to be ¥22,000/kl (108.4$/ton, Ex. rate ¥277.9/US$) on the basis of the import price of naphtha into Japan.
Ethylene	333.5	The average ethylene price, US$333.5/ton, of "European Contract Price" (ECN April 8, 1977) is taken as the ethylene price as of 1977. This is the price of ethylene used for EDC.
Propylene	219.5	The estimation was made same as in the case of ethylene. This price is for propylene used for the production of diethyl hexanol.
Butadiene	222.0	The estimation was made same as in the case of ethylene. This price is valued at the butadiene price used for the production of SBR.

Table AII-3-5 Labor and Surpervision of IJPC (Estimate)

	Capacity (1,000 ton/year)	Process Plant: Operator, Foreman, Staff Manager	Utilities: Operator, Foreman, Manager	Works Manager: Director, Laborer, Helper	General Service: Safety, Maintenance, Administration	Total
Gas Fractionation	Feed 3,000 LPG 1,500	90	40	25	70	225
Ethylene*	300	290	95	39	85	509
Butadiene*	25	80	10	25	27	142
Aromatics	Benzene 360 Xylenes 120	200	62	70	60	392
LDPE*	100	225	40	105	87	457
HDPE*	60	155	35	75	65	330
PP*	50	155	35	75	65	330
Salt	376	60	20	160	30	270
Electrolysis	NaOH 250 Cl_2 222	190	75	45	60	370
EDC	300	120	40	50	50	260
SBR	40	250	30	55	80	415
Total	-	1,815	482	724	679	3,700

Note: The asterisks indicate the necessary manpower for the cost estimation of polyolefins.

shown in Table AII-3-6 and Fig. AII-3-2. When the price of the ethylene plant feed gas increases by US$1.0/MMBTU, it is clear that the resin cost will accordingly increase by approximately US$170/ton.

As shown in Fig. AII-3-3, the operational rate has a great influence on the production cost, because the ratio of fixed cost in the total costs in high.

A reduction in the operational rate by 10% will result in a cost increase by US$100 to US$160 per ton of product.

(3) Estimation of the resin costs of IJPC in 1980 and 1985

On the basis of the estimated standard cost, the resin costs of IJPC in 1980 and 1985 have been estimated.

The effects at inflational rates of 5%, 10%, and 15%/year will be studied. The future rate of inflation in Iran is expected to be higher than the world average rate. However, the difference between the two rates is assumed to be offset by the foreign exchange rate. In fact, this adjustment is not always readily workable because of the domestic situation in Iran. However, without any of this adjustment through the exchange rate, Iran will clearly lose its competitiveness in exporting resins and plastic products.

At first, the IJPC's resin cost at 1977 constant prices obtained in item (2) was classified into two parts; one representing the cost elements influenced by inflation and the other not influenced. Then, the former part is adjusted on the basis of the rate of inflation.

However, as it is intended here to compare the costs on the basis of real price as of 1977, the latter part of the costs, which is not influenced by inflation, was adjusted downwards by the rate of inflation. However, some of the proportional costs as well as the fixed costs are assumed to increase at the rate of inflation, so long as they are influenced by the inflation.

(a) Part of costs which is not affected by inflation

Proportional costs: Price of feed gas to ethylene plant is set at US$0, US$0.5, US$1.5, US$2.0, and US$2.5/MMBTU. Prices of deduced fuel and off-gas have been slided to the price of feed gas to the ethylene plant, thus showing the following figures:

Table AII-3-6 Average Resin Production Cost of LDPE, HDPE and PP in Iran (1977 Constant Price)

[Ethylene Capacity: 300,000 t/y, Operational Rate: 88%
LDPE, HDPE, PP Capacity: 210,000 t/y Operational Rate: 100%]

	Unit Consumption (ton/ton)	Unit Price (US$/ton)	Unit Cost (US$/ton) Ethylene Plant Feed Gas Price (US$/MMBTU) 0.0	0.5	1.0	1.5	2.0	2.5
Raw material			@US$0.0/ton [1]	@23.4 [1]	@46.7 [1]	@70.1 [1]	@93.4 [1]	@116.8 [1]
Ethylene Feed Gas	3.224		0.0	75.4	150.6	226.0	301.1	376.6
By-products								
Ethylene	Δ0.464	333.5	Δ154.7	Δ271.8	Δ271.8	Δ271.8	Δ271.8	Δ271.8
Propylene	Δ0.231	219.5	Δ50.7					
Butadiene	Δ0.105	222.0	Δ23.3					
Pyrolysis Gasoline	Δ0.398	108.4	Δ43.1					
Off Gas			@US$0.0/ton [2]	@23.4 [2]	@46.7 [2]	@50 [2]	@100 [2]	@150 [2]
	Δ0.963		0.0	Δ22.5	Δ45.0	Δ48.2	Δ96.3	Δ144.5
Chem. & Cat.			33.0	33.0	33.0	33.0	33.0	33.0
Utilities			@US$0.0/ton [2]	@23.4 [2]	@46.7 [2]	@50 [2]	@100 [2]	@150 [2]
Fuel	1.298		0.0	30.3	60.7	64.9	129.8	194.7
Water	39.0	0.07	2.7	2.7	2.7	2.7	2.7	2.7
Variable Cost			Δ236.1	Δ152.9	Δ69.8	6.6	98.5	190.7
Labor	1,120 x 2,067		11.0					
Overhead	648 x 2,067		6.4					
Maintenance	$809.1 \times 10^6 \times 0.03$		115.6					
Insurance & Tax	$809.1 \times 10^6 \times 1/2 \times 0.02$		38.5					
Depreciation	$917.3 \times 10^6 \times 1/10$ $165.0 \times 10^6 \times 1/30$		463.0					
Interest on Fixd Cap.	$1082.3 \times 10^6 \times 1/2 \times 0.05$		128.8					
Interest on Working Cap.	$105.0 \times 10^6 \times 0.05$		25.0					
Fixed Cost			788.3	788.3	788.3	788.3	788.3	788.3
Production Cost			552.2	635.4	718.5	794.9	886.8	979.0
ROE	$183.6 \times 10^6 \times 0.1$		87.4	87.4	87.4	87.4	87.4	87.4
Prod. Cost + ROE			639.6	722.8	805.9	882.3	974.2	1066.4
Sales Expenses	772.8 x 0.05		36.1	36.1	36.1	36.1	36.1	36.1
Prod. Cost + ROE + Sales Expenses			675.7	758.9	842.0	918.4	1010.3	1102.5

Plant Cost (Process, Utilities, Off Site) US$809.1 x 10^6
Fixed Capital US$1,082.3 x 10^6
Working Capital US$105.0 x 10^6

Notes: 1) Ethylene plant feed gas price shown in the unit of US$/ton.
2) Fuel gas price shown in the unit of US$/ton.

