CHAPTER IV

PROPOSAL OF SOLUTION

From the root cause identified in chapter 3, this chapter will discuss on the proposal of solution to the production planning method of XYZ company. Content in this chapter will discuss on the requirement for the good production planning, the additional tools to help planning, and the proper method to use for planning and how to calculate ATP.

## 4.1. The Model of Good Production Planning: A Result from Problem Analysis

From the problem analysis of the current production planning process, found that the root cause of the problems came from the weak planning that cannot result to the real effort of production planning and does not track the result of plan to the real situation, also the inefficiency of planning. The author with the working team at the company had discussed and decided to create the new planning system that can be the role model for company to follow and continuous develop.

As per academic research in chapter 2, the model of good production operation planning is multilevel sequential processes which involved aggregate planning, master production scheduling, detail operation planning and scheduling, and material resource planning. The aggregate planning concern the determination of the overall guideline for master production schedule that can help pre-generate the target development for MPS in terms of resource requirement and time needed. However, as per product characteristic that cannot be kept in the shelf more than 7 days prior to shipping, and since the production of Arare in XYZ company is a made-to-order, this means the aggregate planning will basically base on the actual customer order over the period of time.

The MPS will need to be fed by the correct and timely update information from the bill of material to be scheduled, inventory and stock records, production capacity and machine efficiency; also the product data specification in case of new product has been developed. The role model for new production planning has been indicated as shown in figure 4.1.

Figure 4.1 shown that in order to make the detail production planning, the important data required for making the MPS are customer order, BoM, inventory and stock level, and production capacity. The inventory and stock record and production capacity update must be transferred from store/factory to planning everyday in order to keep the record and update to the schedule for the plan that reflect the actual supply situation of the company. The bill of material for scheduling must be identified for the level of product and how to justify production planning from the BoM given.

Figure 4.1: Model for new production planning
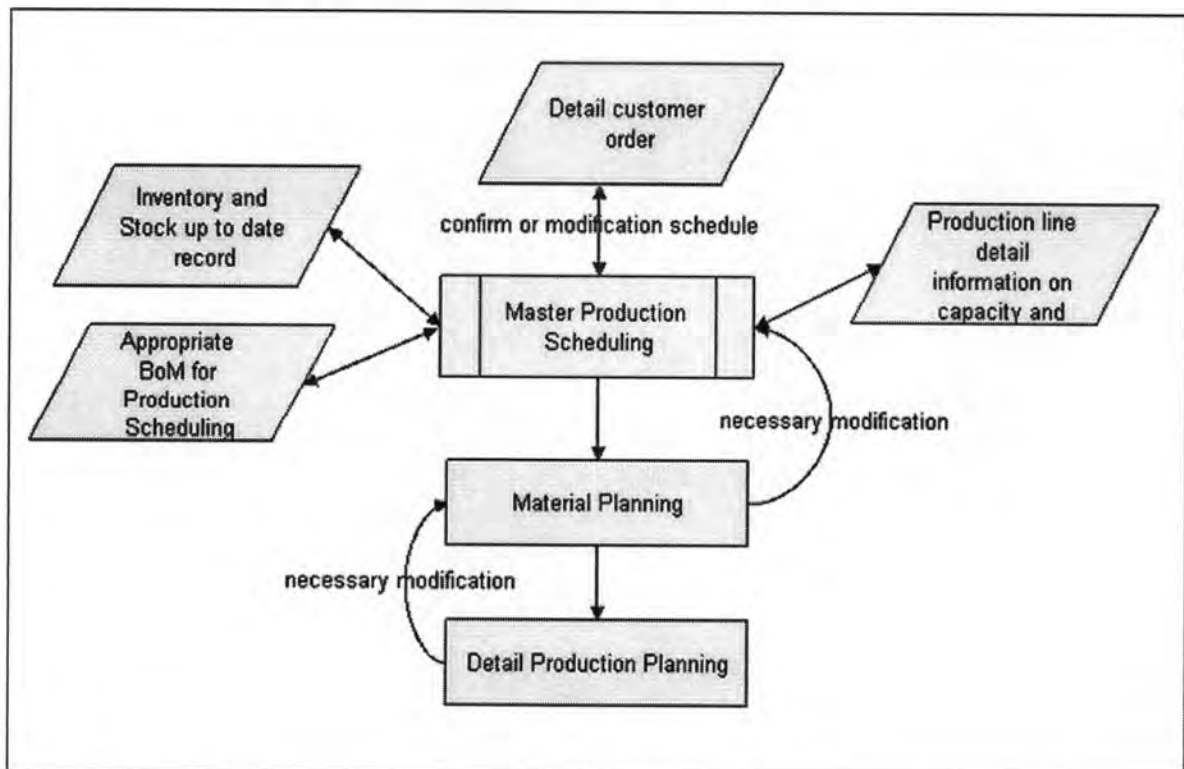
4.2. Identify the BoM Level for Master Scheduling

The current product has two level which are the mix order level and the single order level. The mix order product is the customer order that have more than one product contain in the package. While the single product have only one product in the package. According to the production procss, the bill of material level for the MPS should be single level product. The packageing detail will then identify separately in the order detail for the mix requirement of the product and how to pack for delivery.

The current single product code use the marketing customer product code. The customer code is, as discussed in chapter 3 that it did not indicate the product specification but to give the mareketing the idea of what customer has order the product. This thype of coding is good for the marketing stand point but does not suit to the manufacturing requirement. Since the good coding for manufacturing needed to be able ot show the designation of product in order to manage the production more efficientiy in terms of less fault, easy to recognise, more systematic classification, and ability to manage the product group. Therefore the to set up the new production code that relate to the product feature will help internal factory control to better manage on the production and planning. However the code will not replace the customer code that maketing use as in order to ship it out, the custom clearance will need to refer to the same old codes.

As stated in chapter 2, GT is a tool that base on a general principle that many problems are similar and by grouping similar problems, a single solution can be found to a set of problems, thus saving time and effort and suit to the production requirement. In order to develop GT coding for XYZ, the important criteria for the coding was investigated base on product characteristic, production process, customer order code, and sale characteristic.

a) Product characteristic: Each product has own developed characteristic that has been developed to reach customer requirement

b) Production process: All Arare product have the common production line

c) Customer order: Customer will order base on the developed product code or the existing product that suit to the requirement

d) Sales characteristic: Arare sale have 2 type of sale; continuous, and discrete, refer to chapter 3

As earlier discussed in chapter 3, sale characteristic and customer order are relied hugely on the Japanese customer and continuous order. However the variety in order and sale are not enough to set up the product code. Production process is common to every product only different some process based on product recipe which is part of product characteristic.

