

## CHAPTER III

### MANUFACTURING ANALYSIS

This chapter discusses manufacturing process of cutting die at PF. Intertech Co., Ltd.. The traditional production planning and process layout are described and then analyzed it..

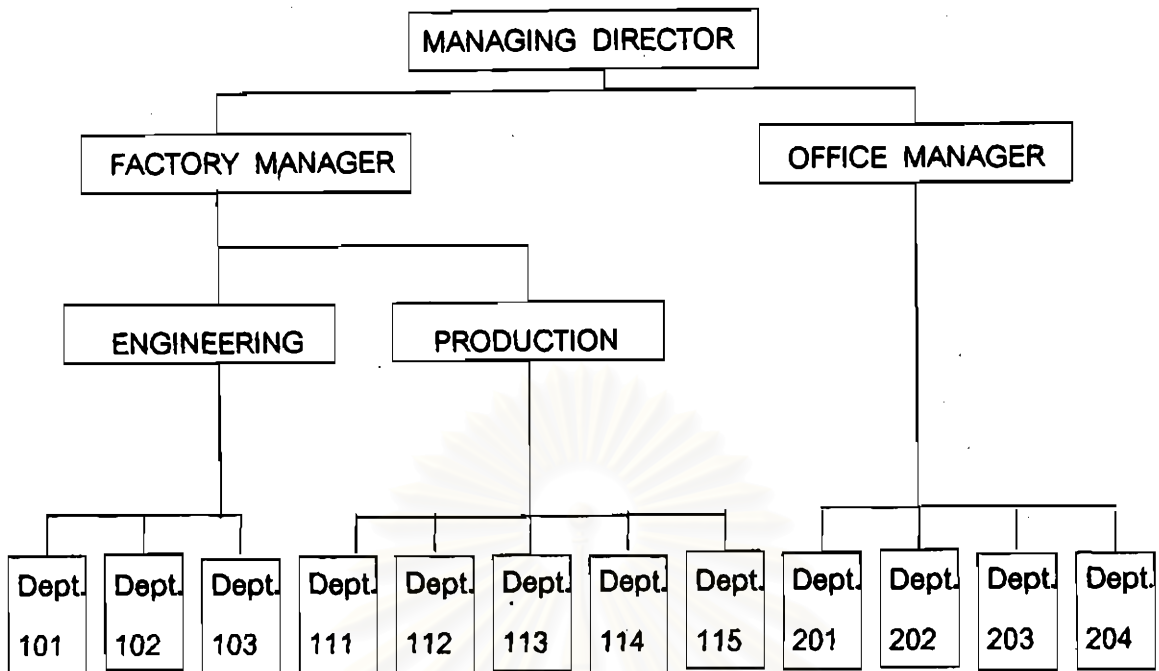
#### 3.1 Background

PF Intertech Co., Ltd. (PF) was established in 1989 with the responsibility of adapt and develop an expensive imported machine. Its factories are located at 507 M. 11 Sukhapiban 8 Rd. Nongkharm , Sriracha, Cholburi 20280

PF' product and service can be classified into five groups as follows:

- 1) Adapt and develop a shoe making machinery.
- 2) Maintenance for all shoe making machinery.
- 3) Installation and election of piping.
- 4) Installation and service for air condition.
- 5) Making a cutting die .

The company organization breaks into functional organization in engineering , production , and office area as fig. 3.1 .The production area , PF Intertech Co., Ltd. provide through product or business unit . Each business unit ( department ) we provide people into teams or cellular with team leader to accomplish the job to be the final product by each team . This would make the company more flexibility , compact and dynamic due to the product order trend are small batch size and more variety types and design .



**Figure 3.1** Organization structure of PF Inter Tech Co., Ltd.

Dept. 101	Drawing graphic
Dept. 102	Project
Dept. 103	Quality Control
Dept. 111	Cutting Die
Dept. 112	Maintenance
Dept. 113	Electrical & Air condition
Dept. 114	Production
Dept. 115	Piping
Dept. 201	Human resource
Dept. 202	Marketing
Dept. 203	Accountant
Dept. 204	Purchasing

The department of cutting die of PF Intertech Co., Ltd. has selected to conduct this study, cellular manufacturing and incentive plan for cutting die process. The customer for the cutting die is from in our group ( PAN Group ). Orders from the customer will pass to the supervisor of the department . Lead time to work depends

on order size , pattern and complexity , which may vary from 3 - 8 patterns a month with 200 - 500 pieces per patterns. Generally, the lead time that the customer want 4 days per order .

