

# Shipping Operation Diagram (SOD) Method in Setting The Departure and Arrival Hours of Trucks at PT ABC

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## ABSTRACT

PT. ABC is a company engaged in the plastic manufacturing industry that produces a wide range of products, from automotive plastics, cosmetic plastics, houseware plastics, health plastics to plastics for pharmaceutical purposes. Meeting customer needs in a timely manner is necessary so that customers have satisfaction with company services. The problems experienced by PT ABC. is the arrangement in scheduling automatic product delivery to customers. This research is aimed at using the Shipping Opertaion Diagram method in determining the hours of departure and arrival of trucks by considering the pulling time of late delivery and visualizing delivery information to make it right on target. The results of this study are expected to be able to adjust the departure time for delivery of goods based on product storage.

## 1. Introduction

Business development in the plastic manufacturing industry is increasing day by day, where plastic manufacturing companies are required to be able to meet the desire of consumers to achieve the desired level of satisfaction. Service quality is built on a comparison of two main factors, namely the perception of consumers of the real services they receive (perceived service) with the desired service (Parasuraman, Zeithaml, and Berry, 1990).

The mode of transportation as a medium for distributing the results of the production process to customers is one of the important aspects in the sustainability of the industry. Before the industry needed a more organized distribution network to meet the needs of an expanding market and to coordinate production between factories that were miles apart from each other. On the other hand, the transport function is a simple operation. His duties are to provide vehicles to transport products to customers' premises, maintain and repair all company owned vehicles, provide advice on vehicle replacement policies, provide advice on vehicle purchasing policies, control fuel inventory, provide driver services. (Frank H. Woodward, 1986).

PT ABC is a company engaged in the plastic manufacturing industry. The company still encounters problems in determining the time of departure and arrival of trucks in shipping goods. At PT ABC the time of departure and arrival of trucks in the shipping area is not optimal, which results in the delivery process not according to the specified time. This is indicated by the arrangement of delivery schedules beyond normal operating hours. The excess of delivery hours which reached two work shifts and the time lag from delivery to the car arriving again reached 10 hours, this resulted in the length of the process so that the performance of the delivery was not optimal.

Based on the departure data, the method used in this study is the Shipping Operation Diagram (SOD) method with the aim of optimizing the departure time of the truck and its preparation process. SOD (Shipping Operation Diagram) or Truck and Kanban Diagram is a diagram that describes the sequence of all shipping activities, starting from receiving information until the truck

leaves for the customer (TMMIN, 2017). Based on previous research using SOD, it will be seen whether there is still a buildup of activities for forklifts or a buildup of truck queues (Hendrastuti Hendro, 2019). The shipping operation diagram is used as a reference or standard for JIT operations starting from arrival information, setting heijunka (a place for leveling kanban pulling), pulling, preparation for delivery, even until the vehicle returns. (Dewey Petra, 2012). Constraints that can occur in the delivery process include delays in releasing goods, shortages of goods, incorrect order of delivery plans, inadequate transportation fleets, and trucks that do not meet standards (Hutapea, 2017). This problem will certainly affect the delivery time of goods to their destination so as to reduce the level of customer satisfaction.

The Shipping Operation Diagram (SOD) method assists truck drivers in doing work in order so that shipping activities are effective. The order of work displayed on the Shipping Operations Diagram SOD is information on the arrival of trucks, the time needed to take care of administration, filling in goods in preparation, the time required for quality checks, loading and unloading time and truck departure times. The time information listed in the SOD is in the form of a mapping result from organizing the time for filling goods in preparation which is supported by the actual situation in the delivery area (TMMIN, 2017).

## 2. Method

This research uses primary data sources, namely data obtained based on direct research by being directly involved in the existing process problems. The data contained is based on the actual conditions that are in PT.ABC in the current condition. The data collected is truck departure data which is carried out in one day for one customer with a delivery cycle of 2 cycles. Product delivery is intended for PT.BMI with certain Kanban. The stage begins with information coming in the form of Kanban information sent by PT.BMI to PT.ABC which is sent on H-1 delivery. Followed by several other stages to support the delivery stage as delivery requirements. The process activities will be displayed in the form of a diagram using the SOD method.