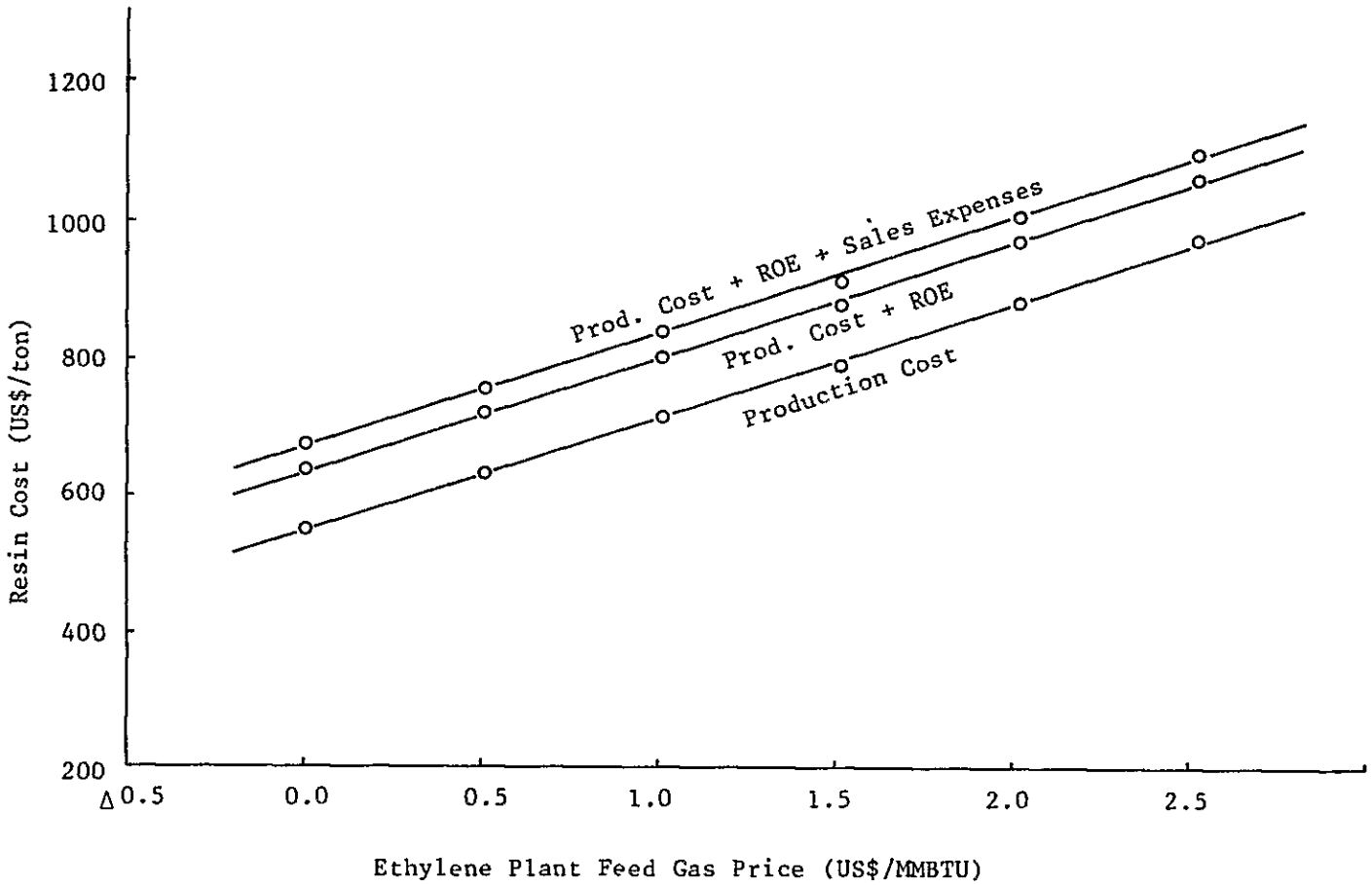
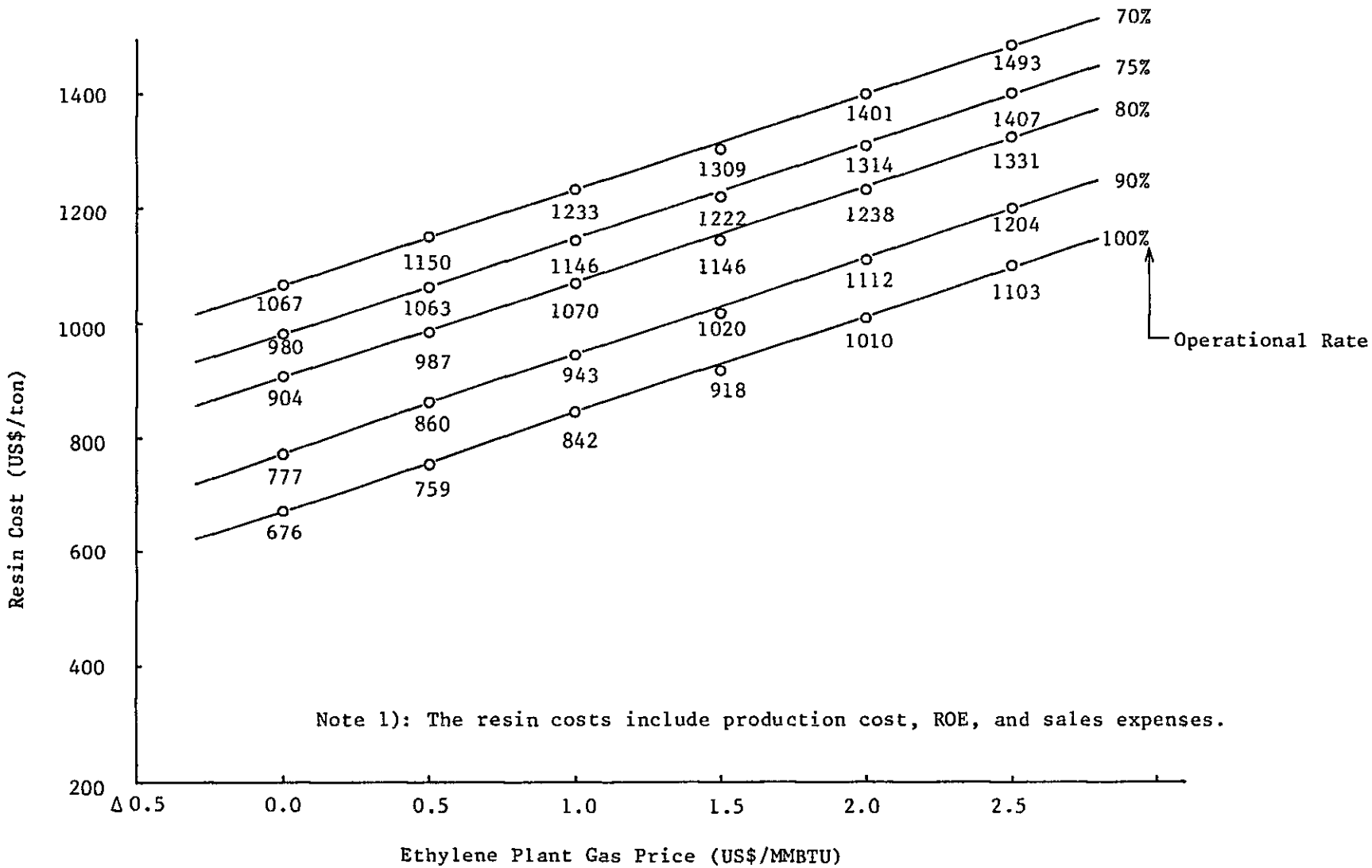


Fig. AII-3-2 Resin Cost of IJPC in 1977
(An Average of HDPE, LDPE and PP Costs)



Note 1): The resin costs include production cost, ROE, and sales expenses.

Fig. AII-3-3 Effects of Operational Rate on Resin Cost1) of IJPC in 1977

(Unit: US$/ton)

Price of Ethylene Plant Feed-gas	(0.0)	(0.5)	(1.0)	(1.5)	(2.0)	(2.5)
Cost of Raw Material	0.0	75.4	150.6	226.0	301.1	376.6
Off-gas	0.0	-22.5	-45.0	-48.2	-96.3	-144.5
Cost of Fuel	0.0	30.3	60.7	64.9	129.8	194.7
Total	0.0	83.2	166.3	242.7	334.6	426.8

Part of the fixed costs which is not influenced by inflation is the investment for production facilities and is indicated below: (There are some parts such as interest on working capital, which are influenced by inflation, however, they were neglected in view of the fact that they are insignificant when compared with others such as interest on the investment for the equipment.)

Depreciation Costs Insurance premium, Taxes Interest	US$655.3/ton
ROE	US$87.4/ton

(b) Part of costs which is influenced by inflation

Among the proportional costs, the following items belong to this category: deduced cost of byproducts such as ethylene, propylene, butadiene, pyrolysis gasoline, costs for catalysts and chemicals, utility costs (especially cooling water).

The costs of these items are as follows (at constant price at 1977):

(Unit: US$/ton)

Deduced amount of by-products including ethylene for other uses	-271.8
Cost for catalysts and chemicals	33.0
Cost for cooling water	2.7
Total	-236.1

Labour cost, sales expenses, etc. belong to the part of fixed costs. Their costs are as follows (at 1977 constant price):

	(Unit: US$/ton)
Labour costs, overhead	17.4
Maintenance costs	115.6
Sales expenses	36.1
Total	169.1

By dividing those costs which are not influenced by inflation by the rate of inflation, the real price at 1977 is obtained as shown in Table AII-3-7, Fig. AII-3-4, and Fig. AII-3-5. As mentioned above, the rates of inflation are 5%, 10%, and 15%, and the operational rates are 100%, 90%, 80%, 75%, and 70%.

The calculated results show that the effects of inflation on the resin cost are very great, when the price of feed gas to the ethylene plant and fixed cost are kept constant.

The higher the rate of inflation becomes, the lower will be the IJPC's resin cost (1977 basis). However, as stated above, it has been assumed that the difference between the rate of inflation in Iran and the average world inflation rate can be adjusted by the foreign exchange rate.

3-4 Comparison with the prices of natural materials

The level of resin prices in Iran as of 1977 was US$586/ton in terms of an average of the prices of the HDPE, LDPE, and PP. This resin price level is a result of the competitive relationship between the prices of natural resource material other than plastic materials. As a result of the balance established between these two sets of material prices, it is reasonable to assume that a balance between the consumption of the plastic materials and natural resource materials has been maintained so far.

While it is true that the prices of the natural materials will keep fluctuating in the future depending on the supply/demand position of these materials themselves, it is a clear fact that the prices of these natural materials are more vulnerable to the effect of inflation than the resin prices are. As shown in Fig. AII-3-6, an assumption is made there that the prices of the natural materials will show a proportionate behaviour against the movement of the inflation rate for the

Table AII-3-7 Resin Cost of IJPC in 1980, 1985 (1977 Constant Price)

(US$/ton)

Operational Rate	Inflation Rate	1980						1985					
	Gas Price[2] (US$/MMBTU)	0.0	0.5	1.0	1.5	2.0	2.5	0.0	0.5	1.0	1.5	2.0	2.5
100%	0%	676	759	842	918	1010	1103	676	759	842	918	1010	1103
	5	575	646	718	784	863	943	436	492	548	600	662	724
	10	491	553	616	673	742	812	279	318	357	393	436	479
	15	421	476	531	581	641	702	176	203	230	255	285	315
90%	0%	777	860	943	1020	1112	1204	777	860	943	1020	1112	1204
	5	665	736	808	874	953	1033	510	566	623	674	737	799
	10	572	634	697	754	823	892	337	376	414	450	493	536
	15	494	549	604	654	714	775	222	249	276	301	331	361
80%	0%	904	987	1070	1146	1238	1331	904	987	1070	1146	1238	1331
	5	777	849	921	987	1066	1146	603	660	716	768	830	892
	10	673	735	798	855	924	994	408	447	486	522	564	607
	15	586	640	695	745	806	866	279	306	333	358	388	418
75%	0%	980	1063	1146	1222	1314	1407	980	1063	1146	1222	1314	1407
	5	845	916	988	1054	1134	1213	659	716	772	824	886	948
	10	733	796	858	916	985	1054	451	490	529	565	607	650
	15	641	695	750	800	861	921	313	340	368	393	423	453
70%	0%	1067	1150	1233	1309	1401	1493	1067	1150	1233	1309	1401	1493
	5	922	994	1066	1131	1211	1290	723	780	836	888	950	1012
	10	803	865	928	985	1054	1123	500	539	578	614	656	699
	15	703	758	812	863	923	984	352	380	407	432	462	492

Note: 1) The Resin Costs include Production Cost, ROE, and Sales expenses.

2) The gas prices are feed gas prices to the ethylene plant.

3) The operational rate is an average of HDPE, LDPE and PP plant operational rates.