### 3.2 Work Breakdown Structure Model

Strip steel that used to make cutting die have a component as fig 3.2

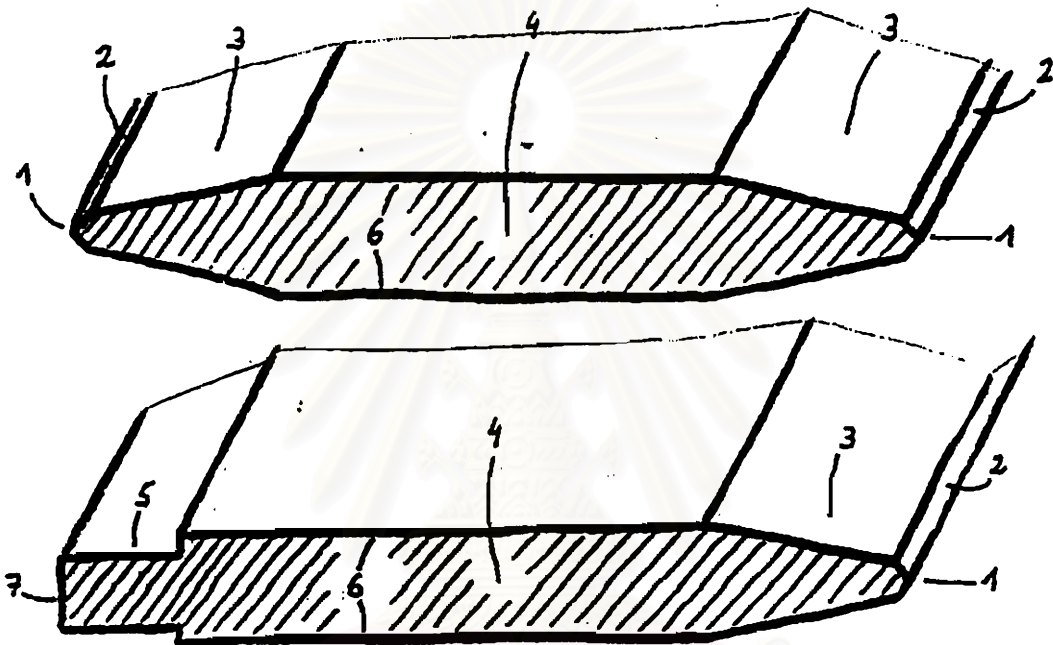
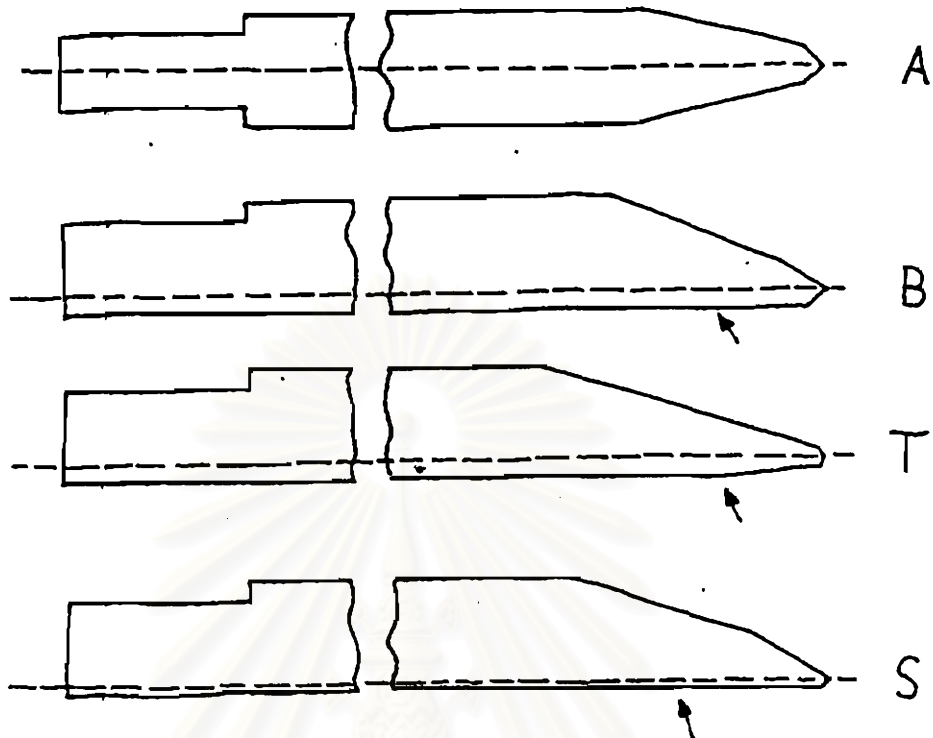


Figure 3.2 Component of strip steel

1) Sharp 2) Grinding 3) Long-clip off the side 4) Body 5) Compensate-clip off the side 6) decarbuzatio 7) Edge

#### Type of strip steel

There are 4 types of strip steel that differ in the sharp as fig. 3.3



**Figure 3.3** Type of strip steel

- 1) Type A , the sharp is at the middle and it similarity both side.
- 2) Type B , the sharp is at one and the other is clip off the side.
- 3) Type T , clip off the side is longer than type B.
- 4) Type S , clip off the side is closely to the sharp but upper the decarbulization layer.

