CHAPTER IV
CELLULAR MANUFACTURING

This chapter discusses the cellular manufacturing for the manufacturing of cutting die , implementation and improvement of it.

4.1 Manufacturing for Productivity

By concept to make a high volume of the production , reduce lead time to work and solve the problem of the bottleneck . The theoretical of group technology can be used to solve the problem of manufacturing in the department of cutting die . A big group and long line production can reduce to a small line . The small group can easily to control and better relationship between the employees than the big group .

The designing for each part will flow through the specific area. Machine will justify utilization and some parts may skip certain operation . Cellular Manufacturing is a suitable case of group technology to improve the production .

4.2 Part Families

By the theoretical of part families, these are 3 types of parts classification and coding : design attribute group, manufacturing attribute group and combine attribute group. The cutting die will be grouping by manufacturing attribute group because the production process.

1) The normal type
2) Cutting die with pin / punch
3) Cutting die with white mark

The production rate and complexity of it is similarity. The sample of 3 types are shown as fig. 4.1 the normal type , fig. 4.2 cutting die with pin / punch and fig. 4.3 cutting die with white mark.

Figure 4.1 The normal type

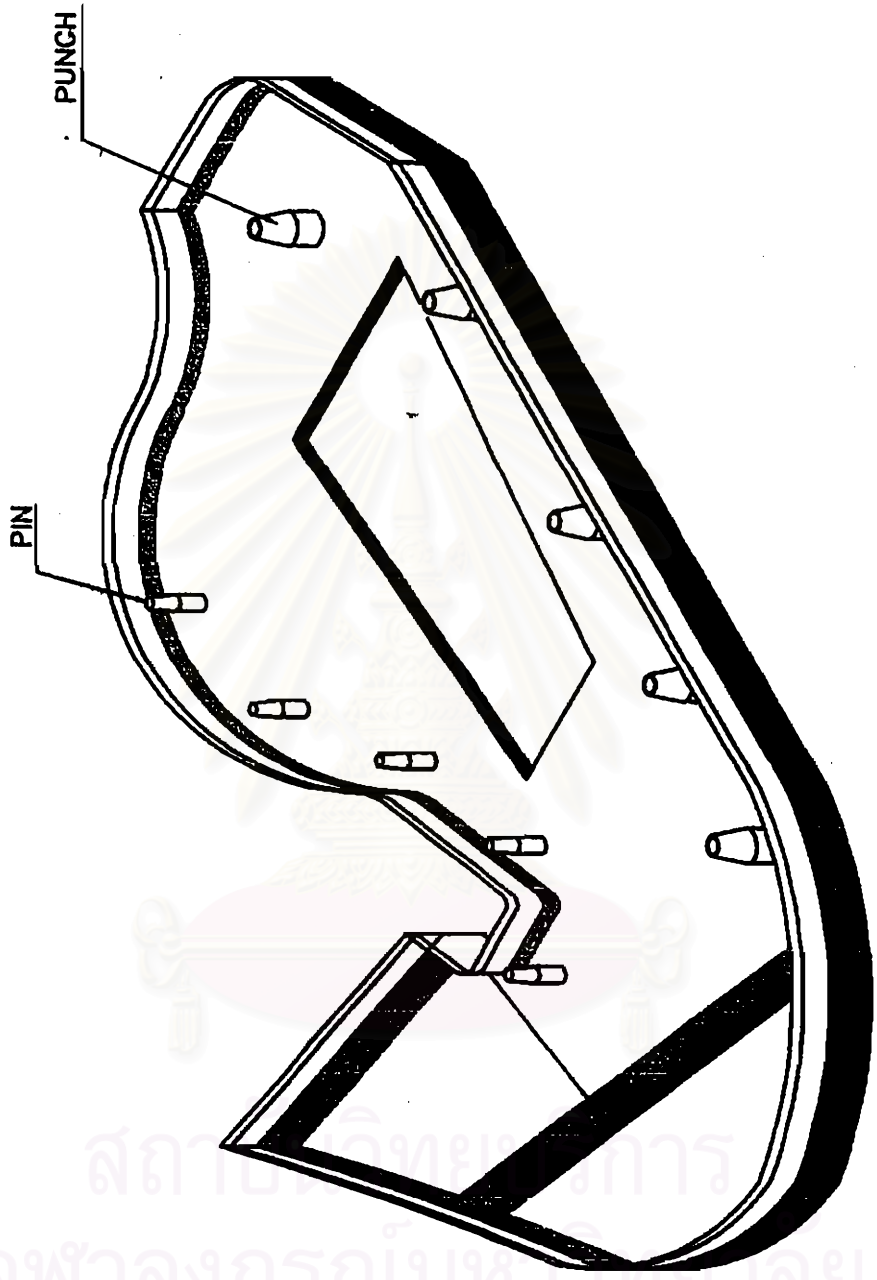

Figure 4.2 Cutting die with pin / punch