4.2.1. Justify Product Characteristic for New GT Coding

Since the Arare product differentiation is on the variety of its own feature. The new coding should be able to tell any reader about:

- Raw material ingredient

- Major product specific characteristic/feature: cutting pattern, size

- Product differentiate information: option mix, additional process, and extra requirement for product

Based on current product, difference factors on product feature are:

a) Product size: tell dimension of cut mochi

b) Cutting pattern: tell pattern of cut mochi

c) Baking machine: the code tell which machine is most suit to the mochi. There are 2 types of baking machine which are auto baking and long baking.

- Auto baking is good to bake the round or roll shape mochi that are easy to control color by the machine. Auto baking also heat evenly along baking chamber and cause more smooth baking colour on the Arare.

- Long baking is good for the difficult shape mochi as the baking line is open and can be manually check and turn the mochi.

d) Baking colour: the specific baking color is specified by the R&D and approved by customer

e) Sauce colour: the specific sauce color is specified by the R&D and approved by customer

f) Option mix: this is a notice for the special addition or seasoning for example adds sesame, special color, icing, etc.

g) Sauce ingredient: the secret sauce recipe is coded in 3 digits code; the selected sauce will be assigned to Arare.

h) Rice mix: the rice bought has difference grade base on the percentage of broken grain. Rice mix start from 100% full grain to 25% full grain the remaining will be fulfilled with the lower grade rice broken grain.

i) Bake weight: the weight that loose moisture after baking

The above factors can be justified to 3 cases; required information, additional information, and note.

Table 4.1: Product features justification

Factor	Justify	Reason
Product size	Required	Indicate product specific information
Cutting pattern	Required	Indicate product specific information
Baking machine	Note	A note for preferred baking machine for easy production schedule
Baking colour	Note	Give planner information of product
Sauce colour	Note	Give planner information of product
Option mix	Additional	Add information for product
Sauce ingredient	Required	Indicate product specific information
Rice mix	Required	Indicate product specific information
Bake weight	Note	Give planner information of product

In response to the feature justification, the base product features are product size, cutting pattern, and rice mix. Then the variation found in sauce ingredient, color, and other option mix.

Arare single code shall be encoded base on the required and additional information. The product feature will then be collected for generate new coding.

Table 4.2: Required and additional features physical product range

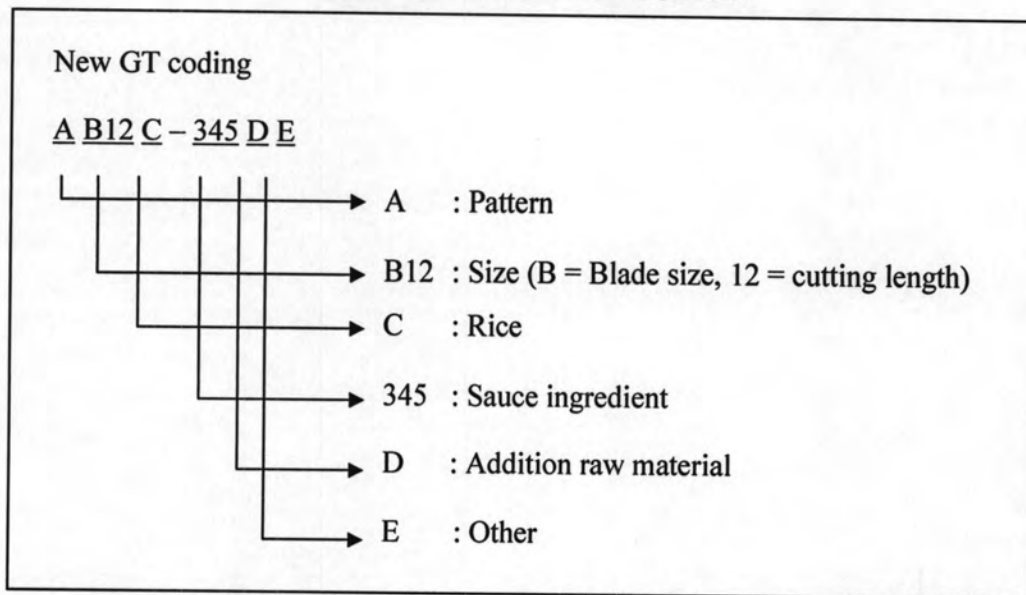| Factor	Detail	Product Range
Product Size	Dimension	30*38 - 60*48
	Blade number or cutting pieces/width	2-17
	Length	0.9 - 10 cm
Cutting Pattern	Cutting Pattern	1 - 21
Sauce Ingredient	Register number of mixed sauce	1 - 354
Rice Mix	Amount of full grain rice mix with broken rice	20%-100% full grain, 80%-0% broken
Option Mix	Other special mix ingredient	Sesame, Seaweed, Anchovy, Nuts, Coffee, Garlic, etc.

