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A STUDY ON MRP/JIT SYSTEM FOR VENDOR MANAGEMENT

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ABSTRACT

This paper examines both MRP and JIT for reducing WIP(Work In Process). The MRP/JIT system is suitable for multi-model, small-production manufacturing companies in Korea because of the short delivery distance and low risk of accident during delivery. The objective of this paper is to manage vendors effectively by informing supply points and quantity of parts of vendors with MRP and JIT.

I. INTRODUCTION

As the desire of people becomes various and industrial techniques progress rapidly, the cycle time of production in industry becomes gradually shorter than ever before. In other words, mass production system is declining and multi-model and small-production manufacturing systems become more important than any other production types. Effective methods of production management for multi-model and small-production manufacturing system have been developed, such as MRP(Material Requirements Planning), JIT(Just-In-Time), GT(Group Technology), FMS(Flexible Manufacturing System), etc. Among them MRP and JIT manufacturing systems are suitable for supply and demand of materials in assembly line. This paper focuses on supply points and quantity of parts by using advantages of MRP and JIT manufacturing system. Because of limited available space and high inventory cost, it is very important to acquire the information of supply points and quantity of parts in the environment of electronic and automobile industry. The objective of this study is to reduce WIP(Work In Process) and to manage vendors effectively.

MRP was developed in America. Orlicky[10] divided materials into independent items and dependent items. He presented a way to calculate dependent items through BOM(Bill of Material) when independent items were gained. After the priority planning and CRP(Capacity Requirements Planning) were applied, a closed loop MRP system which has the function of control was developed. In the 1980's, MRP has been expanded into the concept of MRP II(Manufacturing Resource Planning) that treats the part of business, accounts, and technology as well as production and mate-

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rials.

Many papers dealt with not only MPS(Master Production Schedule),BOM, and inventory records file, which are input parts of MRP, but also lot sizing and CRP to reduce WIP[5]. Further studies of MRP for service industry were also presented.

On the other hand, JIP was developed in Japan and was originated in calculating the flow of materials conversely. Toyota production system controls the flow of materials between the company and vendors, proceeding process and subsequent process by using Kanban as a tool[6,14]. The necessity of studying JIT was recognized in America according as JIT become successful in Japan, therefore, many papers were presented about various issues of JIT[7,8,12,17].

Many papers to introduce JIT and its production methods were also presented in Japan.

Especially, Monden[20] introduced the Toyota production system in detail. The concept of push type based on schedule and the concept of pull type which is suitable for supply to demand were developed. MRP is a typical push type and JIT is a typical pull type. Kimura and Terada[15] mentioned that pull types are better than push types when the demands of production are fluctuating. But pull types do not give good information when company plans advanced planning of sales and investment.

Many papers represented several advantages and disadvantages of these two methods. For example, Jacobs[4], Aggarwal[18] and Hendrick[19] described the advantages and disadvantages of MRP. On the other hand, Ebrahimpour[14], Walleigh[16], Schroer[3], and Rice[8,9] described advantages and disadvantages of JIT.

Because of various characteristics of MRP and JIT, the study to combine MRP with JIT is in progress. Putnam[1] presented a flexible Kanban system to modify repetitive manufacturing shops and described how to use it in detail. Owing to the merits of MRP and JIT,MRP and Kanban system has been used to control daily necessary materials for a long time in several companies. In other words, total production planning is performed by MRP, and shop floor control is performed by Kanban. Sepehri[12] named it American-style Kanban. Ebrahimpour and Schonberger[14] explained the reason why Japanese use MRP and Schroer et al.[3] designed a model to use Kanban in small batch productions and analyzed 2-card Kanban(Production Ordering Kanban and Withdrawal Kanban) system through simulation using computer. Belt[2] mentioned that MRP would complement the weakness of Kanban in case that MRP is combined with Kanban and concluded that A class or B class companies are suitable for combining MRP with Kanban.

Mori[13] explained Synchro-MRP system as follows. After MRP made a master schedule, the Kanban system could be applied as a dispatching tool of production within each bucket. Synchro-MRP works well in the environment of high variety of production, many fabrication centers, and relatively low-volume usage of many parts like Yamaha's production environment. But the major weak point of Synchro-MRP is that part orders must be scheduled by the computer a day before production and some buffer inventory must be retained as a hedge against planning errors.

