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Kanban System Analysis and Improvement of the Supply Carset in BMW Logistics at Jakarta Plant Using Just in Time (JIT) Method

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Abstract:- Production system Just In Time (JIT) - Just In Time or often abbreviated as JIT is a production system that is used to meet customer needs at the right time in accordance with the amount desired by the customer. The purpose of the Just In Time (JIT) production system is to avoid excess quantity / amount in production (over production), excess inventory (excess Inventory) and also waste in waiting time. Just In Time has also been applied to BMW logistics at PT. Tjahja Sakti Motor (TSM) by means of Inventory Management method, thus the Stock Level or level of inventory of raw materials, supporting materials, components, semi-finished materials (WIP or Work In Progress), and also finished goods will be maintained at the level or the most amount minimum. This can help companies optimize Cash Flow and avoid costs that will occur due to errors in excess of raw materials and finished goods, logistics BMW has implemented the Carset process to overcome the problem. However, in the process of carset in the area of Commissioning and Pack Check, there are still frequent shortage parts and damage parts which are caused by the many processes of handling parts and sequence parts that are not organized. This is an indication of the cause of the still high percentage of damage parts in the provision of the carset. By doing improvements on the Carset process to overcome the problems that occur, namely parts damage, which mean when the process of preparing parts that are not standard or the arrangement of parts has not been arranged (Sequence) according to the arrangement of the use of parts that will be assembled (Assembled) by production operators based on the guidebook production line and every terminal or production post.

Keywords:- *Kanban, Just in Time, Improvement Supply Carset.*

I. INTRODUCTION

Carset is a system owned by BMW AG that is applied to the Logistics PT. Tjhaja Sakti Motor, where several parts are placed in the same place, namely a Container Box that has been designed to place various parts needed for each one unit of the car, making it easier for assembly operators to no longer look for parts in the F-Colli.

In this research, author will doing improvements on the Carset process to overcome the problems that occur, namely parts damage, which is when the process of preparing parts that are not standard or the arrangement of parts has not been arranged (Sequence) according to the arrangement of the use of parts that will be assembled (Assembled) by production operators based on the guidebook production line and every terminal or production post.

By the previous process, Carset parts were only placed on the Pack Check conveyor, while the improvement process carried out was to prepare a special racks to placed the car parts, After the special racks has implemented and process can change the flow of the preparation process of the carset parts to be more sequenceand can find out earlier the quantity problem of part inside the boxes. The process of preparing the Carset parts is organized according to line supply requirements, where previously the process was carried out randomly and unorganized.

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II. LITERATURE REVIEW

➢ *Just In Time*

Hilton, Maher, Selto (2003) Just in time is “The objective of just-in-time (JIT) processes is to purchase, make, and deliver services and products just when needed.”

Henry Simamora (2012) states that "A timely system (Just-In-Time, JIT) is a comprehensive manufacturing and inventory management system in which raw materials and various spare parts are purchased and produced when they are produced and will be used in every time the stage of the production / manufacturing process ".

Erry Rimawan (2019) Just in Time is a sustainable and compelling problem-solving philosophy that supports lean production. Lean production supplies customers exactly as customers want when customers want it, without wastage, through continuous improvement.

➢ *Just In Time and its Benefit*

AgusRistono (2010) suggested that some of the main objectives to be achieved from the JIT production system are as follows:

- Reducing scrap and rework.

- Increase the number of suppliers participating in JIT.
- Improving the quality of industrial processes (zero defect orientation).
- Reducing inventory (zero inventory orientation).
- Reducing the use of factory space.
- Factory output linearity (producing at a constant rate for a certain time).
- Reducing overhead.
- Increase total industry productivity as a whole.

Based on the quotation of the JIT objectives above, it can be given a general summary of the objectives of JIT, namely eliminating waste through continuous improvement by reducing inventory, avoiding the remaining material that has the potential to experience quality degradation and reworking and trying to eliminate production defects. The use of factory space also needs to be minimized to reduce overhead costs.

The main benefits of the Just In Time system are that it will change the cost-effectiveness of the cost, improve the accuracy of determining the cost of the product, reducing the need for indirect cost allocation, changing the behavior and relative importance of direct labor costs, and influencing the system of order and boarding costs.

