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SITORY Inventory System Using the FIFO (First In First Out) Method and Caesar Chipper Algorithm

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Abstract

PT. Indopradana Mahakarya Sejahtera is a procurement company in the field of packaging such as cosmetic bottles. PT. Indopradana Mahakarya Sejahtera already has an inventory where inventory will be entered into stock, then sales will be made by looking at the available stock. Inventory management is very important to increase productivity and company performance in managing goods and stock of goods. The current inventory system is still manual and has many weaknesses and deficiencies that hinder the company's performance and is very time-consuming starting from recording goods to preparing reports. The purpose of this research is to create a web-based inventory information system that can be used by companies. The system includes real-time inventory management, purchase transaction entry, shipping management, sales transaction entry, report generation, and sales receipt. The method that will be used in this study is the FIFO (First In First Out) method which will be applied to the sale of goods, and when a sale of goods occurs, the system will automatically obtain goods with a longer purchase date. This study also uses the Caesar Chipper algorithm to secure data in the database which when entered will encrypt the data entered into the database and then decrypt it for display on a web display. This research resulted in a "SITORY Inventory System Using the FIFO (First In First Out) Method and Caesar Chipper Algorithm", which will help problems that exist in PT. Indopradana Mahakarya Sejahtera.

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1. Introduction

Technological developments in this day and age are very interesting to develop technology with flexibility. This technology emerged because many people wanted to be minimalist in their activities. With the rapid development of this technology, various types of new systems have emerged that can meet the needs of society. Many new companies have started to emerge with the aim of providing human needs more easily and efficiently. The internet is one of the fastest-growing technological

developments every year. Because the Internet is the largest network that can connect millions of computers spread all over the world. By using the internet, organizations can exchange information with the outside world quickly. The internet is most needed in the business world, especially in trading companies[1].

A trading company such as PT Indopradana Mahakarya Sejahtera, this company wants to profit from its sales. PT Indopradana Mahakarya Sejahtera wants accurate data from its business processes. This makes it possible to clearly read the flow of profits earned, and to avoid losses. If there are indeed losses, PT Indopradana Mahakarya Sejahtera also wants accurate data on how losses and profits can occur. To get a clear advantage, PT Indopradana Mahakarya Sejahtera requires a detailed inventory of trading products.

Inventory is an operational problem and one of the internal problems often faced by trading companies. The inventory contains records of incoming and outgoing goods and the number of goods to be stored in the warehouse. If the number of items stored is too small to meet demand, work will stall. Likewise, if too many commodities are stored it will also cause losses to the company because the costs are too high, but many commodities cannot be sold, and more space must be provided, which can reduce the use value of these commodities. . Therefore interested parties must be able to decide how much of the goods to be prepared (stocked) for their needs. Also, management must be good at spotting needs and making them feel satisfied because they are getting what they need[1].

Inventory is also conventional data storage, and processing of data such as determining the number of incoming goods, setting the minimum amount of stock, determining the outgoing goods, and the maximum amount of stock for each item. By creating an inventory system, the admin can determine whether goods should be reproduced or not. The inventory process at PT Indopradana Mahakarya Sejahtera is still done manually using ledgers or using software such as Microsoft Word or Excel which have risks such as data loss, goods stored in warehouses for too long, and human errors (errors from the admin). Some of the big risks that can occur are data theft carried out by outsiders and parties from within the company itself[2].

Therefore, by creating an inventory system at PT Indopradana Mahakarya Sejahtera based on a website using the FIFO (First In First Out) method, namely where the earliest goods entered the warehouse will leave first and the data will be stored without having to experience the risk of data loss or human error, and the stored data will be encrypted or it can be interpreted that the data will be changed into a form that cannot be understood by other people so that data cannot be stolen using cryptography. Cryptography is the art of writing and decoding code[3]. This cryptography will be developed using Caesar cipher encryption, which converts plaintext into ciphertext.

With the main issues above, a "SITORY Inventory System will be created using the FIFO (First In First Out) Method and the Caesar Chipper Algorithm" which is expected in the future PT Indopradana Mahakarya Sejahtera can have an inventory system that is practical, effective and safe from theft data.

2. Literature Review

In the initial research, researchers will analyze the system that will be made concerning the needs of PT Indopradana Mahakarya Sejahtera. The data will be obtained through direct interviews with informants selected by researchers and data in the form of documents.

2.1 Previous Research

1. Abdullah Attaqiy

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In the research conducted by Abdullah Attaqiy, entitled "Inventory Information System at Iron&Sun.Co Company". The problem lies in manual management, data recording that still uses Ms. Excel so that it is possible for errors to occur such as duplication of data, recording errors, incomplete data tends to be large and the preparation of final inventory reports tends to take longer because all inventory data must be recapitulated in detail in advance from the results of sales and purchase notes. In the problems that arise, it is necessary to have an application program "Inventory Information System at Iron&Sun.Co Company" to identify and analyze the current system and to design and build an Inventory Information System[4].
The difference from previous research with the title of the application "Inventory Information System at Iron&Sun.Co Company" with research conducted by the author is that in previous research there was no storage in the database which was stored encrypted using Caesar Cipher. The similarities in operating the database are both using MySQL and applications that are built on a website basis.

