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Packaged Palm Cooking Oil business Process Design in Indonesia

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Abstract:- Since the government imposed the Indonesian National Standard (SNI), which aims to protect public health and increase its competitiveness, packaged palm cooking oil in Indonesia has drawn attention. It establishes the precise standard for vitamin A content overall. This study's goal is to create a commercial procedure for packaged palm cooking oil that will lower costs. The approach of this study makes use of Business Process Modelling Notation (BPMN) and Value Stream Mapping-Lean Thinking (VSM-LT). According to the study's findings, waste can be identified by integrating the VSM-LT and BPMN models.

Keywords:- *Palm cooking oil; Business Process Improvement; Business Process Model Notation; Value Stream Mapping-Lean Thinking*

I. INTRODUCTION

Indonesia, the largest producer of palm oil [1] in the world, endeavors to foster the development of competitive, healthy, and sustainable palm oil derivative industries. Palm packaged culinary oil is an essential palm oil derivative product. [2] The National Standardization Agency (BSN) has issued the SNI 7709:2019 standard for packaged palm heating oil. The Indonesian government issued Regulation No. 46 of 2019 [3] through the Ministry of Industry as a legal mandate for the mandatory implementation of the Indonesian National Standard (SNI). Beginning on January 1, 2022, packaged palm cooking oil in Indonesia must bear the SNI label, per this regulation. The mandatory implementation of SNI aims to safeguard safety and health, foster healthy business competition, and enhance palm cooking oil's competitiveness. The mandatory implementation of SNI 7709:2019 poses a challenge to business actors in terms of modifying their business processes so that the resulting products are competitive and marketable. To meet the established quality standards, it is necessary to enhance business processes, which can reduce expenses. Table 1 displays the SNI's essential quality requirements for packaged palm heating oil.

Table 1 Essential Requirements for Packaged Palm Cooking Oil According to SNI.

No	Test criteria	Units	Requirements
1	Color	-	Yellow to orange
2	Moisture and volatile matter content	mass fraction, %	maximum 0.1
3	Free fatty acid (as palmitic)	mass fraction, %	maximum 0.3
4	Peroxide value	meq O_2/kg	maximum 10[1)]
5	Vitamin A (total)[2)]	IU/g	minimum 45[1)]

➢ *Note:*

- Testing was carried out on samples taken from the factory.
- Total vitamin A is the sum of vitamin A and provitamin A (carotenoids) expressed as vitamin A equivalents. Source: [2]

In order to meet the minimum requirement of 45 IU/g for total vitamin A, which presently relies on vitamin A fortification, it is necessary to improve business processes in order to meet the specified quality standards. In the interim, production processes can be modified to satisfy the remaining quality requirements. Vitamin A fortification is a cost incurred by businesses, primarily because the demand for vitamin A in Indonesia is still dependent on imports and will continue to rise with the implementation of SNI on packaged palm cooking oil, resulting in higher prices.

Palm oil naturally contains provitamin A. [4] According to research conducted by Kumar and Khrisna (2014), palm oil contains between 500 and 700 ppm of provitamin A (beta-carotene). The natural provitamin A content of palm oil is lost as a result of extensive processing [5]. Business Process Improvement (BPI) is a business practice that identifies, analyzes, and optimizes existing processes in order to reduce or eradicate errors and boost productivity and efficiency [6]. Implementing BPI encourages the development of both

internal and external quality parameters (service speed, customer satisfaction, responsiveness, and reliability) [7]. Changes to the BPI are implemented incrementally and continuously to improve performance, thereby maintaining and enhancing market quality [8].

The production process will be the focus of the business process design in this study, which will not encompass the entire purview and will not involve a radical change. To support the investigation, Business Process Modelling Notation (BPMN) and Value Stream Mapping (VSM) are used as models. The combination of BPMN and VSM models adapted for business process design can be synergistic and beneficial in overcoming their limitations, and the outcomes can support and complement one another [9].

II. OVERVIEW AND LITERATURE STUDY

- *Palm Cooking Oil*

In order to meet the minimum requirement of 45 IU/g for total vitamin A, which presently relies on vitamin A fortification, it is necessary to improve business processes in order to meet the specified quality standards. In the interim, production processes can be modified to satisfy the remaining quality requirements. Vitamin A fortification is a cost incurred by businesses, primarily because the demand for vitamin A in Indonesia is still dependent on imports and will continue to rise with the implementation of SNI on packaged palm cooking oil, resulting in higher prices.

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- *Business Process Management (BPM) and Business Process Improvement (BPI)*

Business process management (BPM) is a methodical strategy that aids in analyzing and continually enhancing a company's core business operations in order to gain or maintain a competitive advantage by enhancing process efficiency, increasing product quality, and reducing costs [6]. BPM is centered on optimizing and enhancing business processes. Implementing Business Process Improvement (BPI) can increase the effectiveness and efficiency of a company's business processes. BPI entails in-depth analysis and evaluation of existing business processes in order to identify problems and obstacles in their execution. BPI practices can identify and fix inefficiencies in an organization's core functions by improving individual processes.

- *Business Process Modelling Notation (BPMN)*

The Business Process Modelling Notation (BPMN) is a visual system for representing business processes from beginning to conclusion, utilizing standardized symbols and flowcharts to make information more understandable. BPMN 2.0 is the most recent iteration of this innovation. In 2004, the Business Process Management Initiative (BPMI) first introduced BPMN. After BPMI and OMG merged in 2005, the Object Management Group (OMG) assumed responsibility for future development. In 2010, OMG began developing BPMN 2.0, and in 2013, OMG issued a new official release [13].

Business Process Modelling Notation 2.0 (BPMN 2.0) provides a Business Process Diagram (BPD) based on flowcharting techniques in order to create graphical representations of business process operations. A business process model consists of a network of visual objects, activities (tasks), and flow controls that determine the order of their execution [14]. BPMN is intended to incorporate multiple modeling types and can be utilized for a variety of business process modeling purposes. BPMN has been extensively adopted in multiple industries, including manufacturing, finance, marketing, and information technology [15]-[18]. BPMN aids in increasing productivity, decreasing expenses, and enhancing service quality.