➢ *Kanban Method, Fungction, & Rules*

Kanban (signboard or billboard in Japanese) is a scheduling system for lean manufacturing and just-in-time manufacturing (JIT). Taiichi Ohno, an industrial engineer at Toyota, developed kanban to improve manufacturing efficiency. Kanban is one method to achieve JIT. The system takes its name from the cards that track production within a factory. For many in the automotive sector, kanban is known as the "Toyota nameplate system" and as such the term is not used by some other automakers.

Kanban has two main functions, namely as a control of production and as a means of increasing production. Its function as a production controller is obtained by bringing together processes together and developing a system that is timely so that the raw materials, components or products needed will come when needed in quantities that are in accordance with the needs in all workcenter on the production floor, even extending to suppliers related to the company. While its function as a means of increasing production can be obtained if its application is to use an inventory level reduction approach. Inventory levels can be reduced in a controlled manner by reducing the number of Kanban in circulation during the production process.

The function of Kanban is in application of the supply chain poduction is closely related to the basic rules of Kanban. Kanban function is strengthened by the rules contained in the implementation of the Kanban system, where this relationship is explained in Table 1.

KANBAN FUNCTION	RULES USED
• Provide information on collection and transportation.	• Process after taking the number of items indicated by Kanban from the previous process.
• Provide production information.	• The previous process of producing goods according to the number and sequence shown Kanban..
• Preventing production or transport advantages.	• None goods are transported without Kanban.
• Valid as work orders placed directly on the goods.	• Always attach Kanban to the goods.
• Prevent defective products by recognizing the processes that create defects.	• Defective products are not sent to the next process. The result is 100% defect-free goods.
• Disclose existing problems and maintain inventory control.	• Kanban adjust to fluctuations in demand.

Table 1:- Relationship between Kanban Functions and Rules Used
Source : Journal of Timely Production Strategies (JIT) 2011

➢ *Data Analysis Method*

Analysis Method After seeing and analyzing the problem more thoroughly, the authors make changes to the existing system in the warehouse of PT. TJAHJA SAKTI MOTOR by changing into the Just In Time kanban system which is implemented into the Carset system and the following mechanism:

• A semi-automatic kanban system will be applied by means of the Assembly line scanning the QR-Code printed

on the rack supply so that there is no queuing time in the material warehouse and a material withdrawal order card for Production where the kanban explains the part number and quantity of goods.
• Every goods / material needed for production must be in accordance with the kanban and will be cross-checked and then the data collection and supply of the required goods or materials will be carried out.

The Carset Process flow system, created by looking at the previous flow system used by BMW's logistics warehouse at PT. Tjahja Sakti Motor. This system was created in order to smooth the new system using material kanban cards and material withdrawals and stock warehouse kanban. It aims to get a system that expedites production and eliminates waiting times that have no added value to the company.

➢ *Kanban JIT Konsep*

Determine the signal system that triggers at a certain amount of supply in a timely manner with its needs both from Logistics to production lines. When the material reaches the production line, then the barcode is scanned. With scanning, the number of items will be automatically updated by logistics and production stock. Then using same stand rack as like in BMW logistics wackersdorf have used attached fig 1

