

Efficiency Study of Air Conditioner (AC) Service Part Supply Costs Using the Just in Time (JIT) Method

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ABSTRACT

PT Panasonic Manufacturing Indonesia is a company engaged in manufacturing that produces household electronic products, one of which is Air Conditioner (AC). The problem that occurred at PT Panasonic Manufacturing Indonesia was the accumulation of service parts in the raw material inventory warehouse which had an impact on production activities. This research was conducted in the AC Business Unit Warehouse Division of PT Panasonic Manufacturing Indonesia. This study aims to identify the factors that cause accumulation and determine the control system. From the analysis using the Just In Time (JIT) method, it can be concluded that the JIT system is more efficient in calculating the total cost of compressor service part inventory at PT Panasonic Manufacturing Indonesia's AC Business Unit. The cost savings obtained were IDR 12,463,500 from the total initial inventory of service parts of IDR 18,933,000.

Keywords: Cost Efficiency, Just In Time, Part Service, Inventory Control.

1. INTRODUCTION

Industrial operational activities are strongly related to the production process and market demand. In carrying out the production process, raw materials are needed to be the main problem, the majority of problems encountered such as too much inventory of raw materials to the point of stockpiling of raw materials causing inefficiency in inventory costs [1]. Compatibility of raw materials with the number of needs of the production process certainly supports the company for the smooth running of the production process and can avoid wasting costs for hoarding raw materials. In manufacturing companies, inventory costs at the company are important costs assigned to product inventory in the production process and need to be controlled so that waste does not occur. Inventory cost control must be held to achieve inventory cost efficiency [2].

The manufacturing industry that is the object of inventory control method analysis is PT Panasonic Manufacturing Indonesia, which is known as an electronics manufacturer a joint venture between Japan and Indonesia that produces household electronic products. One that is produced is an air conditioner (AC). Reviewing the many types of products marketed with various demands and consumer needs that are constantly changing and the raw materials ordered to suppliers are not the same as the company's specifications until there is an accumulation in the raw material warehouse. The research topic is focused on the production of air conditioners which are directed to the supply of service parts in the form of compressors. There is table data 1 for the supply of compressor service parts for the 2022 period.

Table 1. Compressor service parts inventory data

Month	Initial Inventory	Purchase	Needs	Ending Inventory	Price (pcs)	Total Purchase Cost
January	300	300	200	280	IDR 800.000	IDR 240.000.000
February	280	255	240	254	IDR 800.000	IDR 204.000.000
March	254	340	290	260	IDR 800.000	IDR 272.000.000
April	260	350	290	266	IDR 800.000	IDR 280.000.000
May	266	335	325	270	IDR 800.000	IDR 260.000.000
June	270	290	285	320	IDR 800.000	IDR 232.000.000
July	320	340	330	283	IDR 800.000	IDR 272.000.000
August	283	272	260	290	IDR 800.000	IDR 217.600.000
September	290	350	315	350	IDR 800.000	IDR 280.000.000
October	350	350	315	385	IDR 800.000	IDR 280.000.000
November	385	363	340	272	IDR 800.000	IDR 290.400.000
Desember	272	285	250	50	IDR 800.000	IDR 228.000.000
Total	3.530	3.830	3.150	3.280	IDR 9.600.000	IDR 2.776.000.000

(Source: PT Panasonic Manufacturing Indonesia, 2022)

Based on these data, the supply of parts at Air Conditioner (AC) Business Unit (BU) PT Panasonic Manufacturing Indonesia experienced an order discrepancy or experienced an oversupply of service parts, resulting in a holding cost of IDR 40,000,000 in a warehouse with a final inventory of 50 compressors. This shows that the compressor inventory control is not optimal. The table also shows the total value issued for ordering part service in the 2022 period. The value for the total purchase is obtained at the price per pcs multiplied by the order per month. In the 2022 period AC BU requires 3,830 pcs and a total of 3 purchase prices amounting to IDR 2,776,000,000. The table also shows that total purchases and needs are not always the same because they are determined by the amount of market demand.