The above intensive survey shows that there are several studies to use JIT on the basis of MRP and to use MRP on the basis of JIT. Also there are a few companies in which production planning is managed by MRP and production control is managed by Kanban everyday. It is necessary to

inform vendors of supply points and quantity of parts precisely and rapidly under the circumstance of electronic and automobile industry in Korea. A system considering various kinds of models and acquiring the simple information is also necessary. To reduce WIP, it is indispensible to focus on the supply points and quantity of parts delivered by vendors because of short delivery distance, low risk of accident during delivery, and precise delivery by the ordered point in our production environment.

However, there is no paper to consider MRP and JIT simultaneously in the relationships between company and vendors. Only some papers depicted some policies and methods to manage vendors briefly. Therefore, to acquire the information suitable for this desire, this study combines MRP with JIT as follows. Production planning is managed by MRP roughly and production control is performed by using the concept of Kanban in MRP/JIT system. This system is suitable under the circumstance of low production variety. However, the system is independent of the number of models and quantity of parts if they are not limited by the computer capacity. Although necessary information is acquired by PC(Personal Computer) in this study, this system can be extended easily. Also this study aims to suit supply to demand on the basis of schedule. It is not necessary to plan part orders by Computer everyday. But smoothed production is very important to apply this system to the electronic and automobile industry.

Ⅱ. MRP/JIT SYSTEM

2.1 Design of MRP/JIT System

If the MPS about the independent demand of model by forecasting and fixed orders are determined, MRP calculation is done by BOM and inventory records files. After determining the net requirements of independent items of each model, sequencing is performed by BOM and the information of net requirements. Once the sequence of independent items is determined, the completing points of independent items are acquired by the information related to JIT. Generally, MRP assumes that the necessary items in a time bucket are arrived at initial point of the time bucket. If the unit of the time bucket is a week in this case, the items used during a time bucket should be stored in inventory system at first day. If they are delivered at one time, however, many difficulties such as space limitation, inventory cost may occur in the electronic and automobile industry. Confusion may occur in the process of offsetting if the lead time is not the multiple of unit of the time bucket.

To overcome the weak points of the above system, MRP/JIT system is designed as follows. When net requirements of independent items are determined, sequencing is performed. Then, the necessary point and quantity of dependent items are gained by the information of net requirements of dependent items, by offsetting information through the level of parts and pitch time. The order is released to vendors by this information. The delivery frequency of vendors is determined by part sizes, percentages of defective items, delivery distance and importance of parts. Several vendors use roundtour mixed-loading systems.

To reduce the risk that entire production line may be stopped, parts are divided into three groups roughly. Priority parts do not permit inventory except that the inventory occurs because of delivery frequency. Semipriority parts permit sa-

fety stock in order to reduce the risk that entire production line may stop. If the gross requirements are less than net requirements on hand, parts on hand are used first and the parts supplied by vendors are used later in the production line. The above two parts are managed by MRP/JIT system. Nonpriority parts are stored at warehouse, and feeder supplies the parts at several time intervals. The inventory of nonpriority parts are managed by signal Kanban.

Furthermore, by the information of MRP and JIT, MRP/JIT system overcomes the weak points of the time bucket and solves the problem ocurring when lead times are not multiple of the time bucket at time of offsetting. If the production planning changes occur, after acquiring the fact that these changes are caused by the information related to MRP or JIT, new information is acquired through the feedback. We can know whether the overtime work is necessary or not, and whether the due dates should be changed or not from these results. Figure 1 represents a flow chart of MRP/JIT system.

2.2 MRP Calculation

The information by BOM and inventory records file is used for MRP calculation. Then, BOM considering the option of various models is constructed. Scheduled receipts are not considered because delivery period is short. Although the inventory of independent items rarely exist, MRP calculation should be derived, especially when the cost of inventory of independent items is very expensive. The calculation to get supply points by offsetting the lead time is not performed. MRP calculation about independent items is performed first and the result of calculation is used for sequencing. After these procedure, MRP calculation about dependent items is performed. The time bucket is a week in this calculation.

2.3 Sequencing

If net requirements about independent items of each model are determined, Goal Chasing Method[11] and sequencing algorithm are used for smoothing production. Weekly sequence is acquired through these methods. Vendors use these results in their production planning. The notation and algorithm are shown in the table 1.

2.4 Calculation of completing points about independent items

The completing points about independent items are calculated by using such information related to JIT as working time per week, shift cycle, pitch time, and result of sequencing. This result is used to calculate the supply points of parts.