The first step in making SOD is to prepare data in the form of working hours per day, working days in one month, rest time in one day, customer name, work order and work time, and Cycle Issue (CI). Irregular product storage causes the length of the product preparation process to be sent to be a factor in smooth shipping. The work sequence on the SOD contains information on truck arrivals, time required for administration, product pulling, time used for loading and unloading and information on truck departure times. Information on SOD is a mapping of work time sequences that are sourced from real time.

## 3. Results and Discussion

PT.ABC has several provisions in regulating production hours, working hours, rest periods, main customer names and cycle issues. Production activities are carried out in one month for 26 working days with production operational hours for 3 shifts. Each shift lasts for 8 hours, with the provisions of 7 hours of work and 1 hour of rest. Delivery of plastic products to customers of PT. BMI uses a cycle issue of 1-2-X, meaning that in one day there are 2 delivery cycles and X is a combination of the intervals of all consumers. The data used are as follows in Table 1 below.

**Table 1** Truck Departure Time

Customer	Before	After	Cycle
PT. MBI	10:30	11:05	2
	07:00	07:35	

The preparation area that has been made is tested by considering the output and also Kanban from the customer. Tests carried out using cycle time data to ensure that the prepared product will be able to meet the Kanban demand. The stages of pulling preparation to start pulling should pay attention to the following:

1. Truck departure time, time required for loading.
2. Loading start time in preparation for pulling.

The time to prepare the product in this pulling process has been tested to get 90 minutes of preparation time. Products prepared in the pulling process with a span of 90 minutes are listed in Table 2.

**Table 2 Delivery Amount**

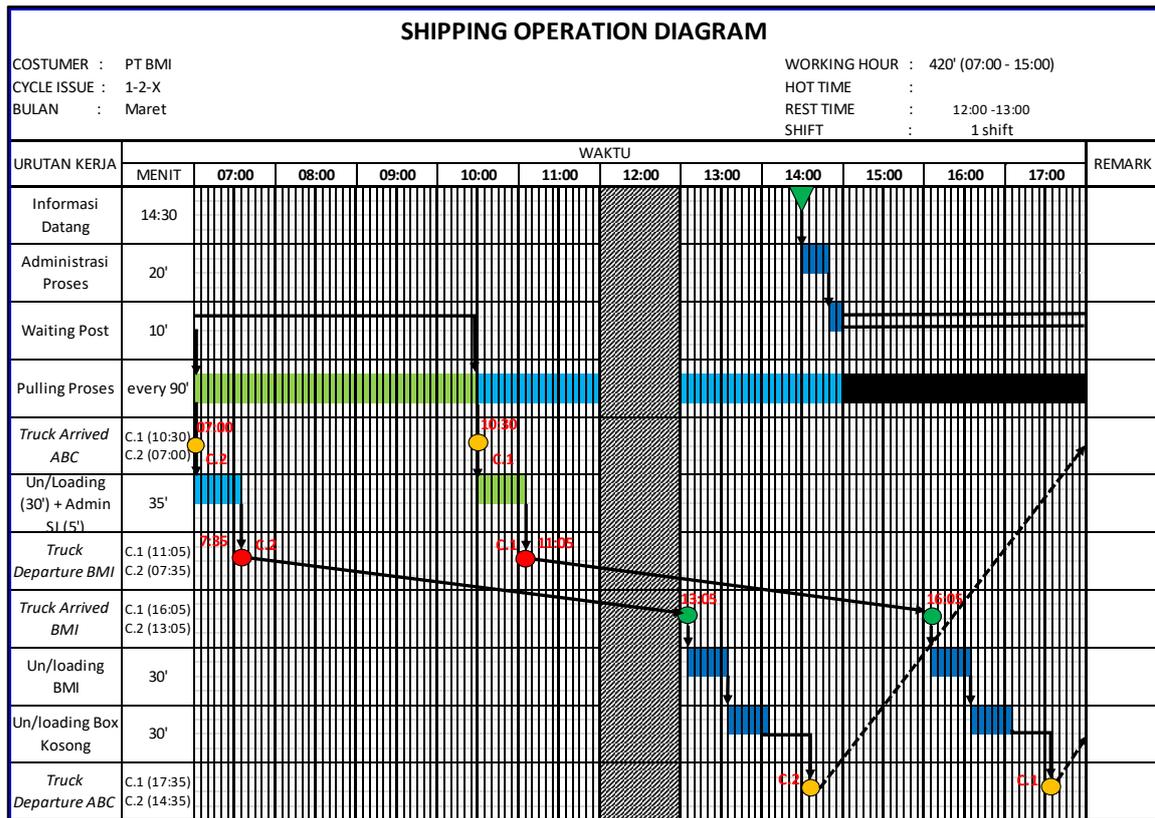
<b>Product Code</b>	<b>Total Kanban Delivery(1 Month)</b>	<b>Delivery (1 Day)</b>
CJM	816	31
FS	414	16
CLM	565	22
PDR	2.756	106
PDR-RH	1.320	51
PDR-LH	1.260	48
D-OLD	336	13
D-NEW	12.420	478
N-RHD	541	21
CE-1	20.970	807
CE-FR	20.800	800
CE-RR	21.870	841
IAC	12.452	479