Modeling business procedures serves multiple functions. Creating appropriate information systems to support the business by providing descriptive models, enhancing current business operations by identifying ways to make them more efficient, and enabling groups to share a common understanding of processes are a few of these objectives, according to [19]. BPMN has become the dominant business process modeling language due to its expressiveness and simplicity [14].

- *Value Stream Mapping-Lean Thinking (VSM-LT)*

VSM is an industrial technique used to map the transfer of value across all processes, from the entry of materials into production to the delivery of materials to customers. By utilizing VSM, it is possible to record any product or service implementation-related deviations [20]. Not only does VSM aim to map the current state, but also the future state. For

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implementing and utilizing changes to the production plan, such as modifying processes or technologies, changing manufacturing processes, changing production layouts, modifying sequencing, etc., it is highly advantageous to create maps of current and future conditions.

Value Stream Mapping-Lean Thinking (VSM-LT) is an expanded variation of Value Stream Mapping (VSM) that incorporates Lean Thinking (LT) principles to address and investigate specific problems [21]. VSM-LT's primary function is to propose an improved version of the traditional VSM by combining a framework structure and model integration with specific lean tools. Depending on the specific requirements, there are a number of methods to combine conventional VSM simulation with various lean tools. Total Productive Maintenance (TPM), Do It Right First Time (DIRT), 5S, takt time, Single Minute Exchange of Die (SMED), kaizen, and kanban, among others, are common lean tools used in integrating simulation with VSM. Using VSM-LT can make business process optimization more efficient, and there is no loss risk associated with Future State Mapping (FSM) development.

III. RESEARCH METHODOLOGY

In business process management, Business Process Modelling Notation (BPMN) and Value Stream Mapping-Lean Thinking (VSM-LT) are two distinct instruments. Using graphical symbols, BPMN is used to design and document business processes in great detail. VSM-LT, on the other hand, is used to graphically represent the value flow in a business process, with the assistance of Lean Tools for identifying root causes and solution mechanisms. For Business Process Improvement (BPI) in this investigation, BPMN and VSM-LT will be utilized jointly.

Combining BPMN and VSM-LT begins with the design of BPMN for the existing business process (As-Is) in order to acquire a summary of the business process cycle time. In Value Stream Mapping-Lean Thinking (VSM-LT), this cycle time summary is mapped as the Current State Mapping (CSM) to identify value-added and non-value-added activities. On the Current State Mapping (CSM), non-value-added activities are considered waste types, and their fundamental causes are identified and addressed using lean tools. The model is based on mapping the chain-effect relationship in order to identify the root causes of non-value-added effects (NVA) and generate effective solutions. The structure of the model consists of four major components: LT-based operations based on corresponding feature deficiencies, NVA effects, possible root cause mapping, and solution mechanism identification and description.

After acquiring the solution, improvement-related data was collected and used to design a new Business Process Modelling Notation (BPMN) to be mapped as the Future State Mapping (FSM) in the new Value Stream Mapping-Lean Thinking (VSM-LT). Comparing "As-Is" to "To-Be" of cycle time, value-added activities, and non-value-added activities is the indicator of success in this study for determining the effectiveness of business process design using a combination of BPMN and VSM-LT models.

A successful business process design reduces cycle time and non-value-added activities while increasing value-added activities.

IV. THE COLLECTION AND PROCESSING OF DATA

- *The Current Data (As-Is)*

The information flow consists of the activities of the marketing, PPIC, and purchasing departments. Table 2 illustrates the time required to execute information flow activities based on source data.

Table 2 Data of Information Flow Activities (As-Is)

Actor	Task	Time (hour)	Description
Marketing	Receiving purchase orders from customers	6.0	Make to order
PPIC	Scheduling production	2.0	Weekly basis
Purchasing	Procuring Crude Palm Oil	144.0	Time of loading, transportation, and unloading

The inventory/tank farm CPO department, the refinery process, the semi-finished RBDPO tanks, the fractionation process, the RBDPL product tanks, the packaging process, and the finished product warehouse are responsible for material flow. Table 3 displays the activities presently performed in the material flow (As-Is).

Table 3 Data of Material Flow Activities (As-Is)

Actor	Task	Time (hour)	Description
Tank farm	Maintain safety stock available of CPO	168.0	Comply with stock rules
Refinery process	CPO enters the process	1.0	Minimum temperature 50ºC
	Degumming process	1.0	Minimum temperature 110ºC
	Bleaching process	2.0	Minimum temperature 110ºC
	Deodorizing process	20.0	Minimum temperature 260ºC
RBDPO semi-finish tank	RBDPO temporary storage	24.0	Maximum temperature 45ºC
Fractionation process	RBDPO enters the process	1.0	Minimum temperature 70ºC

	Crystallization process	10.0	Slow cooling to 17ºC
	Holding process	2.0	Maintain at temperature 17ºC
	Filtration process	2.0	Yield 60%
RBDPL product tank	RBDPL temporary storage	24.0	Maximum temperature 40ºC
Packing process	Vitamin A fortification process	2.0	Minimum 45 ppm
	Packing activity	24.0	108.000 kg per day
	Aging treatment	3.0	Reject 0.05%
Finish product inventory	Store finish product	12.0	Ready to be sent to customers

- *The BPMN Model in Earliest form (As-Is)*
  As shown in Figure 1, the Igrafx program can be used to model BPMN from the initial data.