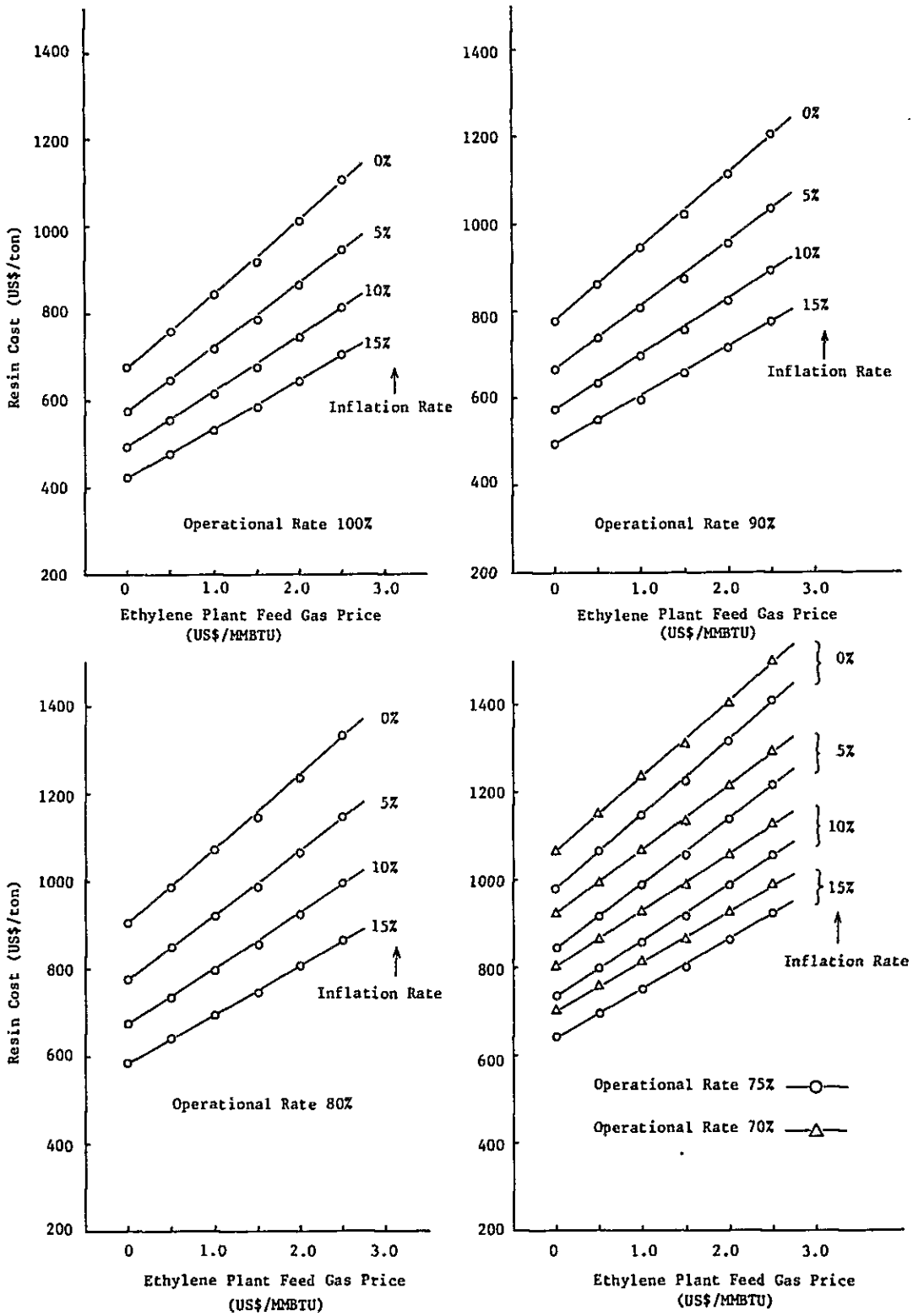


Fig. AII-3-4 Resin Price of IJPC, 1980

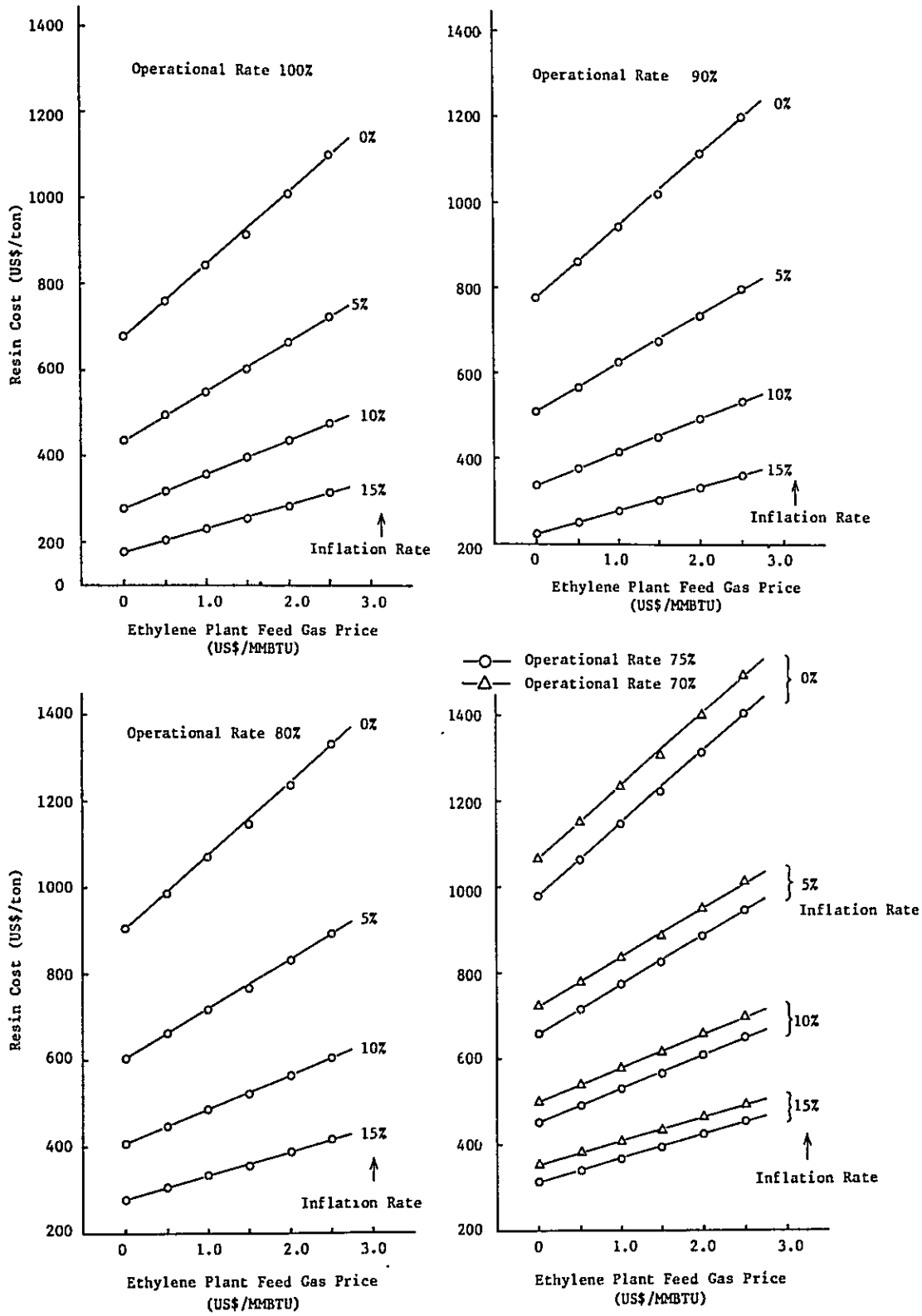


Fig. AII-3-5 Resin Price of IJPC, 1985

purpose of comparing the natural material prices with the cost of resins to be produced by the IJPC.

Fig. AII-3-7 and AII-3-8 were drawn by dividing the IJPC's resin cost figures by the natural resource prices as of 1977 (i.e., the Iranian 1977 resin price taken as US$586/ton).

If it is assumed that the Iranian foreign trade environment and the Iranian domestic status of economy are kept unchanged from the level of 1977, it is possible to draw the following observations on the basis of these illustrations:

(1) As of 1980, IJPC's resin costs will stay on a level considerably higher than that of the prices of other natural materials. Therefore, in view of the price consideration alone, it is slightly difficult that the plastic materials will replace the natural materials by an extent greater than prevailing in 1977.

(2) It seems probable that the IJPC's resin costs will be on a level considerably lower than that of the natural material prices as of 1985, so that the substitution of the natural materials by the resins will progress further than the 1977 status.

3-5 Comparison with the international resin price

The international price of is affected by demand and supply in the world market and the production cost of price-leading countries therein.

From this result, it may be predicted that there will be a continuous oversupply in the world's supply/demand balance until 1980, and then the supply and demand will come to a balance by 1985.

Therefore, the international price will be below production cost until 1980, and finally in 1985 price competition will start at a level above the production cost.

Accordingly, the real international price (the real price of imported resin in Iran on the 1977 basis) should be obtained by adding the effects of the world inflation to the present (1977) price of resin in Iran (imported resin price), and the international price should be obtained from the costs of developed countries (the Eruopean countries).

(1) Estimation of the international prices in 1980 and 1985

The following prices of imported resin in Iran as of 1977 were obtained by the Survey Team. The weighted average price of LDPE, HDPE, and PP by the production capacity rates of IJPC is US$586/ton (domestic price of resin in Iran).