Product delivery data uses normal operational working hours for one full month, which is 26 working days. Based on the departure data of these hours, then we need the intake hours of each process before the product is sent. The preparation of each process will determine the creation of a shipping operation diagram. The preparation is contained in the following Table 3.

**Table 3** Work Process Sequence

Customer	Process	Processing Time	Processing Duration	Cycle	
PT BMI	Information Come for 2x pulling	14:30	-		
	Process Administration	-	20'		
	Waiting Post	-	10'		
	Pulling Process	-	90'		
	Truck Arrived ABC		10:30	-	1
			07:00	-	2
	Un Loading (put the ready-to-ship product into the truck)	-	30'		
	Travel Letter Administration	-	5'		
	Truck Departure BMI		11:05	-	1
			07:35	-	2
	Truck Arrived BMI		16:05	-	1
			13:05	-	2
	Un Loading BMI (derive product from ABC in BMI)	-	30'		
	Un Loading empty Box from BMI to be filled with products at ABC	-	30'		
	Truck Departure ABC		17:35	-	1
			14:35	-	2

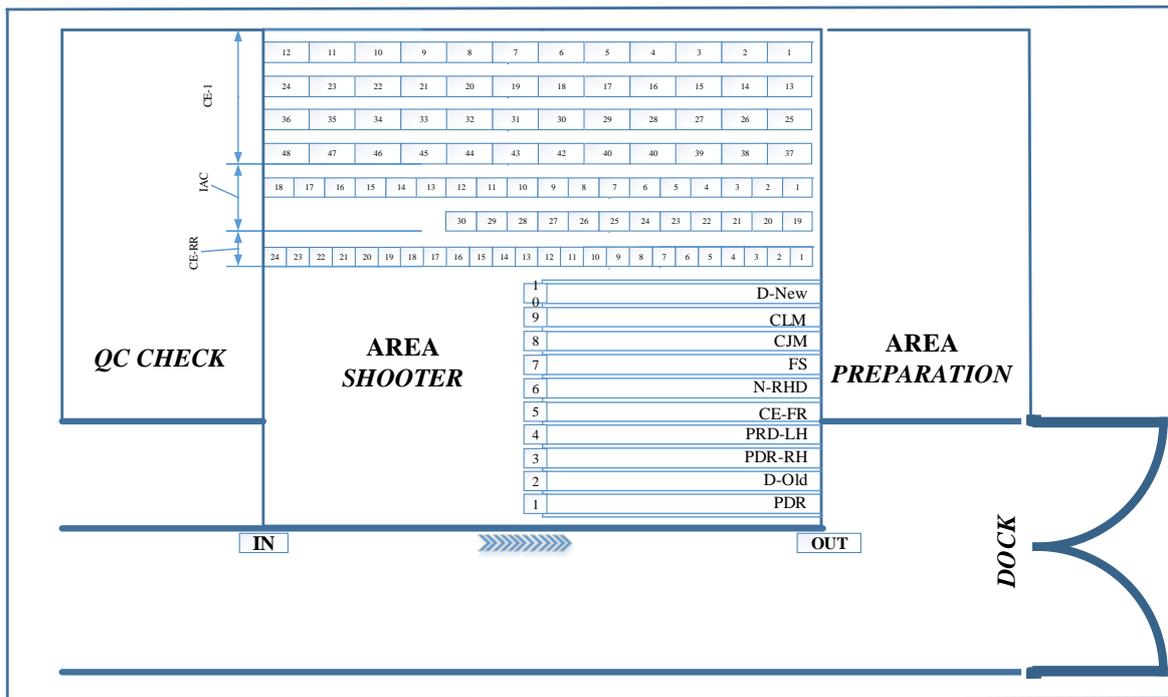
Based on Table 3, the shipping operation diagram can be described which contains preparations from the initial process of receiving Kanban (Incoming information) to sending it back. The process preparation pattern is contained in the SOD in Figure 1.



