

## **Analysis of Fuel Tank Truck Productivity in Supply Chain Oil and Gas (Case Study: State-Owned Enterprise of Oil and Gas Indonesia)**



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**ABSTRACT:** Fuel oil (BBM) is one of the main needs of Indonesian society. Modes of transportation such as tank cars are needed to be able to distribute fuel from TBBM or depots to distribution institutions for consumption by the public and industrial companies. The strategic role of tank cars in the fuel supply chain is as security of supply, flexibility of supply, and economics of supply. Pertamina uses Third Party Logistics (TPL) services which aim to achieve operational service excellence in the implementation of fuel distribution activities which are influenced by 3 main criteria, namely Men, Machines and Methods. Based on the results of the analysis that has been carried out to be able to distribute fuel on time and efficiently, there are several initiative strategies, namely Route Efficiency and Cargo Co-loading, increasing safety by regularly checking tank cars, and developing AI (Artificial Intelligence) in projecting or forecasting demand. Apart from that, tank car operations are also influenced by several factors such as the route or travel route, the planning and implementation process, tank car maintenance, the health of the tank car crew, and the technology used in operational activities. The costs required for managing a tank car are tank car rental costs, GPS costs and routine maintenance costs.

**KEYWORDS:** Tank Cars, fuel, fuel distribution, tank car management, tank car crew

### **INTRODUCTION**

Fuel oil (BBM) is currently still one of the basic needs for society and the Company's industry in transportation activities. The main problem in fuel supply is Indonesia's geographic location which consists of islands and locations in areas that are difficult to reach by heavy vehicles, so fuel supply planning must be prepared effectively and efficiently in terms of time and cost. PT Pertamina Patra Niaga (PPN) as a Commercial & Trading Subholding under PT Pertamina (Persero) is tasked with distributing fuel and non-fuel products throughout Indonesia, which of course has adequate infrastructure to support the distribution, marketing and sales of fuel and non-fuel products.

Based on the Minister of Energy and Mineral Resources (ESDM) Regulation Number 20 of 2021 concerning Calculation of Retail Selling Prices for Oil Fuel, the components for calculating the retail selling price of certain types of fuel (JBT) are the base price plus Value Added Tax (VAT) plus Fuel Tax Motorized Vehicles (PBBKB), and specifically subsidized fuel, the subsidy value will be reduced. Meanwhile, for the Special Assignment Fuel Type (JBKP), the basic price plus additional distribution costs in the assignment area is 2% of the basic price and plus VAT and PBBKB. The basic price referred to in the formula above consists of acquisition costs, distribution costs, storage costs and margin. The selling price of fuel in accordance with the Minister of Energy and Mineral Resources regulations above is greatly influenced by logistics and distribution costs. According to Bräysy & Gendreau (2005), distribution costs can reach 75% of the total logistics costs incurred by a company so that optimal planning and strategies are needed so that fuel distribution can run effectively and efficiently.

Fuel plays a very important role in a country's economy, namely as a driving force for transportation modes, fuel for manufacturing machines, and as a commodity that can increase state income. The demand for fuel availability means that every supplier must pay attention to and maintain the reliability of its distribution channels. Pertamina, as one of the fuel distribution institutions in Indonesia, of course pays great attention to the effectiveness of fuel distribution throughout Indonesia. This was done as a real effort by Pertamina to act as a driving force for the economy in Indonesia.

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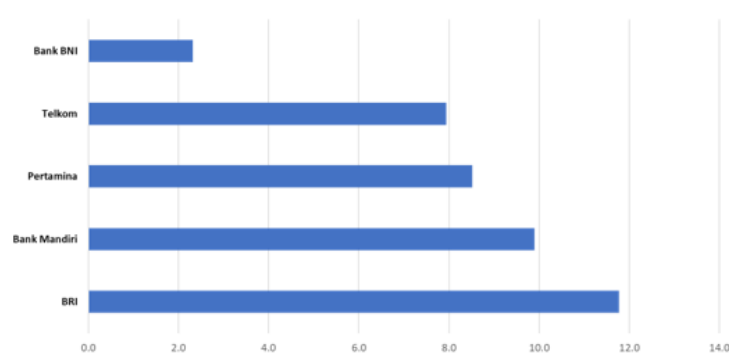


Figure 1. SOEs Contributing the Biggest Dividends in 2020

Sumber <https://newssetup.kontan.co.id/news/ini-5-bumn-penyumbang-dividen-terbesar-bagi-negara-pada-tahun-2020#:~:text=Terperinci%2C%20sumbangan%20dividen%20terbesar%20pertama,Tbk%20sebesar%205%2C%25.>

Pertamina makes a big contribution to the country, as can be seen in Pertamina's financial performance as one of the state-owned companies that contributes the most dividends to the country. This achievement is divided into the income of several Pertamina business segments, where Pertamina's downstream business has a greater contribution in terms of revenue achievement in 2020.

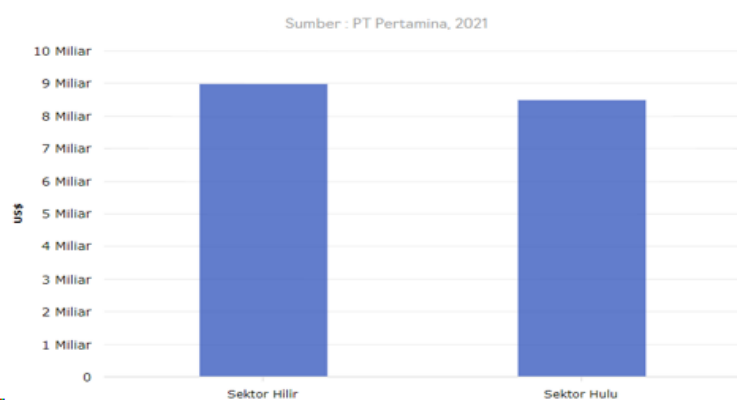


Figure 2. Business Income of PT. Pertamina in 2020

<https://databoks.katadata.co.id/datapublish/2022/02/10/pendapatan-pertamina-tahun-2020-lebih-banyak-disumbang-sektor-hilir>

Pertamina's downstream business performance cannot be separated from the role of transportation in distributing fuel to all corners of the country. The means of transportation used to distribute fuel throughout Indonesia include pipelines, tank cars, rail tank wagons (RTW), tankers and airplanes. This article will focus on discussing land transportation facilities, namely Tank Cars to distribute fuel from Pertamina Depots to the public via Public Fuel Filling Station (SPBU) or Pertashop channels.