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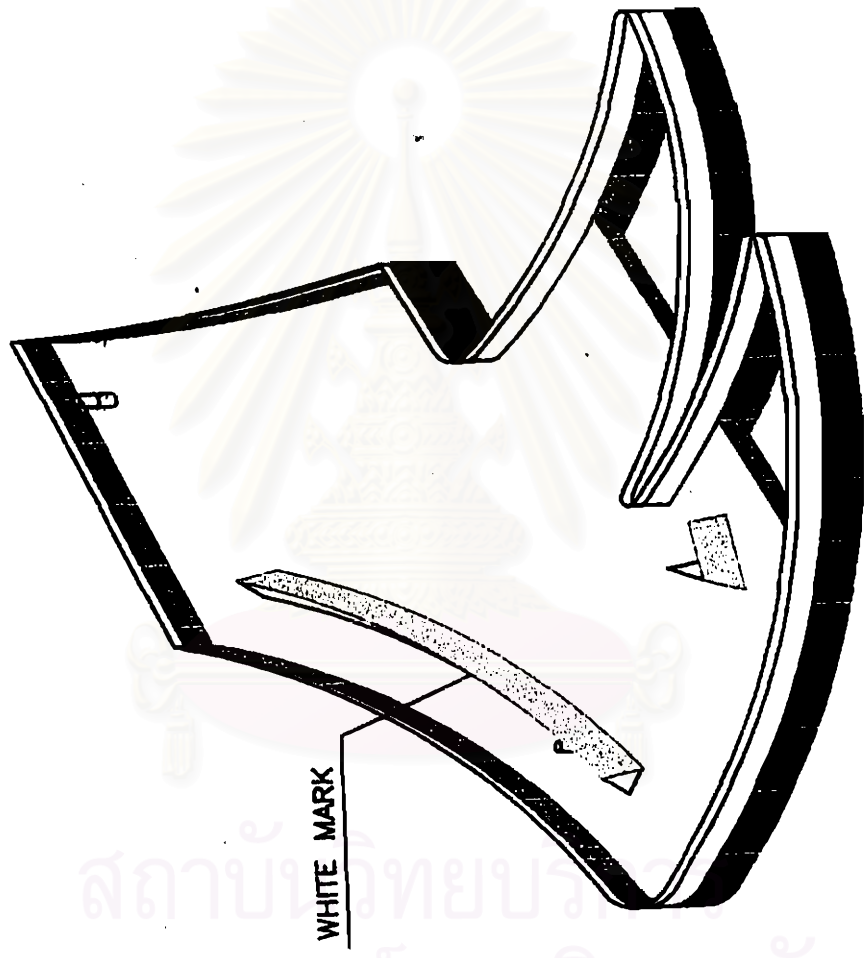

Figure 4.3 Cutting die with white mark

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4.3 Cellular Manufacturing Approach

The cellular manufacturing has always been based on getting the best out of people. The management and team leader have to drive the project, we have a meeting between cutting die department and the management level for designing team of the manufacturing. The cellular manufacturing approach are in the following.

1) The involvement. The management was explain that the cellular manufacturing project will only succeeds if everyone believes it is going to improve the productivity. A team building, everyone is committed to the wider objectives of the manufacturing , improve productivity, reduce unit cost and cut off lead-time to work.

2) Strong leadership. Forming team concept, the employees have got to understand that they are required to work as a team. They will select the team leader and a suitable process for themselves. The report to the supervisor of the department, the supervisor must check all of an information and seeking for the appropriate position and process.

3) Empowerment. When the team has been designed and the commitment of the team gained, the employees need to have the freedom of working for improve skill of themselves. They can related the position working. They must teach the un-skill technician for improve the total productivity of team.