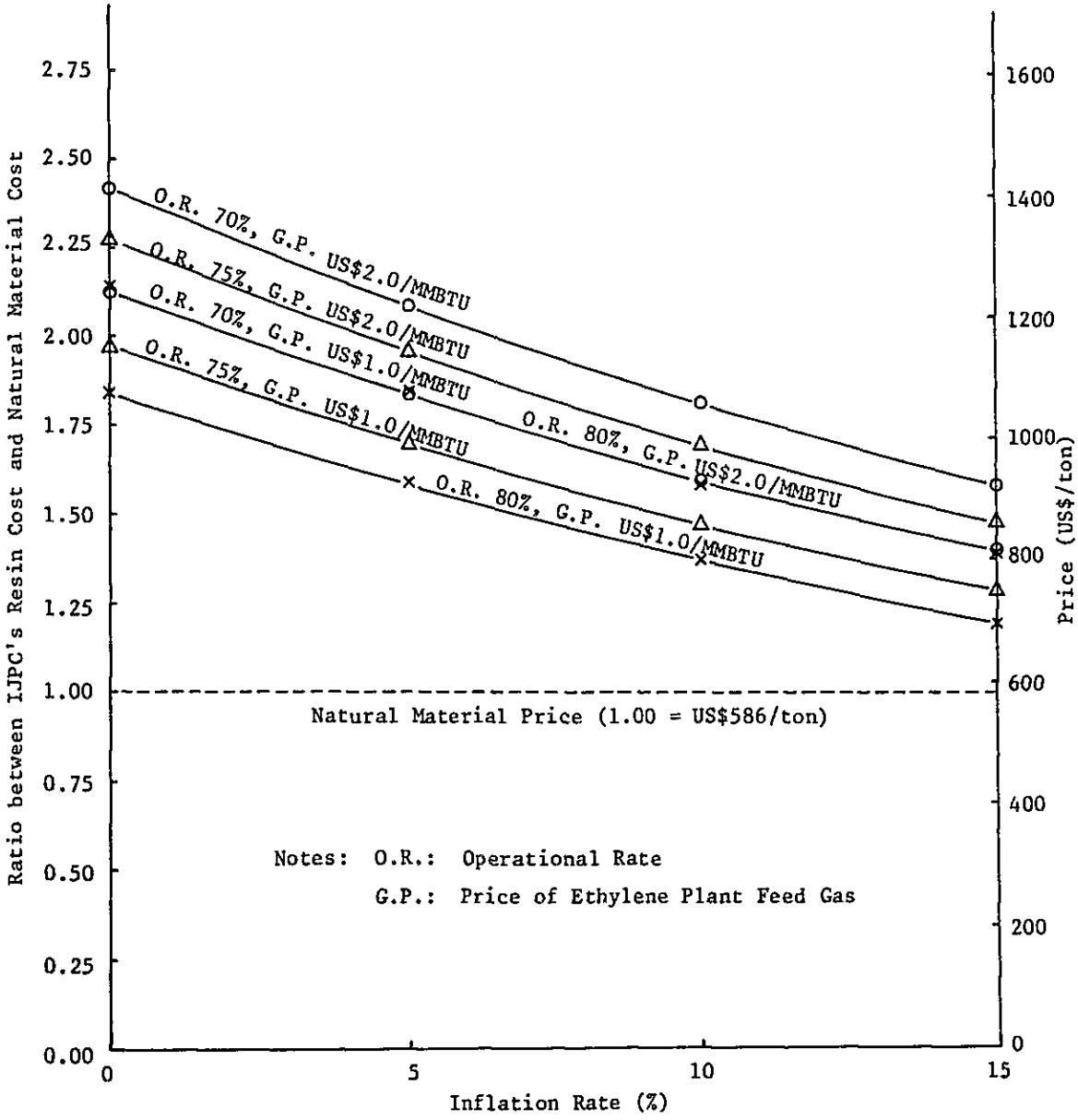


Fig. AII-3-6 Comparison between IJPC's Resin Cost and Natural Material Price in 1980

[1977 Constant Price
Operational Rate: 80%, 75%, 70%
Prices of Ethylene Plant Feed Gas : US$2.0/MMBTU, US$1.0/MMBTU]

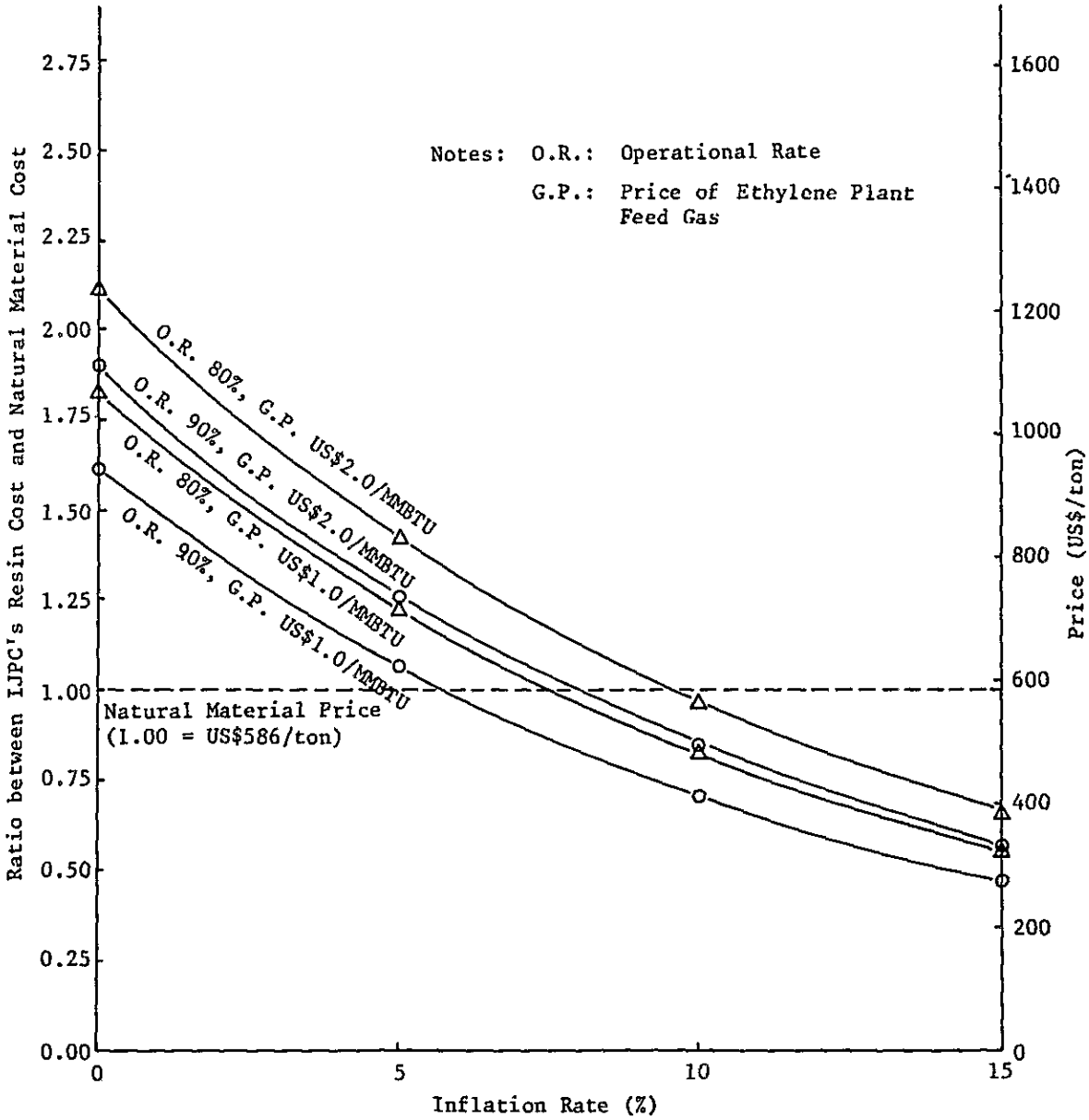


Fig. AII-3-7 Comparison between IJPC's Resin Cost and Natural Material Price in 1985

[1977 Constant Price
Operational Rate: 90%, 80%
Prices of Ethylene Plant Feed Gas: US$2.0/MMBTU, US$1.0/MMBTU]

Price of Resin in Iran, 1977 (US$/ton)

LDPE	550 ~ 580
HDPE	610 ~ 650
PP	560 ~ 590
(Average)	(586)

If Iran decides to import resins at all, the supply sources are likely to be Japan or West Europe. If supply and demand of resin in the world should remain unchanged, the import price of resin from Japan or Europe in 1980 should then be obtained by adding the inflation price increase to the price of resin in 1977.

The produceable amounts (production capacity x technical oprational rate at 0.9) of the existing plants (ordered before 1975) and the new plants (after 1976) in Europe are shown below:

(Unit: million ton)

	1980	1985
Produceable Amount of PE		
Production Facilities built before 1975	5.29	5.29
Production Facilities built after 1976	1.27	1.71
Total	6.56	7.00
Produceable Amount of PP		
Production Facilities built before 1975	9.50	9.50
Production Facilities built after 1976	7.80	11.00
Total	17.30	20.50

Then, an assumption is made that the production is being carried out in accordance with the capacity ratio of the existing and the new plants. On this assumption, the average cost (production cost + ROE + sales expenses) of West European PE (an average of HDPE and LDPE) and PP has been calculated as shown below. These results therefore represent the average European resin costs as of 1980 and 1985 on an assumption that the rate of inflation is 0%.

European cost of resin (in 1977 real price; rate of inflation 0%, rate of operation 90%)

(Unit: US$/ton)

	1980	1985
Cost Related to Production Facilities	133.4	140.4
Raw Materials and Others	575.1	576.5
Total	708.5	716.9

If it is assumed that the item "Raw Materials and Others" above is influenced by inflation, costs under respective inflation rates of 5%, 10%, and 15% will be as shown in Table AII-3-8.

The already given sales (import) price in Iran as of 1977, i.e., US$586/ton, will be reduced by the same rate as the lowering rate of European costs of resin in Table AII-3-8. (The costs are reduced because they have been estimated on the 1977 real price basis). Therefore, the import prices of resin in Iran as of 1980 (which signifies the international price on the price basis of 1977) are as shown in Table AII-3-9.

The import price of resin in Iran as of 1985 will be in competition on the cost basis, obtained by adding the transportation charges to the European costs shown in Table AII-3-8 (production cost +ROE + sales expenses), thereby giving figures as shown in Table AII-3-10. Here, the transportation charges are deemed to be included in the 20% of ROE, thereby being deemed to be nil.

(2) Comparison between the IJPC's resin costs and international price

By comparing the IJPC's costs of resin in 1980 and 1985 and the above-mentioned resin import price in Iran, the figures in Fig. AII-3-8 and Fig. AII-3-9 can be obtained.

An important premise in this case is that in estimating the resin costs of IJPC (production cost + ROE + sales expenses), the feed gas prices for the ethylene plant and the prices of fuel oil are fixed at US$0, US$0,5 US$1.0, US$1.5, US$2.0, and US$2.5/MMBTU regardless of the existing rate of inflation.

An important premise for the international price obtained from European cost (production cost + ROE + sales expenses) is that an oversupply in the world will persist until 1980 and that supply and demand will come to a balance in 1985.