2. Quaysia Andika Rahmani

In the research conducted by Quaysia Andika Rahmani, entitled "Design and Build Stock Applications Using the FIFO Method at PT. CWT Commodities Services". The problem is in the warehousing process which still uses manual input which causes messy reports of goods and less work efficiency, with the existence of an application that makes warehousing more precise because the storage media already uses a database. The system can make it easier for administrators to enter data. The administrator can also determine the accessories for goods received in each building, as well as existing and new items[5].
The difference from previous research entitled "Design and Build Stock Applications Using the FIFO Method at PT. CWT Commodities Services" with research conducted by the author, namely previous studies did not use the Caesar Chipper Algorithm for company data security. The similarities lie in the website-based system application.

2.1 System

The system is a set of interconnected components that help to achieve a goal. This term is used to describe two or more interacting entities[6]. The system is important in designing an information system. All organizations must have an information system that aims to collect, store, view and distribute data that will be presented in the form of information. Information systems are formed because of the large number of requests for information needs that are always increasing every day[7].

2.2 Inventory

Inventory in Indonesian is Inventory, which means, that is, a list that contains all items belonging to offices, schools, companies, and so on that are used in carrying out tasks, by the meaning of inventory. Inventory or inventory is material or goods stored that will be used to fulfill certain purposes. (Inventory) is a general term that shows everything or organizational resources stored in anticipation of fulfilling requests[8].

2.3 FIFO (First In First Out)

The first-in, first-out (FIFO) method assumes that the oldest items in stock (meaning merchandise purchased first) will be sold first, and the items purchased last will become ending inventory. This method continues until the last stock is entered, at which point the item will be the last to sell. The first-in, first-out rule relies primarily on the assumption that this is a good approximation of the specific identification of most typical industrial goods types. Inventory management is considered

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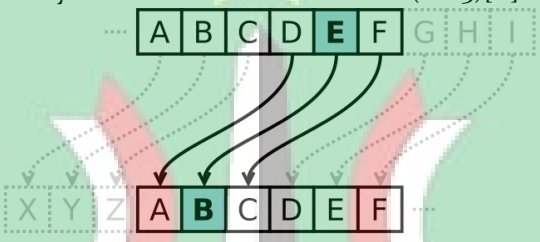
good to start the oldest units first and maintain the current inventory showing the newest inventory items. Therefore, FIFO is an estimate of the flow of certain goods[9].

2.4 Caesar Chipper

In cryptography, the Caesar cipher, also known as Caesar's cipher, the shift cipher, Caesar's code, or Caesar shift, is one of the simplest and most widely known encryption techniques. It is a type of substitution cipher in which each letter in plain text is replaced by a letter in some fixed position down the alphabet. The encryption steps performed by the Caesar cipher are often combined as part of a larger scheme[10]. The Caesar Cipher is one of the oldest best-known now ciphers in cryptographic development. This is a cryptographic algorithm that was first used by the Roman Emperor Julius Caesar for the messages he sent to his governors. The trick is to replace each character with another in alphabetical (alphabet) order. For example, each letter is replaced by the next third in the alphabet. In this, case the key is the number of letter shifts (k = 3)[11].



The action of Caesar chipper is to replace each letter of plain text with a different letter in several places below the alphabet. The cipher illustrated here uses a shift of three to the left, so that (for example) every occurrence of E in the plaintext becomes a B in the cipher text[12].

3. Result and Discussion

At this stage, the system is used by researchers to make a diagram of how it works and how to use it. This is done through the use of system design tools such as use case diagrams and activity diagrams.

3.1 Use Case Diagrams

Table 1.
Admin Use Case Design

No.	Actor	Process Use case	Information
1	Admin	Login	The administrator uses the given username and password to log in to the system
2	Admin	Manage Master Data	Admin manages Master data, namely item master, supplier master, user master, and admin master viewing, changing, deleting, and making reports.
3	Admin	Manage Reports	Admin prints receipts for purchasing goods in real-time without being able to reopen on different days makes reports of outgoing goods, makes sales reports, and makes reports on the value of goods assets.

Table 2.
User/Employee Use Case Design

No.	Actor	Process Use case	Information
1	Users/Employees	Login	Users/Employees use their usernames and password to enter the system.
2	Users/Employees	Manage Sales Data	Users/Employees input sales based on available items, and enter the number of items sold per type of item.

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3	Users/Employees	Manage Reports	Users/Employees make sales reports, and make reports on the remaining stock available.

