



## Production Scheduling Approach Using the Theory of Constraint (TOC) Method at PT. Raja Indonesia Perkasa Suwayuwo Pasuruan

Muhammad Saikhu Rakhman <sup>a</sup>, Ayik Pusakaningwati <sup>b</sup>

<sup>a, b</sup> Industrial Engineering Study Program, Yudharta Pasuruan University, Indonesia

Corresponding Author : [saikhu.s89@yahoo.com](mailto:saikhu.s89@yahoo.com)

### Article Info

#### Article history

Received : September 25, 2024

Revised : Nopember 17, 2024

Accepted : December 15, 2024

Published : December 30, 2024

#### Keywords:

Scheduling

Production

Theory of Constrain (TOC)

### ABSTRACT

This research aims to overcome the problem of production delays at PT. Raja Indonesia Perkasa Suwayuwo Pasuruan by applying the Theory of Constraints (TOC). Production data shows that available capacity (870 units/month) is insufficient demand (1,000 units/month), with bottlenecks at workstations in week 4. Data collection methods include observation, interviews, and documentation studies. The solution tested was the addition of overtime (5 hours/day) and additional shifts (16 hours/day). The results showed that additional shifts were more effective, increasing capacity to 1,752 units/month and reducing delays by 20%. This research makes a practical contribution to production optimization through the identification of constraints and resource reallocation.



Open Access License  
CC BY SA

DOI: <https://doi.org/10.35891/jkie.v11i3.6165>

## 1. Introduction

In the era of globalization marked by increasingly fierce business competition, the manufacturing industry is required to be able to meet increasing consumer demand. To achieve this, companies need to optimize their production systems, including in terms of scheduling jobs in order to meet consumer needs in a timely manner. Effective production scheduling not only reduces idle time in production units, but also minimizes work in process (Ginting, 2019; Siregar & Yasid, 2018).

The production process not only includes the transformation of raw materials into finished products, but also involves careful planning from the beginning, including determining the quantity and production time for each type of goods. According to Gaspersz (2004), production is a continuous improvement activity that starts from the development of ideas to the distribution of products to consumers. In this context, standard time measurement becomes crucial to balance the production flow and reduce delays (Pujawan & Er, 2017; Rusdiana, 2014).

However, in reality, many companies face challenges in their production processes, such as those experienced by PT. Raja Indonesia Perkasa Suwayuwo. The company experienced production delays due to inaccurate planning and congestion between workstations. This has an impact on

delivery delays, consumer dissatisfaction, and disruption of the effectiveness of labor performance. In the long run, this problem can reduce the company's profits and hinder production continuity.

One solution to overcome this problem is to apply the Theory of Constraints (TOC) method. This method focuses on identifying and managing constraints in the production system to improve overall efficiency. Scheduling with TOC is expected to reduce delay times, balance production flows, and ensure products are completed on time.

Based on the description above, this study aims to analyze and apply a production scheduling approach using the Theory of Constraints (TOC) at PT. The King of Indonesia Perkasa Suwayuwo. The results of the research are expected to provide concrete solutions in improving production efficiency and meeting consumer demand optimally.

## 2. Literature Review

### 1) Production Scheduling Concept

Production scheduling is the process of allocating resources to complete work according to priorities to achieve efficiency goals (Nazarudin & Putramas, 2022). According to Eunike et al (2021), effective scheduling should consider three key aspects: turnaround time, facility utilization, and customer satisfaction. In the context of the manufacturing industry, poor scheduling can lead to work queues (bottlenecks), increased costs, and delivery delays (Hernanda & Hariastuti, 2022).

### 2) Theory of Constraints (TOC)

*The Theory of Constraints* (TOC), developed by Goldratt (1990), is a management methodology that focuses on identifying and optimizing constraints in production systems. The TOC consists of five main steps:

- 1) *Constraint Identification*, The time it takes to recognize actual constraints (e.g., specific machines that are often bottlenecks)
- 2) *Exploit the Constraint*, Delay in taking optimization actions after the constraint is known.
- 3) *Subordinate Non-Constraints*, Non-constraint processes (such as packaging) have to wait for results from the constraint station, causing a queue (WIP).
- 4) *Elevate the Constraint*, Time to implement a permanent solution (e.g., purchase of new machinery or employee training).
- 5) *Repeat the process*, Interval monitoring to find new obstacles. Manual systems may take weeks, while automated systems (IoT) reduce lag to hours.