One effort to avoid the above problems is to establish an optimal inventory control system, namely the Just In Time (Purchasing) method. Just in Time (Purchasing) is a system of purchasing goods with the right amount and time so that the goods can be received immediately to fulfill requests or for use [3]. This method focuses on consumers who produce only the amount that consumers demand and need in order to emphasize control costs and the possibility of less damage and loss due to stockpiling of raw materials. This research aims to reducing inventory levels with the total quantity saved on AC service parts at PT Panasonic Manufacturing Indonesia. This research refer to previous studies on how to implement JIT method for inventory cost efficiency [4]. However, this research specifically implement the JIT method in AC BU that not yet explored by other research and focus of research on cost efficiency used in previous research is production costs [5].

2. LITERATURE REVIEW

2.1 Inventory Cost

Inventory control is carried out because it has a goal to be achieved, namely minimizing the company's total operating costs. The inventory cost system is all expenses and losses arising from inventory [6].

2.2 Warehouse

Warehouse is a place to store goods, either raw materials to be used in the manufacturing process, as well as ready finished goods shipped [7].

2.3 Just In Time (JIT)

Lean manufacturing has emerged as a solution to decrease waste in production processes implementing the concepts originated at the Toyota Production System (TPS) developed by Eiji Toyoda, Taiichi Ohno, and Shigeo Shingo at the beginnings of the 1940s [8]. The applicability to discrete industries, assembly industries, has been straightforward. However, applicability in process industries, continuous industries, remains behind [9].

Just In Time is a production strategy which helps the organization or company to achieve and improve profit. JIT is also implemented by many manufacturing companies with a purpose reduce inefficiencies and unproductive time in the production process [10].

The application of JIT can be applied to various functional areas of the company such as procurement, production, distribution, management. However, many functional areas that have been implemented are purchasing and production because they are the starting point for JIT implementation before being applied to other functional areas. In calculating the optimal number of orders and total inventory costs using the JIT method are as follows (11):

1. Determine the optimal number of ordering quantities

$$Qn = \sqrt{n} \times Q \quad (1)$$

2. Determine the frequency of ordering raw materials

$$N = \frac{Q}{Qn} \quad (2)$$

3. Calculation of the total cost of inventory

$$Tjit = \frac{1}{\sqrt{n}}(T) \quad (3)$$

4. Determine the optimal number of shipments in units

$$q = \frac{Qn}{n} \quad (4)$$

The main goal of JIT is eliminating waste and consistent in improving productivity. frequent use of the term JIT interpreted as "zero inventories" (12).

3. RESEARCH METHODS

The type of research used in this research is quantitative research with a descriptive case study approach. With a descriptive case study approach through data collection and data processing from the company and analyzing it with a predetermined system so that conclusions can be drawn from the research results. Data obtained from the results of direct observation and interviews. Figure 1 shows the research flow diagram.