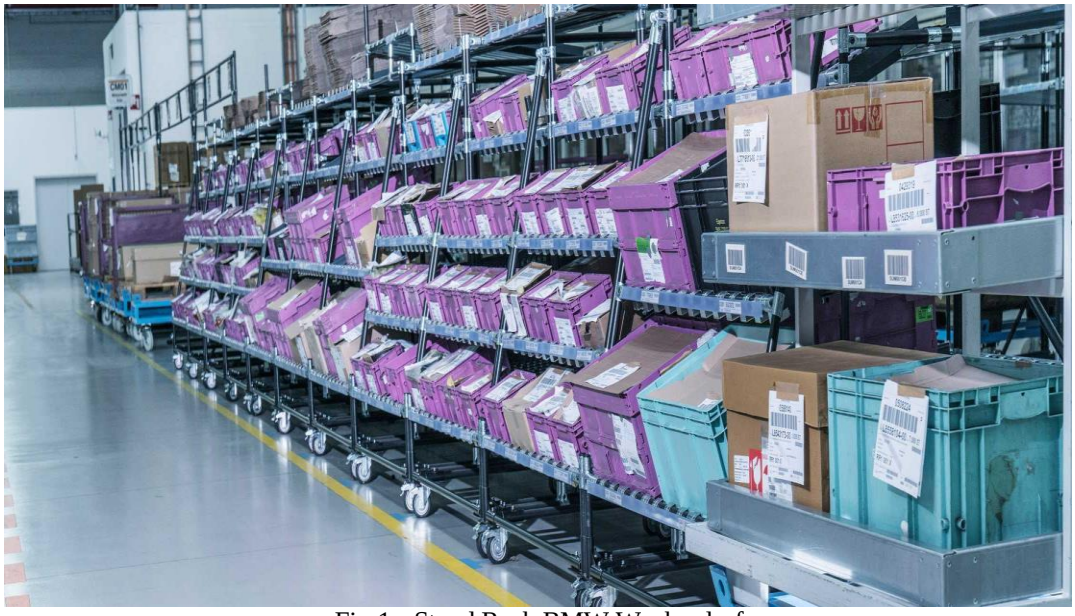

Fig 1:- Stand Rack BMW Wackerdorf
Source : BMW Wackerdorf

Fig 2:- Stand Rack BMW Jakarta
Source : BMW Jakarta

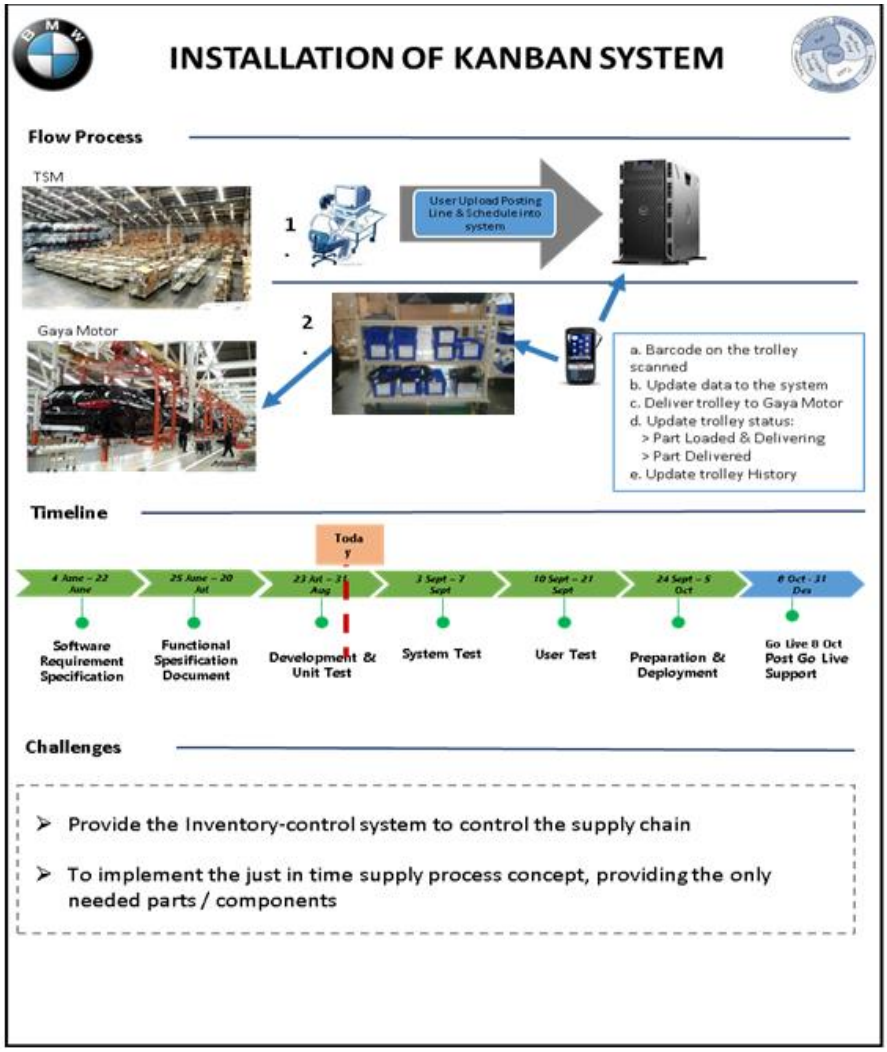

Fig 3:- Instalation Kanban System BMW Jakarta
Source : BMW Jakarta

The Kanban system is a simple, effective way to increase production which is widely applied in practice in the field. Based on the logistical process involved, the kanban system can be divided into a system of order quantities and constant cycle cycles.