Table 4.3: Example of current product code and feature

PRODUCT MASTER

CODE	ARAME	DESCRIPTION	PATTERN	1ST DI	2ND DI	3RD D	4TH D	MARK	BAKING	NAME	BAKING COLOR	SAUCE COLOR	OPTION MIX	SAME ITEM	INGR T	YIELD	ข้าวเจ้า	BAKE WEIGHT	% SOY SAUCE
101	A-44NG	40x45 - 15 - 4.9(1.12)	05-3	33	23	-	-		LONG		น้ำตาล	ดำ	ต.3.42X2.6		35	82	หล่อน25		24
102	AB-05NG	60x20 - 4 - 2.9	-	33	19	-	-		AUTO	NORIMAKI	น้ำตาล	ดำ	ต.2.92X1.85		50	82	หล่อน25	2.7-2.8/10	20
103	NAB-09	36x45 - 9 - 1.1	-	33	19			R3hxWW	AUTO		น้ำตาล				0	65	เซ็น20	4.2-4.5/18	0
104	SBF-01Q	60x31 - 11 - 2.65	10-6	33	18	-	-		AUTO	SHICHIMI	น้ำตาล	ดำ	ป.0.2 X 0.3		2	77	หล่อน25	3.7-3.8/18	20
105	ABF-0X(N)	60x28 - 5 - 4.5(0.64)	01-5	33	19	-	-		LONG	ISOKAKU	น้ำตาล	ดำ	ป.0.2 X 0.3		3	82	หล่อน25	2.7-2.8/18	20
106	ABF-06	60x35 - 3 - 3.8(0.64)	01-5	33	19	-	-		LONG		น้ำตาล	ดำ			11	82	หล่อน25	1.5-1.6/10	18
107	ABF-09	36x45 - 9 - 1.2	-	33	19	-	-	R3hxWW	LONG		น้ำตาล	ดำ			18	76	หล่อน25		16
108	ABF-1UNG	60x45 - 17 - 2.9(0.75)	04-5	33	18	-	-		AUTO		น้ำตาล	ดำ	ต.1.86x2.64		50	82	หล่อน25	2.0-2.1/10	25
109	ABF-40NG	40x56 - 14 - 5.5(1.0)	05-3	33	23	-	-		LONG	NORIMAKI	น้ำตาล	ดำ	ต.3.4X3.5		15	82	หล่อน25	1.7-1.8/10	25
110	K-40NG	40x56 - 13 - 4.9(0.95)	04-5	33	24	-	-		AUTO	NORIPI	น้ำตาล	ดำ	ต.2.27x3.6		15	80	หล่อน25	1.7-1.8/10	25
111	KF-09	60x43 - 5 - 6.1(0.64)	16-1	33	20	-	-		LONG	ECHIGOMOCHI	น้ำตาล	ดำ			62	82	หล่อน25		20
112	KL-01	60x36 - 9 - 3.0(0.70)	10-6	33	21	-	-		AUTO	AJIKKO	น้ำตาล	ดำ	ป. AOSA(SMTC)		80	82	หล่อน25	225-275/1	16
113	KL-02	60x36 - 9 - 3.0(0.70)	10-6	33	21	-	-	รูปทีมที	AUTO	AJIKKO	จากเส้น	บวก	ป. AOSA(SMTC)		79	82	หล่อน25	225-275/1	16
114	KL-03	60x31 - 6 - 5.3(0.39)	01-5	33	19	-	-		LONG	SHIKISHIMA	น้ำตาลอ่อน	บวก	ป.0.2 X 1.3		79	82	หล่อน25	175-225/1	16
115	KL-04	240g x 1.7 mm	-	33	23	-	-		AUTO	CHILLI BITS	น้ำตาล	ดำ			81	82	หล่อน20	315-365/1	13
116	KL-05	40x56 - 13 - 4.9(0.95)	04-5	33	24	-	-		LONG	STICK TYPE (FLAT)	น้ำตาล	ดำ			80	82	หล่อน25	170-220/1	16
117	KL-06	60x20(24-14)	-	33	19	-	-		AUTO	SAKURA	น้ำตาลอ่อน	บวก			79	82	หล่อน70	265-315/1	13
118	KL-07	60x20(24-14)	-	33	19	-	-		AUTO	SAKURA	น้ำตาล	ดำ	ป. AOSA(SMTC)		80	82	หล่อน70	265-315/1	13
119	KL-08	60x20(24-07)	-	33	19	-	-	รูปทีมที	AUTO	LEAF	จาก	บวก			79	82	หล่อน25	275-325/1	13
120	KL-09	40x40 - 8 - 1.8(0.35)	01-5	33	24	21.5	-		AUTO	GENKOTSU BIG	น้ำตาล	ดำ	ป. AOSA(SMTC)		80	82	หล่อน25	265-315/1	16
121	KL-10	60x45 - 10 - 1.4(0.75)	01-5	33	24	21.5	-		AUTO	GENKOTSU SMALL	น้ำตาลอ่อน	ดำ			80	82	หล่อน25	275-325/1	16
122	KL-11	60x35 - 4 - 1.8(0.64)	10-6	33	19	-	-	รูปทีมที	AUTO	YAKKO MEDIUM	จากเส้น	บวก	ป.0.2 X 0.3		79	82	หล่อน25	252-304/1	16
123	KL-12	60x32 - 5 - 1.6(0.59)	10-6	33	19	-	-	รูปทีมที	AUTO	YAKKO SMALL	จากเส้น	ดำ			80	82	หล่อน25	215-265/1	16
124	KL-13	60x35 - 4 - 1.8(0.64)	10-6	33	19	-	-		AUTO	YAKKO MEDIUM	น้ำตาล	ดำ			80	82	หล่อน25	185-235/1	16
125	KL-14	60x40 - 4 - 2.1(0.74)	10-6	33	19	-	-		AUTO	YAKKO LARGE	น้ำตาลกรีน	ดำเขียว			78	82	หล่อน25	205-255/1	18
126	KL-15	60x40 - 4 - 2.1(0.74)	10-6	33	19	-	-		AUTO	YAKKO LARGE	น้ำตาลกรีน	เขียวม			88	82	หล่อน25	205-255/1	16
127	KL-16	60x20 - 6 - 4.1(0.25)	01-5	33	19	-	-		LONG	SHIKISHIMA TYPE	น้ำตาล	ดำ			88	82	หล่อน25	125-175/1	16

4.2.2. New Arare Coding

As described in 2.1 that the coding technology has 2 methods which are mono code which each code will relate to the others and poly code which each digit is not related.

Since the Arare process are common and only have single level identified depend on product characteristics and each characteristic are not related to the other. From the defined features, the author has chose the single level poly code for XYZ Arare coding, refer to figure 4.2,

Figure 4.2: New GT coding pattern

New GT coding

A B12 C – 345 D E

A	: Pattern
B12	: Size (B = Blade size, 12 = cutting length)
C	: Rice
345	: Sauce ingredient
D	: Addition raw material
E	: Other

The first 5 digits represent the base feature of the product and the last 5 digits show the additional ingredient or manufacturing need to diversify the product.

Table 4.4: New GT Coding Reference

Pattern code		BLADE		LENGTH		RICE			SAUCE		ADDITION		OPTION	
01	A	1	A	0.10	01	01	0	*	0	000	0	*	1	
02	B	2	B	0.20	02	02	Full Grain	A	1	001	Anchovy	A	2	A
03	C	3	C	0.30	03	03	1-20% Broken	B	2	002	BBQ	B	3	B
04	D	4	D	0.40	04	04	21-24% Broken	C	3	003	Colors	C	4	C
05	E	5	E	0.50	05	05	25%	D	4	004	Chilli	D	5	D
06	F	6	F	0.60	06	06	26%	E	5	005	Curry	E	6	E
07	G	7	G	0.70	07	07	27%	F	6	006	Cheese	F	7	F
08	H	8	H	0.80	08	08	28%	G	7	007		G	8	G
09	I	9	I	0.90	09	09	29%	H	8	008		H	9	H
10	J	10	J	1.00	10	10	30%	I	9	009	Icing	I	10	I
11	K	11	K	1.10	11	11	31-40% Broken	J	10	010		J	11	J
12	L	12	L	1.20	12	12	41-50% Broken	K	11	011		K	12	K
13	M	13	M	1.30	13	13	51-60% Broken	L	12	012		L	13	L
14	N	14	N	1.40	14	14	61-70% Broken	M	13	013		M	14	M
15	O	15	O	1.50	15	15	71-80% Broken	N	14	014	Nuts	N	15	N
16	P	16	P	1.60	16	16	81-90% Broken	O	15	015		O	16	O
17	Q	17	Q	1.70	17	17	91-99% Broken	P	16	016	Pizza	P	17	P
18	R	18	R	1.80	18	18	Broken Grain	Q	17	017		Q	18	Q
19	S	19	S	1.90	19	19	Non Allergy	R	18	018		R	19	R
20	T	20	T	2.00	20	20		S	19	019	Strawberry	S	20	S
21	U	0	*	2.10	21	21		T	20	020		T	21	T
22	V			2.20	22	22		U	21	021		U	22	U
23	W			2.30	23	23		V	22	022	Wasabi	V	23	V
24	X			2.40	24	24		W	23	023	Wrap Sea	W	24	W
25	Y			2.50	25	25		X	24	024		X	25	X
26	Z			2.60	26	26		Y	25	025		Y	26	Y
0	*			2.70	27	27		Z	26	026	Others	Z	27	Z

