

Question 1:

A cement plant is scheduled to operate for 320 days next year. The plant is planned to work 24 hours daily. The production rate at 50% capacity is 625 tones per 12 hours. The plant is planning to increase the level of the plant availability to 95%, the level of process rate to 98% and the level of productive capacity to 80.396%. The administration planning staffs realized that to reach these levels, the plant should control the downtimes resulted from planned maintenance and breakdowns, the volume of the cement that is lost as a result of production slowdowns and the total rejected production tones. Therefore, the plant wants your help to determine the following (show all calculations) in order to achieve the above targeted levels:

1. The overall equipment effectiveness, OEE.
2. The quality rate, QR.
3. Downtimes resulted from planned maintenance and breakdowns.
4. Tones lost as a result of production process.
5. Total rejected tones.

Question 2:

A maintenance department in a company has three types of maintenance jobs that should be performed in one of the company’s production areas. These types are the planning maintenance jobs and the emergency/ breakdown maintenance jobs and the improvement maintenance jobs. The information about these three types is given in tables 2, 3 and 4. The number of hours that assigned craftsman can work in each month in any given production area is 55 hours. The productivity of the assigned electrical workers in this area is 90.9% whereas the productivity of the assigned mechanical workers in this area is

80.0%. Construct the next year maintenance master schedule for the maintenance jobs of this department and calculate the total workload for each type of craftsmen in each month. (Hint: the number of working days in one month is 22 days).

1. Planning Maintenance Jobs: Table 2

| Job | Maintenance Workload for Each Craftsmen (Hours/Machine) | | Number of Machines | Machine Working Hours per Day (Hours/Day) | Maintenance Due Time for Each Machine (Hours) | Date of Last Maintenance Month/Day |
|-----|---------------------------------------------------------|------------|--------------------|-------------------------------------------|-----------------------------------------------|------------------------------------|
| | Electrical | Mechanical | | | | |
| PP1 | 3 | 3 | 3 | 9 | 198 | 12/05 |
| PP2 | 4 | 3 | 3 | 12 | 528 | 11/11 |
| PP3 | 5 | 5 | 3 | 10 | 660 | 11/10 |
| PP4 | 2 | 2 | 2 | 8 | 176 | 12/08 |
| PP5 | 3 | 4 | 3 | 6 | 132 | 12/10 |

2. Emergency/ Breakdown Maintenance Jobs: Table 3

| Months | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|-----------------------------|---|---|---|---|---|---|---|---|---|----|----|----|
| Electrical Workload (Hours) | 3 | 3 | 3 | 2 | 5 | 2 | 4 | 4 | 3 | 2 | 5 | 2 |
| Mechanical Workload (Hours) | 3 | 4 | 3 | 3 | 5 | 3 | 3 | 4 | 4 | 2 | 5 | 3 |

3. Improvement Maintenance Jobs: Table 4

| Jobs | Maintenance Hours Needed by Each Craft to Finish the Job | | Notes | Priority |
|-------------|-----------------------------------------------------------------|-------------------|------------------------------------------------------------------------------------------------------|-----------------|
| | Electrical | Mechanical | | |
| IM1 | 12 | 10 | The two types of crafts should work together and once the job started, it should not be interrupted. | First |
| IM2 | 20 | 40 | The job should be done in two consecutive months. | Third |
| IM3 | 5 | 10 | The two types of crafts should work together. The job should be done in one month. | Second |