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A Web-Based Safety Stock Monitoring Information System for Production Materials at CV. Ewelding's Iron Workshop

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ABSTRACT

CV. Ewelding is a metal workshop that faces challenges in managing production material stock due to manual processes, which often result in data discrepancies and production delays. This study aims to develop a web-based stock monitoring information system that integrates customer orders, raw material tracking, and safety stock calculations to ensure the availability of minimum stock levels. The system was developed using the waterfall methodology, with stages including requirements analysis, design, implementation, testing, and maintenance. PHP and MySQL were used in the development, and the system supports customer data management, material ordering, automatic safety stock calculations, and real-time reporting. The novelty of this research lies in the integration of safety stock methods with order and production monitoring in a single web-based platform, which has not been addressed in previous studies. Implementation results show that the system provides real-time information, reduces the risk of shortages, improves decision-making, and enhances efficiency in managing overall production operations.

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1. INTRODUCTION

Managing raw material stock is a crucial element for ensuring smooth production, particularly for small and medium-sized industries such as CV. Ewelding. Currently, this process is conducted manually, causing several problems such as delays in production.

due to stockouts, excessive stock that increases storage costs, and inaccuracies in recording.

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Several related studies have been conducted. Piranti & Sofiana (2021) applied safety stock with ABC analysis for cutting tool inventory [2]. Sabilla & Mahendra (2022) developed a convection stock system with a safety stock approach for fluctuating demand [3]. Irawan et al. (2023) designed a product stock monitoring system in the snack food industry [4]. Putri et al. (2024) proved that the safety stock method effectively maintains continuity of stock in the culinary business [5]. However, these studies did not integrate order management, safety stock calculation, and production monitoring into a unified web-based system. This research aims to fill that gap.

2. RESEARCH METHOD

This research was conducted at CV. Ewelding, a metal workshop located in Pedawang Village, Bae District, Kudus Regency. The methodology used in this study aims to create a web-based production material stock monitoring information system using the Safety Stock method as a tool for inventory control. The following is a general flowchart for calculating safety stock.

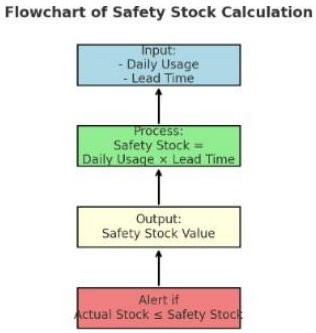

Figure 1. Flowchart

The first step in this research process is **data collection**, which is carried out using several techniques, namely **observation, interviews, documentation studies** and **literature studies**. Observations are carried out to directly understand the production workflow and ongoing stock recording in the field [7]. Interviews are conducted with business owners and warehouse administrators to explore information needs and obstacles faced in the material monitoring process. Meanwhile, documentation studies are used to collect historical data related to material stock and material procurement times from vendors. Literature studies are used to strengthen the theoretical basis related to the safety stock method and relevant information systems. In system development, the **waterfall method approach is used**, namely a linear and sequential software development model, starting from the analysis, design, implementation, testing, and maintenance stages [8].

The first stage is **requirements analysis**, which focuses on the specifications of the functions and features that the system must have. After the system requirements are defined, **the system is designed** using UML (Unified Modeling Language)-based modeling

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diagrams, such as use case diagrams, class diagrams, activity diagrams, sequence diagrams, and statechart diagrams, to describe the structure and workflow of the system. After the system design is complete, the next stage is **implementation**, where the system is built using the PHP programming language with a MySQL database [9]. The system is developed as a web-based application so that it can be accessed by users flexibly and in real-time. The system is designed to have three main user roles, namely the owner, warehouse admin, and cashier, each with different access rights.

The system testing phase is carried out to ensure that all features are running properly and meet user needs. Testing is conducted functionally with specific scenarios for each key feature, such as material recording, customer ordering, calculating material requirements using the safety stock method, and production process reporting. The safety stock method is implemented in the system to calculate the minimum amount of stock that must be available to anticipate uncertainty in demand and supply delays. The basic formula used is:

$$Safety\ Stock = Average\ daily\ consumption\ x\ Lead\ Time \quad (1)$$

For example, if a material has an average daily consumption of 50 units and a procurement lead time of 4 days, the required safety stock is 200 units. This calculation is performed automatically by the system for each material type based on historical data.

The final stage is maintenance, where the system is evaluated and adjusted to address any additional needs that may arise after the system is deployed. With this methodical approach, the developed system is expected to assist CV. Ewelding in managing production material stock efficiently and in an integrated manner.

3. RESULTS AND DISCUSSION

This research resulted in a web-based information system designed to assist in the management of production material inventory at CV. Ewelding. This system not only records inventory but also integrates the entire production process from initial ordering to completion, and provides a safety stock calculation feature using the safety stock method.

3.1. Implementation of Stock Monitoring Information System

The system was built using the PHP programming language and a MySQL database. It consists of three main actors: the Owner, Warehouse Admin, and Cashier. Each actor has different access rights according to their responsibilities:

1) Owners can monitor the entire production process, view reports on material stock and customer requests, and approve or reject orders.
2) Warehouse Admin is responsible for recording incoming and outgoing material data, plotting materials for production, and monitoring remaining material stock.

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3) Cashiers record and validate customer payments, and manage the history of transactions that occur.

Figure 2. Use Case

The above is a use case as the scope of the system, and to run a system, a database is required. The following is a display of the database structure.