4.3. Identify Stock and Inventory Record Needed

The good planning system must have the timely confirm of stock and inventory available. The proposal of time interval for update the information is daily update. The type of stock and inventory input needed are

4.3.1. Raw material stock record

This record must come from purchasing and store to confirm the available stock material of every day. The data input must include

- All list of raw material with specification

- Quantity available in the store

- Quantity to come from purchasing confirm with arrival date

4.3.2. Finish goods inventory record

In order to confirm the number of available to commitment are maintained as agreed, the confirm finish goods stock must be made through the Finish Goods Store Room daily. Then the information must be confirmed with the plan ATP available date in MPS planned. This confirmation will be the latest check out of the MPS created to confirm the available date can be met.

4.4. Identify Production Information Needed

In addition to the stock record, the manufacturing capability also required to feed in the planning system in order to make the plan that replicate the right situation and ensure that the plan does not over or under estimate the efficiency on specific period. The information required to feed to MPS including.

4.4.1. Machine and facility information

- Each machine yield
- Machine maintenance planning
- Production cycle time for each product, especially for new product

4.4.2. Work in process information

- Daily work in process record
- Short fall of work in process compare to the planned quantity

4.5. Master Schedule for XYZ

Master schedule for XYZ is to be set up according to the new product code and the forecast chart follow 3 steps as described in chapter 2; design, create, and control.

4.5.1. Designing the Master Schedule

4.5.1.1. Select the items that show in the bill of material

According to the actual order, both single product and mix product have been ordered depend on the customer. Therefore, both level of product code should be included in the bill of material in MS database.

The MPS will then extend all mix code to single code in order to manage with the production planning. However the mix sale code will be used as input information and finally use in the packaging area. The scope of study items for designing MS will use 2006 sale items as base.

4.5.1.2. Organize the MS by product groups

To reflect the effective master scheduling, the Arare product should be grouped by product manufacturing feature, and product order type. The grouping product by manufacturing feature will help planner to see the common product or process. This will help reducing process set up and machine washing.

4.5.1.3. Determine the planning factors

The scheduling related factors can be separated in to process related and order related. The process related factors including

- Production time per kilograms for each process
- Production process need for each product
- Production yield of each machine
- Machine availability

The order related factors including

- Order weight
- Order date
- Shipment date

- Order detail (product code, weight, other special need)

4.5.1.4. Identify the method for calculating the available-to-promise

The available-to-promise is calculated from the work in process plus stock and then less the back log order.

$$ATP = (ST + WIP) - BL$$

When;   ATP   = Available-to-Promise, kg

                   ST   = Stock, kg

                   WIP   = Work-in-Process, kg

                   BL   = Backlog order, kg

Since the Arare need to pass many process, the MPS need to generate base on requirement of each process. Note that the work-in-process is the production plan for work in certain process for each day and must be completed in that process in the planned day.

4.5.2. Creating the Master Production Schedule for XYZ company

The author decided to generate MPS in steps from one process to another as explained in chapter 3 that most of product can have common base process and the deviation will varies from the additive seasoning processes.

The MPS shall then set up in separate to each process level considering:

- Cutting
- Drying
- Baking
- Seasoning
- Seaweed Wrapping

The MPS was written in Microsoft Excel to determine model validation. The sample model show the MPS plan from the input of forecast

order and actual committed order. The Rough Cut Capacity Calculation of the input order in the 3 months time interval, were then calculated and assigned machine for production. As earlier state, the product mix and packaging detail is separated from the production planning for manufacturing process as the detail product mix and the packaging will be send directly to the packaging section for further packing, inspection, and delivery.

The model created including 4 categories of spreadsheet.

1) Master product code and feature matching for reference that already map the new production code and marketing code

2) Master production capacity of every machine that must be update yearly. This is to be used as base calculation for the best manufacturing status input from the factory section as discussed in section 4.4. Note: daily actual yield will be allowed to input in individual process plans.

3) Order input sheet that the planner have to input information of new order including customer code, order date, ship date, marketing product code, quantity of order. Table 4.5 gave and example view of the worksheet. The yellow highlighted will be formula and only white cells are to be input information. The formula will link with other spreadsheet to show the order code, new production code that refers to input marketing code, and ATP available date. The ATP available date is confirm from the latest production which is the seaweed wrapping

4) Individual process plans; cutting, dry 1, dry 2, baking, seasoning, and seaweed wrapping. Note that packing is managed separately from the initial 'Order Detail' release.

Table 4.5. Order Input Sheet

Item	Order Date	Ship Date	code	Customer	Customer Abv	Customer Order Number	Order Code	Product Code	Product Mix code	Production Bill	GT single code	No. of Container	Weight @ (kg)	TTL weight (kg)	Test Requirement	ATP
1	01/01/2007	15/01/2007	KAMEDA	KAMEDA	KAM	1421	KAM-1421	WSN-86G		KAM-1421 (1)	DM49D-000**	40	6	240	Y	11-Jan-07
2	01/01/2007	15/01/2007		KAMEDA	KAM	1421	KAM-1421	WKM-01G		KAM-1421 (2)	DM49N-000**	15	7	105	N	11-Jan-07
3	01/01/2007	22/01/2007	KAMEDA	KAMEDA	KAM	1422	KAM-1422	WSN-86G		KAM-1422 (1)	DM49D-000**	279.48	9	2515.32	N	19-Jan-07
4	01/01/2007	22/01/2007		KAMEDA	KAM	1422	KAM-1422	WKM-01G		KAM-1422 (2)	DM49N-000**	263.04	8.5	2235.84	N	15-Jan-07
5	01/01/2007	22/01/2007	KAMEDA	KAMEDA	KAM	1423	KAM-1423	WSN-86G		KAM-1423 (1)	DM49D-000**	33.3	4	133.2	N	18-Jan-07
6	01/01/2007	22/01/2007		KAMEDA	KAM	1423	KAM-1423	WKM-01G		KAM-1423 (2)	DM49N-000**	33.3	4	133.2	N	18-Jan-07
7	01/01/2007	26/01/2007	KAMEDA	KAMEDA	KAM	1424	KAM-1424	WKM-01G		KAM-1424 (1)	DM49N-000**	33.3	4	133.2	N	22-Jan-07
8	01/01/2007	26/01/2007		KAMEDA	KAM	1424	KAM-1424	WSN-86G		KAM-1424 (2)	DM49D-000**	3122	0.66	2060.52	N	29-Jan-07
9	01/01/2007	15/01/2007	BEST FOOD	BEST FOOD	BES	245	BES-245	MS-52E		BES-245 (1)	DN40D-000**	100	4	400	N	11-Jan-07
10	01/01/2007	15/01/2007	LEBANESE	LEBANESE	LEB	578	LEB-578	R-01G		LEB-578 (1)	DB25D-000**	2489	1.08	2688.12	N	22-Jan-07