The coding of the strip steel is an abbreviation

- 1) The first is type of strip steel.
- 2) The second is type of sharp , one side or two side.

3) The third is the number of size.

The following are the example of coding,

1) AE 32 x 2

A is stand for type A of strip steel.

E is stand for strip steel that have one sharp side.

32 x 2 is stand for high 32 and thickness 2 mm.

2) BD 19 x 2

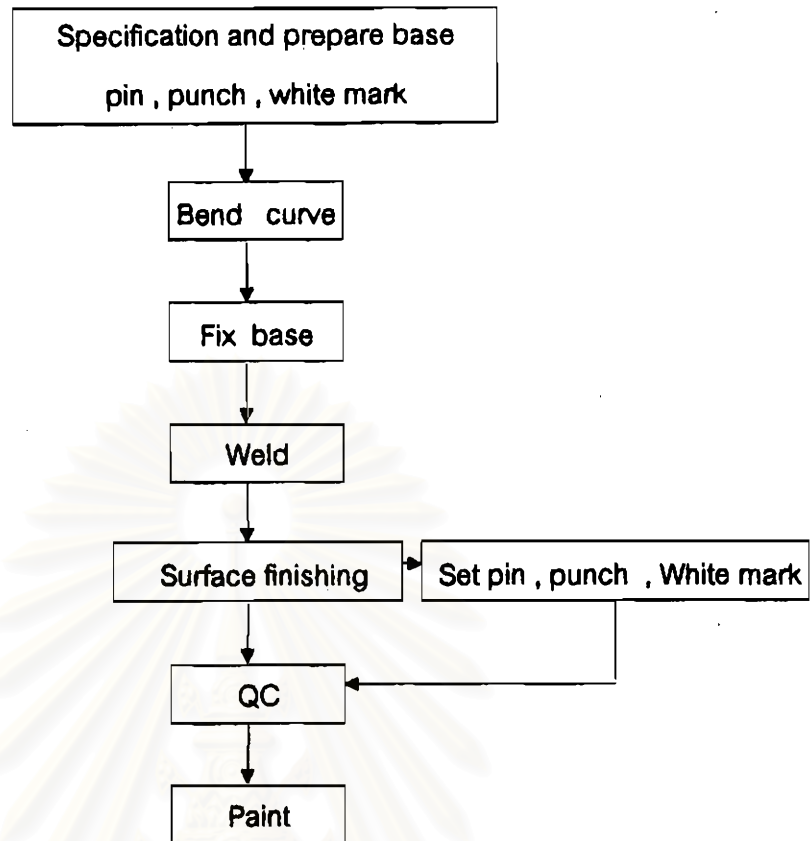
B is stand for type B of strip steel.

D is stand for strip steel that have 2 sharp sides

19 x 2 is stand for high 19 and thickness 2 mm.

Approximately 80% of the marketing is type BE and BD , it will be 90% when up with type TE.

A cutting die comprises mainly a base, pin, punch, white mark and other accessories. The operation start when received order. The first operation starts with grouping pattern to the similarities manufacturing. Then, sent all pattern to team working for make a cutting die. The production process of a cutting die involves a number of size pattern, unit, the process can be breakdown into the following flow chart.



**Figure 3.4** Process chart for making a cutting die

**Table 3.1** Process and Machinery for cutting die

No	Process	Machine/tool/accessory	Qty.
1.	Specification and prepare base , pin , punch , white mark	Table	1
2.	Bend curve	Bending Table	1
3.	Fixed Base	Welding Machine	1
4.	Weld	Welding Machine	
5.	Surface finishing	Hand Grinder	1
6.	Set pin, punch, white mark	Hammer, Drill Machine	1/1
7.	QC		
8.	Paint	Color spray	

### **Prepare**

Preparing is the pre-production process. It is used to make clear to the technician in pattern, material, payment and delivery.

When strip steel was received, the employees must check the packaging and the sharp of strip steel was not damaged. Although it keep in a good packing and use the prevent rust oil , it should keep in dry place.

The removing of strip steel from a roll must be done carefully, check the sharp and then put in the case and beware it flick.