The following conclusions may be drawn from Figs. AII-3-7 and AII-3-8 on the basis of the above prerequisite conditions:

(1) As of 1980, the IJPC's resin cost will be on a level much higher than the international level (i.e., the price of resins imported into Iran).

(2) As of 1985, the IJPC's resin cost will drastically be reduced to such an extent that the level will be below the international price level.

Even so, the effects of the operational rate and the inflation rate exerted upon the IJPC's resin cost are still great.

Table AII-3-8. Resin Cost in European Countries, 1980 and 1985
(Actual price based on 1977 level, operational rate 90%)

(US$/ton)

Year \ Inflational Rate (%)	0	5	10	15
1980	709 (1.00)	690 (0.97)	675 (0.95)	663 (0.94)
1985	717 (1.00)	672 (0.94)	642 (0.90)	622 (0.87)

Note: The figures in the parentheses show magnification.

Table AII-3-9 Resin Import Price into Iran in 1980
(Actual price based on 1977 level)

(US$/ton)

Year \ Inflational Rate (%)	0	5	10	15
1980	586	568	557	551

Table AII-3-10 Resin Import Price into Iran in 1985
(Actual price based on 1977 level)

(US$/ton)

Year \ Inflational Rate (%)	0	5	10	15
1985	717	672	642	622

Note: Opeoational rate is 90%.

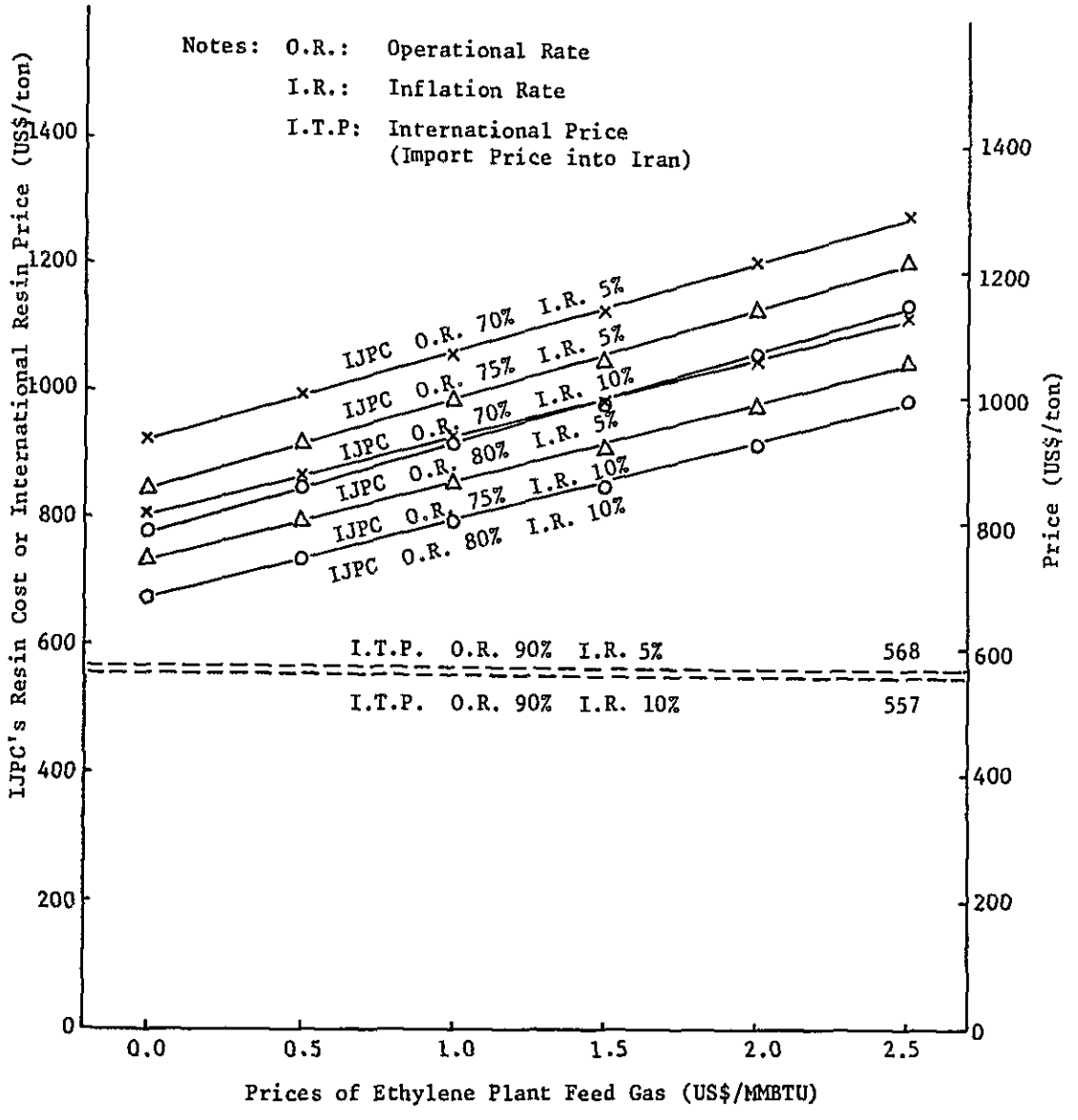


Fig. AII-3-8 Comparison between IJPC's Resin Cost and International Price in 1980

[1977 Constant Price
Average Price of HDPE, LEPE, and PP
Operational Rate: IJPC 80%, 75%, 70%
Inflation Rate: 10%, 5%]

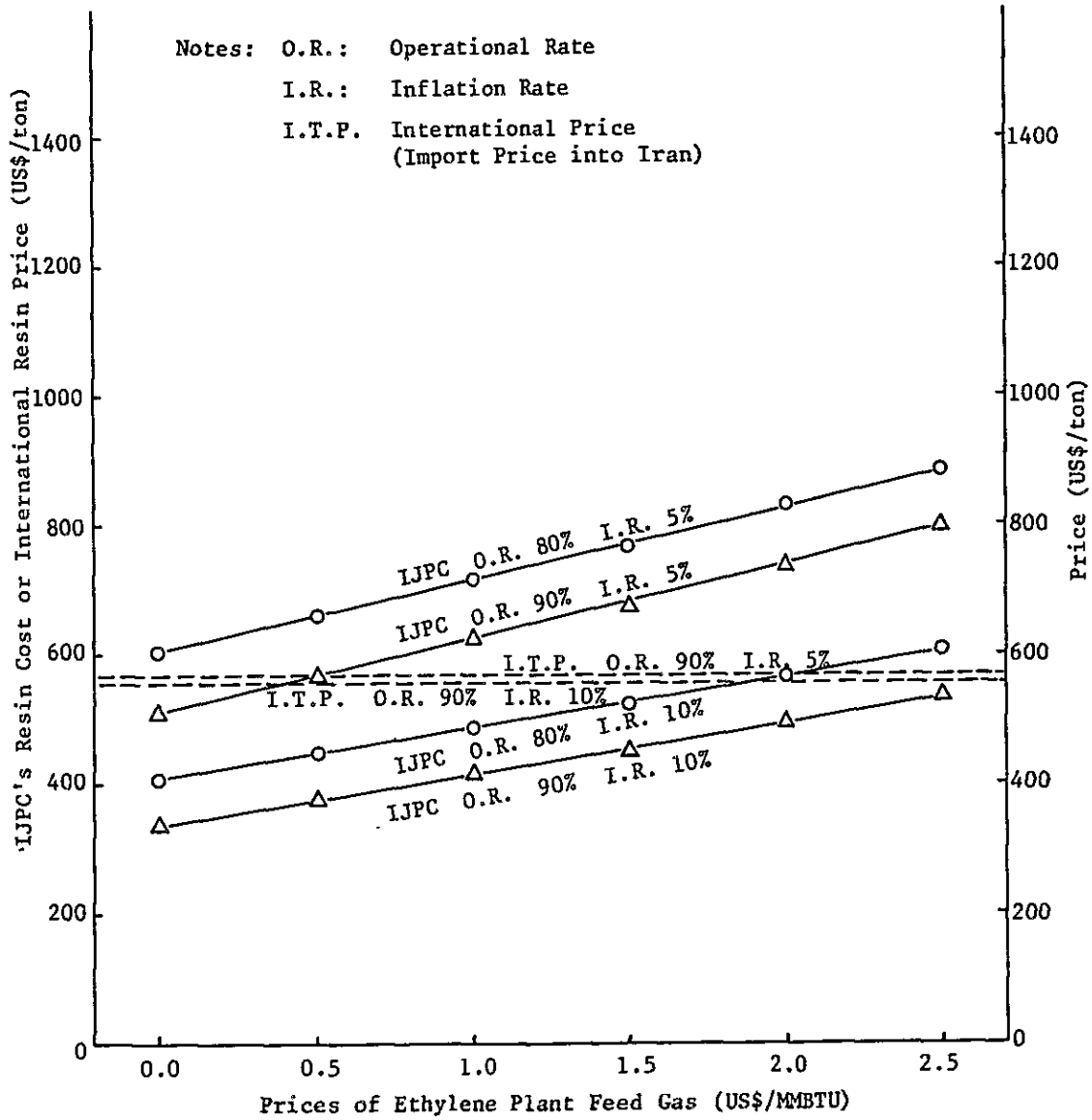


Fig. AII-3-9 Comparison between IJPC's Resin Cost and International Price in 1985

[1977 Constant Price
Average Price of HDPE, LDPE, and PP
Operational Rate: IJPC 90%, 80%
Inflation Rate: 10%, 5%]

Appendix III MISCELLANEOUS

1. Industrialization in Iran

The national objectives of Iran is understood to be the ultimate establishment of a pattern for the economic development in line with the industrially developed countries centering on the overall industrialization of the national economy after taking off the traditionally agriculture-based economic stage. Implementation of planned economy has so far been carried out towards this goal. The First Seven-year Plan which started in 1948 has now been incorporated into the Amended Fifth Five-year Plan (1973 - 1977). It is further scheduled that the Sixth Five-year Plan is to start in 1978 which will most likely take over the currently effected plan. During the periods of these national plans, series of ambitious development projects have been formulated and a vast variety of development work has been put into practice. Among these projects, the most conspicuous is the epoch-making land reform which started in 1962 under the Imperial Ordinance by the Shar of Iran. This land reform is to put an end to the traditional feudal society to give birth to industrialization and modernization of the society.