The individual process plan spreadsheet was set up based on support formula relate production planning requirement. As shown in figure 4.3 that the spreadsheet was separated into 4 areas which are

1) Machine capacity section

    a. The shortlist of all machine in the process is required to confirm the yield

    b. Daily yield input in percentage. The assumption is 100% yield every machine for weekday. The percent yield for each machine can be adjusted every day based on the actual ability.

2) Product grouping section

    a. The product will be grouped by the feature that is related to the production process.

        i. Cutting process : relate feature is cutting pattern

        ii. Dry 1 : no relate feature, assumption 1 day process

        iii. Dry 2 : no relate feature, assumption 1 day process

        iv. Baking : machine type Auto or Long

        v. Seasoning : ingredient code

vi. Wrapping : 9th digit in the production code if show 'W' needed to be confirmed further production.

3) Order planning section that give the ability to plan production interval individually either manually or formula wise

    a. The order and production code will be looked up from the order sheet.

    b. The pattern code is identified in order to do grouping

    c. The machine capacity requirement in %

Capacity require = Order Qty / machine max capacity per day

    d. The machine usage to input number of machine require to run the production per day per product

    e. The dates for production

Latest due date cutting = Ship Date – 7

Start date = Latest due date – (roundup integer(capacity required/machine usage))

4) Plan summary section

    a. Max capacity: summation of total capacity input in section 1)

    b. Forecast: marketing forecast input monthly

    c. Actual order: summation of total production of the day from section 3)

d. Stock: if positive, the stock product from previous day left over. If negative, the bag log of production and need supplement production for the day

e. WIP = total production plan summation from section 3

f. Pull   =   Actual order

    or if actual order > max capacity

   Pull   =   Max capacity

g. ATP = WIP + Stock − Actual Order

The sheet will pull information from the 'order input' and make an automatic calculation to find the best suit production start date then generate the group production plan based on the cutting pattern. Therefore the operator can feed the product that have same pattern to the same setting machine without need to reset new machine or queue up other machine that is making other pattern.

The same structure of 'individual process plan' for Dry1, Dry2, Bake, Seasoning, and Wrapping were create with the continue start date on the next day after the previous process finish and use same calculation to come up with the planning and the finish production date. The result of finish date from the wrapping sheet will feedback to the order sheet in ATP available date column in order to tell the planner whether the plan can be achieved or needed to review. The procedure and how to manipulate with the worksheets will be described in next section.

Figure 4.3: The Example of Microsoft Excel MPS model

Rice Cutting Plan

	Max	Mon 01-Jan	Tue 02-Jan	Wed 03-Jan	Thu 04-Jan	Fri 05-Jan	Sat 06-Jan	Sun 07-Jan	Mon 08-Jan	Tue 09-Jan	Wed 10-Jan	Thu 11-Jan	Fri 12-Jan	Sat 13-Jan	Sun 14-Jan	Mon 15-Jan	Tue 16-Jan	Wed 17-Jan	Thu 18-Jan	Fri 19-Jan
	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%
	1126	1126	1126	1126	1126	1126	0	0	1126	1126	1126	1126	1126	0	0	1126	1126	1126	1126	1126
	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%
Cut 2	1126	1126	1126	1126	1126	1126	0	0	1126	1126	1126	1126	1126	0	0	1126	1126	1126	1126	1126
	100%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%	0%	0%	100%	100%	100%	100%	100%
Cut 3	1126	1126	1126	1126	1126	1126	0	0	1126	1126	1126	1126	1126	0	0	1126	1126	1126	1126	1126
	100%	0%	0%	100%	100%	100%	0%	0%	100%	100%	100%	100%	0%	0%	0%	0%	0%	0%	0%	0%
Cut 4	1126	0	0	1126	1126	1126	0	0	1126	1126	1126	1126	0	0	0	0	0	0	0	0
	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cut 5	1126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cut 6	1126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cut 7	1126	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cut 8	1801	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	100%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Cut 9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

		Mon 01-Jan	Tue 02-Jan	Wed 03-Jan	Thu 04-Jan	Fri 05-Jan	Sat 06-Jan	Sun 07-Jan	Mon 08-Jan	Tue 09-Jan	Wed 10-Jan	Thu 11-Jan	Fri 12-Jan	Sat 13-Jan	Sun 14-Jan	Mon 15-Jan	Tue 16-Jan	Wed 17-Jan	Thu 18-Jan	Fri 19-Jan
Max Capacity		3,378	3,378	4,504	4,504	4,504	0	0	4,504	4,504	4,504	4,504	3,378	0	0	3,378	3,378	3,378	3,378	3,378
Forecast		9,707	9,707	9,707	9,707	9,707	0	0	9,707	9,707	9,707	9,707	9,707	0	0	9,707	9,707	9,707	9,707	9,707
Actual Order		3378	3378	3378	4504	3230	2400	2400	3941	3941	6540	1689	4420		0	2252	3312	0	0	0
Stock		0	0	0	1126	1126	2400	2400	2400	2963	3526	1490	0	-1042	0	-1042	0	0	0	0
WIP		3,378	3,378	4,504	4,504	4,504			4504	4504	4504	199	3378	-1042		3294	3312	0	0	0
Total		3378	3378	4504	5,630	5630	2400	2400	6904	7467	8030	1689	3378	-1042		2252	3312	0	0	0
Pull		3378	3378	3378	4504	3230	0	0	3941	3941	6540	1689	3378	-1042		2252	3312	0	0	0

Total Order

		Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri
2		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13		3378	3378	3378	4504	3230	0	0	3941	3941	6540	1689	4420		0	2252	3312	0	0	0
14		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Remaining Total Plan