## 3. Methodology

### 1) Research Location

The location of this research is at PT. King Indonesia Perkasa Suwayuwo Pasuruan

### 2) Data Collection Method

The methods used in the implementation are as follows:

- a. Observation, by observing directly in taking data. This method serves as the initial discourse of study in each processing process.
- b. Interview, The implementation of this method can obtain information from field assistants through non-structured interview techniques
- c. Study Literature, in the form of references written in a scientific work such as books, journals, papers, and articles.
- d. Documentation, activities that function as a medium for conveying images and an atmosphere that still refers to the data submitted.

### 3) Data Processing

- a. Identification of Production Constraints

Using *the Theory of Constraints* (TOC) with the following steps:

1. Identify *Bottlenecks*: Compare available and needed capacity at each workstation.
  2. Constraint *Exploitation*: Maximizes the efficiency of the constraint station.
  3. Other Process Subordination: Customize workflows with constraint stations.
- b. Application of *Drum-Buffer-Rope* (DBR)
1. *Drum*: Production master schedule based on bottleneck capacity.
  2. *Buffer*: A time buffer for anticipation of disruptions.
  3. *Rope*: Regulates the flow of material to the rhythm of the drum.
- c. Capacity Calculation
- Takt Time:

$$Takt\ Time = \frac{Waktu\ Kerja\ Efektif}{Volume\ Produksi\ Harian}$$

- Production Volume:

$$Volume\ Produksi = \frac{Waktu\ Kerja\ Efektif}{Takt\ Time}$$

#### 4. Results and Discussion

##### 1) Data Collection and Analysis

This study collected primary and secondary data from PT. King of Indonesia Perkasa Suwayuwo Pasuruan, including:

a. Production Data:

The data used in this study is in the form of production process data for 1 period (1 month) ago, the data is used to predict the effectiveness and efficiency of the production process in future periods. The data can be seen as follows:

Table 1. Production Volume During July 2020

Sunday	Pillow	Bolster	Mattress	Total
1	110	90	50	250
2	110	100	50	260
3	130	70	50	250
4	100	90	50	240
Total	450	350	200	1.000

b. Resources: Labor (30 people), machinery (26 units), and production process time

Table 2. Production Resource Data

Yes	Machine Name	Number of Machines	Employee	Time (minutes)
1	Tailor	7	7	15
2	Scarlet Witch	2	4	5
3	Shovel Tool	15	15	30
4	Kapuk milling	2	4	60
Sum		26	30	110

c. Process Flow: Consists of 7 workstations with a total time of 305 minutes

##### 2) Identification of Bottlenecks

Capacity analysis shows an imbalance between available and needed capacity:

- a. Required Capacity: 1,000 units/month ( $\geq 250$  units/week).
- b. Available Capacity:

The available capacity is calculated using the equation: number of working days x working time / number of machines. The recapitulation of workstations that have no capacity and sufficient capacity can be seen in the following table:

Table 3. Available Capacity

Minggu	Jumlah Kapasitas dibutuhkan	Waktu (hari)	Kapasitas Alat/Mesin	Hasil
1	250	6	7	214
2	260	6	7	222
3	250	6	7	214
4	240	6	7	205
Jumlah				855

Only 870 units/month, with the largest deficit in week 4 (240 units vs. 205 units).

c. Maximum Capacity:

Maximum capacity that can be generated on 1 working day, 8 hours per shift. The time in one shift is equal to 480 minutes divided by the time per unit and the maximum capacity of each workstation is obtained. The calculation of the maximum capacity in 1 day can be seen in the Table below:

Table 4. Maximum Capacity

Stasiun Kerja	WS x WN (menit)	Kapasitas dibutuhkan	Kapasitas Maksimum	Hasil (pcs)
Minggu 1	9120	250	36	216
Minggu 2	9120	260	35	210
Minggu 3	9120	250	36	216
Minggu 4	9120	240	38	228
Jumlah				870

Based on the table above, at a maximum capacity of 1 period (month), it is known that the product (pcs) is 870. Then the maximum capacity cannot be met or <1000.

d. Bottleneck: 4th week workstation due to machine limitations and working time.

