Modeling simulation application Monte Carlo method for LPG distribution

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Abstract. The purpose of writing this journal is to create a model and simulation of the distribution of LPG (Liquefied Petroleum Gas) Gas Stock Availability that can meet the needs of Pertamina, agents and bases and existing community elements. The design of this application uses the PHP programming language (Personal Home Page) with a database using My SQL [1]. The method used in the design is Monte Carlo [2], and the test method used is the Black box and Questionnaire methods. Monitoring System for Gas Stock Availability Distribution This Liquefied Petroleum Gas (LPG) tube in Makassar presented report printing criteria. In the form of distribution monitoring report, in the form of proof of purchase transactions of LPG (Liquefied Petroleum Gas) Gas to Pertamina agents and bases in real-time per day, month and year Monitoring System Availability Stock Distribution This LPG (Liquefied Petroleum Gas) Gas Tube in Makassar will also be able to control the LPG (Liquefied Petroleum Gas) stock in each existing agent and base in the form of several a stroke on the monitoring map [3].

1. Introduction
The increasing need for LPG (Liquefied Petroleum Gas) and evenly distributed throughout the region in Indonesia is very influential given the possibility of a surge in the need for LPG (Liquefied Petroleum Gas). The number of requests for LPG (Liquefied Petroleum Gas) in each agent until the assessment is also considered being increasing, to determine the amount of incoming and outgoing LPG (Liquefied Petroleum Gas) stock data information that can be taken as a reference.

Based on the data got through the survey method in the form of interviews with questionnaires and secondary data collection from relevant agencies [2]. The researchers concluded that the need to provide a simulation model that can determine the amount of demand for LPG (Liquefied Petroleum Gas) that occurs every day Pertamina, agents, bases by the community.

This design uses the PHP programming language (Personal Home Page) with a database using My SQL. The aim of research and design is to provide information on the demand for LPG (Liquefied Petroleum Gas) stocks needed every day/week, and month

2. Methods

2.1. Location and time of research
This research was carried out in Makassar, South Sulawesi Province carried out for 10 months starting from December 2015 to October 2018.
2.2. Data source
The data used in this study are LPG (Liquefied Petroleum Gas) documents got from PT. PERTAMINA PERSERO Makassar and the results of interviews in the field with the handling of LPG (Liquefied Petroleum Gas) from Pertamina and parties from several LPG (Liquefied Petroleum Gas) agents in Makassar. Secondary data is in the form of searching as much literature as possible, both from books, the internet and journal references or related research reports and other sources considered supporting research.

2.3. State of the art

Table 1. State Of The Art

| No | Researchers | Research Title | year | Classification |
|----|-------------|----------------|------|----------------|
| 1  | Ilyas Masudin [4] | Facility Location Modeling in Multi-Echelon Distribution System: A Case Study of Indonesian Liquefied Petroleum Gas Supply Chain. | 2013 | Investigate the relationship between distribution costs such as transportation, inventory costs and facility locations in Indonesia's multi-echelon LPG supply chain. |
| 2  | Asri Cahyaningrum and Togar M. Simatupang | An agent-based model for the subsidized LPG with a closed distribution system | 2013 | Differences in the number of requests, ration sharing systems, and inventory supplies affect the improvement of closed distribution systems to target |
| 3  | Aditya Wiralaksana Putra, Ketut Buda Artana, Trika Pitana | Optimization of Scheduling of Shipping Routes for LPG Distribution Vessels at PT. PERTAMINA Based on the Composition Change Scenario, 30% Propan - 70% Butan | 2013 | The output of this research is only a system simulation model. |
| 4  | Eric Broni-Bediako, Ohenewaa Kakra Dankwa | Assessment Of Liquefied Petroleum Gas (LPG) Utilisation In Ghana - A Study At Tarkwa | 2013 | Use of city Tarkwa assessment test as a tool Liquefied Petroleum Gas in Ghana. |
| 5  | Arvind Ankalikar,, Smantha | Supply Chain Management Of Downstream Retail Oil And Gas Products – Imperatives For Next Generation E-Gas Station | 2014 | At the writing of this paper-based system created intelligent GIS that use RFID technology. System used automation. |
| 6  | Amelia Santoso, Dina Natalia Prayogo, JoniartoParung | Integrated Supply Chain Network Model for Allocating LPG in a Closed Distribution System | 2015 | Network model Integrated supply chain to allocate subsidies to Liquefied Petroleum Gas |
2.4. Design research
Research this is a research experimental Where room scope problem could do with method studies library (library research), method field data collection (field research) and design system. In the research, design carried out the researcher used Application Monte Carlo method in modeling simulations carried out guna get results calculations later made into information.

