



# Implementation of The Economic Order Quantity (EOQ) Method in The Web Based Monitoring and Management Application of Heavy Equipment Spare Part Units

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**Abstract.** The Economic Order Quantity (EOQ) method is known as an efficient approach to optimizing inventory by minimizing total inventory costs, including holding costs and ordering costs. In this research, we focus on implementing EOQ in system related to heavy equipment spare parts units, with a web-based approach to facilitate information access and management. This application is designed to monitor and manage spare part inventory effectively, increase management efficiency and reduce the risk of stock shortages. We investigate how implementing EOQ can improve inventory control and optimize order cycles, so organizations can avoid high costs associated with excess or shortage inventory. In addition, this research includes a performance evaluation of web-based application that utilize the EOQ method in the context of heavy equipment units. The results of this research can make a positive contribution to the development of inventory management system, especially for heavy equipment unit, by integrating EOQ principles in a web-based environment. The implementation of this method is expected to bring significant benefits in improving operational efficiency and inventory management in various industries that use heavy equipment units as critical assets in their business processes.

**Keywords:** The Economic Order Quality Method, Heavy Equipment, Application.

## 1 Introduction

Currently, the development of information technology is progressing rapidly. Technology is not only seen as a complement but has become a determinant in achieving that goals or business strategies of a company. This compels companies to provide a system capable of integrating existing information needs, making it easier for the company to make decisions [1]. The competitive advantage of a company compared to its competitors is determined by several key factors, including time, quality, cost, and human resources. Time, in particular, is a primary determinant of competitiveness. If a company aims to achieve a competitive edge in terms of time, the necessary steps

involve the ability to meet consumer demands promptly, as well as identifying and reducing non-value-added activities in the business process. One strategy to attain a time advantage is by focusing attention on raw material management. Therefore, a company's success in achieving a time advantage depends on its ability to efficiently meet the needs of raw materials. With high competitiveness, a company is expected to survive and achieve victory in the global competitive arena [2].

The efficient management of inventory is a critical aspect of successful business operations, and various methodologies have been developed to optimize this process. One such method that has gained prominence is the Economic Order Quantity (EOQ) method. This method plays a pivotal role in determining the ideal order quantity for inventory, minimizing both holding and ordering costs. In the context of heavy equipment spare parts, effective inventory control becomes even more vital due to the intricate nature of the equipment involved [3].

This research focuses on the implementation of the Economic Order Quantity (EOQ) Method in the Web – Based Monitoring and Management Application of Heavy Equipment Spare Part Units. The utilization of the EOQ method in the management of spare parts for heavy equipment holds great promise in enhancing operational efficiency and reducing costs. The integration of EOQ method principles into a web – based system adds an extra layer of accessibility and real – time monitoring, which is particularly crucial in the dynamic environment of heavy equipment operations.

The design and development of a web-based monitoring and management application for heavy equipment spare part units serve as the focal point of this study. This prototype application aims to showcase how the EOQ method can be seamlessly integrated into modern, technology – driven solutions to provide efficient inventory control. The significance of this research lies not only in its theoretical underpinnings but also in the practical implications it holds for industries relying on heavy equipment.

As we explore the implementation of the EOQ method, it becomes evident that its application in a web-based system can revolutionize the way spare parts are managed for heavy equipment units. The potential for cost savings, operational streamlining, and improved decision – making underscores the importance of this research in contributing to advancements in inventory management practices within the heavy equipment industry.

## **2 Literature Review**

According to Kusminai et al 2020 in their journal entitled analysis of raw material inventory control using the economic order quantity (EOQ) method at PT Duta Abadi Primantara Palembang. Stated that in companies there are often problems in controlling raw materials, resulting in suboptimal supervision of the existing raw material inventory control in the warehouse. The result of this study indicates that, based on the determination of raw material control using the Economic Order Quantity (EOQ) method, it is more optimal and efficient compared to the conventional methods established by the company [4].