2.5 Degree of offsetting about dependent items

Degree of offsetting about dependent items can be calculated by using the information related to JIT and degree of level. This result is also used to calculate the supply points of parts.

2.6 The information of MRP/JIT system

Degree of offsetting about dependent items, the result of MRP calculation about dependent items, and the supply points and quantity are calculated by the information of completing points about independent items. Orders are released by using this result, and this study can manage vendors through the supply points and quantity of parts.

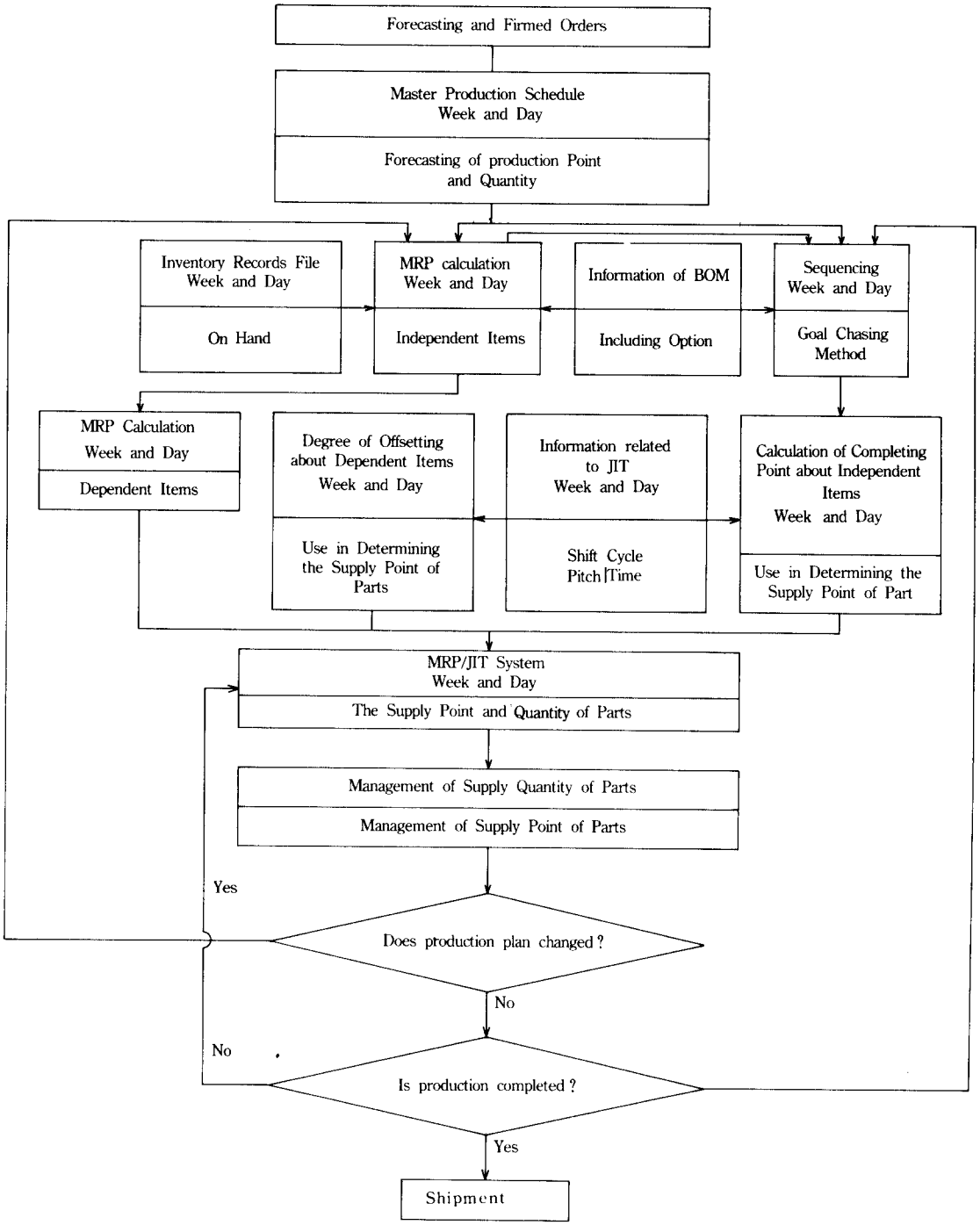

Figure 1. Flow Chart of MRP/JIT System.