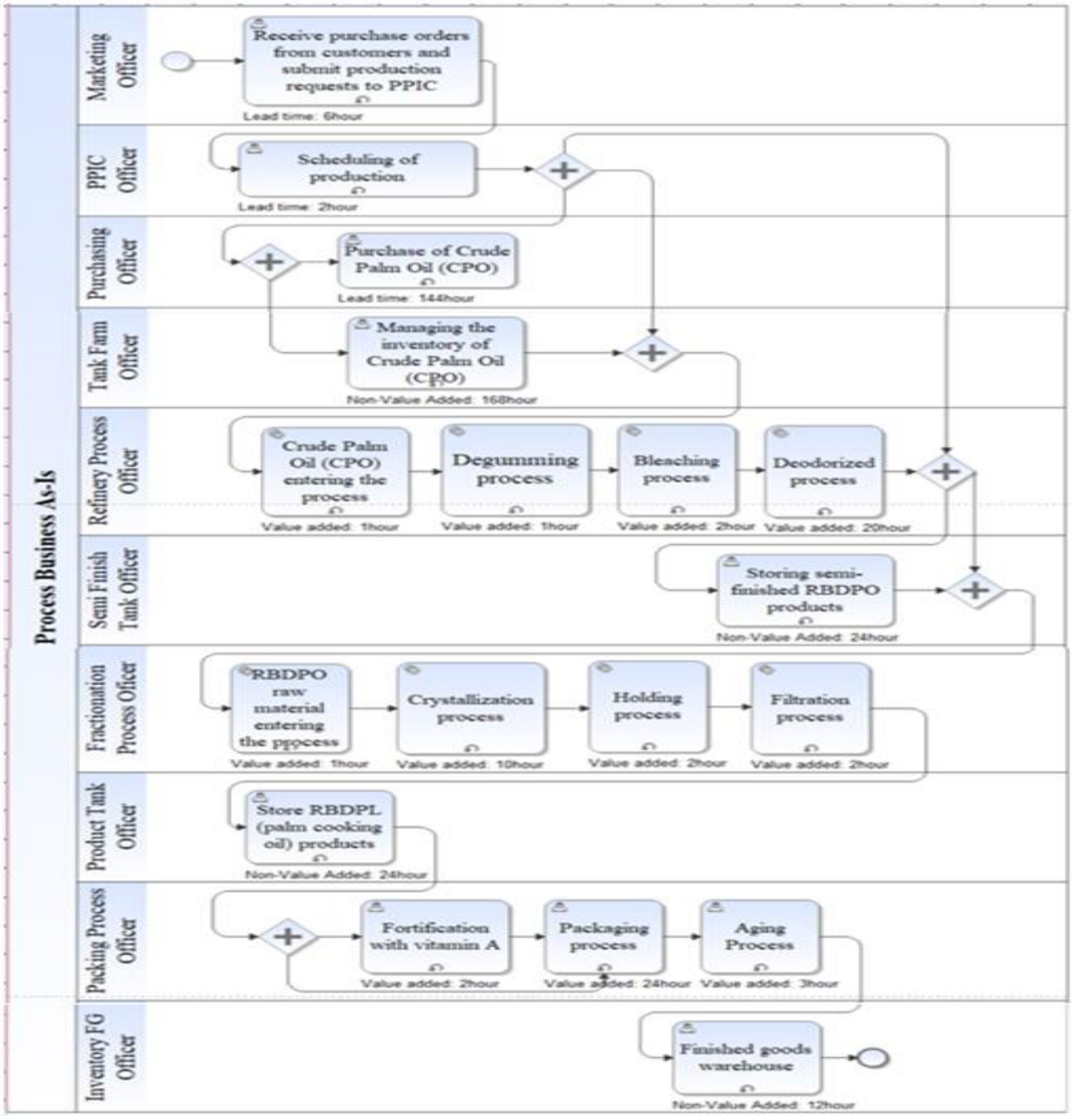

Fig 1 BPMN As-Is

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The BPMN As-Is model design produced a data table displaying each actor's total cycle time/elapsed time and detailed cycle time, which served as the basis for developing the Value Stream Mapping (VSM) and is shown in Table 4.

The production of bundled palm culinary oil requires 59.29 days (1,422.96 hours) of elapsed time, as depicted in Table 4, which also provides a breakdown of cycle time values.

Table 4 Current BPMN (As-Is) Elapsed Time and Cycle Time Data.

Elapsed Time (Days)

59,29

Transaction Statistics (Days)

Count	Avg Cycle	Avg Work	Avg Wait	Avg Res Wait	Avg Block	Avg Inact	Avg Serv
1	59,29	4,11	55,17	0,00	43,17	12,00	47,29

Transaction Statistics (Days)

	Count	Avg Cycle	Avg Work	Avg Wait	Avg Res Wait	Avg Block	Avg Inact	Avg Serv
Process Business As-Is/Fractionation Process Oficer	1	4,71	0,76	3,96	0,00	0,00	3,96	0,76
Process Business As-Is/Inventory FG Officer	1	7,19	0,57	6,63	0,00	5,92	0,71	6,49
Process Business As-Is/Marketing Officer	1	1,00	0,34	0,67	0,00	0,00	0,67	0,34
Process Business As-Is/Packing Process Officer	1	11,25	1,23	10,02	1,31	0,00	8,71	2,54
Process Business As-Is/PPIC Officer	1	0,11	0,11	0,00	0,00	0,00	0,00	0,11
Process Business As-Is/Product Tank Officer	1	3,03	1,03	2,00	0,00	0,00	2,00	1,03
Process Business As-Is/Purchasing Officer	1	58,17	6,05	52,13	0,00	34,13	18,00	40,17
Process Business As-Is/Refinery Process Officer	1	39,20	1,00	38,20	0,00	34,20	4,00	35,20
Process Business As-Is/Semi Finish Tank Officer	1	6,12	1,06	5,06	0,00	3,06	2,00	4,12
Process Business As-Is/Tank Farm Officer	1	58,39	7,15	51,24	0,00	29,20	22,04	36,35

➢ *Value Stream Mapping-Lean Thinking (As-Is)*

The decomposition of cycle time values in Table 4 can be used to create a preliminary Value Stream Mapping (VSM) model (As-Is). The resulting model is the Current State Mapping (CSM) of the combined palm cooking oil business process, as shown in Figure 2.