The role of land transportation, in this case tank cars, is very important in the distribution of oil fuels, where tank cars are the final sender from the Pertamina depot to gas stations or Pertashop.

### Problem Definition

Land transportation, especially tank cars, is very influential in the fuel distribution system in Indonesia. The main problems in fuel distribution operations are:

- How to distribute fuel on time and efficiently. The location of many fuel depots or terminals (TBBM) and gas stations in Indonesia as well as quite diverse geographical locations is a challenge for Pertamina in distributing fuel.
- What are the factors that influence the operation of Tank Cars in fuel distribution?
- What costs are needed in the operational management of tank cars.

### Objective

The purpose of writing this paper is to find out how the fuel distribution pattern is effective and efficient, what factors influence the operation of tank cars in fuel distribution, and what costs are required for tank car operations.

### Framework

The framework for this writing can be seen in the following flow diagram:

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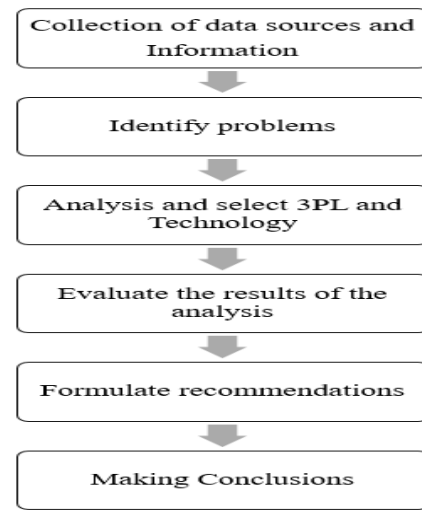


Figure 3. Writing Framework

### LITERATURE REVIEW

#### Transport fuel products to the depot

According to Abduljabar and Tahar (2011), the order needs of several depots can be combined into one order, where officers will create and optimize the number of orders and their travel routes. The rates or fees paid by Oil & Gas Companies to transporter companies are based on the distance per kilometer and the volume of fuel products sent.

#### Driver Scheduling

Goel (2014) used truck scheduling problems in his research to assess the impact on the number of service hours and the impact on operational costs and road safety. The results of the study indicate that the additional costs and benefits of monetized travel safety insurance are in the same order across all regulatory options, but for some cases the benefits of monetized travel safety insurance are above the additional operational costs.

#### Third Party Logistics

Third Party Logistics (TPL) is the activity of outsourcing all or most of a company's logistics operations through a company specialized in logistics management (Novack, Robert.A. 2018). Services provided include inventory management, warehousing, distribution, financial services and transportation.

#### Type of TPL Service Provider

TPL Logistics service providers are divided into several types referring to the basic offerings they provide, including:

- Transportation Based. This is a company that originally provided goods delivery services via transportation and tracing services via transportation via trucks, trains, planes and other modes of transportation.
- Distribution based. This company originally ran a business in warehouse and distribution center rental services, but has now expanded into the logistics business.
- Forwarder based. This TPL includes freight forwarders, brokers and agents who facilitate the flow of goods on behalf of customers.
- Financial Based. Financial Based This category of TPL providers helps customers with monetary issues and financial flows in the supply chain.
- Information based. These companies have digitized many activities that were previously performed manually or required the use of licensed software. They also offer companies access to transportation management systems (TMS)

#### TPL Company Performance.

Measuring the performance of a TPL company can use several Key Performance Indicator parameters including (Stokes, Jordan. 2021):

- On-Time Shipping Percentage. This is an important criterion in measuring the performance of a TPL company where 87% of companies include this parameter in their KPI list.
- Shipping Accuracy. Not only speed, but also accuracy of delivery is an important factor and is the KPI of a TPL company
- Order Accuracy. The same as shipping accuracy, order accuracy is the accuracy of the contents of the goods between the goods ordered and the goods delivered.

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- d. Inbound Receiving Time. Speed in unloading goods that have been delivered, or what is called dock-to stock, is also an important parameter in selecting a Third Party Logistics company. The faster dock-to-stock will reduce the potential for out-of-stock items and result in loss of revenue.
- e. Order Time-to-Fill. One factor in choosing a TPL company is that the company has good order time-to-fill because that means there are no shipping delays.
- f. Inventory Accuracy. Without good inventory accuracy management, it will be difficult to calculate revenue or project future demand. So accuracy is needed in recording accuracy with the use of a good system.
- g. Time to Process Return. In reverse logistics, there is a need to return goods or returns. So one of TPL's performance in this case is the speed in carrying out the return process (typically 48 to 72 hours).
- h. Return Rate Due to Shipment Damage or Error. The percentage of goods returned due to handling damage during the delivery process is also one of the factors for choosing a good TPL. The lower the return of goods due to damage during delivery, the better the TPL company.
- i. Cost Per Unit Shipped. The appropriate costs will differ depending on the type of goods and handling that needs to be prepared during delivery. The more competitive the price, the better, if it is balanced with the good performance of the TPL company.

### Operational Analysis of Fuel Tank Cars

#### *The Strategic Role of Tank Cars in the Fuel Supply Chain*

In Indonesia, fuel products are produced from refineries located in 6 (six) locations spread across the islands of Sumatra, Java, Kalimantan and Papua.