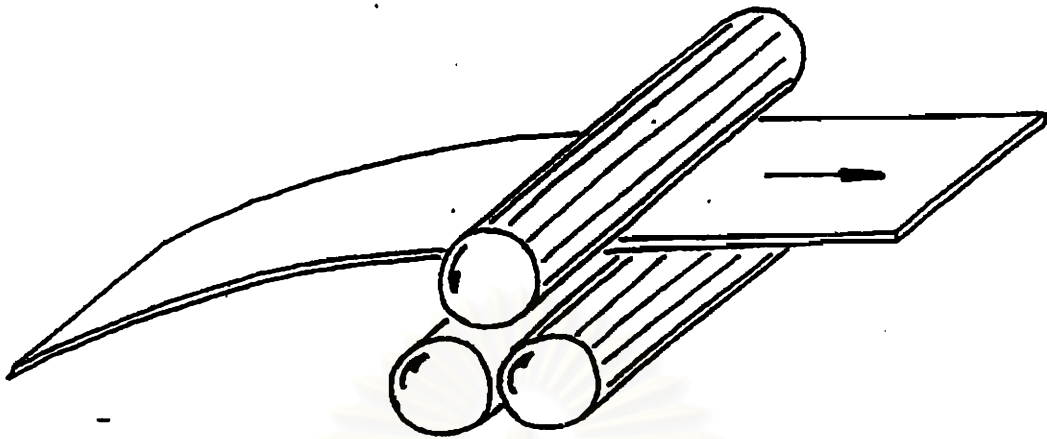
### **Bend curve**

Strip steel is a material that used to cut. Set the length, then bend curve in the same line by pattern.

The length of pattern measure by the measurement tape, photometric or calculate by computer and it exceed 2-3 cm. That depend on the shape and pattern by size from the customer.

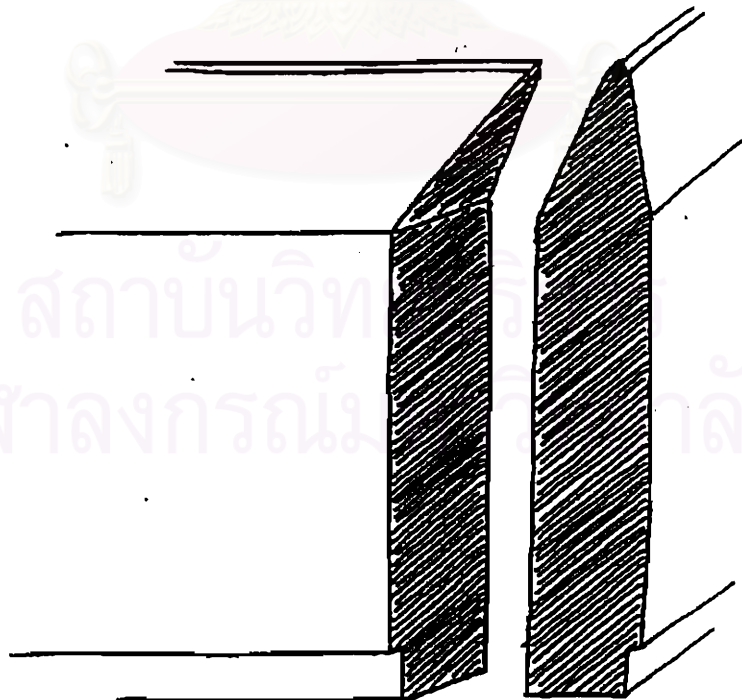
Sometimes strip steel must be forced out by roller before sending to bend curve because strip steel from the packing was not a straight line.

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**Figure 3.5** Rolling for a straight line strip steel

When strip steel was measure , then it was mark for the recognition of model, size. Marking should be at side , not at the corner for avoid the gap between the sharp. Cutting edge should have distance as fig. 3.6 for a smooth welding.



**Figure 3.6** Distance between the cutting edge



Glue tape will be put on the pattern as a guide for bending then bending a strip steel.