The research conducted by Sa'adah and Wahyuningsih's 2021, titled Analysis of Economic Order Quantity (EOQ) Method as Raw Material Control at CV Zam – Zam Collections, raw material supply problems often become problems such as shortages of raw materials, causing the production process to not run smoothly. The conclusion of the research is that using the EOQ method results in total cost savings and is also efficient compared to company policy [5].

Based on previous research, it has been found that utilizing the Economic Order Quantity (EOQ) method successfully in helping the problem of controlling raw material supplies in each company. So, the author designed a monitoring and management application for heavy unit spare parts using the Economic Order Quantity (EOQ) Method.

### 3 Research Methodology

#### 3.1 The Economy Order Quantity (EOQ) Method

The Economic Order Quantity (EOQ) Method is one of the inventory management models. EOQ method is highly valuable for determining the order quantity of inventory by minimizing storage costs and ordering costs. EOQ method is also useful for solving problems related to uncertainty through safety stocks [1].

The Economic Order Quantity (EOQ) method is a technique used to optimize the purchase of raw materials (the most economical quantity of material purchase) to minimize inventory costs, ensuring the efficiency of raw material inventory in the company [6].

EOQ formula :

$$EOQ = \frac{\sqrt{2 \times D \times S}}{C} \quad (1)$$

Information :

EOQ	= Economic Order Quantity
D	= Number of request 1 period / year
S	= Costs for each order
C	= Storage costs period

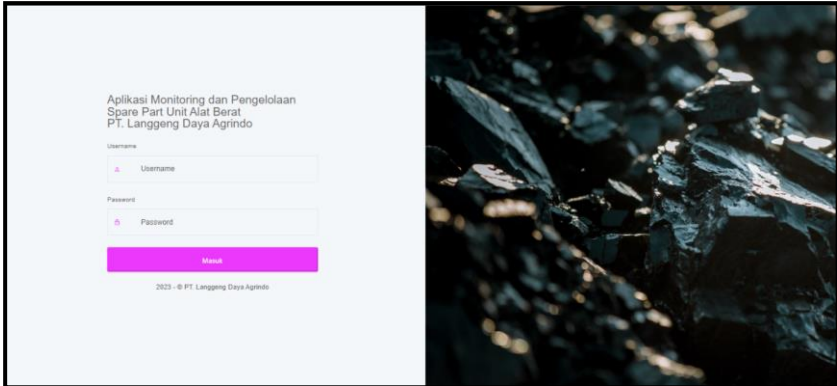
### 4 Result and Discussion

The development of a monitoring and management application for heavy equipment spare parts, created by the author, has resulted in a prototype application using the Economic Order Quantity (EOQ) method based on the web.

#### 1. Page Login Form

The login form function is used for securing the application by assigning access rights to the logistics head, logistics department, and plant department. The logistics department section includes pages for spare part stock, spare part data processing, economic order quantity (EOQ) calculation page, spare part history

page, report history page, spare part request page, and user data page. The logistics head section consists of spare part history page and report history print page. The plant department section comprises spare part data page and spare part request page.



**Fig. 1.** Page Login Form

## 2. Page All Item Spare Part Unit

Here is the display page to show all spare parts that have been entered into the system. The function of the product data menu form is used to display the spare part recording of warehouse.

NO.	ST	Category	Name	Qty
1	ST00036	Consumable	WATER SEPARATOR V06-11110883 VOLVO	72 PCS
2	ST00084	Fast Moving	FILTER AC OUT V06-18052788 VOLVO	95 PCS
3	ST00097	Fast Moving	OIL FILTER ELEMENT 468821 HITACHI	42 PCS
4	ST02214	Fast Moving	CONTACT CLEANER REXCO	158 PCS
5	ST02061	Consumable	RAWAT LAG 3.2 MK1 LB-15U FAMILIAR	75 PCS
6	ST02281	Fast Moving	POWER COOLANT TOP 1	44 PCS