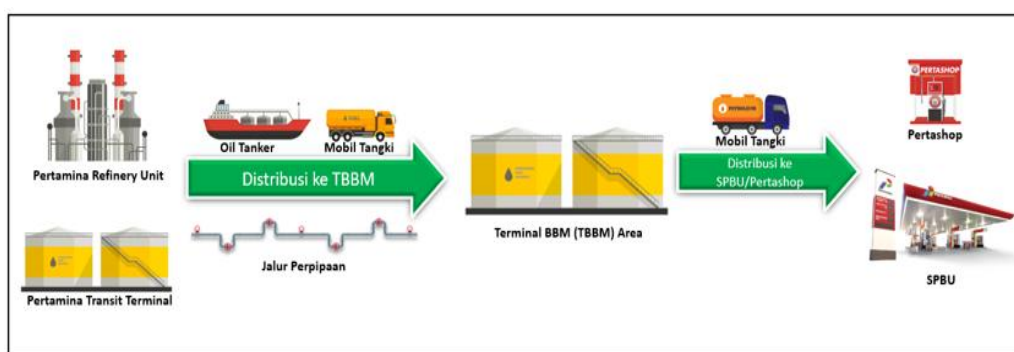


Figure 4. General description of fuel distribution

In Figure 4, it can be seen that the Tank Car transportation mode is responsible for sending or moving fuel products that have been processed at the Refinery to the Oil Fuel Depot or Terminal (TBBM) and then to distribution institutions such as Fuel Filling Stations/Pertashop.



Figure 5. Location map of regions/fuel distribution centers in Indonesia

This mode of transportation is very important for the fuel supply chain throughout the country considering that Indonesia, apart from consisting of islands, also has a diverse geographic location, and remote areas can only be reached by tank cars even though the terrain is quite difficult.

The strategic role of tank cars in the Supply Chain and Distribution is as follows:

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- Security of Supply, namely to guarantee the availability or security of fuel supply throughout Indonesia.
- Flexibility of Supply, namely being able to reach remote areas, so that people in remote areas can also feel the benefits of BBM.
- Economic of Supply, namely being able to open up new jobs as drivers and maids as well as opening up partnerships with transporters (tank car fleet owners).

The aim of the three roles above is to provide good service to customers, supply point effectiveness, reduce illegal supply channels, increase distribution productivity, as well as reliability and an integrated system.

### Pattern of the Fuel Distribution Process

The fuel distribution process using tank cars from the fuel terminal can be described in detail in the process diagram as follows:

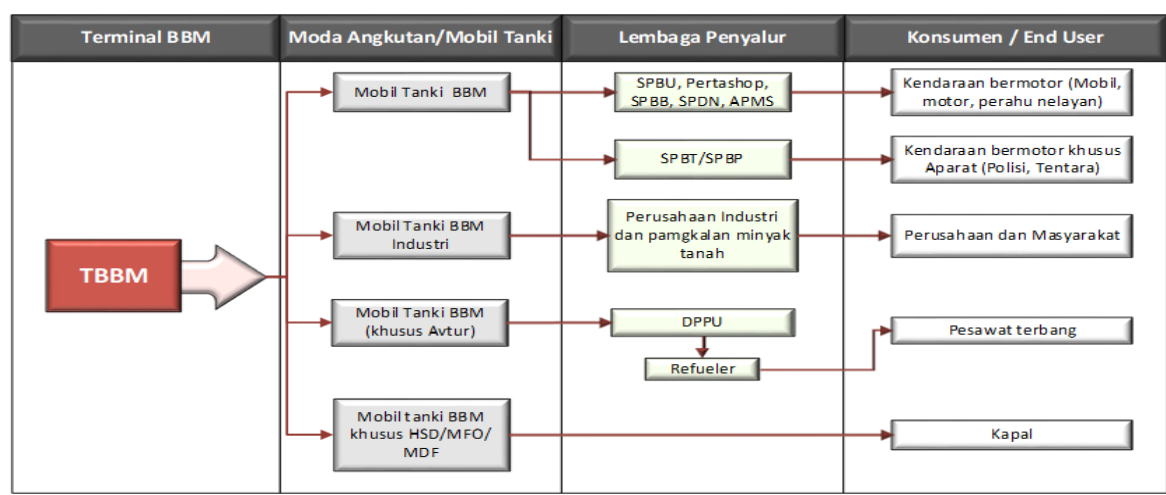


Figure 6. Fuel distribution process using tank cars

In Figure 6, you can see the fuel distribution pattern from the fuel terminal to consumers. In distribution, tank cars are divided into 4 categories, namely:

- Fuel tank cars that will distribute fuel through distribution institutions such as Public Fuel Filling Stations (SPBU), Pertashop, Bunker Fuel Filling Stations (SPBB), Solar Packed Fisherman Dealers (SPDN), and Diesel Oil Premium Agents (APMS), for later consumed by end consumers who use motorized vehicles. Apart from that, BBM/BBK tank cars also distribute specifically to TNI Fuel Filling Stations (SPBT) and Police Fuel Filling Stations (SPBP) whose consumers are TNI and police officers.
- Industrial fuel tank cars distribute fuel to industrial companies and kerosene bases.
- The Avtur Special Fuel tank car distributes Avtur through the DPPU which will then be transported from the DPPU using a Refueler (special car for filling BBK to aircraft) to refuel the aircraft.
- HSD/MFO and MDF type oil tank cars are tank cars that contain ship fuel. In this case, from TBBM, the fuel will be directly distributed to the ship.

### Operational Problems

Tank car management is necessary so that operations can run optimally effectively and efficiently, orderly, safely and smoothly in accordance with Government standards and regulations while still prioritizing customer service and satisfaction. This transportation management follows technological developments by using an integrated system to control tank car activities starting from the driver, location and travel route, as well as costs that arise. Operational service excellence in Tank Car management cannot be separated from the Men, Machines and Methods criteria.

Several operational considerations and problems that will be faced in tank car operations are as follows:

#### Distribution locations and routes

Indonesia is an archipelagic country consisting of 17,508 islands. The obstacles faced in fuel distribution are geographical location and the routes that will be taken. This will of course affect delivery times and costs. Many factors influence the choice of fuel distribution route, such as the geographical conditions of an area, the type of vehicle, the type of fuel distributed, and the driver's health.