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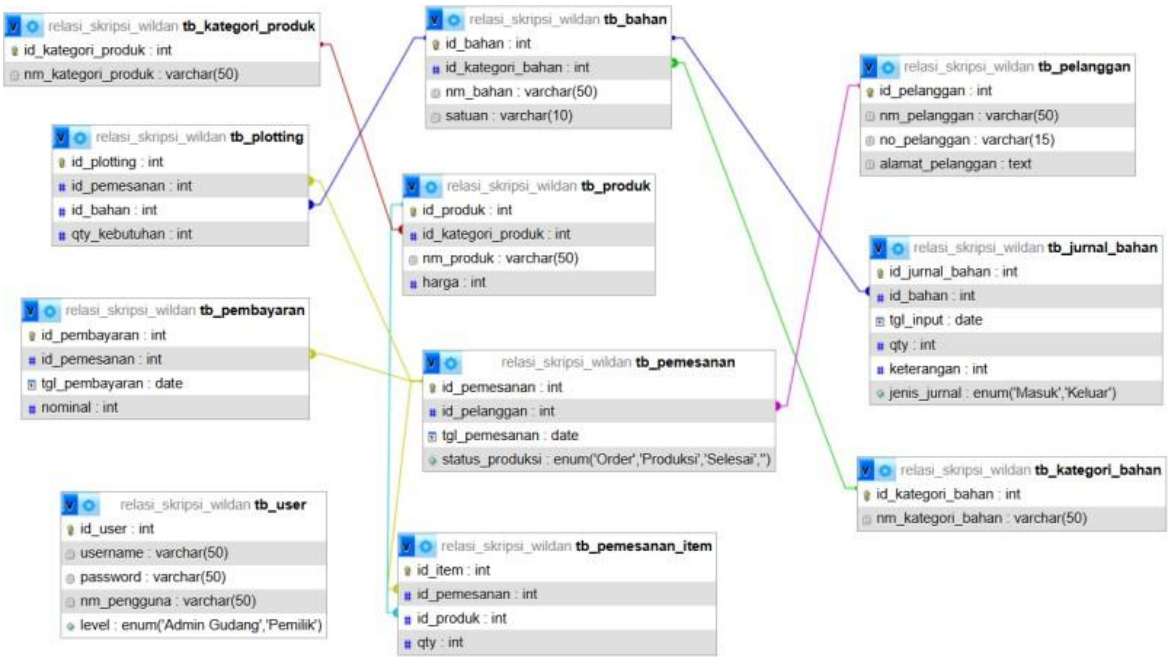

Figure 3. Database Structure

3.2. Discussion

One of the key features of this system is the implementation of the safety stock method to calculate the minimum safe stock level. This method is crucial to avoid material shortages when demand increases or when supplies are delayed.

The calculation is done based on two main parameters:

- **Average daily consumption** of ingredients
- **Lead time** (waiting time) for procuring materials from suppliers

Calculation example:

If the material "Welding Wire" has an average daily consumption of 115 rods and a waiting time of 4 days, then:

Safety Stock = 115 X 4 = 460 sticks

The resulting system consists of three main actors: owner, warehouse admin, and cashier. Each actor has different access rights. The safety stock method is implemented to calculate the minimum stock required to avoid shortages. For example, if welding wire has an average daily usage of 115 units and a lead time of 4 days, the required safety stock is 460 units.

Table 1. Safety Stock Calculation for Several Production Materials

No	Name of goods	Daily Consumption	Lead Time	Safety stock
1	Carbon Steel	15 sticks	4 days	60 sticks

2	Aluminum	86 sticks	4 days	344 sticks
3	Welding wire	115 sticks	4 days	4 60 sticks
4	Welding Electrodes	211 sticks	4 days	844 sticks

With this feature, warehouse admins can proactively procure materials before stock runs out, so that the production process is not disrupted. Compared to manual recording, this system improves efficiency, data accuracy, decision-making speed, cost control, and customer satisfaction. Automatic alerts allow proactive stock procurement, ensuring uninterrupted production.

3.3. System Efficiency Evaluation

Compared to the manual recording system previously used, this information system provides a number of significant advantages:

1) **Time efficiency**: Recording of materials and production processes can be done quickly and automatically. No more repetitive paperwork.
2) **Data accuracy**: The system is able to calculate material requirements automatically and provide real-time information regarding remaining stock in the warehouse.
3) **Decision making**: Management can make decisions about purchasing materials or scheduling production based on data presented quickly and accurately.
4) **Reduction of operational costs**: The risk of excess materials (overstock) or shortage of materials (stockout) can be minimized because the system provides automatic stock limit notifications[10].

Increased customer satisfaction: With a more scheduled and monitored production process, products can be delivered on time according to the promised deadline.

3.4. Obstacles and Challenges

Initial implementation encountered limited internet access and resistance from users unfamiliar with digital systems. After short training sessions, these barriers were overcome, and users adapted to the system effectively.

4. CONCLUSION

This study successfully designed and developed a web-based stock monitoring information system for CV. Ewelding by applying the safety stock method. The novelty lies in the integration of safety stock calculations, customer order management, and production monitoring within a single web-based system. The system reduces errors, accelerates decision-making, and increases stock accuracy. Challenges encountered included limited internet access and initial user resistance, which were mitigated through training and

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mentoring. Future development may include adding demand forecasting features and mobile integration to enhance usability and business continuity.

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