4.4 Cellular Manufacturing

The feasibility of the resulting structures and the characteristics of the cells will depend on the equipment available within the department of cutting die .The number of cells in a department is as likely to be a consequence of team size as of products or equipment.

When the cells have been defined , each one needs to have its own dedicated core team , the employees remain together as a team and are not asked to move about between cells too much . The advantage of this is that the team will learn to understand the unique problems associated with the manufacturing product group .

The organization structure of the cutting die department is divided into three team as shown in Figure 4.4. It QC By themselves.

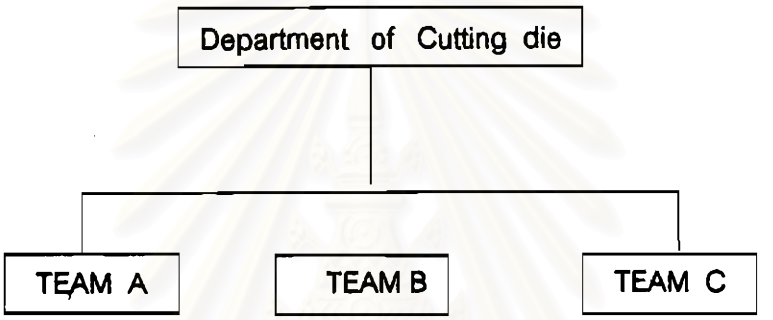

Figure 4.4 Organization structure of Cutting die department

The employees who work in the team could get a little short-sighted, and the company always needs the employees who are able to stand away from day - to - day tasks and look ahead, so there is a supervisor for control output and pre-production planning.

The effective of group technology is cellular manufacturing . the department of cutting die have 3 cells called team A, team B, team C. Each team contain every types of machines, which performs a different operation on the cutting die . There are 3 types of cutting die : normal , with pin / punch and with white mark . In each type it have a various pattern . By cellular manufacturing , team A will work with the normal type . Team B will work with the cutting die that have pin / punch . And team C will work with the cutting die that have white mark. Because of the similarity of complexity and the same production rate so total output per day is 3 times of each

team. Machine will fixed for the process of manufacturing , every team can rotate to work every type of cutting die in every month . The machine group can be used for every type of cutting die .

Manned cells for the cutting die department . The technician in each team will be train to get the specific technique in the operation . They can used machine and substitute work for the other in the team . Total quantity per lot of a cutting die approximately 500 units with the delivery time of 4 days . So each team must work approximately 170 units per lot . The machine are grouped to be used for many types of product due to product variety and small lot size . Each team can be used in every machine group to improve flexibility in team and machine rotation .

The new employees will be train before the real production. It is important because it helps in reduction in accidents, labor turnover, bad workmanship and cost of product. Supervisor will be train a short-time process and technical knowledge to the new one. The new will sent to the real production when he can do every type by himself.

4.5 Manufacturing Cell Design and Implementation

All machine arranged in group . The basic requirement of a cutting die is the flexibility in the similarities manufacturing for cover all the parts.

Method for manufacturing cells design :

1) There are 3 types of the cutting die, classified by sight significant and production process . The average requirement per lot approximately 500 units. Each team work 170 units total in 4 days .

2) Machine will be divided into 3 cells by the product process type and existing facilities , we utilize our existing machines and adding 2 new white mark table, one drilling and one bending machines with a few investment . Each machine

cell can be used for every product type and every team also . Parts can be skip from one machine to the other machine by the manufacturing process .

3) The cutting die manufacturing process has 7 process maximum , 3 product group and 3 cells . Our existing manpower has 12 persons so we divided employees into 3 teams with 4 persons each team . Each person in the team will work 1 or 2 operation steps divided by themselves .

4) Machine lay out is divided for 3 groups of machine to utilize the area and reduce the transportation time . Team can use every group of machine .The machine in cell are typically arranged in GT cell as shown in fig 4.5. This allows team members to work in close proximity and to pass material from one process to the next easily . When output requirement are low , one or two team members can operate the complete process with a minimum of movement . Changing from the tradition , GT center to GT Cell because the minimum of movement. GT center is suitable when a large machines have already been located and can not be moved , or when product mix but the manufacturing of cutting die is not a mix and it is a small machine that can relotated all the time. GT Cell allows parts to move from any machine to any other machine, machine are located in process series in close proximity so the department of cutting die relayout as GT Cell and the U-Shaped arrangement due to specifi area and convenient and efficient because the operator can easily reach the various machines. Some process should be backward with minimum movement Both feeding and output take place at the same end, it allows both receiving and dispatching of goods to be done at one side it is easier for supervision. The goal of the manufacturing cells is to seek continuous improvement . Therefore , as production requirement change , it must be possible to move machines from one place to another , so it is better not to fix them permanently to the floor or otherwise make them immobile.