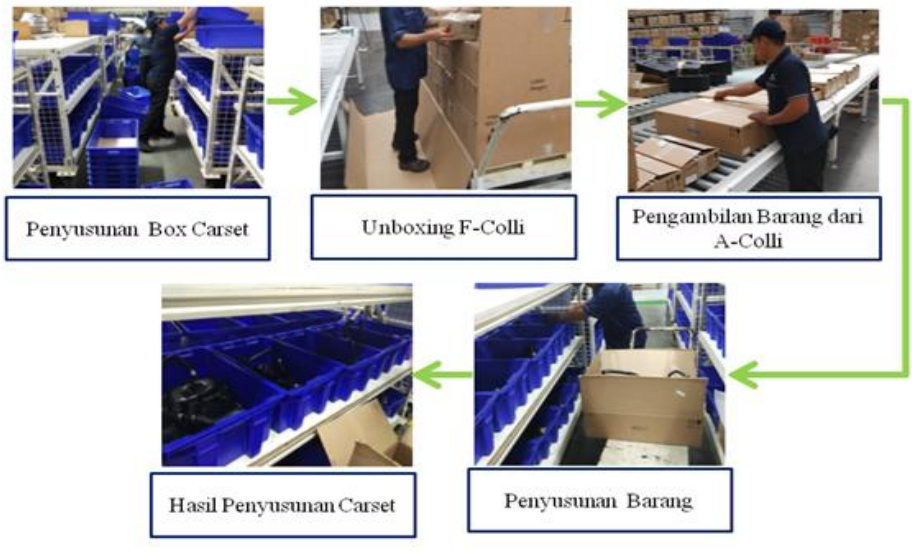

Fig 4:- Before Improvement
Source : BMW Jakarta

➢ *Problem Indicator*

During this process the number of parts damage increases and it is too late to overcome. As a result of an irregular arrangement of parts where parts with heavier weights are placed above other parts, with lighter weights are placed below that cause parts damage during the supply process and placement of parts in the container box. Based on the results of the report taken for 8 months, problems that often occur can be seen with the number of 97 events found due to damage parts and 49 problems caused by part shortages, can be seen from chart below.