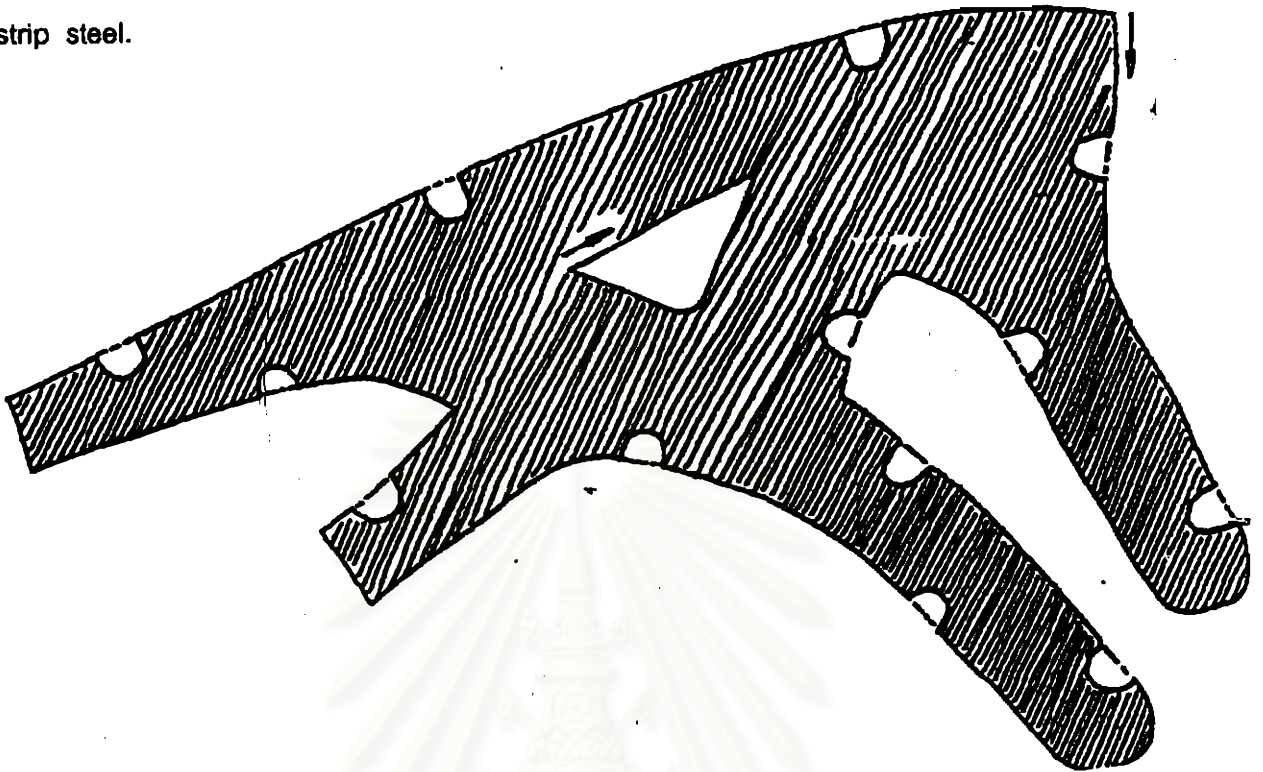


Figure 3.7 Pattern with glue tape as a guide

Bending machine are foot step, electronic and hydraulic machine. Starting point of bending is important because it can make a problem collide with of the part before and after bending.

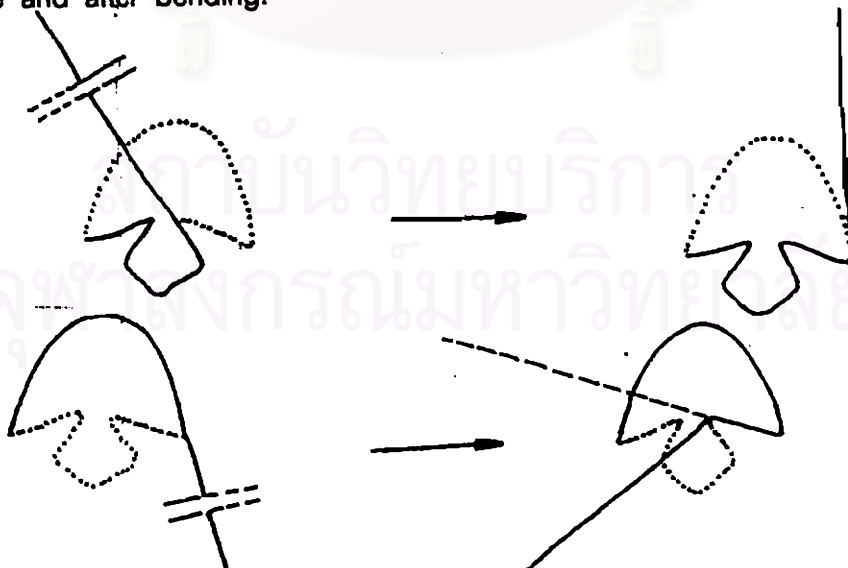


Figure 3.8 Starting point for avoid the collide with of the part before and after bending

In the case of narrow angle , the following are three methods :

1) Cool-rolled it may be break the strip steel, so bend the strip steel close be side the pattern then heat it to 700 °C at the middle strip , after that bend for a complete pattern. The temperature should not more than 860 °C because it will crack by the changing of phase and molecule structure. After the process of heating, it must quenching by the wet-paper at the heat paint, or the strength of it will be , reduce as the process of annealing.

2) Bend the opposite side and then bend back to the angle that you want.

