



Design of Manufacturing Systems – Job Shop and Manufacturing Cells



Job-shop. Exercise

A small manufacturing company is currently designing a new production system, organized in job shops. It is installing 3 different departments (M1, M2, M3), which will serve to produce at least 3 types of product (A, B, C). We have the following information:

Product	Production process (Department, Cycle Time [min / pcs])	Average annual demand (pieces)
A	(M1, 15) – (M2, 10)	15000
B	(M1, 9) – (M3, 8)	25000
C	(M2, 17) – (M3, 7)	35000

The production system will work 3 shifts of 7 hours per day, 240 days/year. Departments have different coefficient. M1 considers a human coefficient (HC) of 0.96 and an Availability (A) of 0.96. M2 considers a human coefficient (HC) of 0.95 and an Availability (A) of 0.93. M3 considers a human coefficient (HC) of 0.91 and an Availability (A) of 0.93. The scheduling efficiency (SE) must be set equal to 0.82. M1 scrap rates (SR) is equal to 0.07, M2 scrap rates is equal to 0.05, while M3 scrap rates is equal to 0.09. In M1 department, setup lasts 2.8 hours for each change of production; in M2 setup lasts 2.3 hours for each change of production; in M3 setup lasts 1.9 hours for each change of production. It is expected to produce average batches of about 1000 pieces (regardless of the type of product). The objective is to determine the number of machines and the rate of saturation for each department.

ROC. Exercise

The following matrix identifies the bill of process of the j -th products on the i -th machines. The cycles have been defined with the objective of designing a manufacturing system organized in cells.

There are 5 types of products to be made, and for the realization of all bills of process of different products are required 7 different types of machine.

The objectives are: (i) the number of cells for the system; (ii) the types of machine to be installed in each cell.

		j-th product				
		1	2	3	4	5
i-th machine	1	0	1	1	0	1
	2	1	0	0	1	0
	3	0	1	1	0	0
	4	1	0	0	1	0
	5	1	0	0	0	0
	6	1	0	0	1	0
	7	0	0	1	0	1