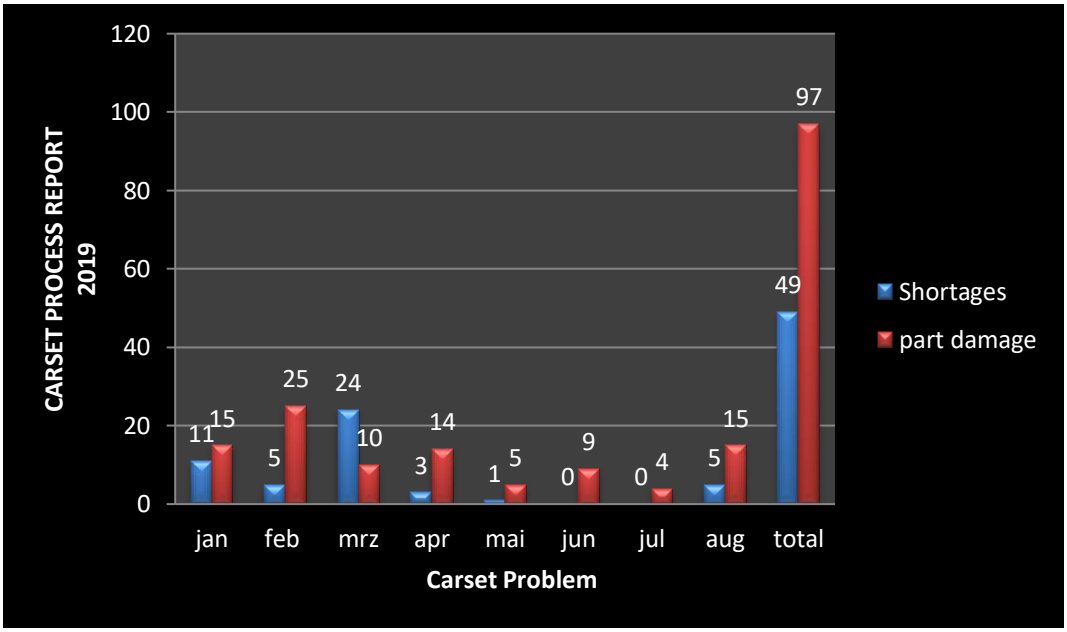

Fig 5:- Problem Chart
Source : BMW Jakarta

No	Obstraction	Description
1	Not standard process handling part of A-Colli.	So far, the operator has put carset parts into the conveyor line.
2	Process setting part carset was doing randomly, caused by the carset part didnt have storage rack and they didnt have standard setting part.	Which is the obstacle as constrained number 4, namely they do not have a system that can regulate the work of the warehouse operator in a clear and must be followed
3	Setting parts that are not organized and caused setting parts in the conteiner box so irregular.	This is due to the unavailability of special rack for put F-colli (Boxes) carset parts and controlling the flow of setting parts same as assembling station process.

Table 2:- Indicator Causes of Part Damaged and Shortages
Sourche : BMW Jakarta

The data obtained Commissioning and Pack Check area are indicative of the causes / constraints obtained so as to cause damage to parts / materials from interviews with warehouse foreman and operators of the carset process in the for production, it is because the need for material continues to flow per day then human error also cannot be avoided.

III. RESULT

➢ *Improvement Carset*

It can be seen in Table 2 that the settlement time for each lot takes 2-3 days to complete the whole part setting process from Small Part to Big Part.

Model/Type	Quantity of Case/ Box CKD		PackCheck & Comissioning Process	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15
				CW 40							CW 41							
F30 320i 8A36	Quality Check	42	Box Big Part	90				26			87	77	35					70
	PackCheck	208	Box Small Part	38				11			30	30	12					22
	Total	250	Box Big Part Commisioning	35				10			36	24	22					25
			The rest of box not finished yet	0				153			0	69	0					83
			Achievement Percentage per Day	82%				24%			77%	66%	35%					59%
			Total Achievement Percentage	100%				24%			100%	66%	100%					59%
			Problem When Process PackCheck Running	NO				NO			NO	NO	NO					NO
			Robbing Process	NO				NO			NO	NO	NO					NO
Lot				91				92			92	93	93					94

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	01	02	Sub Total						Total
CW 42						CW 43									CW 44			CW 40	CW 41	CW 42	CW 43	CW 44	CW 45	
39		60	49												0	86	28	116	199	218		114		647
23		24	21												4	28	14	49	72	90		46		257
21		12	34												0	22	26	45	82	92		48		267
0		104	0												204	68	0							
42%		48%	52%												2%	65%	33%							
100%		48%	100%												2%	67%	100%							
NO		NO	NO												NO	NO	NO							
NO		NO	NO												NO	NO	NO							
94		96	96												97	97	97	91,92	92,93	94,96		97		

Table 3:- Monthly Packcheck & Comissioning Report Oktober 2018
Source: Data Processing

Description		Total Time		
Model	Type	Model	Type	jam
F 15	KR06 A7	93600	1560	26
F 30	8A36 B7	131040	2184	36,4
F 48	JG16 A7	112320	1872	31,2
F 60	7E26 A0	84240	1404	23,4
G 01	KJ56 A7	74880	1248	20,8
G 12	7E26 A0	60840	1014	16,9
G 30	JA56 A7	81120	1352	22,5

Table 4:- Counting Cycle Tie Carset Preparation before Improvement
Source: Company Data 2019

Description		Total Time		
Model	Type	Seconds	Minutes	Hours
F 15	KR06 A7	18720	312	5,2
F 30	8A36 B7	43680	728	12,13333
F 48	JG16 A7	37440	624	10,4
F 60	7E26 A0	28080	468	7,8
G 01	KJ56 A7	24960	416	6,933333
G 12	7E26 A0	20280	338	5,633333
G 30	JA56 A7	40560	676	11,26667