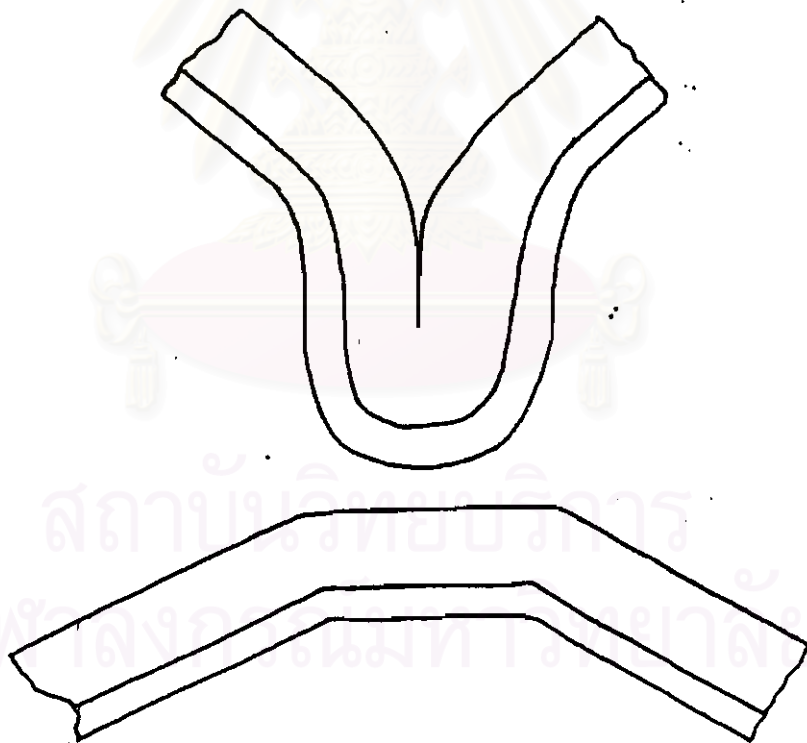


Figure 3.9 Bending the opposite side

3) Use the file to bevel the back of strip steel and bend in shape and spot weld to support as fig. 3.10.

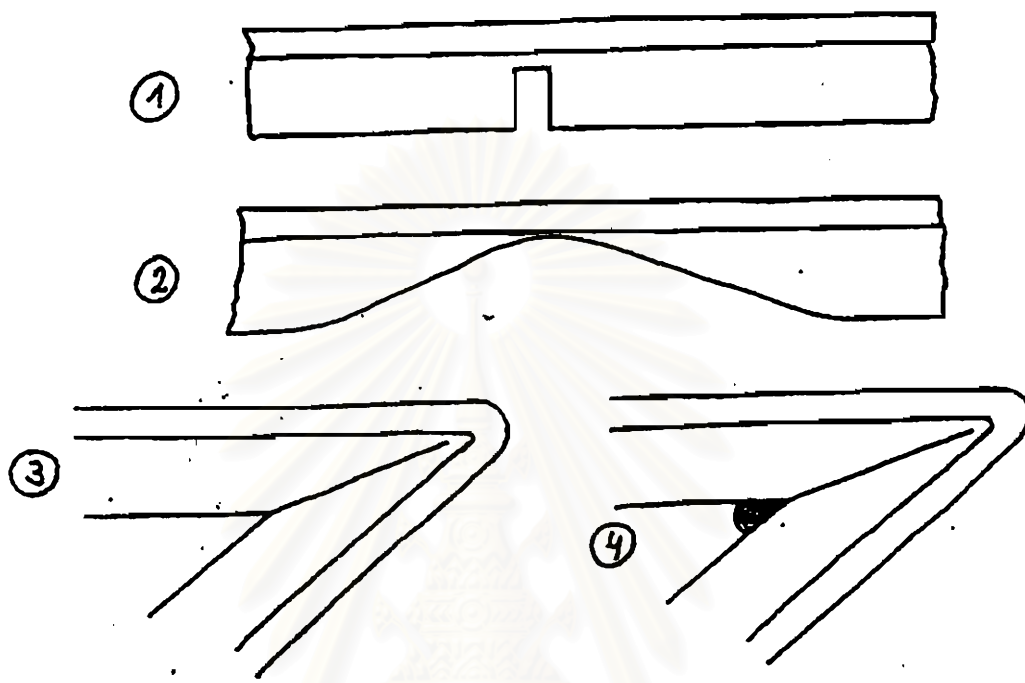


Figure 3.10 Narrow bending by clip off the sides

#### Fix base

Base fixing is a process after bend curve, strip steel must not movement so set base line by pattern.

#### Weld

Weld for strong structure. These process is important, it must look well. There are 2 types of welding for a cutting die , electrical welding and mix.

#### Surface finishing

Surface the point welding, make sure that it is similar to pattern.

**Set, pin, punch, white mark**

The specific pattern have pin, punch, white mark. Make sure that it fixed in the specific point.

**QC**

The first QC, by the technician , the second QC , the team leader.

**Paint**

Make color by the requirement of the customer.

The ordering of cutting in type and quantity in 1996 are shown as table 3.2



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### 3.3 Batch Manufacturing and Cutting Die Process

The process of manufacturing cutting die is a batch manufacturing . It depended on the order .In traditional , the machine plant layout was functional , the product flowed in a process of making a cutting die is shown in fig. 3.11 Machines in the same type are arranged in groups : strip steel , 5 bending tables, 2 drilling machines, 3 hand grinders , 3 fibers cutting , 3 welding machines and 6 surfacing tables . From the function layout , it is a random movement , shown by the arrows that indicate movement of materials and parts . From the arrangement , it is not efficient because there is a wastes time .

