MRP I SYSTEMS AND MRP II SYSTEMS

GUIDED PROBLEM - 2

Calculate the manufacture capacity of the working centres according to the established production plan.

Determine the workload for each working centre (assembly, C100, C200, C300 and C400), indicate the dates when it is necessary to work in 1 shift, 2 or 3 shifts or even sub-contract some work or work overtime to comply with the indicated plan, if in each working centre we know the following conditions:

In final product P1 the time to prepare the assembly line is 2 hours for a 10 unit lot and the operation time is 18 minutes for each assembled part.

Logically, the preparation and operation times are also included in each working centre, as well as the manufacturing lot sizes. We work with two shifts a day in all the working centres.

PRODUCT	Nº STAGE	W. LOAD	TERM	LOT	PREP. T.(hours)	OPER. T. (minutes)
P1	1	Assembly	1	100	2	18
T1	1	c100	1	100	4	7
	2	c200	1	150	3	8
C1	1	c300	1	100	1	4
C2	1	c300	1	200	1	4
C3	1	c400	1	100	1,5	4

Basing on the above figures, we calculate the occupation times for each of the machines required to perform the master plan. **We start from the manufacture orders resulting from Guided Problem 1**, which are the orders we are going to launch to production.

Thus, on 25 March, in the assembly line, we determine the manufacture time for the 245 units of P1 to be manufactured, which will be calculated as follows:

$$\text{Operation time (hours)} = \frac{245 \text{ units x } 18 \text{ minutes/unit}}{60 \text{ min/h}} = 73.5 \text{ hours}$$

$$\text{Preparation time} = \frac{245 \text{ units x } 2 \text{ preparation hours}}{100 \text{ units}} = 4.9 \text{ hours}$$

Manufacture time = 73.5 hours + 4.9 hours = 78.4 hours

On 1 April, in the assembly line, we determine the manufacture time of the 220 units of P1 to be manufactured, which will be calculated as follows:

$$\text{Operation time (hours)} = \frac{220 \text{ units x } 18 \text{ minutes/unit}}{60 \text{ min/h}} = 66 \text{ hours}$$

$$\text{Preparation time} = \frac{220 \text{ units x } 2 \text{ preparation hours}}{100 \text{ units}} = 4.4 \text{ hours}$$

Manufacture time = 66 hours + 4.4 hours = 70.4 hours

All the other times are calculated following the same procedure, from the data of preparation and operation times included in the chart. In the case of the subassembly T1, we have to take into account that it is at machining centre C100 for one week and the following week at the machining centre C200. Therefore, it has a two-week manufacture time.

We calculate the resulting manufacture time of 11 March at machining centre C100, considering the amount of 500 units of T1 to be manufactured in the first week.

$$\text{Operation time (hours)} = \frac{500 \text{ units x } 7 \text{ minutes/unit}}{60 \text{ min/h}} = 58.33 \text{ hours}$$

$$\text{Preparation time} = \frac{500 \text{ units x } 4 \text{ preparation hours}}{100 \text{ units}} = 20 \text{ hours}$$

Manufacture time = 58.33 hours + 20 hours = 78.33 hours

For 18 March, in the machining centre C200, we determine the manufacture time of the 500 units of T1 to be manufactured in the second week, which will be calculated as follows:

$$\text{Operation time (hours)} = \frac{500 \text{ units x } 8 \text{ minutes/unit}}{60 \text{ min/h}} = 66.67 \text{ hours}$$

$$\text{Preparation time} = \frac{500 \text{ units x } 3 \text{ preparation hours}}{150 \text{ units}} = 10 \text{ hours}$$

Manufacture time = 66.67 hours + 10 hours = 76.67 hours

We calculate the preparation and operation times of the other machines in their corresponding dates and we get a chart as follows:

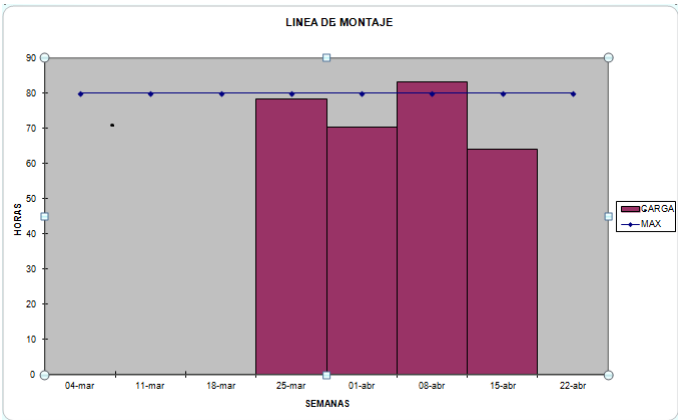
	COM	04-Mar	11-Mar	18-Mar	25-Mar	01-Apr	08- Apr	15- Apr
ASSEMBLY	P1				78.40	70.40	83.20	64.00
C100	T1		78.33	70.50	83.03	64.23	0.00	
C200	T1			76.67	69.00	81.27	62.87	
C300	C1	80.50	72.84	88.17	65.17			
C300	C2	39.,42	34.04	39.42	32.25			
C400	C3			63.29	77.58	85.75	73.50	26.54

And, adding the times resulting for the centre C300, we calculate the total workloads per centre.