**Fig. 2.** Page All Item Spare Part Unit

## 3. Page Incoming Spare Part Form

This page contains a form that functions to input incoming spare part data such as document number, entry date, supplier name, and quantity. It includes a submit button and a form displaying the spare part data entered by the user

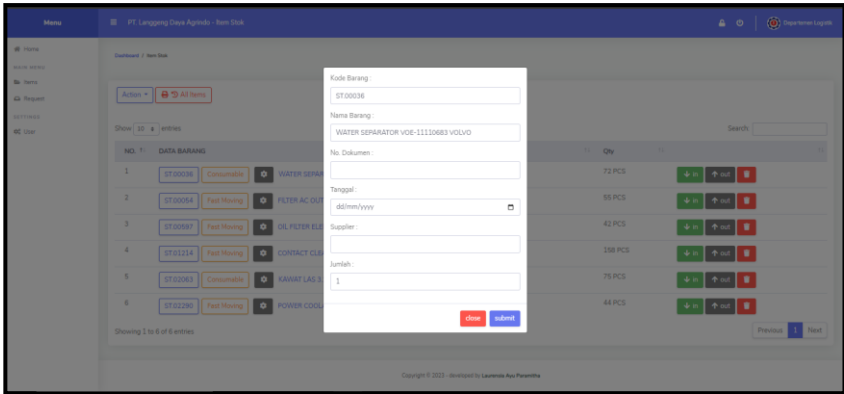


Fig. 3. Page Incoming Spare Part Form

4. Page Outgoing Spare Part Form

This page contains a form that functions to record outgoing spare parts, including the exit date, quantity, and description. It includes a submit button and a form displaying the spare part entered by the user.

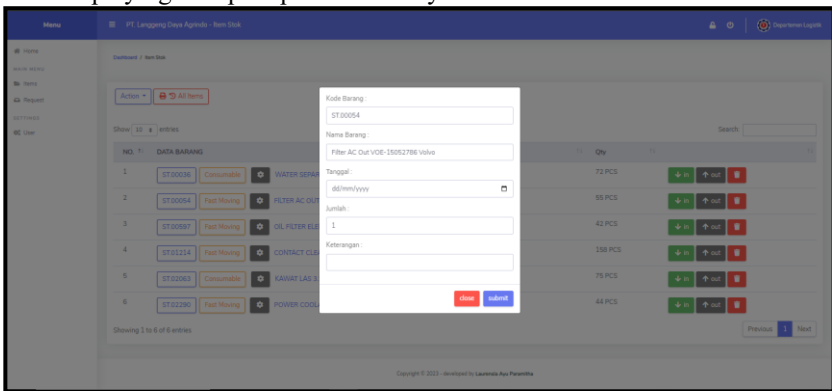


Fig. 4. Page Outgoing Spare Part Form

5. Page Update Spare Part Form

This page is for updating spare part data. This form serves to update previously entered spare part data, including the item code, item name, and item category.

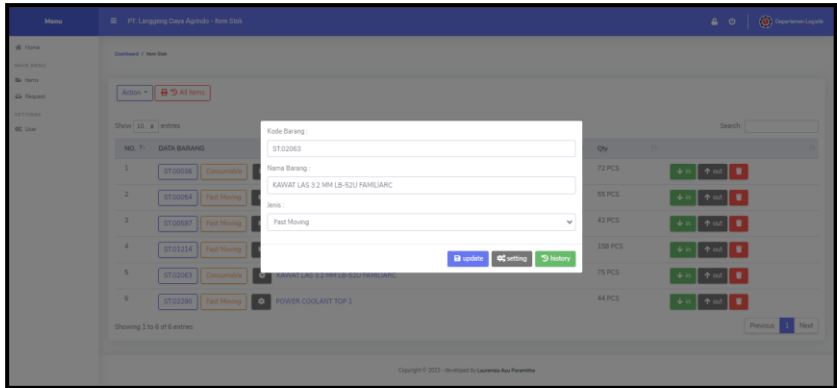


Fig. 5. Page Update Spare Part Form

#### 6. Page EOQ Calculation Form

This page is used for calculation using the Economic Order Quantity (EOQ) method by entering data such as order frequency, order quantity, ordering cost, and holding cost. It is then supplemented with a “calculate” button for computation. The “save” button is utilized to view the calculation results in the spare part data.