The traditional of the production is a random. It is a line production, 12 technician work for the total quantity per lot size .The technicians are divided into specific process and machine function .There are a lot of the bottleneck in the production. Bending table, the important machine is fixed for the high skill technician. The new technician and the lower - skill are fixed to work with the basic operation , cutting and welding. The employees can do only one task. Long lead time to work because the different skill of the technician . If the important technician is not come , the total output will be very low . The new technician can not improve themselves to the next level . Production planning has many problems due to small lot size , various type , design and complexity of the product . The change of customer order in pattern and volume and shorten delivery time , urgent work or unforeseen work always interrupt the production planning schedule especially the unbalance of the labors . Variable cost is very high by over time and can not forecast payment of the department . The product - finishing is a lot within a week , not daily , if it un-spec , it will reject by lot.

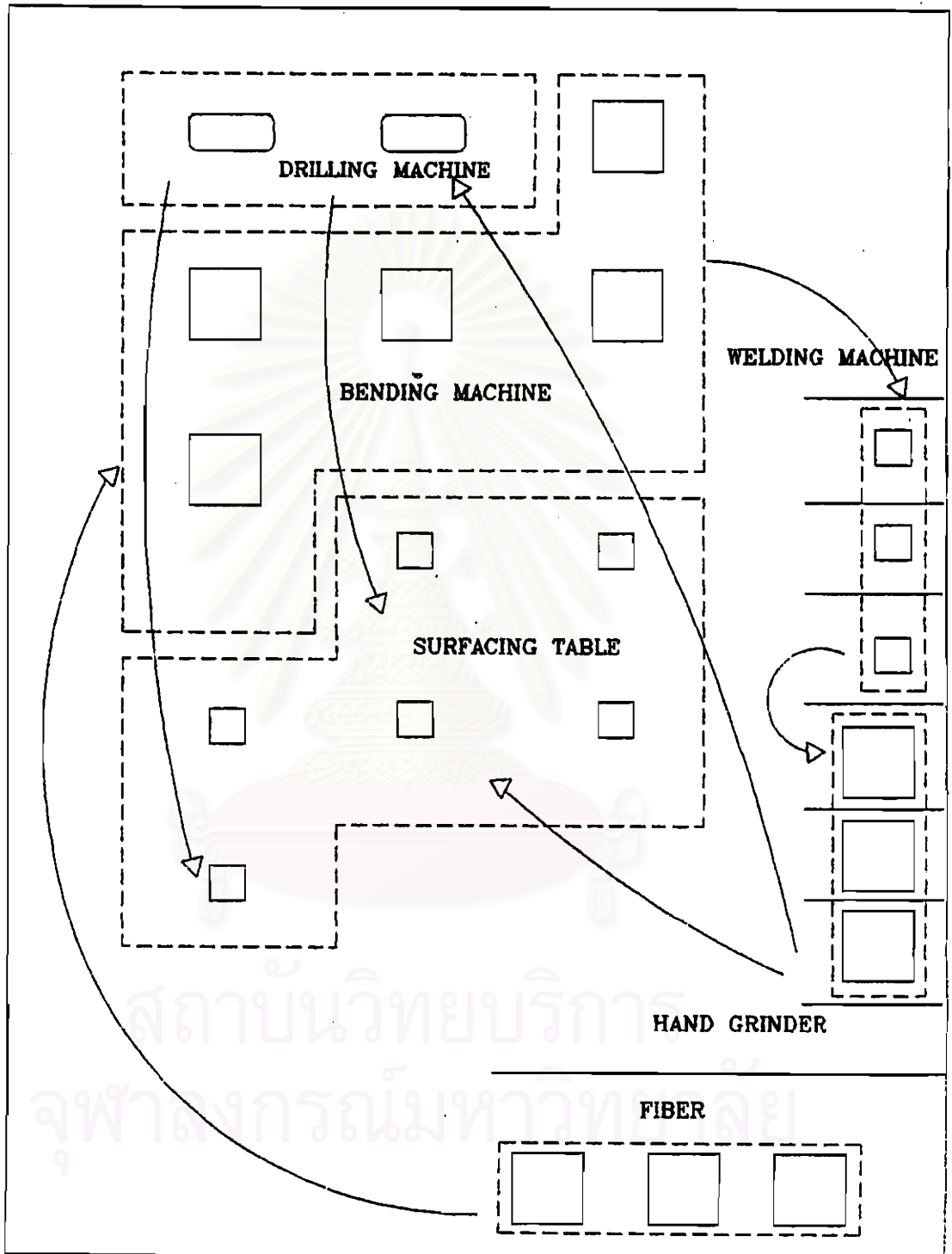


Figure 3.11 The tradition production layout

Table 3.2 Model of Manufacturing , 1996

MONTH	MODEL	SIZE	QTY.	CUSTOMER
Jan '96	AIR OUTLET		121	BRC
	AIR SCREECS		58	BRC
	AIR RESISTANCE		190	BRC
	AIR BURN		120	PAF
	AIR MAXLIGHT	6-15	120	PAF
	W. AIR ACCEL		165	PAF
	PUNCH		65	PAF
	EXTREME FLIGHT II BG		61	ICF
	SGE SADDLE		140	FTC
	PUNCH		15	FTC
	AEW LT WEIGHT BOAT SHOE	6-14	90	FTC
	PUNCH		65	FTC
	TOTAL			1210
Feb '96	LADY WEIGHT BOAT SHOE		110	FTC
	PUNCH		87	FTC
	AIR ACCESS PLUS		150	FTC
	AIR ZOOM TRADITION T	6-15	155	FTC
	PUNCH		65	FTC
	TRAINER POINT	6-15	265	PAF
	AIR ZOOM TRADITION S	6-16	256	FTC
	AIR MAX LEATHER	6-15	210	ICF
	ACB V (BG)	1-6	80	ICF
	PUNCH		40	ICF
TOTAL			1418	
Mar '96	AIR ZOOM		136	FTC
	STATUS	39-46	86	PAF
	AIR YACO	5-1	137	ERC
	AIR ACCEL	5-12	256	PAF
	W.AIR TRAINER POINT	5-12	209	PAF