2.4.1. Monte carlo simulation
Research this is a research experimental Where room scope problem could do with method studies library (library research), method field data collection (field research) and design system. In the research, design carried out the researcher used Application Monte Carlo method in modeling simulations carried out guna get results calculations later made into information.

2.4.2. Flowchart

![Flowchart](image_url)

**Figure 1.** Flowchart problem-solving method
3. Results and discussion

3.1. Simulation demand annual
There are 2 stages in request data simulation. First do is simulation magnitude request (order received = volume per each order). Next, it is done simulation date the arrival request. For simulation, the mount request, done with Monte Carlo simulation. For the simulation date, the arrival request, done with formula distribution exponential.

3.2. Volume simulation of each order
Monte Carlo simulation techniques are applied for do estimation (forecasting) of order orders received. Results from request data analysis for one year (2018) shows that pattern demand is not erratic. it showed by the results testing (goodness-of-fittest) using SPSS which concludes not there is distribution theoretical that is right to describe pattern request. because of it is compiled distribution empirical demand shows a pattern, as in Table 2.

Hackl hose class that is then compiled a Monte Carlo simulation model with pattern distribution empirical, like shown in Table 2.

| Range of numbers | Simulation demand | Rounding demand |
|------------------|-------------------|-----------------|
| 0-0.44           | 9.15              | 9               |
| 0.45-0.62        | 23.55             | 24              |
| 0.63-0.67        | 37.95             | 38              |
| 0.68-0.76        | 52.35             | 52              |
| 0.77-0.91        | 66.75             | 67              |
| 0.92-0.93        | 81.15             | 81              |
| 0.94-0.96        | 95.55             | 96              |
| 0.97-1.00        | 109.95            | 110             |

The simulation process was carried out with Microsoft Excel Software because of its ease of aspect in programming mathematical models. In addition, Excel MIS also has a function to generate random numbers to facilitate the simulation process. To obtain results that converge to a stable parameter value, the simulation is carried out several times run (run). One of the simulation outputs, as shown in Table 3.

| Selang waktu perbulan | Selang waktu perhari | Tanggal datangnya permintaan | Bilangan Acak | Banyaknya permintaan |
|----------------------|----------------------|------------------------------|---------------|----------------------|
| 0.081766636          | 2                    | 3                            | 0.76          | 52                   |
| 0.127553549          | 4                    | 7                            | 0.69          | 52                   |
| 0.024484513          | 1                    | 8                            | 0.38          | 9                    |
| 0.059583414          | 2                    | 10                           | 0.24          | 8                    |
| 0.044217436          | 1                    | 11                           | 0.05          | 9                    |
| 0.019324899          | 1                    | 12                           | 0.5           | 23                   |
| 0.024442412          | 1                    | 13                           | 0.71          | 52                   |
| 0.131623941          | 4                    | 17                           | 0.51          | 24                   |
The Monte Carlo simulation technique as described previously can be produced an estimate of the volume of each order and the time interval between (arrival) orders. Further analysis, can be made an estimate of the volume of product demand for one year.

4. Conclusion
From the results research this could conclude, among other conditions probabilistic management te distribution retama determined by the order, the size of the order, time Wait order is of a nature uncontrollable; For resolving a The use of technique simulation for describing situation probabilistic in a period long proven enough effective.

References
[1] Buffa E 1983 *Manajemen Produksi dan Operasi* ed Erlangga (Erlangga)
[2] Joey S 2012 Aplikasi Laboratorium Kimia Virtual Viclab untuk Pelajar SMA Berbasis Android Menggunakan LIBGDX
[3] Gordon G 1978 *Operation Research* ed I Prentice Hall (New Jersey: Prentice Hall, Inc)
[4] Kaligis D A 2018 Web Services Technology Using Liquefied Petroleum Gas (LPG) Availability Coding On The Distribution Area Map To Reach The Community
[5] Masudin I 2013 Facility location modeling in multi-echelon distribution system: A case study of Indonesian Liquefied petroleum gas supply chain *Aceh Int. J. Sci. Technol.* 2 37–43