	04-Mar	11-Mar	18-Mar	25-Mar	01- Apr	08- Apr	15- Apr
ASSEMBLY				78.40	70.40	8320	64.0
C100		78.33	70.50	83.03	64.23		
C200			76.67	69.00	81.27	62.87	
C300	119.92	106.88	127.59	97.42			
C400			63.29	77.58	85.75	73.50	26.54

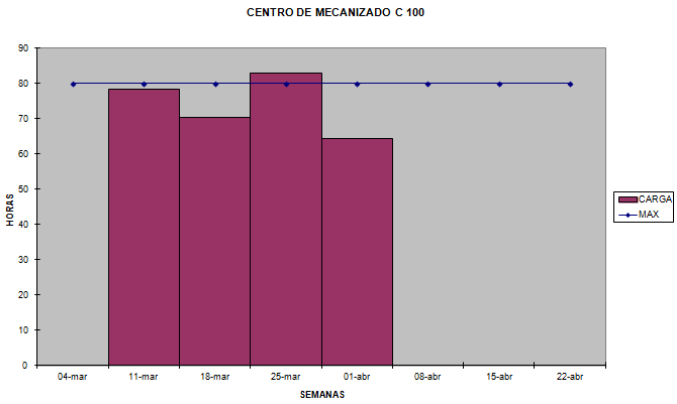
The working centres with the figures in blue have to work in two shifts to meet the manufacture schedule, the centres with the figures in black can work one shift and those with the figures in green have to work three shifts to meet the schedule, the centres with the figures in red or in maroon require extraordinary measures to meet the capacity.

To identify quickly the possible manufacture problems we can find we make bar graphs by weeks with the required capacity of each machine and the maximum capacity.



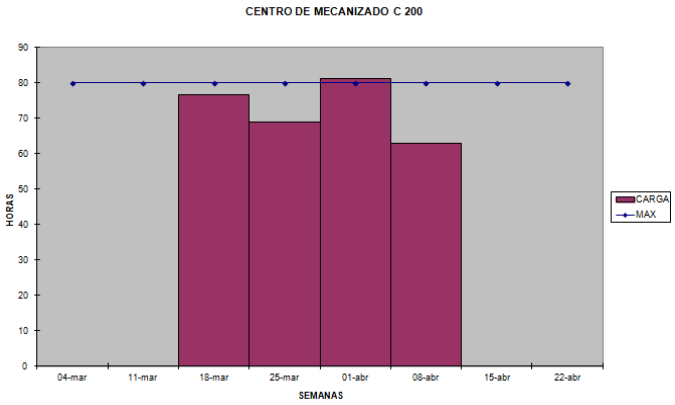
In the graph, we can see that this working centre has to work two shifts.

But, besides, on the week of 8 April, it is advisable to work 3.2 hours overtime to meet the manufacture program.



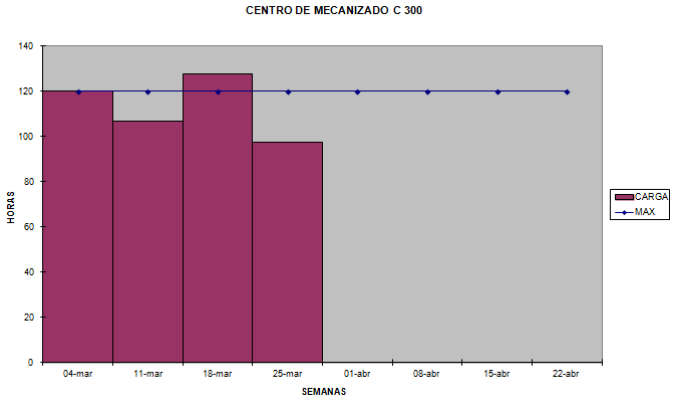
In the graph, we can see that this working centre, C100, has to work two shifts.

But, besides, on the week of 25 March, it is advisable to work 3.03 hours overtime to meet the manufacture program.



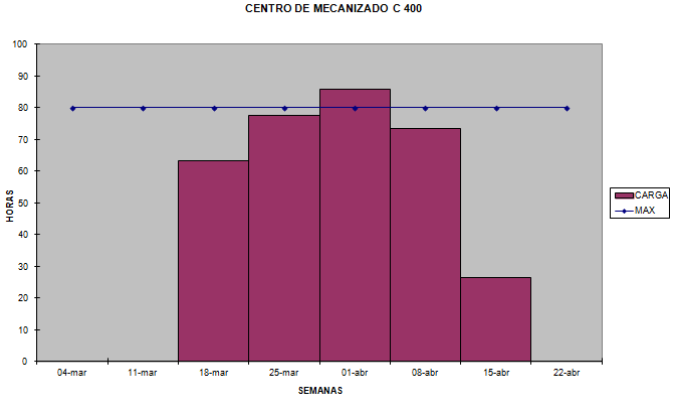
In the graph, we can see that this working centre, C200, has to work two shifts.

But, besides, on the week of 1 April, it is advisable to work 1.27 hours overtime to meet the manufacture program.



In the graph, we can see that this working centre, C300, has to work three shifts.

But, besides, on the week of 18 March, it is advisable to subcontract 8 manufacture hours to meet the manufacture program.



In the graph, we can see that this working centre, C400, has to work two shifts the weeks of 15 March to 8 April and the last week, 15 April, only one shift.

But, besides, on the week of 1 April, it is advisable to work 5.75 hours overtime to meet the manufacture program.