The oil price hike effected by the OPEC member countries in the fall of 1973 also gave a grave impetus to the industrialization of Iran. The increase in the augumentation of foreign exchange revenue, brought about by the upward revision of oil price gave Iran the fund for investment capital which is indispensable for socio-economic development. At the same time, the national industry based on oil and natural gas obtained a great extent of international competitiveness. The construction of IJPC on an international production scale of the petrochemical industry in addition to the already existing PVC plants conspicuously symbolizes the great change now taking place in this country. As a result of the implementation of these national development projects, the per capita GDP of Iran which was estimated to be about US$200 during the early part of 1960s is now estimated to have reached to a level of US$1,900 by 1976. Also, if it is assumed that the extent of industrialization can be measured in terms of the weight occupied by the non-oil GDP in the total output in the manufacturing industry, it is obvious that the Iranian industrialization has so far made a great forward step as the non-oil GDP rate greatly leaped to about 33% in 1976 from a level of about 12% registered during the early stage of 1960s. The current stage of economic development of Iran may be observed as shown in Table AIII-1-1 on the basis of the macro-economic indexes:

However, it is deemed possible that the oil production in Iran will be reduced from the current level by 1990s, and on the other hand, the development of the national economy will obviously increase the extent of domestic oil consumption. In view of such a possibility, it is highly likely that the foreign exchange revenue now gained through the oil exportation might fall as shown in Table AIII-1-2 if all the other conditions remained unchanged. This signifies that the Iranian national

economy will have to intensify the dependence upon income sources other than oil exportation. However, if the agricultural development during the same period is estimated to be only 5% to 10% per year at best, it would be imperative that the development of industry and commerce is the absolutely necessary conditions for the future development of Iranian national economy. (Ref. Table AIII-1-3) One of the features of the Iranian nationalization is, as was stated clearly by Shar, the utilization of oil and gas not as fuel but as effective industrial raw materials. This aspiration naturally leads to the necessity for enhancing the value added to the oil- and gas-based export products. Here rises the signification of the construction of the new petrochemical industry in Iran on a world-standard scale in addition to the existing PVC plants.

Under the administration of NPC, five indigenous chemical industrial companies have already been constructed and placed onstream in the form of joint venture companies with foreign-based entities. In addition, a giant petrochemical complex is under construction at Bandar Shapur, upon completion of which domestic production of various derivatives centering on the 300-thousand-ton ethylene plant. The products to be turned out by this petrochemical complex include LDPE, HDPE, PP, PS, and PVC as well as aromatics products such as benzene, together with caustic soda, propane gas, etc. In other words, by the completion of the Bandar Shapur complex, Iran will have a full-fledged upper-stream petrochemical industry. On the basis of this accomplishment, Iran will have a stable source of supply of the raw materials for the petrochemical industries, thereby making a great advancement of the national petrochemical industry.

As mentioned above, the signification of the industrialization is extremely grave for Iran. However, it should be noted here that the following points be borne in mind when formulating plans for the future advancement of the industry of the country:

The first point to be noted is the factors concerning the foreign exchange balance. As shown in Table AIII-1-3, it is likely that the revenue based on oil exportation will greatly reduce by 1990. In view of the necessary importation of machinery, equipment, etc. for the implementation of the industrialization, it seems absolutely necessary to further develop the avenue for industrial product exportation by means of wholesome investment made into some industrial sectors the development of which is technically and economically suited for the future situation of Iran.

Another point needing attention is the problems pertaining to the securing of the necessary labour force. Iran by no means have surplus labour force or low-wage manpower available for the industry. This signifies that labour-intensive agricultural or industrial operation is not suited for the Iranian conditions. Both these sectors therefore must be large-scaled and modernized under the control of stream-lined management.

Table AIII-1-1 Current Status of the Iranian National Economy (1976/3 - 1977/3)

(billion US$ in current prices)

GNP	66.4
GDP	65.0
Agricultural Group	6.1
Oil Group	24.7
Industrial Group	13.3
Services Group	20.8
Government Budget	29.2
Oil & Gas Revenue	20.0
Direct Taxes	4.4
Exports	22.9
Imports	18.9
Population (mil people)	33.9
Per Capita GDP (US$)	1,917.0

Source: Bulletin of Bank Markaji, First Quarter 1977.
Echo of Iran, August - Sept., 1977, Iran Trade Industry

Table AIII-1-2 Production and Sales of Crude Oil in Iran

(Unit: 1,000 bbl/day)

Year	Sales Amount to the Consortium	Domestic Consumption	NIOC's Exports	Total Production
1975	5,516	352	450	6,318
1980	5,750	550	1,300	7,600
1985	4,060	851	1,500	6,411
1990	704	1,251	704	2,659
1993	7.5	1,490	7.5	1,505

Source: NIOC

Table AIII-1-3 Forecast of Economic Account in Iran

(Unit: billion US$ in current prices)

	GDP	Oil	Agri-culture	Industry & Service	Population (mil people)	Per Capita GDP
1976	64.9	24.7	6.1	34.1	33.0	1,547
1980	79.1	27.4	7.85	43.85	38.1	2,067
1985	115.2	23.1	10.5	81.6	44.0	2,621
1990	159.3	9.6	14.1	135.6	50.7	3,154

2. Governmental Measures for the Fostering of Petrochemical Industry and Downstream Industry in Japan

It was mid-1950 when the synthetic resin material products such as plastics, synthetic rubber, etc. began to penetrate into the Japanese market. Around the middle of the decade of 1950s, the Japanese economy began to move into a high-speed development which continued for about twenty years thereafter. In this period of high-speed growth, the industrialization of Japan was accelerated as a whole including the petrochemical industry. Therefore, the demand for plastics and synthetic rubber products grew rapidly along with the quick progress of the industrialization. Petrochemical products began to penetrate with a great speed and average encompassing household electronic appliances, automobile manufacturing, and other industrial parts field, as well as the packaging, construction, fishery, etc. The development of the market for each of these plastics and synthetic rubber products had to be undertaken by the private sector enterprises operating in these fields, and it was not unusual practice that the Japanese Government take direct action in marketing and demand generation.

There are two major and basic reasons for the fact that the petrochemical industry and the synthetic resin manufacturing industry registered a phenomenal growth during the period. One is the rapid growth in the demand for these products buttressed by the high-speed economic growth, and the other is the well-organized protective policies taken by the Japanese Government for the petrochemical industry as part of the basic economic policies of the administration during the rehabilitation period of the national economy after World War II. As a result, low-cost and stable supply of material resins was secured, thereby a strong price competitiveness to the synthetic resin products within the framework of the Japanese market in coping with existing materials which came in direct competition with the petrochemical resin materials. The successful development of the market for synthetic resin products is a result of the Japanese governmental policies of properly fostering the petrochemical industry by implementing overall and at the same time detailed administrative measures.

In the economic rehabilitation period (1945-1955 and the high-speed growth period of the national economy, the basic economic policy of the Japanese Government invariably centered on the heavy industrial sector. The petrochemical industry which is an important part of the heavy chemical industry was therefore acknowledged and sanctioned as of the most important national industrial sectors from the outset. Wholesome growth of the petrochemical industry was consequently a grave concern of the authorities in charge of executing economic administrative policies. The Ministry of International Trade and Industry (MITI) was the governmental office enpowered to execute the Japanese industrialization policies. Early as 1951, MITI compiled a report entitled "the Petrochemical Industry of Japan" in which the Ministry placed a strong emphasis upon the necessity for sound establishment of the petrochemical industry

within the framework of the Japanese national economy. During the rehabilitation period, the Japanese chemical industry depended heavily upon domestic coal or imported materials as far as the raw material supply was concerned. Therefore, the most important issue around the period of the time was smooth shift from coal to oil, as well as successful switchover from raw material importation to raw material domestic production. The MITI report contains a paragraph which reads as follows:

"Olefinic products are one of the basic chemical industrial raw materials for the production of solvents, synthetic resins, pharmaceutical goods, plasticizers, etc. for which a great demand is expected in the future. It is therefore extremely precarious for the national economy that most of the supply of the olefinic products must depend upon importation. In order to establish smooth and wholesome development of organic synthetic industry in Japan, it is of an utmost importance that production facilities for olefinic hydrocarbons and derivatives thereof be urgently installed on the basis of cracking of crude oil as is now carried out in the U.S.A."

On the basis of a fundamental concept as embodied in this report, the Japanese Diet in three years later acted the "Resolution upon the Promotion of the Organic Synthetic Chemical Industry." The basic contents of this Resolution was as follows:

"The Diet resolves that the Government of Japan take all the possible means to establish as soon as practicable the organic synthetic industry for the purpose of attaining the objective of independence and autonomy of the national economy, particularly in view of the present status of the foreign exchange position."

On the basis of this Resolution, the development of the petrochemical industry was officially sanctioned to be one of the industrial sectors under full protection and fostering by the governmental authorities. Thus, the policies of the Japanese Government concerning the petrochemical industry from that point onwards pertained mainly as to how to develop the industry in a wholesome direction. In order to cope with this problem, MITI resolved in 1955 an official policy called the "Policies for Fostering the Petrochemical Industry". On the basis of this policy, the government carried out well detailed administrative policies such as follows:

a) Governmental loans to cover plant and equipment cost

b) A special system for depreciation

c) Active introduction of foreign technology

d) Reduction and/or exemption of corporate taxes

e) Securing of foreign exchange allocation to enable importation of petrochemical industrial machinery and equipment

f) Setting of import duty barrier against foreign petrochemical industrial products importation

g) Reimbursement of paid import duty on crude oil importation

Along with these incentive policies, the government also effected practical and realistic action for better development of the petrochemical industry as follows:

a) Advantageous transfer of government-owned lands for the construction of petrochemical complexes

b) Governmental assistance in the establishment of enterprises in the petrochemical industry

c) Extension of loans from the Development Bank to petrochemical industrial companies

The above-enumerated governmental policies are particularly geared to the development of the so-called upper-stream petrochemical industries among the petrochemical industry in a broad sense of the term. Wholesome establishment of the upper-stream petrochemical industries signifies a shift towards a higher extent of domestic production, thereby setting up stable sources of supply of synthetic resins, etc. The basic aim in the fostering policy of the upper-stream industry is to advance the industrialization of various operations in the upper-stream field, so that high-quality and low-cost raw material supply will be secured.