**Figure 1** Shipping Operation Diagram (SOD)

This SOD visualization will facilitate the system from the process starting from preparation and also delivery of goods so that many people in the industrial area can see this visualization information. The application of SOD is a benchmark for delivery performance in delivering products to customers because the time for each process is structured and clear, it can be ensured that delivery can be on time. The application of SOD can be a reference for preparation before the goods are sent to the customer, it is necessary to have a clear calculation as a comparison between the output of the production and the delivery schedule. SOD makes arrangements more structured and directed, compared to before the implementation of SOD, the departure time at PT.ABC is not structured so that there is an erratic delay in the delivery schedule. The delivery schedule reaches more than 1 shift because for each activity carried out it is not yet clear and structured. The application of SOD is one of the supporters so that the time at work is right on target, because it requires definite calculations and preparations before delivery. The existence of this SOD also supports the monitoring process of shipping activities, because its form is in the form of visualization, making it easier for anyone who sees it to find out the position of the truck at certain hours..

The success of the SOD concept is of course supported by clear and structured areas. The clear area and addressing will make it easier for the continuity of the process. The process flow is made to flow starting from the before check area, the Quality Control (QC) checking area, continuing to the shooter area and preparation area. This process flow arrangement must be supported by a uniformized product storage path according to the line. The product storage line will make the pulling process easier. Giving identity and structuring a directed and structured layout is a solution for the pulling process. The existence of this line will make taking according to the initial production lot so as to support the FIFO pulling process. The layout for this process can be seen in Figure 2.



**Figure 2** Layout Preparation

#### 4. Conclusion

Arrangements for regular truck arrivals with this SOD system can describe the delivery flow so as to prevent delivery delays. Delivery before implementing SOD is still not structured for the work process so that the delivery time is uncertain and exceeds operating hours for up to 2 shifts. The application of SOD is the answer to the problem of delivery, by applying the SOD method, delivery activities are directed and the timing is clearer. The delivery process that runs is influenced by preparation before delivery. The process before delivery will be directed if it is simulated in a clear series of work activities, the work process time will also be planned so that all processes will be controlled within the standard. Product delivery is arranged in a 2 cycle departure pattern. Precise and measurable timing can overcome the limitations of people pulling.

The success of the pulling process is supported by the availability of goods to be sent, so it is necessary to compare the processing time between the output process and the requested Kanban. The supporting factor for the success of pulling is the provision of a clear identity and layout arrangement so as to facilitate the process and pay attention to the FIFO process. The structured arrangement of the area will make it easier to pick up and arrange in the preparation area, in the shooter area the items are grouped by product type then in the preparation area the items will be grouped based on the Kanban request. It is hoped that the results of the research on setting departure hours using SOD are able to standardize the product delivery process followed by a comparison of output with Kanban.

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