

Assignment for PRJ301 - FALL 2024 Semester

Building a Production Scheduling System for ABC Company

ABC is a company that manufactures products using bamboo and rattan materials. The company consists of many departments such as the Administration Department, Human Resources Department, Mechanical and Transport Department, Accounting Department, and Planning Department, collectively known as the Head Office. However, the scope of this project only focuses on production planning and the production execution process.

Besides the Head Office, there are production workshops that are numbered, for example, Production Workshop No. 1, Production Workshop No. 2, and so on. Workers in these workshops will manufacture products like baskets, winnowing trays, and flat trays. Each product has an estimated average production time determined by the Planning Department. Specialists in the Planning Department will define the work effort required to produce a product.

Table 1 represents an example of the work effort determination for producing a product by a worker. If a worker fails to produce the product according to the planned schedule, their daily work efficiency coefficient (α) will be deducted. However, if they perform well, their α coefficient score will be increased. Both rewards and penalties are based on the decisions made by the workshop manager.

Table 1: Products and Estimated Work Effort for Production by a Worker.

Product ID	Product Name	Estimated Effort (per manhour)
1	Giỏ	2
2	Thúng	1
3	Mẹt	1

For each customer order, the Production Planning Department will send a detailed production plan to each workshop (Figure 1 illustrates an example of a detailed production plan created by a specialist in the Production Planning Department for Production Workshop No. 01). Accordingly, the workshops must also arrange workers to implement the assigned plans.

The working hours of the workshops are divided into three shifts (3K):

- **K1:** from 6:00 AM to 2:00 PM
- **K2:** from 2:00 PM to 10:00 PM
- **K3:** from 10:00 PM to 6:00 AM the following day.

Production Plan for October and November 2024

Plan ID: 05-2024-T10-T11

Workshop: No. 01

Workshop Manager: Nguyễn Văn A

General Plan:

Product ID	Product Name	Quantity (unit: piece)
1	Giỏ	5000
2	Thúng	7000
3	Mẹt	7000

The detailed production plan is listed in the table below:

Date	Product ID	Product Name	Shift	Quantity (unit: piece)	Note
1/10/2024	1	Giỏ	K1	75	
1/10/2024	2	Thúng	K1	30	
1/10/2024	3	Mẹt	K1	15	
1/10/2024	1	Giỏ	K2	75	
1/10/2024	2	Thúng	K2	30	
1/10/2024	3	Mẹt	K2	15	
...
30/11/2024	1	Giỏ	K3	100	

The workshop managers also need to use the assigned plan to create a detailed production schedule for each day. A workshop may have a large number of workers; however, the managers will allocate work to the workers in a suitable manner. Each worker should only work one shift (K) per day. However, workers can be mobilized to work 2 shifts (K) in a day. Their wages are calculated based on the formula:

Wage for one K worked by the i-th worker = hourly wage * 8 * α_i .

The detailed daily work plan is prepared by the workshop manager, as illustrated in Figure 2. Accordingly, each day, the managers will conduct attendance and track work hours for each worker in accordance with the plan.

Detailed Production Plan at Workshop No. 01 – October 1, 2024

List of Personnel Available for Deployment at Workshop No. 01

Employee ID	Full Name	Salary Level	Hourly rate
CN001	Nguyễn Văn X	F1	30K
CN002	Trần Thế Mỹ	F2	40K
CN003	Bao Chứng	F3	50K
...			
CN150	Triển Chiêu	F3	50K

Assigned Production Plan for Workshop No. 01 – October 1, 2024

Date	Product ID	Product Name	Shift	Quantity	Note
1/10/2024	1	Giỏ	K1	75	
1/10/2024	2	Thúng	K1	30	
1/10/2024	3	Mẹt	K1	15	
1/10/2024	1	Giỏ	K2	75	
1/10/2024	2	Thúng	K2	30	
1/10/2024	3	Mẹt	K2	15	
...

Detailed Personnel Deployment Plan for October 1, 2024

Employee ID	Employee Name	Product Name	Product ID	Shift	Ordered Quantity
CN001	Nguyễn Văn X	Giỏ	1	K1	2
CN001	Nguyễn Văn X	Thúng	2	K1	4
CN002	Trần Thế Mỹ	Mẹt	3	K1	8
...
...
...

The total number of products planned to be completed on October 1, 2024, is calculated as follows:

Product ID	Product Name	Today Production	Cumulative Quantity	Remaining
1	Giỏ	150	150	6850
2	Thúng	90	90	6910
3	Mẹt	50	50	6950

Figure 1: Workshop production plan by day

Attendance at workshop No. 01 – October 1, 2024 – Production shift No. 1							
Employee ID	Full Name	Product ID	Product Name	Ordered Quantity	Actual Quantity	anpha	Note
CN001	Nguyễn Văn X	Giỏ	1	2	2	1.1	Làm vượt hạn mức
		Thúng	2	4	5		
CN002	Trần Thế Mỹ	Mẹt	3	8	8	0.9	Chơi game trong giờ
...
...
...

Note: List CN001, CN002,... are workers who were scheduled to work that day. In fact, they can take unexpected leave. However, to simplify the problem, let's assume that these workers never get sick or take unexpected leave.

Figure 2: Timekeeping at a workshop for a K worker

Tới cuối tháng, từng phân xưởng sẽ gửi báo cáo chấm công cho phòng tổ chức lao động để thực hiện thanh toán tiền lương cho công nhân trong phân xưởng như Figure 4.

Total Effort and Salary at workshop 01 – October 2024						
Employee ID	Full Name	1/10/2024	2/10/2024	...	31/10/2024	Salary
CN001	Nguyễn Văn X	1.1	1		2 (nếu đi làm 2 K)	10,500,000
CN002	Trần Thế Mỹ	0.9	1	...	...	7,500,000
CN003	Bao Chứng	...	...	...	...	10,500,000
...
CN150	Triển Chiêu	...	...	...	...	8,500,000

Figure 3: Salary and attendance sheet of workshop 01 in October 2024