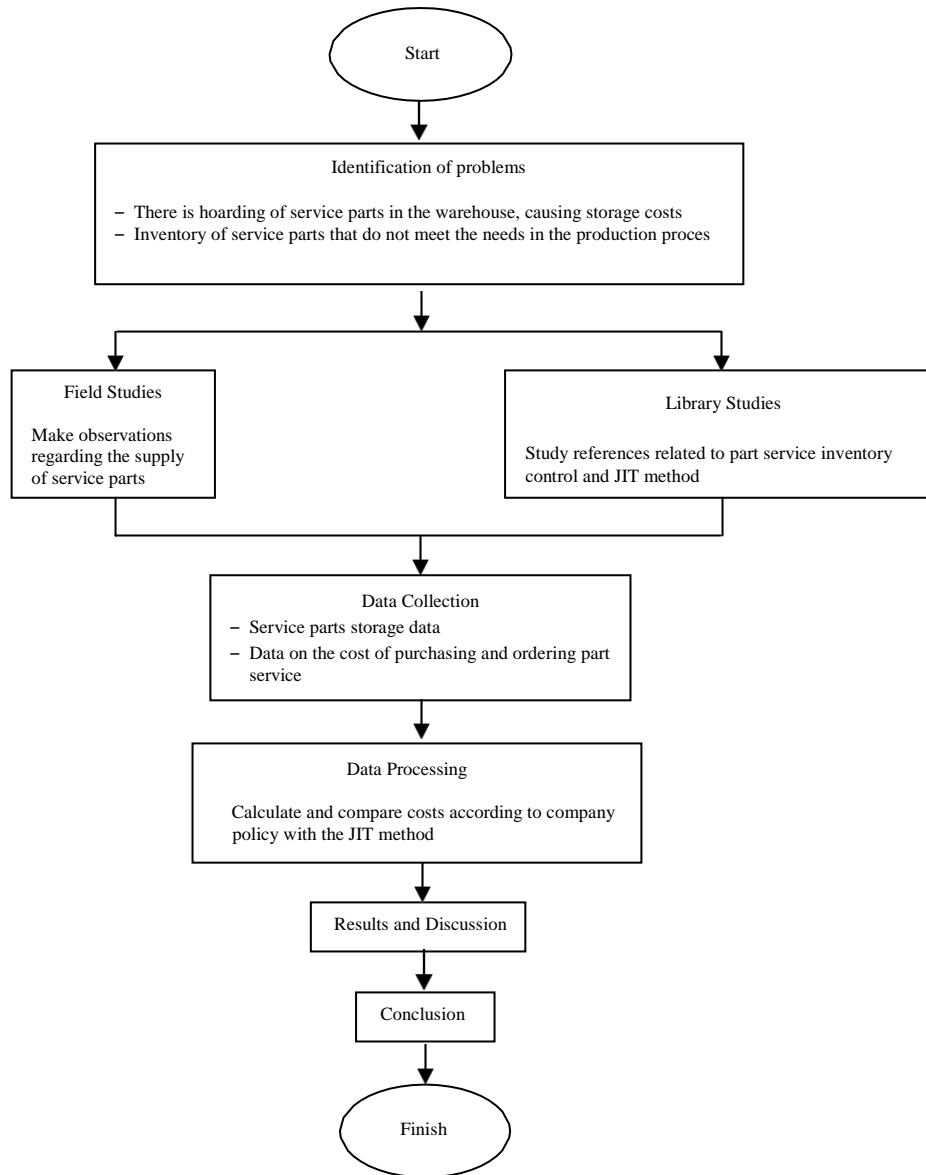


Figure 1. Research Flow Diagram

4. RESULTS AND ANALYSIS

Researchers apply the Just In Time (JIT) system to solve research problems. Processing in this study includes 4 ways, namely based on optimal delivery frequency, optimal delivery quantity, optimal order quantity and the total cost of Just In Time (Tjit).

1. Based on Optimal Delivery Frequency (Na)

$$Na = \frac{Q}{2 \times a} \tag{1}$$

Q = 3,150 pcs

a = If the company has a minimum inventory capacity level of 385 pcs

The optimal number of shipments is:

$$Na = \frac{3.150}{2 \times 385} = 4,0909 \approx 4$$

Order frequency Just In Time AC BU PT Panasonic Manufacturing Indonesia wants part service orders to be held four times a month. With this, the frequency of ordering part service is once in three months from the previous one or the company's policy is twelve times a year.

2. Determine the optimal number of shipments in units

$$q = \frac{Q}{n} \tag{2}$$

Q = 3.150 pcs

n = 4 times

$$q = \frac{3.150}{4} = 787,5 \approx 788$$

Based on the calculation above, the quantity of parts service delivery the optimal is 788 pcs.

3. Determine the optimal number of ordering quantities

$$Qn = \sqrt{n} \times Q \tag{3}$$

Q = 3.150 pcs

n = 4 times

$$Qn = \sqrt{2} \times 3150 = 6300 \text{ pcs}$$

From the calculation above, the calculation results are based on the order quantity lot of 6300 pcs with an order frequency of four times.

4. Calculation of the total cost of inventory

$$T_{jit} = \frac{1}{\sqrt{n}} (T) \tag{4}$$

n = 4 times

T = IDR 1.827.000

$$T_{jit} = \frac{1}{\sqrt{4}} (1.827.000) = 913.500$$

From the calculation above, the total annual cost in JIT is IDR 913,500.