3.2 Activity Diagrams

3.2.1. Activity Diagram Login

The Activity Diagram for the login process shows the steps required to log into the system. First, the user must login to prove that the user has access to enter. After validation, the system will bring the user to the dashboard.

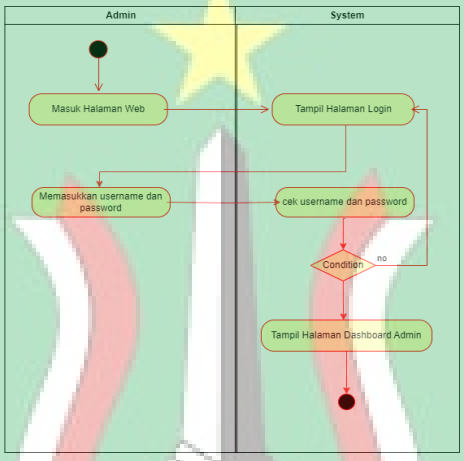

Figure 1. Admin Login Activity Diagram

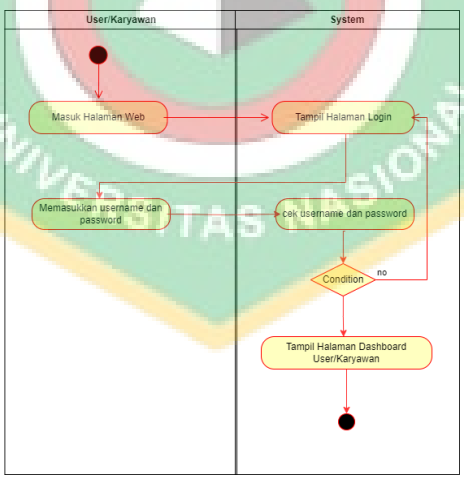

Figure 2. Activity Diagram User/Employee Login

3.2.2. Activity Diagram Master Data

This activity diagram explains admin activities when entering various types of data, and can change and delete the data in it.

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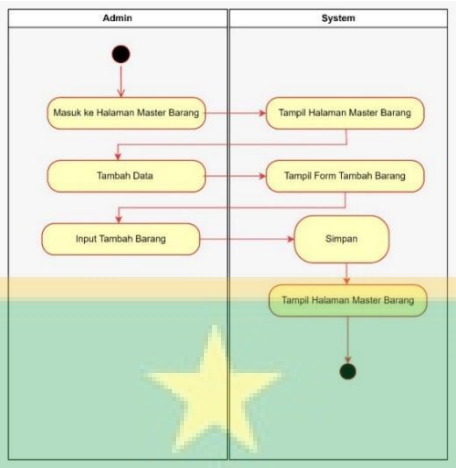

Figure 3. Activity Diagram Add Data

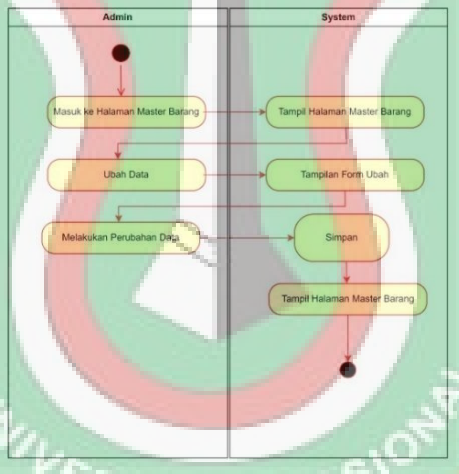

Figure 4. Activity Diagram Change Data

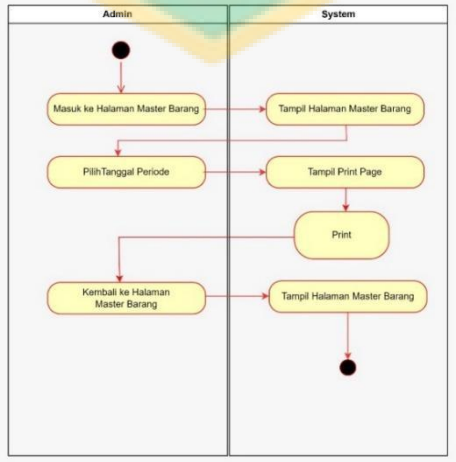

Figure 5. Activity Diagrams Print Reports

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3.2.1. Activity Diagram Report

This activity diagram explains admin activities when the process of printing reports on the application system.