Order	Pattern	Blade	Length	Due	Start Date	Weight	Capacity	Run MC
KAM-1421 (1)	DM49D-290**	04	13	4.9	05/01/2007	04/01/2007	1800	160%	1.0
KAM-1421 (2)	DM49N-001***	04	13	4.9	05/01/2007	01/01/2007	7623	677%	1.5
KAM-1422 (1)	DM49D-290**	04	13	4.9	10/01/2007	08/01/2007	2200	195%	0.5
KAM-1422 (2)	DM49N-001***	04	13	4.9	10/01/2007	01/01/2007	15600	1385%	1.5
KAM-1423 (1)	DM49D-290**	04	13	4.9	12/01/2007	12/01/2007	600	53%	1.0
KAM-1423 (2)	DM49N-001***	04	13	4.9	12/01/2007	06/01/2007	9450	839%	1.5
KAM-1424 (1)	DM49N-001***	04	13	4.9	16/01/2007	12/01/2007	4710	418%	1.0
KAM-1424 (2)	DM49D-290**	04	13	4.9	16/01/2007	15/01/2007	1980	176%	1.0

4.5.3. Controlling the Master Schedule for XYZ company

By setting up the MS, it does not mean that once model complete, the planning is done. The controlling of MS needs to ensure the production has followed the planning and can achieve the plan order. The stock and work-in-process need to be checked and confirm if the available to promise can be achieved and deliver to customer.

The MPS can be timely update and change once found the problem in the process such machine down or need more dry during rainy season, in order that the planner can then reschedule the production to suit the best productivity plan and be able to delivery the product as promise.

4.6. Computer Integrated MS and Database Development for XYZ

The utilization of computer to help calculation and tracking information has now been widely used in the extend type of businesses. However, in the XYZ, computer has been used in the limit effort for the individual calculation, tracking, analysis and e-mailing.

In order to establish the computer integrating modules to the XYZ, we need to ensure that the company has the support plan for the requirement in software that suit to the XYZ requirement, hardware to support the activity, people resource planning, how to maintain the model, and how to keep the storage files.

4.6.1. Software

There are numbers of a ready to use software available in the market for MRP and ERP such as QAD, Oracle, etc. However, to install such software, it needs to adjust the feature to suit the difference production and requirement in the company and will require expend for the installation and maintaining the software. The numbers of assign computer will also limited to the licensed number of PC paid only. The most important of all, since the company is the small to middle size business, it is difficult to put the high continuous investment on the planning.

Therefore, the author proposes the utilization of the existing computer base software which is Microsoft Excel and Microsoft Access for scheduling and database maintaining. The development period and training plan shall then be considered for the implementation of the models

4.6.2. Hardware

In order to maintain the effective utilize of models, the hardware need to be ensured that it is enough capacity to support the system. The hardware considered including

- computers with fully installed modules to be installed in every manufacturing point in order to maintain and update actual production on timely basis

- local area network and enough capacity server to maintain a real time data flow over the system

4.6.3. People

Without a skilled people to control and maintain the computer base software, the software ability is useless. Therefore the company need to prepare and training its own people to support relate activities;

- Database maintaining for each manufacturing unit

- Planning and feeding the information

- Software maintaining for overall system running

4.6.4. Procedure

The system development and maintaining procedure need to set up including

- Responsible person to the maintaining

- Time interval for the updating database

- Relate person for providing information

- Hierarchical of problem solving and the approval authority

- Full detail procedure of the operation

4.6.5. File Storage

The method of data storage and data security is needed to be ensured that

- The data storage are not accessible for the others who are not authorized

- The data stored are not easily altered by the improper input

- The data stored are fully controlled from the procedure on the storage lead time and data existing

4.7. New Production Planning System Procedure

4.7.1. Revise Workflow for the Production Planning Process

Based on the analysed current planning process and found from the cause and effect diagram that the problem occurred from the current method of making the production planning. The solution to identified problem as discussed in chapter 4 was to set up the new production planning system following the method of Master Production Planning (MPS).

From the new MPS created the new production planning flow has been introduced as shown in figure 4.4. The new production planning flow has emphasize on the close loop information flow that need to be shared among the relate party including marketing for the order and customer information, raw material and finish goods store to update the real time ATP, factory line to keep the planner update on the production capability and the work-in-process status, and the production planning itself to share more of planning information to other parties to be able to help cross check each other.

The new flow show that the difference from the current method start from the confirmation of RFQ that all order release must pass production planning to generate and confirm the ATP and response the best achievable date to the marketing. The best date available will then help guide the

marketing to communicate with the customer in case that the customer specified shipment date cannot be achieved.

Once all the order confirmed from customer and marketing, the firm order will send to production planning to generate an order detail and distributed to store and production sections for further order material or supply material to the production line. The work follow sheet (FL) will send to production line on the plan manufacturing date for production as planned.

The system is to be maintained by the authorized planner and the information must be fed from other departments. Further section will be discussed how to manipulate and maintain the system and procedure for other department related works.

Figure 4.4. New Production Planning System

```
┌─────────────────┐        ┌──────────┐
│ Confirm product │        │ Customer │
│ code (new       │───────▶│ Order    │
│ product or      │        └──────────┘
│ existing        │              │
│ product)        │              ▼
└─────────────────┘        ┌──────────────┐
        ▲                  │ Marketing    │◀──────┐
        │                  │ receive      │       │
      (B)                  │ order and    │       │
        │                  │ prepare      │       │
        │                  │ quotation    │       │
┌─────────────────┐        └──────────────┘       │
│ R&D develop     │◀── Y ──◇ New customer? ◇       │
│ product to      │              │                 │
│ customer need   │              N                 │
└─────────────────┘              ▼                 │
        ▲          ◀── Y ──◇ New Product? ◇         │
                                 │                 │
                                 N                 │
```

Focused and modified area

```
┌──────────────────┐              ┌──────────────┐      ┌──────────────────────────┐
│ Daily production │◀────────────▶│ Master       │─────▶│ Confirm Available-to-    │
│ capacity update  │              │ Production   │      │ Promise                  │
└──────────────────┘              │ Planning     │      └──────────────────────────┘
        ▲                         └──────────────┘
        │                                │
┌──────────┐                             │
│ Stock    │◀───────────┐                │
└──────────┘            │                ▼
        │          ┌──────────────┐   ┌──────────────────────────┐
        │          │ Order Detail │   │ Order Detail included    │
        │          └──────────────┘   │ - Customer               │
        ▼                             │ - Order number           │
┌──────────────┐                      │ - Order date             │
│ Production   │                      │ - Shipping date          │
│ supervisor   │                      │ - Product code           │
│ copy         │                      │ - Weight                 │
└──────────────┘                      │ - Packaging detail       │
                                      └──────────────────────────┘
```

Follow Sheet (FL)

```
│
▼
┌──────────┐
│ Cut      │
└──────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────┐
│ Dry 1    │
└──────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────┐
│ Dry 2    │
└──────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────┐
│ Oven     │
└──────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────┐
│ Seasoning│
└──────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────────┐
│ Seaweed Wrap │
└──────────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────┐
│ Packaging│
└──────────┘
│
▼
┌──────────┐      ┌────────────┐
│ FL confirm│◀────│ Inspection │
└──────────┘      └────────────┘
│
▼
┌──────────────────┐
│ Wait for         │
│ consolidate and  │
│ shipping         │
└──────────────────┘
```

Production report, inspection result, capacity confirm, etc.