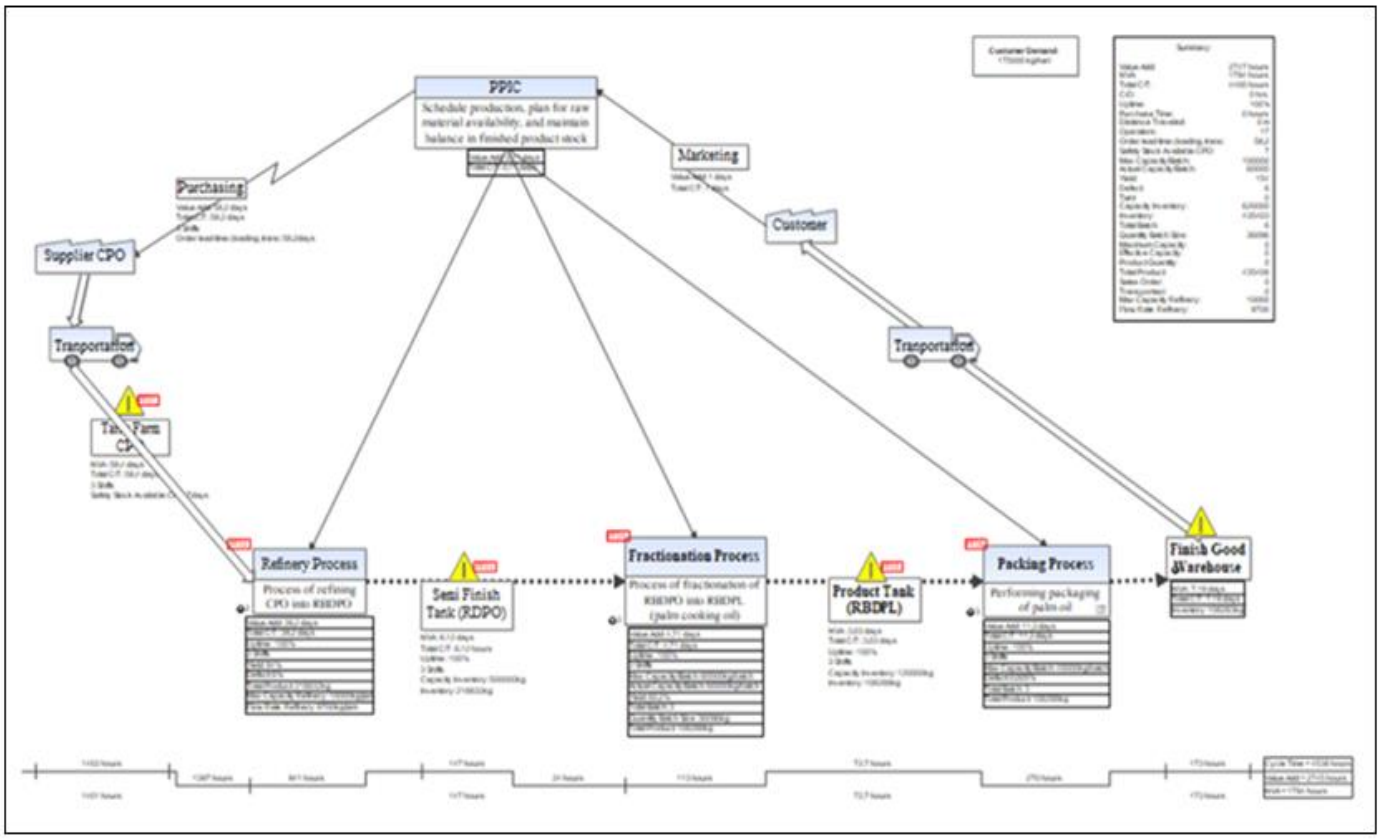

Fig 2 Current State Mapping (CSM) of the Packaged Palm Cooking Oil Business Process

Based on the Current State Mapping (CSM), it was determined that non-value added (NVA) activities required 1,794 hours (74.75 days) while value-added activities required 2,745 hours (114.38 days), for a total cycle time of 4,541 hours (189.08 days). The high number of non-value-added (NVA) activities indicates inefficiency in the business process, which must be evaluated and improved in order to enhance the business process as a whole.

- *Analysis of waste*

Figure 2 depicts the current condition of the packaged palm oil business process. Current State Mapping (CSM) has identified a considerable amount of waste (non-value added) in the process.

Table 5 Description of the Tasks of Each Section of the Material Flow (PF)

Description	Tank Farm of CPO	Refinery Process	Semi Finish Tank	Fractionation Process	Product Tank	Packing Process	Finish Good Warehouse
The objective	Manage CPO tanks according to safety stock available and ensure smooth supply to the refinery process.	Stages of the refinery process, starting from the degumming, bleaching, and deodorized processes to produce semi-finished product (RBDPO)	Storing semi-finished products (RBDPO).	Separate the liquid fraction RBDPL (cooking oil) and the solid fraction RBDPS (by-product).	Storing RBDPL (cooking oil) before the addition of vitamin A (retinol palmitate).	The addition of vitamin A (retinol palmitate) is to ensure that the content of vitamin A and/or provitamin A complies with SNI 7709-2019.	Packing palm cooking oil in 2 kg packages
The type of activity	NVA	VA	NVA	VA	NVA	VA	VA
Time (hour)	168	24	24	15	24	2	24
Raw material	CPO	CPO	RBDPO	RBDPO	RBDPL (palm cooking oil)	Palm cooking oil, Vitamin A	Cooking oil with fortified vitamin A
Process condition	Determination of safety stock available CPO Determination of safety stock available CPO too pessimistic	The refinery's flow rate is 9,700 kg/hour, the max dose of BE is 1.5%, the max dose of phospate acid is 0.07%.	RBDPO in semi-finish tank stored for 24 hours	The capacity is 60,000 kg/batch, 15 hours processing time, with the yield of around 61%.	RBDPL in product tank stored for 24 hours	Vitamin A fortification must be carried out to meet SNI standards.	The capacity packing machine total is 9,000 carton (108,000 kg)

On the basis of the functions of each component in the material flow (PF), as outlined in Table 5, it is possible to identify, using lean tools, the fundamental cause of problems that can be improved and the sources of waste that can be eliminated.