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In supporting fuel trading activities in Indonesia, Pertamina as a domestic energy company has more than 140 depots/TBBM spread throughout Indonesia (pertaminapatraniaga.com, accessed on April 17 2022). Fajriyah Usman (Vice President Corporate Communications Pertamina) explained that as of June 2020 Pertamina as a whole had operated 7,026 gas stations spread throughout Indonesia (Sulestyono, 2020). In 2022, the number of Pertamina gas stations will reach more than 7,400 gas stations. In Indonesia, there are still many routes or transportation routes that are not suitable for tank cars, especially in remote and underdeveloped areas. Based on Pertamina's press release (2017), in order to support the one price fuel program in accordance with Minister of Energy and Mineral Resources Regulation No. 36 of 2016 concerning the Acceleration of Implementation of One Price for Certain Types of Fuel (JBT) & Special Assignment Types of Fuel (JBKP) nationally, Pertamina established SPBU One of the modular ones is in Paloh District, Sambas Regency, West Kalimantan, which is located in a location that is quite difficult to access. The fuel supply for the Modular SPBU comes from TBBM Pontianak which is 260 km from the SPBU with a travel time of up to 8 hours. This is because part of the terrain is still dirt, making it difficult for Pertamina Tank Cars to travel. Unsuitable travel terrain certainly has the potential for Tank Cars to experience safety problems such as falling or slipping, so drivers are required to be more alert and careful and drive in a fit to work condition.

### Planning and Implementation of fuel distribution with a fleet of Tank Cars

Planning and implementation of fuel distribution operations using the Tank Car fleet at Pertamina is generally as follows:

The planning process includes:

- Preparation for the availability of Tank Cars or commonly known as Tank Truck Scheduling.
- Combine Loading Order with the Tank Car that will be used. The input data that will be combined is the Loading Order number, Tank Car police number, tank car crew identity, and seal number.
- Carrying out readiness checks for tank cars and tank car crews (drivers and drivers)



Figure 7. Illustration of distribution of fuel, LPG, Avtur

The implementation process includes:

- Fill fuel in tank cars through the filling shed in accordance with the Loading Instructions.
- Before carrying out transportation, Tank Car Crews are required to check the quality of the fuel being transported through a Certificate of Quality (COQ).
- Physical inspection of the loading results in the Tank Car which consists of checking the after loading volume compared to the volume in the Loading Order and if the entire physical inspection process up to delivery approval is complete then a sealing activity will be carried out.
- Next, the process of transporting fuel from the TBBM/Depot to the Distribution Agency is carried out at a maximum tank car speed of 40 km/hour (if empty, the maximum speed is 60 km/hour).



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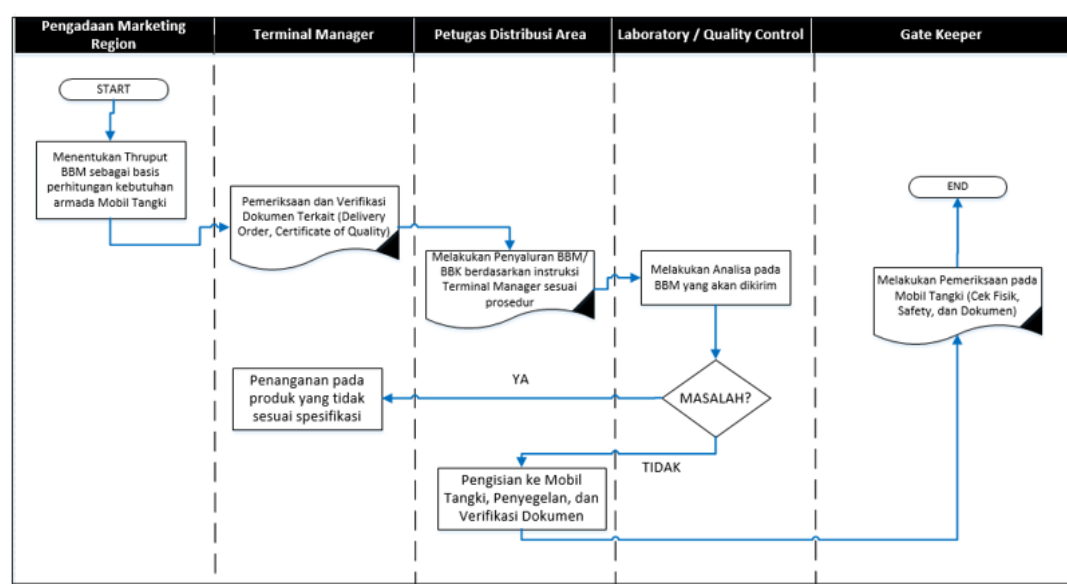


Figure 8. Procedure for filling fuel in tank cars at TBBM

The tank cars used have different capacities, so it is necessary to schedule tank cars according to the number of orders and tank car capacity. The capacity of Tank Cars at Pertamina is as follows:

Table 1. Tank Truck Capacity

No	Capacity (Ltr)	Remarks
1	8,000	Consists of 1 compartment. Only 1 type of fuel can be used
2	16,000	Consists of 2 compartment. Only 2 type of fuel can be used
3	24,000	Consists of 3 compartment. Only 3 type of fuel can be used
4	32,000	Consists of 4 compartment. Only 4 type of fuel can be used
5	40,000	Consists of 5 compartment. Only 5 type of fuel can be used

The Planning and Implementation process cannot be separated from several potential risks including:

1. Loading Order input error with paired Tank Car or vice versa. The causes of input errors include negligence by officers in the input process (human error) or system errors in integrating data.
2. The seal is not in good condition and/or the sealing is not perfect which has the potential for fraud. This can be caused by, among other things, a weak seal checking process during the seal receiving process by the Quality department or inaccuracy of the tank car crew in carrying out the sealing so that the sealing is not perfect.

### Pricing (Tank Car Rental Costs)

Tank car management rental costs are in accordance with the literature review, namely based on the number of distances per kilometer and the volume of fuel products sent (Abduljabar and Tahar, 2011). The Tank Car rental rate formula is based on an agreement or rental pattern contract between the User Company and the Tank Car Rental Service Provider Company as Third Party Logistics (TPL). Tank Car rental patterns at Pertamina include the following:

1. The management of tank cars with a tariff pattern, namely the Rupiah rate per Kiloliter per Kilometer of distance traveled (Rp/KL/KM) and major maintenance is the responsibility of TPL.
2. All-in tank car management is based on a rental pattern, all-in transportation rates (Rp/L) including fuel own use costs (fuel use for tank car operations), and major maintenance is the responsibility of TPL.