	MAGIC SANDLE # 914		150	LBC
	AIR YACO	5-1	185	ICF
TOTAL			1159	

MONTH	MODEL	SIZE	QTY.	CUSTOMER
Apr '96	AIR ACCEL (BG)		419	ICF
	W. A.XCLM		265	ICF
	W.AIR MASTE LOW	5-12	276	ICF
	AIR SPIN C.V.		357	ERC
	TOTAL		1317	
May '96	AIR HASTE LOW	6-15	141	PRC
	AIR MASTE II LOW	6-13T	233	PAF
	X CLM GP		204	ICF
	W.AIR CIRCUIT	5-12	196	PAF
	PUNCH		30	PAF
	AIR XCLM		145	ICF
	KIDAAZE GP	8-13T	162	PAF
	GREEN FILED	39-46	229	PAF
	AIR MAX LIGHT	5T-13	175	ICF
	TOTAL		1515	
Jun '96	MBTRO PLUS	38-44	301	PAF
	AIR WALK	10-13T	348	ICF
	W. AIR SCREECH	5-12	316	ICF
	PUNCH		14	ICF
	AIR X CLM	5-12	254	ICF
	PUNCH		51	ICF
	SPEED TAINER		426	PAF
	TOTAL		1710	
Jul '96	AIR SCREECH		239	ICF
	PUNCH		14	ICF
	AIR SCREECH		248	ICF
	TRADITION		41	FTC
	PUNCH		45	FTC
	AIR ENCORE	6-15	48	ERC
	AIR WALK	5-10	66	LBC
	AIR BLAST BG		67	ICF
	SPEED TRAINER BP		99	ICF
	PUNCH		10	ICF



MONTH	MODEL	SIZE	QTY.	CUSTOMER
Jul '96	AIR SCREECH		89	ICF
	SPEED TRAINER PLUS		83	PAF
	AIR DURA TION BG		71	ICF
	W. TRAINER POINT	5-12	110	PAF
	PUNCH		12	PAF
	W. AIR MAX ASTOUND	5-12	292	PAF
	AIR ONATEAR W.D.	6-15	163	FTC
	TOTAL		1697	



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**Table 3.3 Manufacturing (Output) of the Line Production'96**

Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Average
Manufacturing output (Baht)	364,362.75	425,660.84	347,839.59	401,829.04	454,629.81	513,028.64	509,171.00	430,931.67
Unit (Pieces)	1,210.00	1,418.00	1,159.00	1,317.00	1,515.00	1,710.00	1,697.00	1,432.29
Raw Material Cost (Baht)	119,948.19	141,876.91	117,625.56	131,750.00	152,159.90	173,320.41	163,195.95	142,839.56
Labor Cost (Baht)	46,111.00	55,123.00	46,424.00	53,583.00	61,116.00	69,871.00	64,281.00	56,644.14
Man - Hour (M-H)	2,210.00	2,251.00	2,210.00	2,903.00	2,930.00	3,099.00	2,912.00	2,645.00
Manufacturing / Raw Material	3.04	3.00	2.96	3.05	2.99	2.96	3.12	3.02
Manufacturing / Labor	7.90	7.72	7.49	7.50	7.44	7.34	7.92	7.62
Unit / Man - Hour	0.55	0.63	0.52	0.45	0.52	0.55	0.58	0.54
Manufacturing / Man - Hour	164.87	189.10	157.39	138.42	155.16	165.55	174.85	163.62