Based on the calculations that have been carried out by the researcher, it is known that the comparison of parts service inventory between company policies and the JIT method is based on the frequency of purchases, the total cost of inventory. The following table 2 is a comparison between company policies and calculations using the JIT method.

Table 2. Compressor inventory cost comparison table

Information	Company Policy	JIT Methods	Efficiency
Order Quantity	385 pcs	788 pcs	403 pcs
Order Frequency	12 times	4 times	8 times
Order fee for 1 period	IDR 16.668.000	IDR 5.556.000	IDR 11.112.000
Total Cost of Ordering	IDR 1.827.000	IDR 913.500	IDR 913.500

Based on observations carried out directly at AC BU PT Panasonic Manufacturing Indonesia, the average purchase of compressor service parts per month is 385 pcs and the total purchase of part service for a year is 3830 pcs, while the calculation of planning for the need for part service using the Just In Time method produces a total of 788 pcs. The difference in the need for part service held by AC BU PT Panasonic Manufacturing Indonesia and by using the JIT method is 403 pcs, where the greater the value obtained, the smaller the order frequency so that the ordering cost can be reduced.

The cost of part service supplies held by AC BU PT Panasonic Manufacturing Indonesia is IDR 1,827,000, while the total cost of part service supplies using the JIT method is IDR 913,500, so a difference in costs of IDR 913,500 arises.

The purchase of service parts carried out by the company turned out to be inefficient so that the stock of compressor service parts in the warehouse was added every month, the remaining service parts in the 2022 period reached 3280 pcs. So that the part service costs recorded in the warehouse amounted to IDR 2,624,000,000 which resulted in part service damage from the remaining service parts in the warehouse.

During direct observation carried out at AC BU PT Panasonic Manufacturing Indonesia, there was a part service ordering fee consisting of telephone costs, administrative costs, shipping costs and transportation costs which reached IDR 16,668,000 in a year while the ordering cost using the JIT method was IDR 5,556,000. This resulted in a difference in costs of IDR 11,112,000, this was due to differences in the quantity of service parts purchased.

The application of a method to raw material inventory is important for AC BU PT Panasonic Manufacturing Indonesia so that it can control inventory in the warehouse, save on ordering costs and streamline raw material inventory costs. In this case, the method that can be used to streamline raw material inventory costs is to apply the Just In Time (JIT) method. In applying the Just In Time method in an effort to streamline the cost of supplying part service AC BU PT Panasonic Manufacturing Indonesia, it would be nice to calculate and schedule it correctly so that delays in the arrival of service parts that are to be used for the production process have occurred.

5. CONCLUSION

The cost of part service supplies financed by AC BU PT Panasonic Manufacturing Indonesia policy is IDR 18,933,000 consisting of ordering costs of IDR 16,668,000, storage costs of IDR 438,000, and total inventory costs based on JIT of IDR 1,827,000. If calculated using the JIT method, the cost of part service inventory funded is IDR 6,469,500 consisting of ordering costs of IDR 5,556,000 and total inventory costs based on JIT of IDR 913,500.

From this calculation, it was found that there was a difference in the cost of part service supplies after the calculation using the Just In Time method amounted to IDR 12,463,500. In purchasing service parts, the company applies the JIT method more efficiently. This is because the purchase of service parts is the same as the needs of the production process and carried out at an optimal delivery frequency which is carried out 4 times a year based on the calculation of the JIT method, so planning for the need for compressor service parts in one month is 262 pcs. The need for part service using the JIT method raises efficiency in purchasing the part service needs planned for 385 AC BU. Comparison of the efficiency of the planned service part requirements using the JIT method is 123 pcs or 32%. So companies can apply the JIT method to reduce inventory by saving the quantity of service parts.

The deficiency in this study is the incomplete supporting data provided by the company. This data for the company is confidential data. For further researchers to conduct research that focuses on implementing the Just In Time method in companies with other different manufacturing industries with the aim of inventory cost efficiency including the purchase of good raw materials so that capabilities can be seen whether or not they are good and the risks that arise in implementing the Just In Time method.

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