Table 5:- Counting Cycle Tie Carset Preparation after Improvement
Source: Company Data 2019

Table 3 above, it explains the results of Take time after an improvement in the Carset process taken from the F30 type (BMW Serie 3). The results of calculations of type F30 (BMW Serie 3) are as follows:

Information:

- minute setup: 21 minutes
- container box preparation: 42 minutes
- number of cases: 504 pcs
- time: 60 minutes
- work hours: 8 hours

(minute setup & container box preparation X number of cases / time / work hours)

21 X 42 = 504/60/8 = 12 hours.

The results of the improvement of the Kanban system and the provision of Carset that has been done. It can be concluded that based on available data using the Just In Time (JIT) method and the Carset system owned by BMW AG, it helps to overcome many buffer stock issues in PT. TSM and obtained several benefits, namely:

- Speed up the process of checking time,
- Facilitate operator work,
- Reduces the number of damage parts.
- Can detect the wasting time of a process that is currently or will take place.

Fig 6:- Comparative Results Chart of the Carset Preparation Process
Source: Company Data 2019

Seen from the Chart 1 where problems that often occur in the Carset process area has decreased dramatically.

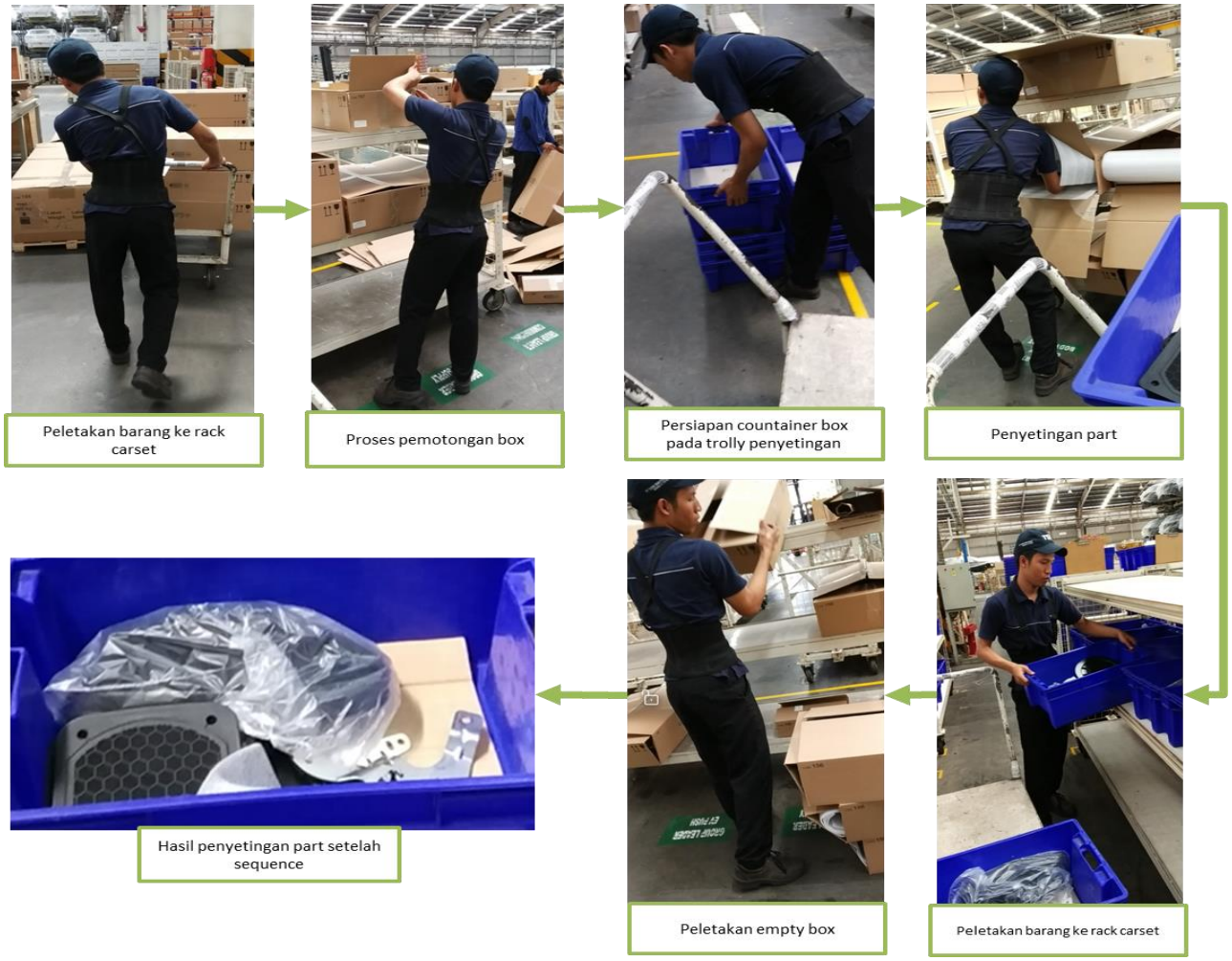

Fig 7:- After Improvement
Source : BMW Jakarta

IV. CONCLUSIONS

Based on data from the calculation of the improvement of the Carset supply process, it can be seen that the Carset process can accelerate the process of checking goods on F Colli from the previous process take time of 2-3 days or equivalent to 36 hours to 1 day or equivalent to 12 hours.

Facilitates the work of the operator during the process of preparing carset parts for each F Colli and guarantees 100% check of every part in the countainer box according to the information listed on the supply rack, and reduces the number of F Colli buildups in the conveyor pack check.