2.7 The case that detailed schedule is necessary

When it is necessary to manage production line and vendors according to the change of production plan, the unit of time bucket changes a week into a day and daily sequencing is performed. The releasing of orders, delivery of parts, production progress can be checked with concentration, and vendors and production line can be also managed precisely.

Table 1. Notation and Algorithm of Goal Chasing Method.

Notation
Q : Total production quantity of all products A_i(i=1, ⋯ , m) where, Q=93 and m=18 in this example. N_j : Total necessary quantity of the part a_j to be consumed producing all products A_i(i=1, ⋯ ,m ; j=1, ⋯ ,n). where, n=21 in this example. X_{jk} : Total necessary quantity of the part a_j to be utilized for producing the products of determined sequence from first to kth(k=1, ⋯ ,Q). b_{ij} : Necessary quantity of the part a_j(j=1, ⋯ ,n) for production one unit of the product A_i(i=1, ⋯, m).
Algorithm
step 1 : Set k=1, X_{jk-1} =0,(j=1, ⋯ ,n), S_{k-1}={1, ⋯ ,m}. step 2 : Set as kth order in the sequence schedule the product Xi which minimizes the distance D_k. The minimum distance will be found by the following formula. $D_{k1}^{*}=\min_{i}\{D_{ki}\},\ i \in S_{k-1}$ where $D_{ki}=\sqrt{\sum_{j=1}^{n}\left(\frac{K \cdot N_j}{Q}-X_{i\ k-1}-b_{ij}\right)^2}$ step 3 : If all units of a product A_i* were ordered and included in the sequence schedule, then set $S_k=S_{k-1}-\{i^*\}$. If some units of a product A_i is still remaining as being not ordered, then set $S_k=S_{k-1}$. step4 : If $S_k=\phi$, the algorithm will end. If $S_k\neq 0$, then compute $X_{jk}=X_{jk-1}+b_{i^*j}$ and go back to step 2 by setting K=k+1.

Ⅲ. Illustration of MRP/JIT System

3.1 The structure of BOM about mixed model

Figure 2 represents a flow chart of BOM necessary in this system, and table 2 represents necessary quantity of the parts. The necessary quantity of the parts may be different according to models. M[⋯] means that each part should be used within the number in [⋯] according to the model. The number of models are 18 and the number of parts are 21 in this example.

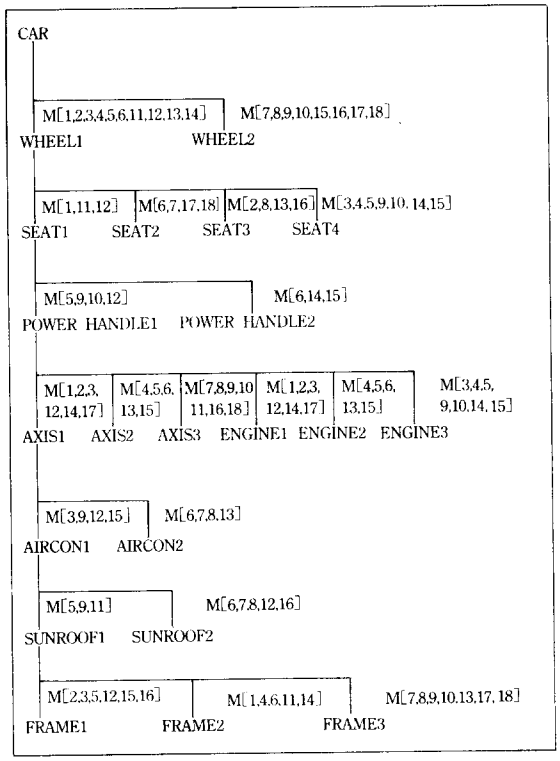

Figure 2. Flow Chart of BOM.

Table 2. Necessry Quantity of the Parts.