In this case study, the rental pattern used by Pertamina is an all-in rental pattern, where the components that form the Tank Car rental price are as follows:

- The applicable Own Use fuel price
- The fuel price per liter is in accordance with the agreement
- The all-in tariff on fuel prices is in accordance with the agreement

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Calculating the all-in tariff can use an interpolation formula, namely to calculate the all-in tariff on the own-use fuel price which is between the two fuel prices in the all-in tariff agreement vs the fuel price. Meanwhile, the extrapolation formula can be used if the non-subsidized fuel price is lower than the lowest fuel price or higher than the highest fuel price from the agreement that has been made.

Apart from the tank car rental fee, there is a GPS fee. GPS costs, namely the costs paid by the Company, are calculated based on the GPS rates determined according to the Availability Factor in the volume of fuel transported. GPS costs can be calculated based on operational recapitulation of GPS usage. Parameters in determining the GPS rental fee formula must be agreed in the Tank Car Management Contract, such as GPS tariff (Rp/L) and Thruput Volume (L).

### *Cost (Operating Costs)*

Maintenance operational costs are divided into 2 (two), namely routine and non-routine maintenance. Routine maintenance is tank car maintenance carried out according to a predetermined schedule, while non-routine maintenance is maintenance such as car engine overhauls or other major maintenance. Tank Car operational costs at Pertamina include routine maintenance costs and light repairs such as:

1. Maintenance of Head Truck, Dump Vent, Bottom Loading System, Interlock system.
2. Replace oil/lubricant, brake fluid, power steering fluid, filters and other spare parts as needed when the replacement time has reached according to the vehicle's routine maintenance schedule.
3. Replacement of Tank Car units or parts if there is damage or other problems that cause the Tank Car to be unable to operate, such as tire damage.
4. Tank Car Cleanliness includes cleanliness of the car body and tank, interior cabin, engine and other equipment such as spill kits, tool kits, HSSE kits.
5. Implementation of re-terracing of measuring tanks for tank cars by the Metrology Service
6. GPS Maintenance

Meanwhile, non-routine maintenance such as engine overhauls or other major maintenance is the responsibility of the rental service company (TPL). Duties and responsibilities for routine maintenance and repairs must be based on the agreement in the Contract. For example, in the All-in rental contract, if the above routine maintenance and repair activities are included in the TPL's duties and responsibilities then all maintenance or replacement costs will be billed to the renting company, however if the routine maintenance and repairs are outside the agreed schedule then the costs incurred becomes a burden on TPL. Operational costs incurred must be in accordance with actual conditions, so monitoring or maintenance checklists are needed so that maintenance history is documented and costs incurred are in accordance with needs.

### *Driver Health and Safety*

Maintaining safety while traveling is the main point in driving a vehicle which is usually called safe driving. Internal factors and external factors are two factors that influence safe driving. According to Elmayanti et al. (2019), internal factors are the driver's age, education, length of service, knowledge, training participation, role of superior, and role of co-workers. Meanwhile, external factors include weather conditions and the road that will be passed. However, vehicle condition factors can also influence safe driving.

The results of research conducted by Elmayanti, et al. (2019) there are 5 (five) variables that most influence safe driving, namely work period, participation in education and training, role of co-workers, road conditions and weather conditions. Therefore, it is important for drivers to be provided with provisions such as attending education and training related to safety driving.

At Pertamina, tank car drivers before loading the cargo will carry out a health check first. The health check process includes medical officers who will conduct interviews and carry out minor checks such as blood pressure, alcohol level and concentration level on the driver. If the driver is declared fit to work then he will proceed to the next procedure to pick up the fuel load. If the driver is declared unfit then it will be recommended to replace the prospective driver.

Fatigue is also a factor that influences driver health and driving safety. The results of research by Carlos et al. (2016) factors that influence fatigue include the duration or length of driving time, the quality of the driver's sleep, and the amount of working time. Apart from that, the research results of Salsabila, et al. (2022) the duration or length of driving time has quite a significant effect on work productivity.

The factors that influence health above will ultimately influence work productivity that is not optimal, so that it will affect the Company's performance. The driver's health will also affect safety driving because driving high-risk vehicles such as tank cars requires quite high concentration, if they are not healthy there is the potential for accidents to occur.



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### Analysis of Third Party Logistics (TPL) Selection

#### Key Performance Indicators

Several Key Performance Indicator (KPI) elements that can be used as evaluation material for selected Third Party Logistics include the following:

1. Vehicle management
2. Operational Management
3. Maintenance Management
4. HSSE Management
5. Organizational Management, Administration, Finance and Customer Service
6. IT Management

The six KPI elements aim to achieve operational service excellence in the implementation of fuel distribution activities to gas stations and Pertashop using a fleet of tank cars from third parties. The following is an example of Key Performance Indicator Parameters for tank car transporter performance:

**Table 2. Examples of KPI Parameters for Tank Car Transport Partners**

No	Parameter KPI	Aspect	Unit	Frequency	Target	Score
1	Compliance Order Scheduling MS2	Min	%	Monthly	100%	20%
2	Tank Truck Utilization	Min	%	Monthly	100%	20%
3	Tank Truck Productivity					20%
	Tank Truck Millage Utilization	Min	Km/MT.day	Monthly	As Contract	
	Tank Truck Capacity Utilization	Min	KL/MT.day	Monthly	As Contract	
	Tank Truck Ritase	Min	KM/MT.day	Monthly	As Contract	
4	Tank Car Crew Productivity	Range	KM/AMT.day	Monthly	As Contract	15%
5	Utilization of Tank Car GPS	Min	%	Monthly	100%	10%
6	ODI Feedback Follow-up	Min	%	Monthly	100%	5%
7	Compliance Tank truck Auto Scheduling	Min	%	Monthly	95%	5%
8	Training & Meeting	Min	times	Monthly	5	5%

### Third Party Logistics (TPL) Selection Process

Pertamina is an energy company whose core business is running an integrated oil, gas and renewable energy business. The core business is not related to the distribution process (lack of competencies), especially land transportation, namely the distribution of fuel using tank cars. So, in carrying out the function of distributing fuel to gas stations or Pertashop, Pertamina partners with transport companies. The reason for outsourcing this activity is to make distribution costs efficient (cost sharing), minimize risk (risk sharing) and improve customer service. This can only be achieved by outsourcing through selecting a competent and professional transport service company (TPL).