5) Team self management / self QC , the team should self select their leader and self divided jobs in the team.

6) The data collection and comparison will show the improvement from the traditional to the cellular manufacturing .The model and lot size of cellular manufacturing in 1997 as shown in table 4.1. The manufacturing output, material and productivity are shone as table 4.2

By the cellular manufacturing method , both the employees and the company have the benefit as the following.

The employees

1) They will have a various skill and team working so that they can work simultaneously and effectively.

2) They will training and development the un-skill to the best on of the people who worked in the cell.

The company

1) Satisfaction of output, delivery conformance.

2) Work in employees down from 12 to 4 men , it is compatible.

3) Reduce unit cost

4.6 Productivity

From the data table 4.2 we can analyse that

Method	Output / Labor	Output / (R/M)
Line production	7.62	3.02
Cellular Manufacturing	9.22	3.24
Increase	20.99%	7.28%

1) Line production : Output per labor average is 7.62 , output per material is 3.02 . It has low efficiency because : inefficiency of payment overtime. It has a bottleneck by the inefficient team work . Product variety and small lot size, urgent and unforeseen work will drop line productivity due to unbalance of employee and machine.

2) Cellular manufacturing can increase the average output per labor to 9.22 or 20.99% and output per material is 3.24 or 7.28% . It is an important method for a high production . The employees have a various skill because it is a small - team working . It can solve a bottleneck problem and unit cost is reduced , but the overtime payments is still high and lack of team incentive .

By the cellular manufacturing, it offer a unique and practical alternative to traditional manufacturing techniques. It allows PF Intertech Co., Ltd. to achieve the flexibility and responsiveness of a small business, which is vital to maintaining competitive advantage in today's cutting die market.

By the method of cellular manufacturing , PF Intertech Co., Ltd. can improve the productivity but can not control the overtime working and budget of the technician .The efficiency of the employees is still low , they wait for work in over time range . When we have a lot of production , they delay work in over time and output is still low . So we used concept of incentive plan to improve their productivity in the next step .