Model / Prats	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18
WHEEL1	4	4	4	4	4	4	0	0	0	0	4	4	4	4	0	0	0	0
WHEEL2	0	0	0	0	0	0	4	4	4	4	0	0	0	0	4	4	4	4
SEAT1	1	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0
SEAT2	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1
SEAT3	0	1	0	0	0	0	0	1	0	0	0	0	1	0	0	1	0	0
SEAT4	0	0	1	1	1	0	0	0	1	1	0	0	0	1	1	0	0	0
POWER HANDLE1	0	0	0	0	1	0	0	0	1	1	0	1	0	0	0	0	0	0
POWER HANDLE2	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0
AXIS1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
AXIS2	0	0	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0
AXIS3	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	0	1
ENGINE1	1	1	1	0	0	0	0	0	0	0	0	1	0	1	0	0	1	0
ENGINE2	0	0	0	1	1	1	0	0	0	0	0	0	1	0	1	0	0	0
ENGINE3	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	1	0	1
AIRCON1	0	0	1	0	0	0	0	0	1	0	0	1	0	0	1	0	0	0
AIRCON2	0	0	0	0	0	1	1	1	0	0	0	0	1	0	0	0	0	0
SUNROOF1	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0
SUNROOF2	0	0	0	0	0	1	1	1	0	0	0	1	0	0	0	1	0	0
FRAME1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	1	1	0	0
FRAME2	1	0	0	1	0	1	0	0	0	0	1	0	0	1	0	0	0	0
FRAME3	0	0	0	0	0	0	1	1	1	1	0	0	1	0	0	0	1	1

3.2 MRP calculation about independent items of each model

Table 3 shows the result of MRP calculation about independent items of each model by using the information of BOM and inventory records file. Net requirements about independent items are calculated according to the unit of the time bucket, a week in this calculation. The net requirement about independent items is 93 in this example.

3.3 Sequencing

Sequencing is performed by using the information of BOM and the information of net requirements about independent items gained from MRP calculation. MRP/JIT system in this study can handle 50 different kinds of models and 1000 different kinds of parts, and total production quantity is limited to 1000 because of the capacity of PC. A sequencing program is developed by PASCAL programming and computing time in the IBM-

PC/XT is about one minute in this example. Table 4 represents a part of sequencing results.

Table 3. MRP Calculation about Independent Items.

MODEL	PRODUCTION QUANTITY [WEEK] [NET REQ]				
	1	2	3	4	5
X1	7	6	3	5	3
X2	9	7	8	8	8
X3	2	2	1	2	2
X4	5	2	10	6	14
X5	2	3	1	2	1
X6	4	1	3	4	2
X7	3	3	1	1	3
X8	1	2	4	2	2
X9	3	2	7	9	7
X10	5	1	4	17	2
X11	12	6	1	4	9
X12	3	2	3	2	2
X13	2	3	2	3	1
X14	5	4	9	2	4
X15	4	2	1	2	2
X16	3	9	12	4	7
X17	12	10	7	12	8
X18	11	7	6	7	4
TOTAL	93	72	83	92	81
PITCH TIME	90.32258	116.6667	101.2048	92.3043	

3.4 Calculation of completing points about indepedent items and degree of offsetting about dependent items

Table 5 represents a part of the results on completing points about indepedent items and degree of offsetting about dependent items.

3.5 The information of MRP/JIT system

Table 6 represents a part of the information of MRP/JIT system in this example. This information is very important because orders are released and vendors supply necessary parts in necessary time by this information. WIP can be reduced from this information.

IV. Analyses of the Results

It is possible to manage the supply points and quantity of parts according as they are informed to vendors if the completing points of independent items are gained by sequencing in MRP/JIT system. After gaining BOM according to the sequence of assembly, the necessary points of dependent items by subtracting the degree of offsetting about depedent items from the completing points of indepedent items are achieved. On the other hand, vendors supply the necessary parts according to their delivery frequency by the above information.

This system can inform vendors of the supply points and quantity of parts by using the information of MRP/JIT system. The quantity of parts is managed by MRP and the supply points of parts is managed by JIT. Companies can reduce WIP and manage vendors effectively from those results.

In other words, the information of MRP/JIT system can be used effectively such company as electronic industry, automobile industry in Korea. The characteristics of this system are as follows. The merit of advanced planning can be used because production planning is managed by MRP. To reduce the risk that entire production line may stop, parts are divided into three groups. The weak points of a given time bucket are also removed, and the problem of offsetting in MRP is solved. Furthermore it is not necessary to schedule the part orders everyday, even though semi-priority parts have a little safety stock.

Table 4. Results of Sequencing.