The process of selecting Third Party Logistic partners in transportation services or transporters for fuel to gas stations and/or Pertashop has several stages that have been determined by the company. Several consideration factors used in selecting TPL partners / transporters include (Aguzezoul, Aicha. 2014):

1. Cost. Cost is the main consideration factor in selecting a transport partner (Third Party Logistics), which refers to the total costs of outsourcing activities. Cost considerations include price, cost reduction, low distribution costs, expected rental costs, operational costs, warehouse rental costs, and cost savings. Costs or cost-based patterns for transport companies depend on the number of loads and the distance traveled.
2. Relationship (Risk share). Consideration in terms of risk sharing regarding damage, accidents and fire to fuel that is being distributed by tank cars
3. Services & Quality. Guarantee of service and quality of transporters in carrying out fuel distribution activities
4. Information and Equipment Systems. Relating to the equipment and information systems owned by transport companies to support their performance in communicating and executing fuel (BBM) distribution.
5. Flexibility & Delivery. The ability to adapt to changing customer needs, including being able to accommodate future needs, being responsive to the target market, and having a good response time.

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6. Professionalism. Transporters have good skills and knowledge of the industry they are running, able to demonstrate punctuality. Professionalism is characterized by attributes such as competence, expertise, and experience.
7. Financial Position. Good financial performance from transporters can guarantee continuity of service, and the ability to improve services in terms of rejuvenating equipment used for company operations.
8. Location. This is related to distribution area attributes, competency specialization in certain geographic areas, marketing areas, and distance.
9. Reputation. In connection with customer opinions regarding the performance of transport companies referring to the quality of service in the past. These elements are taken into consideration in selecting transport partners and the decision is taken by the Supply & Distribution (S&D) Function at the Head Office, and monitoring of company performance is reported regularly by BBM Distribution Depots throughout Indonesia.

### Technology Analysis

#### Types of Technology and Their Uses

Technology also plays a role in supporting the smooth operation of fuel distribution to gas stations and Pertashop using tank cars. Some types of technology applied include:

- New Gantry System (NGS): Automation of the tank car filling system or modernization of the tank car filling system. NGS is a system to support the integrated fuel distribution and delivery process at the fuel terminal. All activity processes starting from the tank car entering the TBBM, the filling process, until leaving the TBBM are monitored from the control room.
- Automation Truck Scheduling System: Integrated ordering system via the MS2 application, namely a fuel ordering program from gas stations to Pertamina using SMS or mobile application. MS2 is software developed to plan fuel deliveries from depots based on input or demand from gas stations and stock stability data at gas stations which can be monitored in real time. This application combines order requests with the readiness of the tank car transporting it and the tank car crew who will be on duty. This application will later be connected to the MySAP enterprise system to process shipments and outbound fuel stock inventory from the depot (sales data).

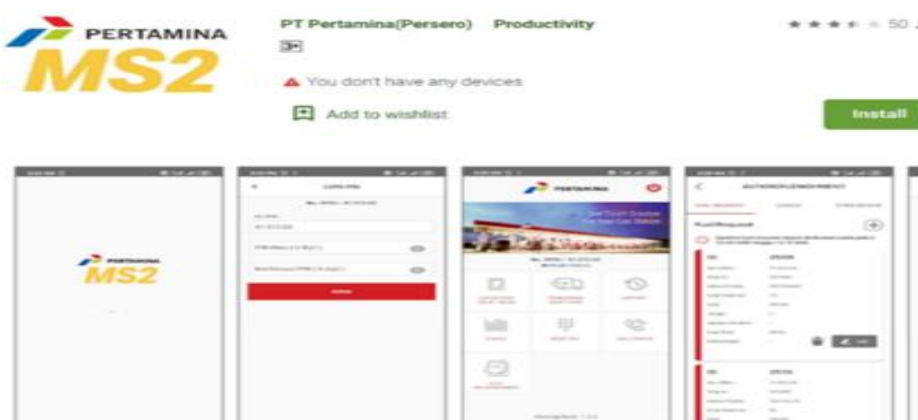


Figure 9: MS2 application in the AppStore for Android platform gadgets

- SmartMT (Smart Mode Transportation): Installation of features that support tank truck safety. There are 15 features in this SmartMT system, namely Controller Overhead Thermal Sensor, Safety Induction Voice, Driver True Sensor, Drive Behavior Sensor, Fuel Consumption Sensor, Tire Pressure Sensor, Brake Pressure Sensor, Product Level Sensor, Pneumatic Seal Sensor & EDR/Blackbox, Auto Route Navigate, Auto Maintenance System, Electronics Sensor System, Legality Sensor System, Safety Distance & CCTV Sensor, Face Fatigue Sensor. So, with the presence of SmartMT, it is hoped that it can improve safety factors in tank car operations and reduce the number of accidents.
- Online Delivery Info (ODI) is an application that can be accessed by gas stations to monitor the status of orders and the position of MTs sending to gas stations via the Online GPS Tracker installed on the Tank Car.

#### Problems in technology implementation

New technology certainly requires adjustments to be implemented and sometimes there are obstacles in its implementation. Some of the obstacles that arise include:

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1. It is necessary to adapt and provide knowledge through training to technology users, namely workers at fuel distribution depots, tank car crews, and gas station or Pertashop managers.
2. System disruption due to network (internet) problems or malware attacks.
3. Damage or poor sensor accuracy.
4. GPS tracker not detected and synchronization problems

However, this technology has helped in distribution operational activities such as scheduling, accuracy of fuel filling in tank cars, and driving safety. Apart from that, in the financial aspect, with the above technology, the recording of oil and financial flows is more reliable and accurate because it uses real-time data and there is security of data where only authorized parties can access the system. Then, from a commercial aspect, service levels can be increased because order monitoring and tank car position monitoring can be carried out. On the other hand, technology continues to progress, so Pertamina still has to upgrade the technology it already has to support operational, financial and commercial activities.