4.7.2. MPS Working Procedure

MPS working procedure, as can be seen in the related department workflow in figure 4.5 and step-by-step work flow figure 4.6. The new work flow allowed planner to be really able to control the production planning and can detect problem or delay and solve the problem or feedback to the marketing for the request to change the shipment date.
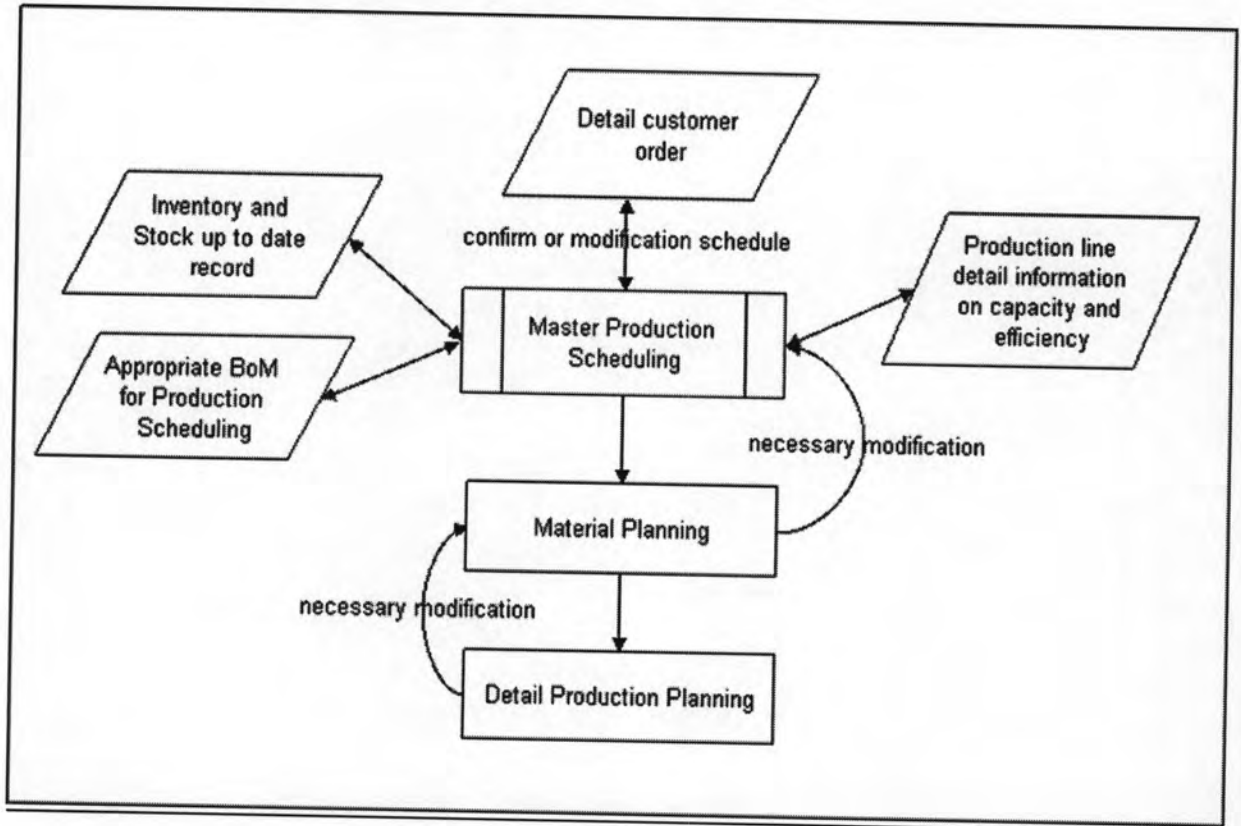
Figure 4.5: Related Departments Process Flow
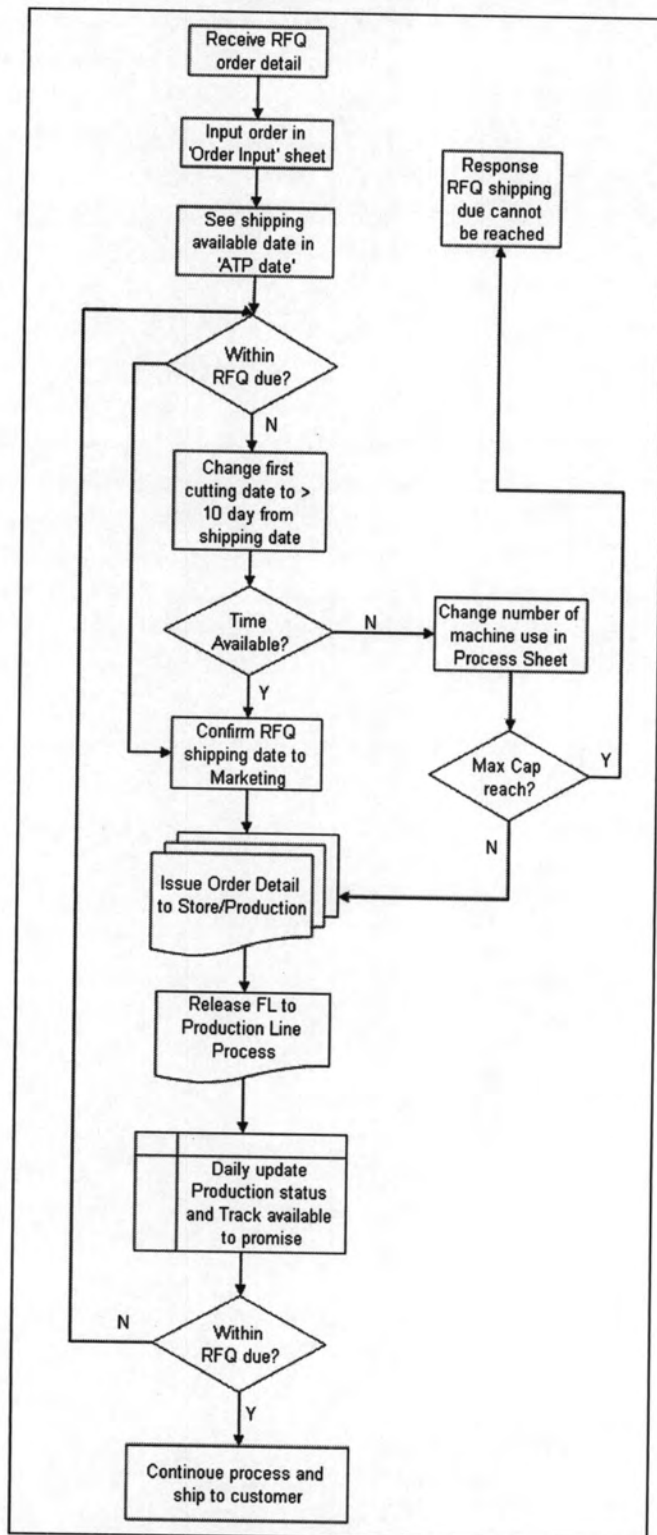
Figure 4.6: Step by Step MPS System Process Flow