Reducing the percentage of problems that occur in the carset preparation area which consists of damage and shortage parts. Where the percentage of improvement before doing improvement reaches 49 parts damage and 97 shortages, whereas after doing improvement gets a significant result to zero defect.

REFERENCES

[1]. Adnan, N.A. 2013. Implementation Of Just In Time Production Through Kanban System. Jurnal Industrial engineering. Volume 3, No 6. Hal. 11-20
[2]. Alindira, A.F., Nuryani, A., Damayanti, R., Az-Zahra, Annisa., 2014, Just In Time dan Kanban, Universitas Islam Indonesia, Yogyakarta.
[3]. Anggraita, W., Juliani, W., dan Suryadhini P., 2015. UsulanPerbaikanSistem Kanban UntukMengurangiPenumpukan Work In Process dan Lead In Time Produksi Pada LantaiProduksiBagian Medium Prismatic Machines di PT Dirgantara Indonesia. Jurnal Teknik Industri. Volume 2, No 1. 1-9
[4]. Gupta, M. S. 2012. Flexible Kanban Sistem. InternasionalJurnal Of Operation &Produktion Management. Volume 19, No 10, 1349-4198
[5]. Hartini, S. dan Rizkiya, I. 2013. PerancanganSistemKanbanUntukPelancaranProduksi Dan MereduksiKeterlambatan. Jurnal TI UNDIP. Vol VIII, No 3. Hal 193 – 202
[6]. Mifta., 2016, Fungsi dan keuntungankanban, Universitas Islam SyekhYusuf,Tanggerang, Banten

[7]. N.Singh, N., Kwok H.S., 1990, PengembanganSistem Kanban, Universitas Windsor, Ontario, Kanada.
[8]. Ratna, K.W, 2011, StrategiProduksiTepat Waktu (JIT) Universitas Wahid Hasyim, Semarang
[9]. Rimawan, E., Mardono, U., Kustiadi, O., dkk. 2019. Design analysis of raw materials inventory on TC1118 cloth products with JIT approach. IOP Conference Series: Materials Science and Engineering. [online] doi:10.1088/1757-899X/673/1/012103. Diakses pada : https://iopscience.iop.org/article/10.1088/1757-899X/673/1/012103/pdf. [Accessed 14 December]
[10]. Robert, C.Lieb., Robert A. Miller., Robert A. Millen., 2018,JIT andCorporate Transportation Requirements, Pennsylvania State University, Old Main, Amerika Serikat
[11]. Viktorovna, I.B., &Ivanovich, P.P. 2016. Application of a Decision Support System to Strategic Warehousing Decisions. International Journal of Physical Distribution & Logistics Management, Vol. 39 (4).