ISSN No:-2456-2165

Table 6 Sources of Waste and Proposed Solutions in Material Flow (PF)

Description	Tank Farm of CPO (PF01)	Refinery Process (PF02)	Semi Finish Tank (PF03)	Fractionation Process (PF04)	Product Tank (PF05)	Packing Process (PF06)
Type/Value	Non Value Added	Value Added	Non Value Added	Value Added	Non Value Added	Value Added
Processing time (hour)	168	24	24	15	24	2
Total man power	1	2	1	3	1	5
Flow rate	-	9,700 kg/jam	-	60 MT/batch	-	40 MT/batch
Yield	-	94%	-	60.16%	-	-
Total Output (kg/day)	232,800	218,832	218,832	108,288	108,288	108,288
Root cause	The tanks are not based on CPO grade, and the determination of the available CPO safety stock is too pessimistic/long	The process does not follow the latest technology, there is excessive color reduction process, and excessive deodorization process	The production planning arrangement is not good, and the residence time of RBDPO in the tanks is too long	The quality of semi finish product is too good compared to the quality requirements set by the Indonesian National Standard (SNI).	The production planning arrangement is not good, and the residence time of RBDPL in the tanks is too long	The beta-carotene (provitamin A) content is very low, so vitamin A needs to be added to meet the quality requirements of the Indonesian National Standard (SNI)
Types of waste	MUDA: *inventory* (I), MURA: *product quality* (PQ)	MUDA: *over processing* (O-pr), MURA: *product quality* (PQ)	MUDA: *inventory* (I)	MUDA: *over processing* (O-pr)	MUDA: *inventory* (I)	MURA: *processing time* (PT) MUDA: *over processing* (O-pr)
Lean thinking based operating features	*The zero-defect direction practice* is consistent in controlling the quality of raw materials CPO; *value stream activities* is involve the planning and management of CPO *tanks*	*The zero-defect direction practice* is consistent in controlling the production process according to optimal quality	*One piece flow* is the continuous flow of raw materials or semi-finished products from one process to another, with minimal or no waiting time in between berdasarkan mekanisme sistem FIFO	*The zero-defect direction practice* is consistent in controlling, monitoring, and proactively supervising the production process to prevent/minimize product defects based on the specified quality requirements	*One piece flow* is the continuous flow of raw materials or semi-finished products from one process to another, with minimal or no waiting time in between berdasarkan mekanisme sistem FIFO	*The zero-defect direction practice* is consistent in controlling and monitoring the production process to minimize product defects; *value stream activities* is involve proper resource planning and management, utilizing appropriate time and equipment
Lean tools	Levelling, Standardization	Technology adoption, Standardization	Levelling	Standardization	Levelling	Standardization

CSM's management of the Crude Palm Oil (CPO) tank farm is a non-value-added waste that requires evaluation. Using historical data to determine the optimal time and taking into consideration the lowest risk factors possible, the available CPO safety stock can be gradually reduced. Differentiating CPO classifications is essential for the production of high-quality palm oil products, according to specialists.

On the basis of technological references, a method for preserving adequate beta-carotene (provitamin A) levels in palm heating oil is developed. During excessive bleaching, beta-carotene (provitamin A) is lost. Deodorization is a process that eliminates odor and reduces free fatty acid (FFA), peroxide value (PV), and water content. In addition to damaging and destroying beta-carotene (provitamin A), an excessive deodorization procedure at 260oC will also damage and eliminate beta-carotene.

According to the MUDA: inventory (I) lean principle, the 24-hour storage of semi-finished products (RBDPO) in containers constitutes waste (non-value added). This does not adhere to the "one-piece flow" rule as it pertains to the Lean Thinking waste categories.

During the refining process, the vast majority of beta-carotene (provitamin A) is removed. Other quality requirements, such as hue, PV, and FFA, are deemed excessive and overprocessed (O-pr). The characteristics of Lean Thinking (LT) do not correlate with the "zero defect direction practice" rule.

RBD Palm Olein (RBDPL) is the final product of fractionation; it is retained in product containers for 24 hours at a maximum temperature of 40°C prior to packaging.

Vitamin A fortification is the most crucial aspect of the packaging process that must be improved. The vitamin A enrichment procedure entails adding at least 45 IU/g of retinyl palmitate directly to the palm heating oil that will be packaged in accordance with the Indonesian National Standard (SNI).

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Figure 3 depicts the use of the Value Stream Mapping-Lean Thinking (VSM-LT) model to examine the flow of materials/processes in the packaging palm cooking oil business process design.