Figure 4.7: Capacity Input Sheet

หน่วยงานที่ผลิต	ความสามารถในการผลิต ต่อ ช.ม.(ก.ก.)			% ความสั้น	น้ำหนักที่ผลิต ความสั้น 0 % (ก.ก.)	ปริมาณ ตัดส่วนใน การผลิต	ปริมาณที่จะ สามารถผลิต ได้ ช.ม.ชิ้น	ปริมาณที่ ผลิตได้ต่อ ช.ม.	ความสามารถ ในการผลิตที่ 0 %/ ช.ม.	เวลาทำงาน ใน 1 กับ/กะ (ช.ม.)		การทำความสะอาดใน 1 วัน			การทำความสะอาดใน 1 กับ/กะ			รวมเวลาทำงานชิง	
										100%	90%	จำนวน ครั้ง	ครั้งละ (นาที)	รวม ทั้งหมด (น.ม.)	จำนวนครั้ง	ครั้งละ (นาที)	รวมทั้งหมด (น.ม.)	เวลาที่ทำ ความ สะอาดชิง	เหลือเวลา ในการปฏิบัติ งานจริง
การเซ่าข้าว (ต้องการ 90 % เม็ดที่ 1000 ก.ก./ช.ม. ท่อนที่ 800 ก.ก./ช.ม.)	ท่อน		1200	14	1032	50%	600	1250	1075	48	43	1	90	1.5	1	480	8	17	26
	เต็ม		1300		1118	50%	650												
การอบนึ่ง LINE A			1260		655	100%	1260	1260	655.2	48	43	1	60	1	1	480	8	14	29
การอบนึ่ง LINE B			1260		655	100%	1260	1260	655.2	48	43	1	60	1	1	480	8	14	29
การอบนึ่ง LINE C	แป้งม้วน		1260	48	655	50%	630	630	327.6										15
	แป้งเส้น (สั่งได้ความต้องการในการสั่งผลิต)	115	11	759	395	0%	0			48	43	1	60	1	1	480	8	14	
		240	8	1152		599	50%	576	576	299.52									
		280	7	1176		612	0%	0											15
		500	4	1200		624	0%	0											
ความสามารถในการเก็บแป้ง	จำนวน	ตัน																
	ห้อง NO 1	100	20	32000		16640	50%	16000	16000	8320	24	24							6
	ห้อง NO 2	100	20	32000		16640	50%	16000	16000	8320	24	24							
	ห้อง NO 3	103	80	13184	48	6856	33%	4394	4394	2285	24	24							
	ห้อง NO 4	45	80	5760		2995	33%	1920	1920	998.3	24	24							6
	ห้อง NO 5	55	80	7040		3661	33%	2346	2346	1220.14	24	24							
	ห้อง NO 6																		
การตัดแป้ง อ้วน	ความหนา	ตอ.บิ้	จำนวนมี ต่อมี	น้ำหนักที่ผลิต (มีที่ 17 ก.ก. ต่อม้วน)															
NO 1	> 3	4.5	13.33	227		118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 2	> 3	4.5	13.33	227		118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 3	> 3	4.5	13.33	227		118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 4	> 3	4.5	13.33	227	48	118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 5	> 3	4.5	13.33	227		118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 6	> 3	4.5	13.33	227		118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 7	> 3	4.5	13.33	227		118	50%	113	283	147	48	43	1	30	0.5	1	120	2	5	38
	< 3	3	20	340		177	50%	170											
NO 8 (ตัดโมล์)	> 3	4.5	13.33	227		118	100%	227	227	118	48	43	1	30	0.5	1	120	2	5	38
NO 9 (ตัดโมล์)	> 3	4.5	13.33	227		118	100%	227	227	118	48	43	1	30	0.5	1	120	2	5	38

4.8. System Analysis

The design system and calculation can be summary base on advantage and disadvantage as below.

4.8.1. Advantage

➜ Coding (Poly code)

- Can identify the product feature from product code

- Easy to notice the odd

- More easy to set up than mono code

- Support long term product development and coding

➜ Master Scheduling

- Help production planning ability to plan the product to market more accurately

- Support marketing to complete the customer request on lead time and capacity during request for quotation

- Ability to foresee the problem may occur base on the production that will result to the delay time to delivery and capacity so that team can generate plan to recover

➜ Computer Integration

- Help increase level of 'user friendly' to the system

- Easy to operate and understanding

- Can set the level of authority, and permission to the system

4.8.2. Disadvantage

➜ Coding (Poly code)

- If pattern have more than 27 code may need to recode again

- Cannot solve the uniqueness after 9 digit repeat more than 10 times

- Too many digits cause difficult to remember in the beginning and new persons

- Master Scheduling

  - Need well train to use the system

  - The user need to understand the nature of the production process

  - User must not fully rely on the system and need to cross check

  - Can be messed up by the non experience user

  - Cannot set the authority to usage

- Computer Integration

  - Need IT person who understand the system very well to maintain the system

  - The system related problem is difficult to change in case some problem or requirement added afterward

  - High cost if hire the external party to right the system

4.8.3. Recommendation for Disadvantage

- Coding (Poly code)

  - Use both letter and number for the digit; the total available will be 37 codes

  - Use both letter and number for the digit; the total available will be 37 times

- Implement using computer integrated and bar code system

➔ Master Scheduling

  - Audit and periodically train the usage and procedure of the MPS to ensure users are fully understand and make use of the system effectively

  - Identify and strictly to the access and authority

➔ Computer Integration

  - Management support and benefit analysis for investment approval