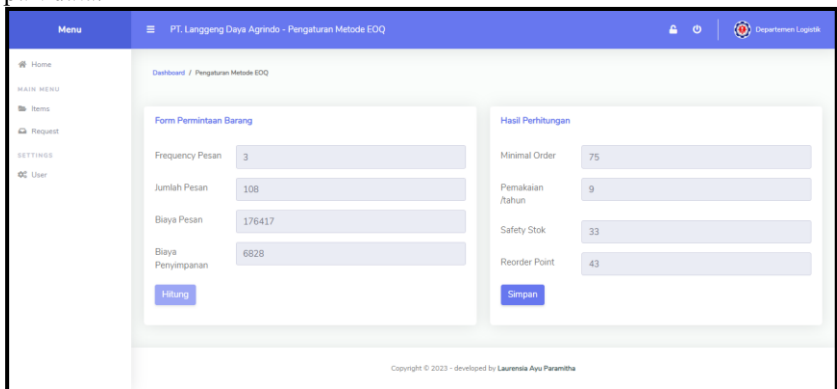


Fig. 6. Page EOQ Calculation Form

#### 7. Page Spare Part Request Form

This page contains data on spare part requests made by the plant department. On this page, the logistics department can validate spare part requests by answering whether they are approved or canceled, based on whether the spare part stock is sufficient or not.

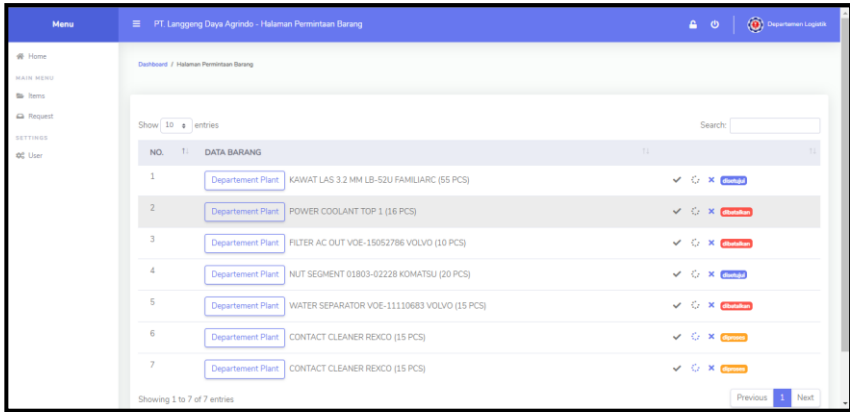


Fig. 7. Page Spare Part Request Form

8. Page history by date

This page is used to view the history of incoming and outgoing spare parts based on dates. There is also a search bar that functions to search for desired spare parts, and the print button is used to print the spare part history.