### Solution

#### Objectives and Evaluation Criteria

Criteria are needed to assess whether business processes are running well in accordance with Company rules and restrictions. In managing land transportation, especially Tank Cars, there are 3 main criteria that influence the operational management of Tank Cars, namely Men, Machines and Methods. Table 3. Explains in more detail the three criteria.

**Table 3. Evaluation Criteria Matrix for Tank Car Management.**

No	Criteria	Evaluation of Criteria	Objective
1	Men	<p>For prospective Tank Car Crew:</p> <ul style="list-style-type: none"> <li>• Carry out competency and certification tests for prospective tank car crew members.</li> <li>• Carry out a health test and interview test.</li> </ul> <p>For Tank Car Crew workers:</p> <ul style="list-style-type: none"> <li>• Periodic physical and health checks before working (driving).</li> <li>• Upskilling by taking training related to safety driving and other related materials.</li> </ul> <p>Prospective tank crew members are declared worthy of being accepted or able to drive a tank car if they meet the qualification requirements, including passing competency and certification tests related to tank cars, passing a medical test, having a B2 driver's license, and passing an interview. Meanwhile, Tank Car Crew workers before work have carried out a health test with the results of being fit for work.</p>	Obtain competent and healthy Tank Car Crew (Men) and prevent incidents caused by lack of competence and unhealthy
2	Machines	<p>Routine and non-routine maintenance of tank cars. A tanker car is declared fit for operation if:</p> <ul style="list-style-type: none"> <li>• There is evidence of routine maintenance in the form of checklists and maintenance monitoring such as adding or replacing oil, brake fluid, brake and clutch linings, filters, and replacing other spare parts if necessary</li> <li>• During routine checks before use, there are no problems with the tool and it can be used normally.</li> <li>• There is evidence of non-routine (major) maintenance according to schedule such as replacing tires and other equipment.</li> <li>• There is a work plan or schedule for routine and non-routine maintenance</li> </ul>	Prevent incidents from occurring due to vehicle suitability issues and issues related to environmental pollution
3	Methods	<p>TBBM/Depot workers and Tank Car Crew are declared fit to do their work if they understand their duties and responsibilities, namely being able to carry out operational activities such as the distribution process, procedures for using tools in the filling shed and Tank Car, and are able to carry out their work using technology in the Company.</p> <p>There is a determination regarding routes and distribution patterns (grouping / non-grouping) with the shortest and safest distance routes.</p>	<ol style="list-style-type: none"> <li>1. TBBM/Depot workers and Tank Car Crew can reliably carry out the distribution process, use tools in the filling shed and Tank Car, as well as use technology or applications.</li> <li>2. Fuel distribution is carried out effectively and efficiently by selecting optimal and safe routes and arriving at the destination on time so that customer satisfaction is maintained.</li> </ol>

### Selection of Tank Car Management Strategy

In improving the management performance of Tank Car operations, it is necessary to carry out strategic initiatives to support operations that continue to run effectively and efficiently and provide added value to the Company. The strategies that can be chosen include:

- Route Efficiency and Co-load cargo: adopting the milkrun concept for multi-station supply in one direction to save transportation costs and efficiency and increase utilization of the tank car fleet
- Increase safety by regularly checking tank cars and tank car crews, conducting regular safety driving or defensive driving training for tank car crews.

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- Development of AI (Artificial Intelligence) in projecting or forecasting gas station demand so that the fuel distribution process can take place more effectively and efficiently.

### **RECOMMENDATION**

To improve tank car management performance, it is recommended that the Company:

1. Conduct studies on the closest and safest Tank Car travel routes or routes to make them more efficient in terms of time and costs.
2. Carry out routine monitoring and maintenance of Tank Cars
3. Carry out routine upskilling for Tank Car Crews related to safety driving
4. Make a cost and benefit study for AI development plans in forecasting demand.

### **CONCLUSION**

Fuel distribution activities are one of the processes in the supply chain which is very important because it is related to the basic needs of the Indonesian people. The role of Tank Cars in economic growth in Indonesia is to be able to distribute fuel with optimal capacity, efficiently and reliably via the most optimal path or route in order to reduce transportation costs and reduce transit time thereby increasing work productivity. Apart from that, the strategic role of tank cars in the fuel supply chain is as security of supply, flexibility of supply and economics of supply.

Operational problems in managing Tank Car activities include selecting the path or route that will be passed to determine the optimal travel distance where there is still a lot of road infrastructure that is not in proper condition, especially for remote and underdeveloped areas. In addition, the planning and implementation of tank car operations must be in accordance with applicable company procedures to mitigate identified risks so that incidents or accidents do not occur. The tank car rental fee is based on the agreed rental pattern, namely in the form of a rental fee with a tariff pattern, namely based on the number of loads and distance traveled (Rp/KM/KL) or an all-in rental pattern calculated using the Rupiah rate per liter (Rp/L). Tank car operational costs consist of routine maintenance costs. The health and safety of the driver is also an important factor in traveling, it is necessary to ensure the driver's health condition and understanding of correct driving procedures (defensive driving capability).

In managing tank car operations, Pertamina uses Third Party Logistics (TPL) services which aim to achieve operational service excellence in the implementation of fuel distribution activities to gas stations. The selection of TPL partners / transporters takes into account several factors such as Cost, Relationship, Services & Quality, Information and Equipment System, Flexibility & Delivery, Professionalism, Financial Position, Location and Reputation. Operation service excellence is influenced by 3 (three) main criteria, namely Men, Machines and Methods.

Pertamina has used technology to support distribution operational activities using Tank Cars including the New Gantry System (NGS), Automation Truck Scheduling System, SmartMT (Smart Mode of Transportation), and Online Delivery Info (ODI). This technology helps in distribution activities such as scheduling, accuracy of filling fuel in tank cars, recording oil and financial flows, driving safety, as well as monitoring orders and position of tank cars.