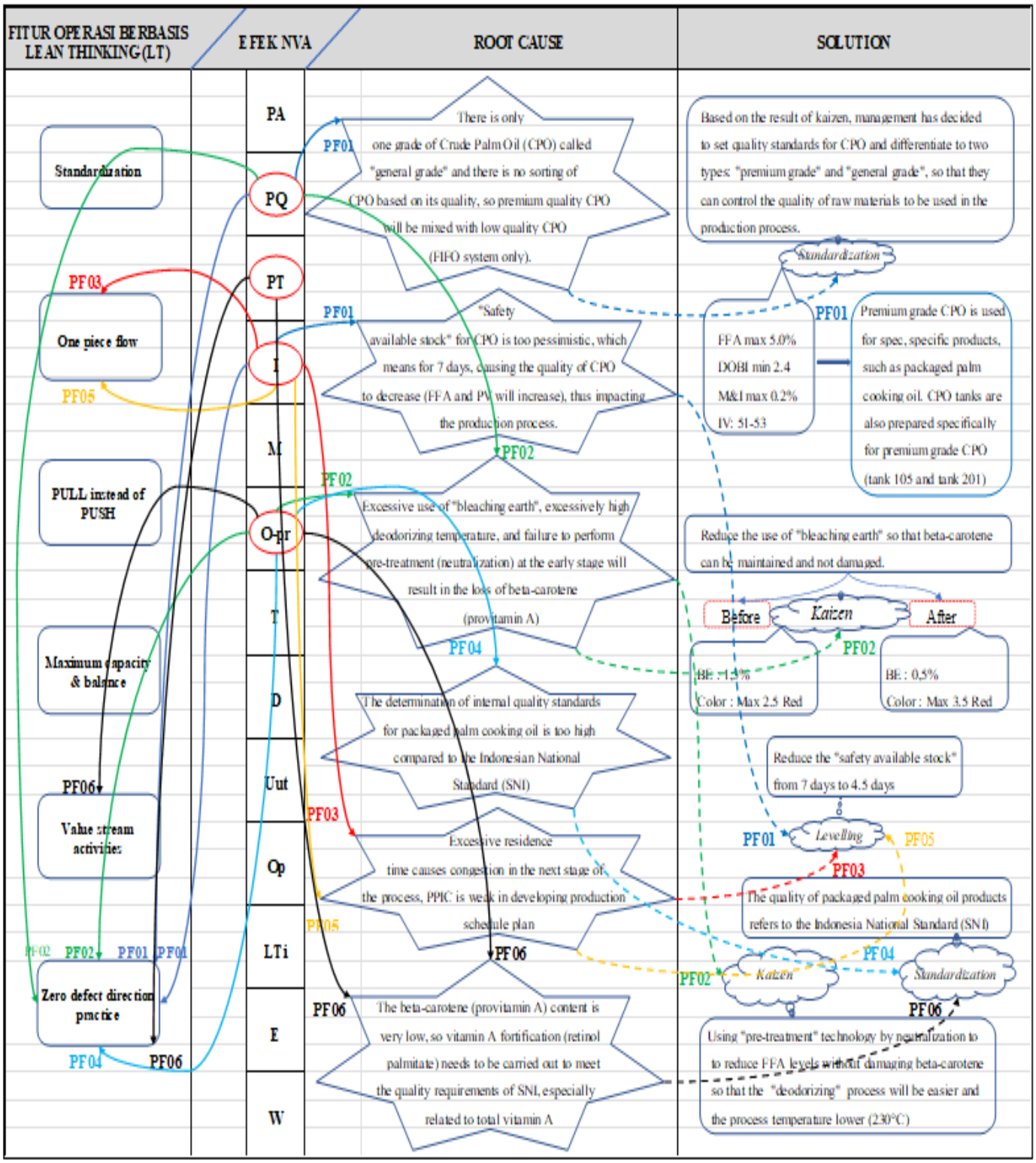

Fig 3 Analysis of the Business Process for Packaged Palm cooking Oil using the VSM-LT Model

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➢ *The Future Data (To-Be)*

As the present activities are already sufficiently compelling, the future information flow will remain unchanged and similar to the current state of information flow (As-Is). Table 2 contains the presented data. Future material/process flow (To-Be) revealed non-value-added waste and enhanced value-added activities. Using the VSM-LT model, an investigation was conducted to determine the primary cause and solution of the problem. Table 7 displays the prospective business process activities (To-Be).

Table 7 Data Activities of the Business Process (information flow & material flow) (To-Be)

Actor	**Task**	**Time (hour)**	**Description**
Marketing	Receiving purchase orders from customers	6.0	Make to order
PPIC	Scheduling production	2.0	Weekly basis
Purchasing	Procuring Crude Palm Oil	144.0	Time of loading, transportation, and unloading
Tank farm	Maintain safety stock available of CPO	108.0	Reducing the safety stock available of CPO to 4.5 days.
Refinery process	CPO enters the process	1.0	Minimum temperature 50^{o}C
	Degumming process	1.0	Minimum temperature 110^{o}C
	Bleaching process	1.0	Minimum temperature 110^{o}C
	Neutralisation process	1.0	Minimum temperature 110^{o}C
	Deodorizing process	20.0	Minimum temperature 230^{o}C
RBDPO semi-finish tank	RBDPO temporary storage	8.0	Maximum temperature 45^{o}C
Fractionation process	RBDPO enters the process	1.0	Minimum temperature 70^{o}C
	Crystallization process	7.0	Slow cooling to 19^{o}C
	Holding process	1.5	Maintain at temperature 19^{o}C
	Filtration process	2.0	Yield 63%
RBDPL product tank	RBDPL temporary storage	8.0	Maximum temperature 40^{o}C
Packing process	Vitamin A fortification process	0	The process is eliminated
	Packing activity	24.0	108.000 kg per day
	Aging treatment	3.0	Reject 0.05%
Finish product inventory	Store finish product	12.0	Ready to be sent to customers

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➢ *The BPMN Model in the Future (To-Be)*

As shown in Figure 4, BPMN can be modeled from the initial data using the Igrafx program.