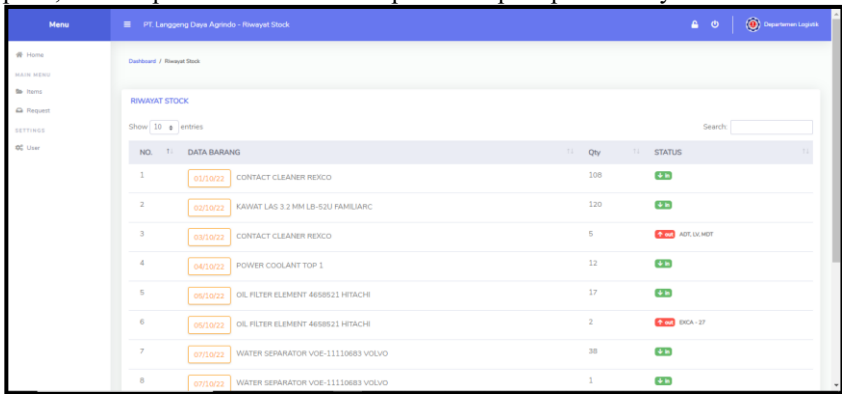


Fig. 8. Page History by date

9. Page Data User

This page contains data of registered system users, including full name, username, and user level. The logistics department has access right to edit and delete user data on this page.

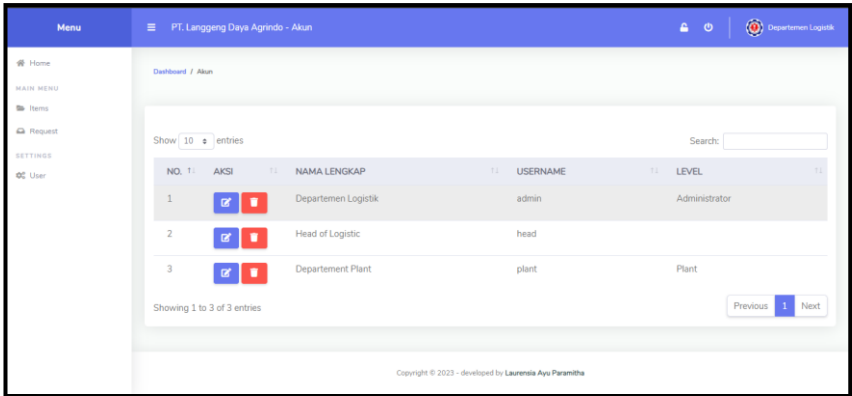


Fig. 9. Page Data User

10. History Report Print Function.

Here is the display page for printing the spare part stock history, which can be performed by the logistics department, plant department, and the head of the logistics department. It serves to facilitate the data search process and decision making.

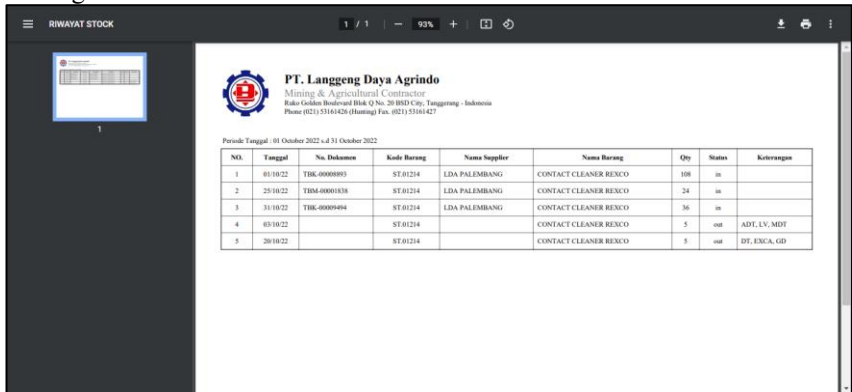


Fig. 10. History Report Print Function

5 Conclusion

The conclusion obtained from this research are as follow :

1. This application was created using the PHP programming language, MySQL database and Code Igniter framework. This system has pages or forms which include a login form, incoming spare part form, outgoing spare part form, EOQ calculation form, spare part request form, history filter form based on date or supplier and history report print function.
2. The implementation of this system can be accessed by three actors, namely the logistics department, head of logistics, and plant department.



3. Implementation using the EOQ method, the logistics department get information on message frequency, number of messages, safety stock, and reorder point for each spare part item for the next period, to make it easier for the logistics department to control stock and minimize spare part ordering and storage costs.

## 6 Recommendation

Currently the application being developed is still website based, in the future it can be developed mobile based and to further maximize the use of applications, socialization of application use is needed in the company.

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