Based on the results of the analysis that has been carried out, to be able to distribute fuel on time and efficiently, initiative strategies can be implemented in tank car management such as route efficiency and cargo co-loading, increasing safety by regularly checking tank cars, and developing AI (Artificial Intelligence) in projection or forecasting demand. Apart from that, tank car operations are also influenced by several factors, namely the path or route of travel, the planning and implementation process, tank car maintenance, driver health, and the technology used in operational activities. The costs required for managing a tank car are tank car rental costs, GPS costs and routine maintenance costs.

### **REFERENCES**

- 1) Peraturan Menteri Energi dan Sumber Daya Mineral (ESDM) Nomor 20 Tahun 2021 tentang Perhitungan Harga Jual Eceran Bahan Bakar Minyak
- 2) Peraturan Menteri ESDM No.36 Tahun 2016 tentang Percepatan Pemberlakuan Satu Harga Jenis BBM Tertentu (JBT) & Jenis BBM Khusus Penugasan (JBKP) secara nasional
- 3) Abduljabbar, W., K., & Tahar, R., M. 2011. A case study of petroleum transportation logistics: A decision support system based on simulation and stochastic optimal control. *African Journal of Business Management*, 6(11), 4350-4361.
- 4) Aguezoul, Aicha. 2014. Third-party logistics selection problem: A literature review on criteria and methods. France: Lorraine University.

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- 5) Aziz, Achmad Wildan A. 2019. Optimasi Distribusi Bahan Bakar Minyak Ke SPBU Menggunakan Optimasi Metaheuristik. Surabaya: ITS
- 6) Bräysy, O., & Gendreau, M. 2005. Vehicle Routing Problem with Time Windows, Part I: Route Construction and Local Search Algorithms. *Transportation Science*, 39 (1), 104-118.
- 7) Carlos, D., Yasnani, Afa, J., R. 2016. Faktor - faktor Yang Berhubungan Dengan Kelelahan Pengemudi Truk Tangki di Terminal BBM PT. Pertamina (Persero) Kec. Latambaga Kab. Kolaka Tahun 2016. *Jurnal Ilmiah Mahasiswa Kesehatan Masyarakat*, 1(4), 1-10.
- 8) Elmayanti, Nuddin, A., Majid, M. 2019. Analisis Kondisi Internal-Eksternal Pengemudi Mobil Tangki Dalam Peningkatan Safety Driving PT Elnusa Petrofin di Kota Parepare. *Jurnal Ilmiah Manusia dan Kesehatan*. 2 (2), 269-283.
- 9) Goel, Asvin. 2014. Hours of service regulations in the United States and the 2013 rule change. *Transport Policy*, 33 (2014), 48 – 55.
- 10) Novack, Robert.A. 2018. *Transportation : A Global Supply Chain Perspective*. Boston: Cengage.
- 11) Pertamina. "Usaha Hilir", <https://www.pertamina.com/id/downstream>, diakses pada 17 April 2022 pukul 17.25.
- 12) Pertamina Patra Niaga. "Penyimpanan dan LPG Depot", <https://www.pertaminapatraniaga.com/penyimpanan>, diakses 17 April 2022 pukul 17.30.
- 13) Prismono. 2020. "Tahun 2020, Pertamina Terapkan Digitalisasi SPBU", <https://petrominer.com/tahun-2020-pertamina-terapkan-digitalisasi-spbu/>, diakses pada 14 April 2022 pukul 09.55.
- 14) Salsabila, M., M., Setyawan H., Narendra A., A., A., K., E. 2022. Hubungan Durasi Mengemudi dan Kualitas Tidur Dengan Produktivitas Kerja AMT PT Pertamina Patra Niaga TBBM Boyolali. *Jurnal Kesehatan Masyarakat*, 6 (1), 583-589.
- 15) Sari, Fitriana Monica. 2017. "Fakta Menarik Mobil Tangki Pertamina yang Jarang Diketahui", <https://www.liputan6.com/bisnis/read/3123218/fakta-menarik-mobil-tangki-pertamina-yang-jarang-diketahui>, diakses pada 25 April 2022 pukul 12.30.
- 16) Sulestyono, Eko. 2020. "Jumlah SPBU Dipastikan Terus Bertambah di Indonesia", <https://rri.co.id/humaniora/info-publik/847020/jumlah-spbu-dipastikan-terus-bertambah-di-indonesia>, diakses pada 17 April 2022 pukul 22.54.
- 17) Siaran Digital Bisnis.com. 2020. "Pertamina Bangun 178 Titik BBM Satu Harga", <https://ekonomi.bisnis.com/read/20201023/44/1308911/pertamina-bangun-178-titik-bbm-satu-harga>, diakses pada 14 April 2022 pukul 11.17.
- 18) Siaran Pers Pertamina. 2017. "Warga Paloh Kalbar Nikmati BBM 1 Harga", <https://www.pertamina.com/id/news-room/news-release/warga-paloh-kalbar-nikmati-bbm-1-harga>, diakses pada 18 April 2022 pukul 23.30.
- 19) Siaran Pers Pertamina. 2018. "Pertamina Tambah Fasilitas New Gantry System untuk Terminal BBM Panjang", <https://www.pertamina.com/id/news-room/energia-news/pertamina-tambah-fasilitas-new-gantry-system-untuk-terminal-bbmpanjang#:~:text=NGS%20adalah%20sistem%20untuk%20mendukung,TBBM%20termonitor%20dari%20control%20room>, diakses pada 19 April 2022 pukul 12.33.
- 20) Stokes, Jordan. 2021. "9 Key Performance Indicators for Monitoring 3PL Operations", <https://www.channelape.com/blog/9-key-performance-indicators-kpis-for-monitoring-3pl-operations>, diakses pada 14 April 2022 pukul 11.01.
- 21) Wibowo, Gayuh Satriyo. 2021. "Intip Nih Deretan Teknologi Canggih di Truk Tangki BBM, Ada Sensor Antimaling Muatan Lho!", <https://www.gridoto.com/read/222938396/intip-nih-deretan-teknologi-canggih-di-truk-tangki-bbm-ada-sensor-antimaling-muatan-lho>, diakses pada 14 April 2022 pukul 10.30.



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