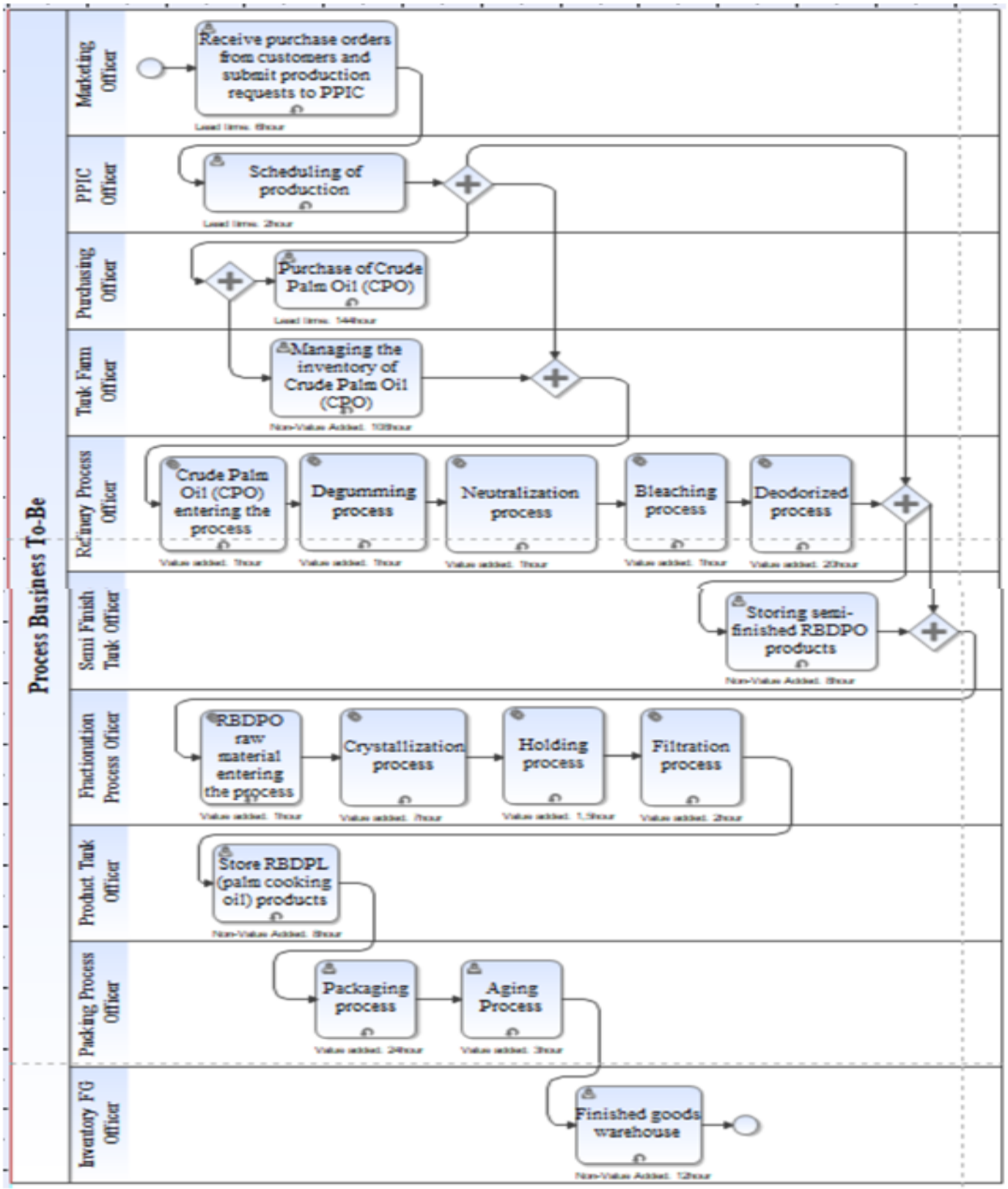

Fig 4 BPMN To-Be

The BPMN To-Be model design produced a data table depicting the total cycle time/elapsed time and detailed cycle time for each actor, which is depicted in Table 8 as the foundation for Value Stream Mapping (VSM) preparation.

ISSN No:-2456-2165

The business process to produce packaged palm culinary oil requires 59.29 days (1,422.96) hours based on future condition BPMN (To-Be) data, with a breakdown of cycle time values shown in Table 8.

Table 8 Data on Elapsed Time and Cycle Time of the Current BPMN (To-Be)

Elapsed Time (Days)

37,30

Transaction Statistics (Days)

Count	Avg Cycle	Avg Work	Avg Wait	Avg Res Wait	Avg Block	Avg Inact	Avg Serv
1	37,30	3,16	34,13	0,00	24,13	10,00	27,30

Transaction Statistics (Days)

	Count	Avg Cycle	Avg Work	Avg Wait	Avg Res Wait	Avg Block	Avg Inact	Avg Serv
Process Business To-Be/Fractionation Process Oficer	1	3,88	0,59	3,29	0,00	0,00	3,29	0,59
Process Business To-Be/Inventory FG Officer	1	1,28	0,57	0,71	0,00	0,00	0,71	0,57
Process Business To-Be/Marketing Officer	1	1,00	0,34	0,67	0,00	0,00	0,67	0,34
Process Business To-Be/Packing Process Officer	1	5,87	1,21	4,67	0,00	0,00	4,67	1,21
Process Business To-Be/PPIC Officer	1	0,11	0,11	0,00	0,00	0,00	0,00	0,11
Process Business To-Be/Product Tank Officer	1	1,02	0,35	0,67	0,00	0,00	0,67	0,35
Process Business To-Be/Purchasing Officer	1	36,18	6,05	30,14	0,00	12,14	18,00	18,18
Process Business To-Be/Refinery Process Officer	1	26,07	1,04	25,03	0,00	23,03	2,00	24,07
Process Business To-Be/Semi Finish Tank Officer	1	2,21	0,40	1,81	0,00	1,10	0,71	1,50
Process Business To-Be/Tank Farm Officer	1	39,97	4,65	35,32	0,00	19,99	15,33	24,64

- *Value Stream Mapping-Lean Thinking (To-Be)*

The breakdown of cycle time values in Table 8 can be used to create a Value Stream Mapping (VSM) model from inception (To-Be). The resulting model is the Future State Mapping (FSM) of the palm culinary oil packaging business process, as shown in Figure 5.