However, the petrochemical industry cannot be completely established by developing the upper-stream alone. The development of the down-stream industrial operations is an equally important issue. The Japanese Government therefore exerted their full efforts in establishing both upper-stream and down-stream petrochemical industrial operations. In 1953, the government formulated the "Synthetic Fiber Industry Fostering Policies", and also in 1955, the "Policies for the Development of the Synthetic Resin Industry." In 1957, the authorities enacted the "Special Act for Enterprises Engaging in Synthetic Rubber Manufacture."

The "Policies for the Development of Synthetic Resin Industry" of 1955 stipulates its objectives and administrative measures as follows:

As the objectives:

(1) Enhancement of the self sufficiency by substituting the importation of the plastics materials

(2) Rationalization of the industrial production facilities by utilizing advantageous characteristics of plastics

(3) Earning of foreign exchange by exporting synthetic resins and products made therefrom

(4) Improvements of the standard of living through modernization of daily and household commodities and reduction of the prices thereof

In order to attain these objectives, Five-year Production Plans were established by covering several types of resins. In order to attain these Five-year Plans, the following policies were also established:

a) Securing of production facility reinforcement funds and sources of rationalized wages

b) Preferential taxation treatment such as reduction/exemption of corporate taxes and local governmental taxes

c) Promotion of technological advancement by technology transfer from overseas and importation of necessary machinery and equipment

d) Intensification of public relations and advertisements concerning the use of plastics products

e) Early development of related basic industries such as petrochemical industry for securing steady supply of raw materials for plastics products

f) Substantialization of related industries such as plastics processing industry

As mentioned above, the policies concerning the fostering of the petrochemical industry in Japan were formulated with a basic objective of establishing an overall system for supply of the petrochemical industrial products. The targets of these policies may be summarized as follows:

a) To maximize the extent of domestic production of the petrochemical industrial raw materials except for crude oil

b) Implementation of various protective and preferential policies in the production of these raw materials

c) Securing of steady and low-cost raw material supply

d) Production of low-cost and high-quality petrochemical industrial products by means of utilizing low-cost raw materials as the inputs

The eventual costs of various petrochemical industrial products will be low and the quality will be high once such a production system is built through the implementation of the governmental policies. Low-cost and high-quality petrochemical industrial products will display an extremely high power in market development and creation of new demand. It would therefore be possible to show an outstanding price competitiveness as substitutes of conventionally used materials.

Such is the background history of the development of Japanese plastics and synthetic rubber manufacturing industries. As a result of steady progress of the industries within the framework of such an overall supply system, it became unnecessary to formulate separate policies for developing market outlets for individual petrochemical industrial products. One of the major reasons for a rapid penetration of the plastics, synthetic rubber, and other synthetic resin products in Japan was the successful establishment of an effective overall supply system by the government in the petrochemical industry.

However, the development of market outlets for plastics, synthetic rubber, and other synthetic resin products cannot be achieved by simply and politically setting up an overall supply system. For instance, it is absolutely necessary to conduct accurate and realistic analyses of the current status of the industry when formulating various policies, if these policies were to be practicable. In order to enable such accurate analyses, it is imperative that all the necessary data and information be made available. In other words, industrial statistics must be substantially carried out. Regarding the specifications of the products, it is necessary that all the manufacturing enterprises abide by a uniform standard, since individually different specifications of the quality and the dimensions of the products will drastically increase the extent of waste in the total system of the economy. Particularly in the case of carrying out mass-production, the standardization of products is absolutely necessary. Such problems as pertaining to the establishment of industrial statistics and product standards are not necessarily limited to the plastics and synthetic rubber products. The problems here are much more basic than in a limited sectors of the plastics industry. Any country which is intending industrialization will be soon or later compelled to face with these issue. In the background of the rapid development of the market outlets for the plastics and synthetic rubber products in Japan since mid-1950s, there was a general trend that the substantialization of the base-work for the industrialization in Japan was also carried out. The basic foundations in this respect in sound promotion of industrialization include the following provisions:

a) Statistics Law

b) Food Sanitation Examination Law

c) Industrial Standard Law

d) Laws concerning the Funds for Modernizing Small and Middle-scaled Enterprises

e) Export Inspection Law

f) Temporary Law for the Promotion of the Machinery Industry

g) Basic Law for the Protection of Consumers

h) Construction and Archetectural Standard Law

i) Import Duty Law

j) Laws concerning the Promotion of Modernization of Small and Middle-scaled Enterprises

k) Audinance for the Construction of Waterwork and Sewerage System

Among the above-enumerated provisions, the following appear to be particularly relevant to the plastics and synthetic rubber industrialization:

(1) Statistics Law (enacted in 1947)

The objectives of this law are "to ensure the accuracy of the statistics, to avoid the duplication of statistical surveys by streamlining the system of statistical work, and to improve and develop the statistical systems." This law is applied to all the Japanese plastics-related enterprises employing more than 14 - 15 persons. The owner of such enterprises are obliged to abide by this law. The data collected through the system therefore must be properly registered and stored. The so-called industrial census is also covered by this law. Only after collecting accurate data, will it be possible to formulate meaningful administrative policies.

(2) Industrial Standard Law (enacted in 1949)

This Law aims "to establish reasonable and rational industrial standard systems and to promote the standardization in the industry for the purpose of improving the quality and production efficiency of mining and industrial products, thereby ensuring fairness in trade to rationalize the consumption aspect, and thereby to contribute to the enhancement of the welfare of the public." The Japanese Industrial Standard (JIS) has been established as a national system in Japan. Under this system, the authorization of the JIS indication is conducted. Products carrying the JIS indication are those which have been recognized to represent satisfactory quality standard. This system

effectively serves to prevent and eliminate the production of poor quality products. The Export Inspection Law is also part of this regulation. Such a system will greatly facilitate the quality control control of the export commodities destined particularly to overseas consumers' market.

(3) Laws concerning the Promotion of Modernization of Small and Middle-scaled Enterprises (enacted in 1953)

This Law aims "to study and implement plans for modernizing small and middle-scaled enterprises on the basis of practical surveys of the current status of the subject industries." This Law also concerns itself with the supply aspect in its primary objective of streamlining and rationalization of the production. When this Law is actually applied to the processors of synthetic resin products, it will eventually serve effectively to develop the market, since the manufacturers will be compelled to set up a system to accurately and promptly fulfill the needs of the customers through streamlining the production facilities and modernization of the management. Particularly in the case of Japan, the number of small and middle-scaled enterprises among the plastics processing industry is considerably high. Therefore, political assistance of these enterprises in terms of enactment of laws seems to be effective in wholesome development of the enterprises.

(4) Import Duty Law

Japan started the development of the petrochemical industrialization much later than the industrially developed countries in the West. Therefore, the prices of the products during the early stage of the domestic production was much higher than the internationally competitive price level. It was obvious then that the development of Japanese domestic petrochemical enterprises was almost impossible if the importation of the products from the developed countries were left uncontrolled. As part of the petrochemical indistrialization policies, the government established both a quota system and the protective import duty barrier against the importation of petrochemical industrial products, thereby encouraging the domestic demand for the products will be fulfilled by indigenous production. It should be noted, however, that the establishment of import duty barrier is meaningful only during the period that the domestic industry is still underdeveloped. These protective measures should not be carried on for an unduly long period.

(5) Audinance for the Construction of Waterwork and Sewerage System (enacted in 1959)

The objectives of this Law are "to establish standards for the administration of the public sewerage systems and urban sewerage network in order to construct a substantial sewerage systems." The market for synthetic resin products will be drastically expanded when they are utilized for the substantialization of the social capital. By formulating suitable laws concerning the reinforcement of the social capital, it is possible to politically generate sufficient demand for the plastics products.

(6) Other Law and Regulations

In addition to the above provisions, the following items are also deemed necessary for reinforcing the foundation for further industrialization:

(a) Labour Standard Law

(b) Consumer Protection Standard Law

(c) Construction and Archetectural Standard Law

(d) Laws concerning the Service Life of the Depreciable Assets

(e) Laws concerning the Treatment of the Industrial Waste

Especially in the case of plastics and synthetic rubber products, the application in general economic activities is extremely wide and versatile. Therefore, the coverage of the policies to be formulated by the government will have to be wide-ranged.

3. Current Status of the Importation of Plastics Processing Facilities into Iran

3-1 Current status of the importation of plastics processing facilities into Iran

Table AIII-3-1 shows the importation value of plastics processing facilities into Iran for a six-year period from 1971 to 1976. These data have been collected from the trade statistics of Japan, the U.S.A., and European countries. In 1976, the importation value of injection molding machines amounted to US$11 million. The importation of extrusion molding machines amounted to US$3.52 million together with press machines, etc. accounting for US$5.73 million, thereby making a total of US$20.41 million. Compared with the importation made during 1971, this 1976 figures shows a multiple as much as 12. Of these machines, injection molders showed a particularly remarkable growth in importation in value. The injection molding machine imported into Iran during 1975 grew by 3.6 times the 1974 level, while 1975 figure grew by 1.9 times the 1976 importation.

As shown in Table AIII-3-2, the price of injection molding machines per unit weight of the machine increased on average by about 10% during 1975, and about 17% during 1976. This signifies a truely enormous growth of the importation of injection molding machines into Iran. This also eloquently demonstrates the fact that the growth of the injection molding industry of Iran has been extremely high since the Oil Crisis.

On the other hand, the importation value of extruding machines and the parts thereof grew by 1.9 times the previous year in 1975, and 1.15 times in 1976. These growth multiples are not remarkably high when the increase in the price of the machines and parts is taken into consideration. This seems to be due to the gradually emerging excess production capacity in major extrusion molded products such as PVC pipes, woven bags, etc.

Regarding press machines, etc., the growth rate has so far been stagnant as in the case of extrusion machines. The increase multiples registered are 2.2 times the previous year's level during 1975, and 1.5 during 1976.