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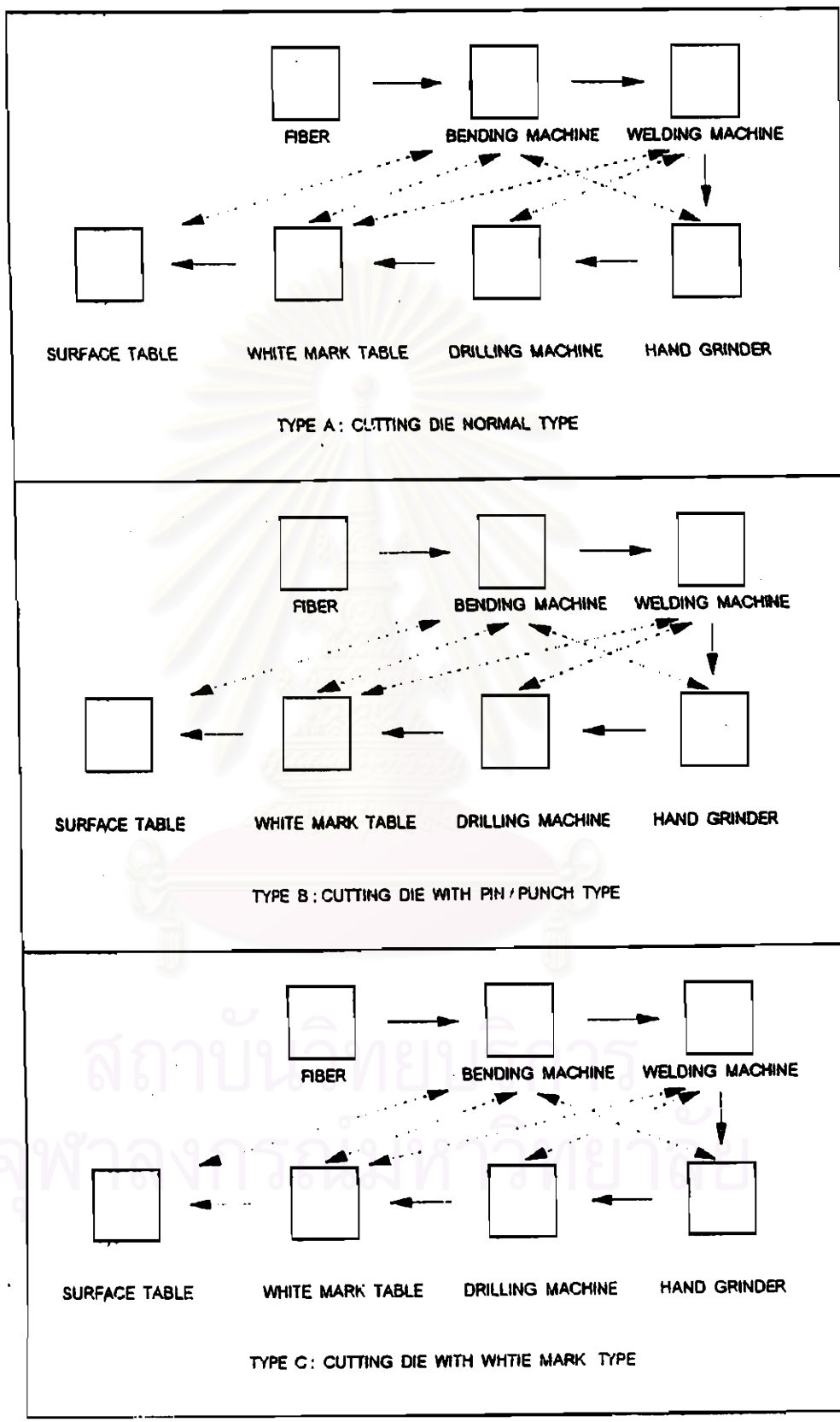

Figure 4.5 Cellular manufacturing : team A , B and C

Table 4.1 Model of Manufacturing , 1997

MONTH	MODEL	SIZE	QTY.	CUSTOMER
Jan '97	W. AIR ORGANT	5-12	193	PAF
	AIR BOSS SHARK PRO II	6-15	435	PAF
	AIR ORGANT	6-14	284	PAF
	W. FLUENT	5-12	330	ICF
	W. AIR WIN RUNNER III	5-12	310	ICF
	FLUENT GP	5-12	331	ICF
	MEN FLEXI		169	F
	AIR DESCHUTZ PRO	6-15	453	BRC
	AIR WALK	36-39	168	LBC
	MEN FREERIOE ASF	36-39	80	LBC
	TOTAL		2753	
Feb '97	AIR ZOM TRADITION SD	6-15	560	FTC
	- PUNCH		251	
	AIR ACCESS T PLUS	6-15	600	FTC
	- PUNCH		216	
	AIR ZOOM TRADITION SD W. EE	6-15	502	FTC
	AIR MAX II REVEAL LOW	6-13	568	ICF
	W. AIR OWGANT	5-13	364	PRC
	- PUNCH		166	
	TOTAL		3227	
Mar '97	AIR MAX LEATHER	6-8	187	ICF
	W. FLUENT	5-12	131	PRC
	AIR BACKER II MID	6-11	162	PAF
	MAGIC SANDLE SCHOLL	1-6T	75	FTC
	AIR ACCESS II SADDLE	6-15	134	FTC
	AIR ACCESS II BLUCHEK	6-15	325	ICF
	AIR ACCESS II SHIKED W.T	6-15	330	FTC
	- PUNCH		30	
	AIR ACCESS II SL SPLIT TOE	6-15	203	FTC
	- PUNCH		10	
	KID X-TREAM GP	1Y-6Y	259	ICF
	- EYELET PUNCH		12	
	TOTAL		1858	