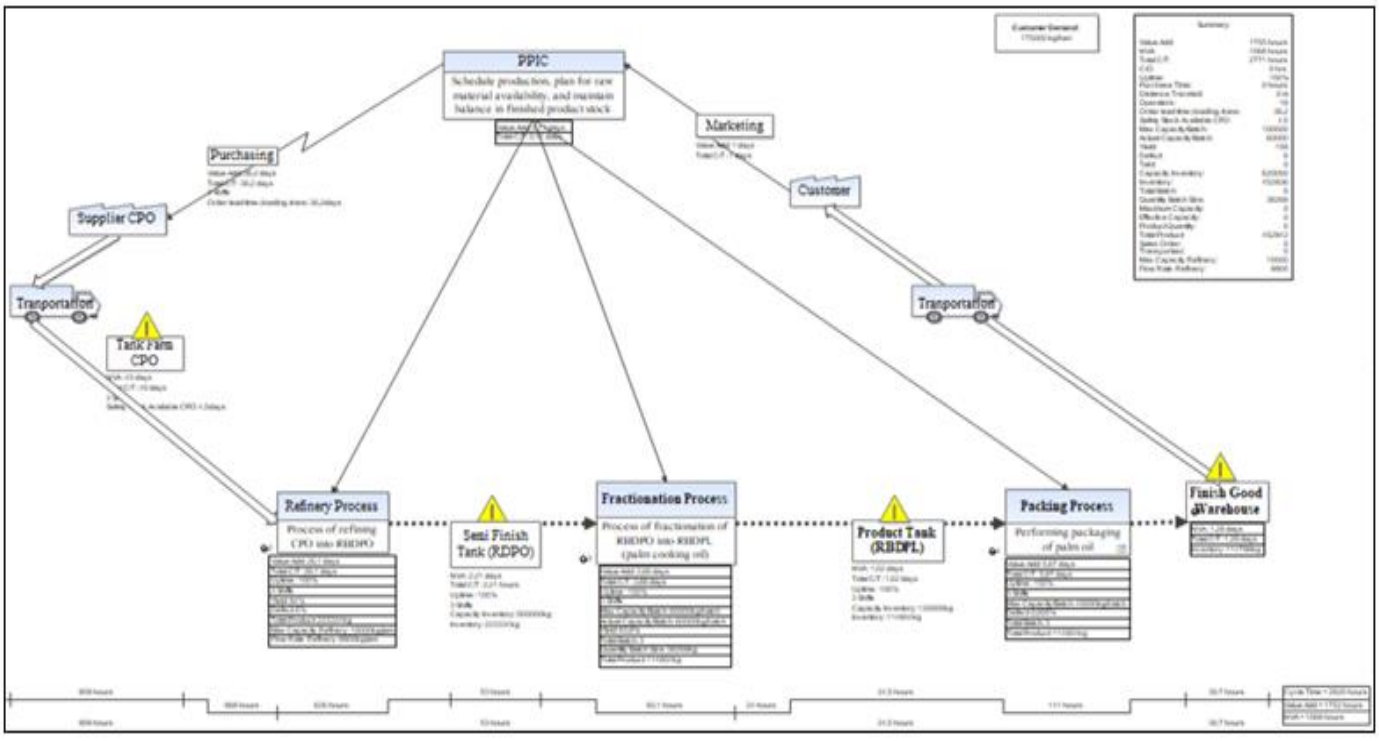

Fig 5 Future State Mapping (FSM) of the Packaged Palm Oil Business Process

Non-value added (NVA) activities required 1,068 hours (44.5 days), while value-added activities required 1,752 hours (73.0 days), for a total cycle time of 2,820 hours (117.5 days).

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V. CONCLUSION

During the data collection period, this study was conducted at one of the palm oil enterprises, PT. Maju Jaya, in North Jakarta, between December 2022 and January 2023. In this study, a commercial process for palm culinary oil packaging in Indonesia is designed. This business process design is necessary due to the government's mandated implementation of the Indonesian National Standard (SNI) for packaged palm cooking oil, which also affects the emergence of costs. The SNI specifies a minimum vitamin A content of 45 IU/g, which must be met via vitamin A fortification (retinol palmitate). The additional cost of fortification will reduce the market competitiveness of packaged palm heating oil, especially as vitamin A (retinyl palmitate) continues to be imported and prices continue to rise. In addition, the mandated implementation of the Indonesian National Standard (SNI) aims to increase the competitiveness of palm oil and safeguard public health and safety.

This research utilized the Business Process Improvement (BPI) methodology, with a focus on the Business Process Modeling Notation (BPMN) and Value Stream Mapping (VSM) models. The combination of adapted BPMN and VSM models for business process design is anticipated to be synergistic and advantageous in overcoming their respective limitations, with the outcomes supporting and complementing one another. Business Process Improvement (BPI) is an initiative designed to improve the effectiveness and efficiency of a business's business processes. BPI entails a comprehensive analysis and evaluation of extant business processes in order to identify issues and obstacles with their execution.

Designing the BPMN (As-Is) based on the current condition of the business process was the first step of the research. During the Gemba and source interviews, data was collected. From the design of the BPMN (As-Is) model, detailed cycle times for each actor will be derived and used as the basis for constructing the Value Stream Mapping (VSM). According to data extracted from the current state BPMN (As-Is), the production of bundled palm culinary oil takes 59.29 days (1,422.96) hours. Based on the Current State Mapping (CSM), it was determined that non-value added (NVA) activities required 1,794 hours (74.75 days) while value-added activities required 2,745 hours (114.38 days), for a total cycle time of 4,541 hours (189.08 days).

Current State Mapping (CSM) has identified waste (non-value added) and value-added activities require refinement. Using "lean thinking," the primary cause and solution of this problem will be identified so that the results can be used to develop BPMN (To-Be). According to data extracted from the future condition BPMN (To-Be), the production of packaged palm culinary oil requires 37,3 days (895.2 hours). Future State Mapping (FSM) indicates that non-value added (NVA) activities require 1,068 hours (44.5 days) and value-added activities require 1,752 hours (73.0 days), for a total cycle time of 2,820 hours (117.5 days).

Compared to the current state of the business process (As-Is), the design of the future business process (To-Be) for packaged palm culinary oil has been enhanced (decrease in waste (non-value added) from 39.53 to 37.87 percent and a decrease in cycle time of 37.86 percent).

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