K	DK1	DK2	DK3···DK16	DK17	DK18	Sequence Schedule
1	3.03	3.09	3.17···3.65	3.47	3.47	X1
2	6.06	5.76	5.78···2.01	2.53	1.54	X18
3	3.33	2.86	2.78···4.19	4.43	4.43	X5
4	5.07	5.02	5.12···2.32	2.26	2.26	X8
5	2.19	2.57	2.27···5.25	4.53	5.00	X14
6	4.52	4.54	4.54···2.89	2.33	2.33	X17
7	2.66	2.76	2.68···5.12	5.56	5.19	X11
8	4.38	4.01	3.89···3.07	3.14	3.14	X15
9	2.34	2.18	2.70···5.74	5.57	5.57	X2
10	4.13	4.55	4.56···3.96	3.66	3.07	X18
·	·	·	·	·	·	·
·	·	·	·	·	·	·
·	·	·	·	·	·	·
85	4.19	3.83	4.20···4.39	4.34	3.85	X4
86	6.21	5.83	6.20···3.07	2.94	2.16	X18
87	3.37	2.68	3.34···4.63	4.51	4.51	X2
88	5.35	5.36	5.50···3.13	2.90	2.10	X18
89	2.65	2.75	2.92···5.23	5.07	5.07	X11
90	4.70	4.36	4.41···3.69	2.75	3.40	X17
91	3.06	2.57	2.57···5.66	5.80	5.80	X6
92	4.31	3.77	3.70···3.52	3.70	3.70	X9
93	0.00	0.00	0.00···0.00	0.00	0.00	X2

Table 5. Completing Points about Independent Items and Degree of Offsetting.

PARTS	WHEEL1	WHEEL2	SEAT1	SEAT2	SEAT3	SEAT4	POWER HANDLE1	POWER HANDLE2	AXIS1	AXIS1	AXIS2
DEGREE OF OFFSETTING	90.32	90.32	180.6	180.6	180.6	180.6	271.0	271.0	361.3	361.3	361.3
PARTS	ENGINE1	ENGINE2	ENGINE2	AIRCON1	AIRCON2	SUN ROOF1	SUN ROOF2	FRAME1	FRAME2	FRAME3	
DEGREE OF OFFSETTING	361.3	361.3	361.3	451.6	451.6	541.9	541.9	632.3	632.3	632.3	

(continued)

SEQUENCE	1	2	3	4	5	6	7	8	9	10
PRODUCT	X1	X18	X5	X8	X14	X17	X11	X15	X2	X18
COMPLETING POINT	90.32	180.6	271.0	361.3	451.6	541.9	632.3	722.6	812.9	903.2
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
SEQUENCE	84	85	86	87	88	89	90	91	92	93
PRODUCT	X12	X4	X18	X2	X18	X11	X17	X6	X9	X2
COMPLETING POINT	7587.1	7677.4	7767.7	7858.1	7948.4	8038.7	8129.0	8129.3	8309.7	8400

Table 6. Information of MRP/JIT System.

SEQUENCE	1	2	3	4	5	6	7	8	9	10
WHEEL1	0	0	0	0	0	1	0	1	1	0
WHEEL2	0	0	0	0	0	0	1	0	0	1
SUPPLY POINT	0	90.3	180.6	270.9	361.2	451.5	541.8	632.1	722.4	812.7
SEAT1	0	1	0	0	0	1	0	0	0	0
SEAT2	1	0	0	0	1	0	0	0	0	1
SEAT3	0	0	0	1	0	0	0	0	1	0
SEAT4	0	0	1	0	0	0	1	1	0	0
SUPPLY POINT	-90.3	0	90.3	180.6	270.9	361.2	451.5	541.9	632.1	722.4
POWER HAN1	0	0	0	0	0	0	0	0	0	0
POWER HAN2	0	0	0	0	0	0	0	0	0	0
SUPPLY POINT	-180.6	-90.3	0	90.3	180.6	270.9	361.2	451.5	541.9	632.1
AXIS1	1	0	0	1	0	1	0	0	1	0
AXIS2	0	0	1	0	0	0	0	1	0	0
AXIS3	0	1	0	0	1	0	1	0	0	1
ENGINE1	0	0	0	0	0	0	0	0	1	0
ENGINE2	0	0	0	0	0	0	0	0	0	0
ENGINE3	0	0	0	0	0	0	0	0	0	0
SUPPLY POINT	-270.9	-180.6	-90.3	0	90.3	180.6	270.9	361.2	451.4	541.9
AIRCON1	0	0	0	0	0	0	0	0	0	0
AIRCON2	0	0	0	0	0	0	0	0	0	0
SUPPLY POINT	-361.2	-270.9	-180.6	-90.3	0	90.3	180.6	270.9	361.2	451.5
SUN ROOF1	0	0	0	0	0	0	0	0	0	0
SUN ROOF2	0	0	0	0	0	0	0	0	0	0
SUPPLY POINT	-451.4	-361.2	-270.9	-180.6	-90.3	0	90.3	180.6	270.9	361.2