MONTH	MODEL	SIZE	QTY.	CUSTOMER
Apr '97	AIR WALK	36-39	462	LBC
	- PUNCH		211	
	AIR ACCESS II SADDLE	6-15	280	FTC
	- PUNCH		115	
	AIR ACCESS II W.T.	6-15	347	FTC
	- PUNCH		111	
	AIR WALK	36-39	303	LBC
	AIR FLUENT GP	1-3	175	ICF
	W. AIR HAST LOW	5-12	116	ICF
	LADIES SUEDE LEATHER		124	FTC
	- PUNCH		50	
	MCS KEY STON 4 LOW	6T-13	154	KPF
	MCS KEY STOW BG	10C-6Y	292	KPF
	W. AIR ORGANT		240	PRC
	TOTAL		2980	
May '97	AIR HASTE LOW		402	PAF
	W. AIR HASTE MID	5-12	452	ICF
	W. AIR HASTE LOW	5-12	250	ICF
	MCS LOW MEN		435	PUC
	AIR WALK		168	PUC
	- PUNCH		31	
	LADIES SUEDE (PUNCH)	10-6	72	FTC
	MCS KEYSTONE 3/4 MEN		131	KPF
	- PUNCH		14	
	AIR HASTE LOW		160	PAF
	TOTAL		2115	
Jun '97	W. ENTICE	5-12	325	ICF
	- EYELET PUNCH		296	
	W. MULTI PURPOST TRAINER		436	ICF
	AIR WALK		443	LBC
	TOTAL		1500	

MONTH	MODEL	SIZE	QTY.	CUSTOMER
Jul '97	MAGIC SANDLE		455	FTC
	AIR HASTE LOW		475	ICF
	AIR LEVITY		442	PAF
	W. AIR FLIGHT DENY		334	ICF
	TOTAL		1706	

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Table 4.2 Comparison between Line Production and Cellular Manufacturing

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Average
Manufacturing output (Baht)								
- Line Production '96	364,362.75	425,660.84	347,839.59	401,829.04	454,629.81	513,028.64	509,171.00	430,931.67
- Cellular Manufacturing '97	825,731.74	968,136.86	557,188.78	894,452.53	634,525.23	450,243.65	512,061.75	691,762.93
Unit (Pieces)								
- Line Production '96	1,210.00	1,418.00	1,159.00	1,317.00	1,515.00	1,710.00	1,697.00	1,432.29
- Cellular Manufacturing '97	2,753.00	3,227.00	1,858.00	2,980.00	2,115.00	1,500.00	1,706.00	2,305.57
Raw Material Cost (Baht)								
- Line Production '96	119,948.19	141,876.91	117,625.56	131,750.00	152,159.90	173,320.41	163,195.95	142,839.56
- Cellular Manufacturing '97	239,702.19	297,888.04	174,552.82	273,532.73	194,638.93	145,264.40	160,701.25	212,325.77
Labor Cost (Baht)								
- Line Production '96	46,111.00	55,123.00	46,424.00	53,583.00	61,116.00	69,871.00	64,281.00	56,644.14
- Cellular Manufacturing '97	90,809.00	82,689.00	64,965.00	95,538.00	71,672.00	56,084.00	56,466.00	74,031.86
Man - Hour (M-H)								
- Line Production '96	2,210.00	2,251.00	2,210.00	2,903.00	2,930.00	3,099.00	2,912.00	2,645.00
- Cellular Manufacturing '97	3,021.00	3,097.00	2,893.00	3,046.00	2,965.00	2,893.00	2,915.00	2,975.71
Manufacturing / Raw Material								
- Line Production '96	3.04	3.00	2.96	3.05	2.99	2.96	3.12	3.02
- Cellular Manufacturing '97	3.44	3.25	3.19	3.27	3.26	3.10	3.19	3.24
Manufacturing / Labor								
- Line Production '96	7.90	7.72	7.49	7.50	7.44	7.34	7.92	7.62
- Cellular Manufacturing '97	9.09	11.71	8.58	9.36	8.85	8.03	9.07	9.22

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Average
Unit / Man - Hour								
- Line Production '96	0.55	0.63	0.52	0.45	0.52	0.55	0.58	0.54
- Cellular Manufacturing '97	0.91	1.04	0.64	0.98	0.71	0.52	0.59	0.77
Manufacturing / Man - Hour								
- Line Production '96	164.87	189.10	157.39	138.42	155.16	165.55	174.85	163.62
- Cellular Manufacturing '97	273.33	312.60	192.60	293.65	214.01	155.63	175.66	231.07

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