3-2 Suppliers of plastic processing facilities to Iran

The share of the Iranian market as the export destination occupied by various exporter countries of plastics processing facilities during 1976 was as shown below:

(Unit: %)

	Injection Molding Machines	Extrusion Molding Machines	Press Machines, etc.
West Germany	84	60	96
Japan	7	5	-
U.S.A.	6	24	-
France	3	12	1
Netherlands	-	-	2
Austria	-	-	1

It was impossible to obtain the Italian statistics data for the year 1976. However, in view of the trend of exportation from Italy to Iran prior to 1975, it is likely that the Italian share of injection molding machines during 1976 was 4% to 5%, that of extrusion molding machines 3% to 4%, and press machines, etc. approximately 10%.

West Germany has been enjoying the highest share since 1971; occupying 70% to 90% in injection molders, and over 60% in extrusion molders. However, the share in the extrusion molder exportation of West Germany fell gradually from 100% prior to 1972, while shipments from Japan and the U.S.A. gradually grew. On the contrary, the exportation of press machines, etc. from West Germany rapidly grew from about 20% in 1971 to a staggering level of 96% in 1976.

Table AIII-3-1 Trend of Imports of Plastics Processing Machinery from Major Exporting Countries into Iran (1971 - 1976)

(1) INJECTION

	JAPAN	U.S.A	GERMANY, FR	FRANCE	ITALY	U.K.	NETHERLANDS	AUSTRIA	(TOTAL)
1971									
VALUE(1000D)	268,2		606,5						874,7
RATIO (%)	30,7		69,3						100,0
1972									
VALUE(1000D)	88,6		337,3						425,9
RATIO (%)	20,8		79,2						100,0
1973									
VALUE(1000D)	128,7		1,776,2						1,904,9
RATIO (%)	6,8		93,2						100,0
1974									
VALUE(1000D)	207,6	23,6	1,321,6		83,3				1,636,0
RATIO (%)	12,7	1,4	80,8		5,1				100,0
1975									
VALUE(1000D)	539,7	251,7	4,849,4		261,3				5,902,1
RATIO (%)	9,1	4,3	82,2		4,4				100,0
1976									
VALUE(1000D)	796,4	627,3	9,378,1	327,6					11,129,3
RATIO (%)	7,2	5,6	84,3	2,9					100,0

(2) EXTRUDER

	JAPAN	U.S.A	GERMANY, FR	FRANCE	ITALY	U.K.	NETHERLANDS	AUSTRIA	(TOTAL)
1971									
VALUE(1000D)			35,8						35,8
RATIO (%)			100,0						100,0
1972									
VALUE(1000D)			243,9						243,9
RATIO (%)			100,0						100,0
1973									
VALUE(1000D)	60,6		493,9						554,5
RATIO (%)	10,9		89,1						100,0
1974									
VALUE(1000D)	226,6		1,338,6		58,5				1,623,7
RATIO (%)	14,0		82,4		3,6				100,0
1975									
VALUE(1000D)	331,7	69,9	2,059,5	510,7	81,4				3,053,2
RATIO (%)	10,9	2,3	67,5	16,7	2,7				100,0
1976									
VALUE(1000D)	163,1	850,0	2,101,2	403,4					3,517,7
RATIO (%)	4,6	24,2	59,7	11,5					100,0

(3) PRESS

	JAPAN	U.S.A	GERMANY, FR	FRANCE	ITALY	U.K.	NETHERLANDS	AUSTRIA	(TOTAL)
1971									
VALUE(1000D)	216,1		177,2		413,6		10,1		817,1
RATIO (%)	26,5		21,7		50,6		1,2		100,0
1972									
VALUE(1000D)	13,9		206,4				326,7		547,0
RATIO (%)	2,5		37,7				59,7		100,0
1973									
VALUE(1000D)	5,4		1,470,6	95,8	870,7		134,9		2,577,4
RATIO (%)	0,2		57,1	3,7	33,8		5,2		100,0
1974									
VALUE(1000D)	6,2		1,410,8	124,2	213,5			45,2	1,799,9
RATIO (%)	0,3		78,4	6,9	11,9			2,5	100,0
1975									
VALUE(1000D)	461,1		3,026,3		389,6		10,4	17,5	3,904,9
RATIO (%)	11,8		77,5		10,0		0,3	0,4	100,0
1976									
VALUE(1000D)			5,492,4	55,1			135,5	43,1	5,726,2
RATIO (%)			95,9	1,0			2,4	0,8	100,0

Table AIII-3-2 Export Price of Plastics Processing Machinery in Major Exporting Countries (1971 - 1976)

(1) INJECTION

	1971	1972	1973	1974	1975	1976
JAPAN						
QUANTITY (T)	4,524.0	5,428.0	8,107.0	7,350.0	6,110.0	8,526.0
VALUE (1000D)	10,353,4	13,348,2	22,342,1	23,004,4	20,801,3	34,361,1
UNIT PRICE (D/T)	2.289	2.459	2.756	3.130	3.404	4.030
NETHERLANDS						
QUANTITY (T)				1,259.0	1,055.0	1,560.0
VALUE (1000D)				5,854,0	5,298,4	9,054,1
UNIT PRICE (D/T)				4.668	5.022	5.804
FRANCE						
QUANTITY (T)				1,192.0	976.0	1,093.0
VALUE (1000D)				8,765,2	8,738,7	9,143,7
UNIT PRICE (D/T)				7.370	8.954	8.366
GERMANY.FR						
QUANTITY (T)	14,499.0	17,469.0	22,252.0	18,806.0	11,469.0	16,571.0
VALUE (1000D)	62,111,7	78,294,8	120,382,5	121,042,3	77,114,8	130,858,6
UNIT PRICE (D/T)	4,284	4,482	5.410	6.436	6.724	7.897
ITALY						
QUANTITY (T)				2,517	3,311	
VALUE (1000D)				10,448,8	18,381,2	
UNIT PRICE (D/T)				4.151	5.552	
U.S.A.						
QUANTITY (T)						
VALUE (1000D)		3,421,0	10,663,6	11,851,6	12,762,9	13,995,7
UNIT PRICE (D/T)						
TOTAL						
QUANTITY (T)						
VALUE (1000D)	72,465,1	95,064,0	153,388,2	180,986,4	143,097,3	197,413,2
UNIT PRICE (D/T)						

(2) EXTRUDER

	1971	1972	1973	1974	1975	1976
JAPAN						
QUANTITY (T)	1,336.0	953.0	1,859.0	2,029.0	2,221.0	1,305.0
VALUE (1000D)	7,498,9	5,869,5	12,944,6	15,561,0	18,573,1	10,031,1
UNIT PRICE (D/T)	5.612	6.159	6.963	7.669	8.362	7.687
NETHERLANDS						
QUANTITY (T)				105.0	99.0	219.0
VALUE (1000D)				853,2	572,9	1,439,2
UNIT PRICE (D/T)				8.126	5.767	6.572
FRANCE						
QUANTITY (T)				1,228.0	1,072.0	1,032.0
VALUE (1000D)				13,377,1	15,113,0	16,266,8
UNIT PRICE (D/T)				10.893	14.098	15.762
GERMANY,FR						
QUANTITY (T)	4,278.0	4,954.0	6.230.0	6.633.0	5,687.0	6,223.0
VALUE (1000D)	36,397,5	43,119,3	68,537,9	94,058,1	77,288,3	95,199,0
UNIT PRICE (D/T)	8.508	8.704	11.001	14.180	13.590	15.285
ITALY						
QUANTITY (T)				1,200.0	1,709.0	
VALUE (1000D)				8,167,6	14,583,0	n/a
UNIT PRICE (D/T)				6.806	8.533	
U,S,A,						
QUANTITY (T)						
VALUE (1000D)		6,753,7	9,497,1	14,208,3	21,043,3	15,719,3
UNIT PRICE (D/T)						
TOTAL						
QUANTITY (T)						
VALUE (1000D)	43,896,4	55,742,5	90,979,6	146,225,3	147,173,7	138,655,3
UNIT PRICE (D/T)						

(3) PRESS

	1971	1972	1973	1974	1975	1976
JAPAN						
QUANTITY (T)	373.0	373.0	597.0	515.0	599.0	819.0
VALUE (1000D)	1,573,5	1,535,5	2,284,1	3,320,1	8,472,4	2,977,3
UNIT PRICE (D/T)	4.218	4.117	3.820	6.447	14.144	3.635
NETHERLANDS						
QUANTITY (T)	3,319.0	3,284.0	3,949.0	1,159.0	971	1,199.0
VALUE (1000D)	16,063,9	16,329,5	24,105,2	12,268,8	10,233,6	12,054,9
UNIT PRICE (D/T)	4.840	4.972	6.104	10.586	10.539	10.054
FRANCE						
QUANTITY (T)	13,408.0	7,862.0	8,564.0	5,548.0	10,224.0	8,941.0
VALUE (1000D)	52,274,1	38,899,9	52,111,5	39,158,4	72,998,7	57,412,7
UNIT PRICE (D/T)	3.899	4.948	6.084	7.058	7.140	6.421
GERMANY,FR						
QUANTITY (T)	10,404.0	12,516.0	13,597.0	14,141.0	23,195.0	21,961.0
VALUE (1000D)	52,160,7	68,746,7	95,563,8	115,371,0	178,990,5	208,008,9
UNIT PRICE (D/T)	5.014	5.493	7.028	8.159	7.717	9.472
ITALY						
QUANTITY (T)	18,291.0	19,011.0	23,265.0	10,027.0	9,101.0	
VALUE (1000D)	68,182,5	78,114,9	99,647,9	38,341,0	38,302,5	n/a
UNIT PRICE (D/T)	3.728	4.109	4.283	3.824	4.207	
AUSTRIA						
QUANTITY (T)	274.0	286.0	672.0	918.0	1,078.0	1,216.0
VALUE (1000D)	2,840,4	2,572,6	5,516,5	7,907,9	6,806,4	10,398,1
UNIT PRICE (D/T)	10.366	8.995	8.209	8.614	6.314	8.551
TOTAL						
QUANTITY (T)						
VALUE (1000D)	193,095,1	206,199,2	279,229,0	216,367,3	315,804,0	290,851,9
UNIT PRICE (D/T)