(continued)

FRAME1	0	0	0	0	0	0	0	0	1	0
FRAME2	0	0	0	0	0	0	0	1	0	0
FRAME3	0	0	0	0	0	0	0	0	0	1
SUPPLY POINT	-541.8	-451.4	-361.2	-270.9	-180.6	-90.3	0	90.3	180.6	270.9
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
.	.	.	.	.	.	.	.	.	.	.
SEQUENCE	84	85	86	87	88	89	90	91	92	93
WHEEL1	1	0	1	1	0	1	1	0	1	0
WHEEL2	0	1	0	0	1	0	0	1	0	1
SUPPLY POINT	7494.9	7585.2	7675.5	7765.8	7856.1	7946.4	8036.7	8127.0	8217.3	8307.6
SEAT1	1	0	0	1	0	0	1	0	0	0
SEAT2	0	1	0	0	1	0	0	0	0	1
SEAT3	0	0	1	0	0	0	0	1	0	0
SUPPLY PIONT	7404.6	7494.9	7585.2	7675.5	7765.8	7856.1	7946.4	8036.7	8127.0	8217.3
POWER HAN1	0	0	0	1	0	0	0	0	0	0
POWER HAN2	0	0	0	0	0	1	0	0	0	0
SUPPLY POINT	7314.3	7404.6	7494.9	7585.2	7675.5	7765.8	7856.1	7946.4	8036.7	8127.0
AXIS1	0	1	0	1	0	1	0	0	0	1
AXIS2	0	0	1	0	0	0	0	0	1	0
AXIS3	1	0	0	0	1	0	1	1	0	0
ENGINE1	0	1	0	1	0	1	0	0	0	1
ENGINE2	0	0	1	0	0	0	0	0	1	0
ENGINE3	1	0	0	0	1	0	1	1	0	0
SUPPLY POINT	7224.0	7314.4	7404.6	7494.9	7585.2	7675.5	7765.8	7856.1	7946.4	8036.7
AIRCON1	0	0	0	1	0	0	0	0	0	0
AIRCON2	0	0	1	0	0	0	0	0	0	0
SUPPLY POINT	7133.7	7224.0	7314.4	7404.6	7494.9	7585.2	7675.5	7765.8	7856.1	7946.4
SUN ROOF1	1	0	0	0	0	0	1	0	0	0
SUN ROOF2	0	0	0	1	0	0	0	1	0	0
SUPPLY POINT	7043.4	7133.7	7224.0	7314.4	7404.6	7494.9	7585.2	7676.5	7765.8	7856.1
FRAME1	0	0	0	1	0	0	0	1	0	0
FRAME2	1	0	0	0	0	1	1	0	1	0
FRAME3	0	1	1	0	1	0	0	0	0	1
SUPPLY POINT	6953.1	7043.4	7133.7	7224.0	7314.4	7404.6	7494.9	7585.2	7675.5	7765.8

V. CONCLUSIONS

This study focuses on reducing WIP by informing vendors of the supply points and quantity of parts to solve the several problems occurring at electronic and automobile industry in Korea with MRP and JIT. The procedure is as follows. After MRP calculation about independent items is performed by the information of BOM and inventory records file, this result is used for sequencing. The completing points about independent items are gained through the result of sequencing and the information related to JIT. The information of MRP/JIT system is calculated by MRP calculation of dependent items and degree of offsetting about dependent items gained by pitch time and level of BOM. This information is used to reduce WIP according to the quantity of parts controlled by MRP and the supply points of parts controlled by JIT.

This study has strong points under the environment that production plan does not change greatly. The kinds of models are limited because of the capacity of PC. This study removes the inconvenience to plan ordering parts with computer everyday because parts are managed with a week time unit. Only if production plan changes and parts must be managed in detail, the parts can be managed with the day time unit. This system does not need supplier kanban of which the information of MRP/JIT system takes the role.

MRP/JIT system in this study is developed for assembly process. Therefore, for the case that manufacturing process and assembly process are mixed, the study to design subsystems of FA(Factory Automation) using the JIT concept for assembly process and GT concept for manufacturing process should be continued.

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