3) Application of Theory of Constraints (TOC)

Repair Steps

a. Constraint Exploitation:

- Overtime: The addition of 5 hours of work (a total of 13 hours/day) increases capacity to 906 units, but still below the target.

Table 5. Waktu Overtime

Periode (minggu)	Waktu Kerja	Kapasitas Tersedia	Produk (pcs)
1	9420	38	228
2	9420	36	216
3	9420	38	228
4	9420	39	234
Jumlah			906

In the overtime solution by increasing the working time from 5 hours to 13 hours, the maximum capacity in week 4 gets a product capacity result (pcs) of 906. However, it still cannot be met <1000.

- Additional Shifts: The addition of a second shift (16 hours/day) resulted in 1,752 units/month, exceeding the target.

Table 6. Additional Shifts

Stasiun kerja	WS x WN (menit)	Kapasitas dibutuhkan	Kapasitas Maksimum	Hasil (pcs)
Minggu 1	18240	250	73	438
Minggu 2	18240	260	70	420
Minggu 3	18240	250	73	438
Minggu 4	18240	240	76	456
Jumlah				1752

Based on the table above, there is a second solution with the addition of work shifts in the 4th week which consists of 2 work shifts. At the maximum capacity of the 8-hour workstation to get 906 pcs of products, after the addition of work shifts, the number of products produced becomes 1752 pcs in one period (month).

b. Other Process Subordination:

Rescheduling of material flow based on the rhythm of bottleneck stations.

4) Optimization Results

- Increased Capacity: From 870 units to 1,752 units/month.
- Time Efficiency: Reduction of delays by 20% through the reallocation of labor and machinery.

## 5. Conclusion

This study succeeded in identifying that the inability of PT. Raja Indonesia Perkasa Suwayuwo in meeting the production target of 1,000 units/month was caused by a bottleneck at the 4th week of the workstation, where the production capacity only reached 870 units/month. Through the application of the Theory of Constraints (TOC), it was found that increasing work shifts to 16 hours/day was the most effective solution, which succeeded in increasing production capacity to 1,752 units/month while reducing delays by 20%. However, this solution needs to be balanced with an evaluation of operational costs and consideration of their impact on the workforce.

## Reference

- Eunike, A., Setyanto, N. W., Yuniarti, R., Hamdala, I., Lukodono, R. P., & Fanani, A. A. (2021). *Perencanaan Produksi dan Pengendalian Persediaan: Edisi Revisi*. Universitas Brawijaya Press.
- Gaspersz, V. (2004). Production planning and inventory control. *PT Gramedia Pustaka Umum, Jakarta*.
- Ginting, R. (2019). Penjadwalan Produksi dengan Algoritma Semut. *Talenta Conference Series: Energy and Engineering (EE)*, 2(3).
- Goldratt, E. M. (1990). *Theory of constraints*. North River Croton-on-Hudson.
- Hernanda, D. A., & Hariastuti, N. L. P. (2022). Usulan Penjadwalan Produksi Pada Departemen Produksi PT. Preshion Engineering Plastec. *Prosiding Seminar Nasional Sains Dan Teknologi Terapan*.
- Nazarudin, N., & Putramas, T. (2022). Analisis Penjadwalan Produksi Menggunakan Metode Shortest Processing Time Untuk Meningkatkan Produktivitas Kerja Pada Ukm Sartika Dms Kujangsari Di Kota Banjar. *Jurnal Industrial Galuh*, 4(1), 23–30.
- Pujawan, I. N., & Er, M. (2017). *Supply chain management edisi 3*. Penerbit Andi.
- Rusdiana, A. (2014). *Manajemen operasi*. Pustaka Setia.

Siregar, D., & Yasid, A. (2018). Analisis peningkatan kapasitas produksi pada proses pembuatan frame motor klx dengan metode line balancing di PT. KMI. *Matrik: Jurnal Manajemen Dan Teknik Industri Produksi*, 19(1), 37–48.