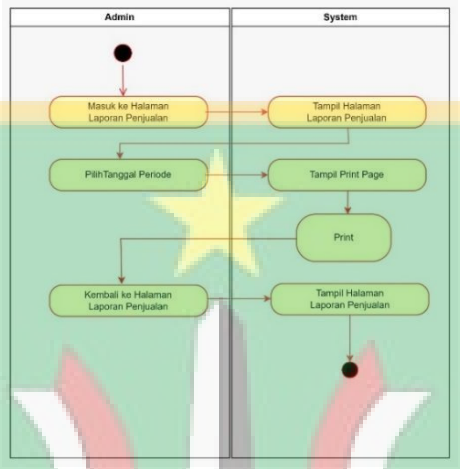

Figure 6. Activity Diagram Print Sales Report

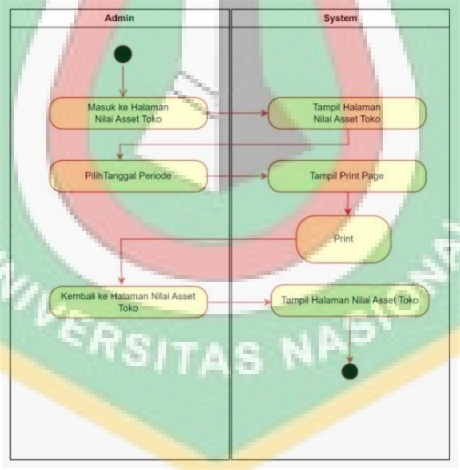

Figure 7. Activity Diagram Print Inventory Report

3.3 Implementation

3.3.1 Caesar Chipper

To store new data that will be input into the database system, the data will be encrypted using the encryption function to become cipher text. Then, the data will be stored in the database, to maintain the confidentiality of the contents of the database itself. This is done using the Caesar Cipher algorithm. The formula for encryption and decryption according to the Caesar Chipper algorithm is as follows:

$$C = E(P) = (P + k)\, mod(26)$$

$$P = D(C) = (C - k)\, mod(26)$$

Where :
C = Chipertext
E = Encryption
P = Plaintext
D = Decryption
k = Key
Mod = Modulo (Remaining Share)

3.3.1.1 Encryption Process

Consider the sample data below:
Name : Jumadi
Email : Jumadi@IMS.com
Pass : Jumadi123
Key : 3

From the example data above, the encryption process will be carried out using a 3-letter shift key in the plaintext.

a	b	c	d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z
A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

Figure 8. Plaintext

Shifting letter A with key 3
C = E(P)= (P + 3)mod(26)
C = E(A)= (0 + 3)mod(26)
C = E(A)= 3 or (D)
So the letter A will shift to D, and then the letters B to Z will also shift to the next 3 letters, as shown in the picture.

d	e	f	g	h	i	j	k	l	m	n	o	p	q	r	s	t	u	v	w	x	y	z	a	b	c
D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z	A	B	C
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	0	1	2

Figure 9. Chipertext

From the description above, the example data will be encrypted to be:
Jumadi
= ((9, 20, 12, 0, 3, 8) +3) mod26
= (12, 23, 15, 3, 6, 11)
= Mxpdgl
Jumadi@IMS.com
= ((9, 20, 12, 0, 3, 8, @, 8, 12, 18, ., 2, 14, 12) +3) mod26
= (12, 23, 15, 3, 6, 11, @, 11, 15, 21, ., 5, 17, 15)
= Mxpdgl@LPV.frp
Jumadi123
= ((9, 20, 12, 0, 3, 8, (1, 2, 3)) +3) mod26

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= (12, 23, 15, 3, 6, 11, (1, 2, 3))
= Mxpdgl123

Then after manually encrypting the sample data, computerized encryption will then be carried out using the PHP programming language, with the source code image below.

```php
$CC = new CaesarCipher();
class CaesarCipher {
  public $shift;
  const alphabet = array(
    "lowercase" => array("a","b","c","d","e","f","g","h","i","j","k","l","m","n","o","p","q","r","s","t","u","v","w","x","y","z"),
    "uppercase" => array("A","B","C","D","E","F","G","H","I","J","K","L","M","N","O","P","Q","R","S","T","U","V","W","X","Y","Z")
  );
  public function __construct($shift = 3) {
    $this->shift = $shift % 26;
  }
  public function encrypt($input) {
    $result = str_split($input);
    for ($i = 0; $i < count($result); $i++) {
      for ($j = 0; $j < 26; $j++) {
        if ($result[$i] === CaesarCipher::alphabet["lowercase"][$j]) {
          $result[$i] = CaesarCipher::alphabet["lowercase"][($j + $this->shift) % 26];
          $j = 26;
        } elseif ($result[$i] === CaesarCipher::alphabet["uppercase"][$j]) {
          $result[$i] = CaesarCipher::alphabet["uppercase"][($j + $this->shift) % 26];
          $j = 26;
        }
      }
    }
    $result = implode($result);
    return $result;
  }
```

Figure 10. Source Code Plaintext Encryption Process to Chipertext

After going through the encryption process in the image above, the results will be obtained in the database in the table from the sample data fields taken, which are as follows:

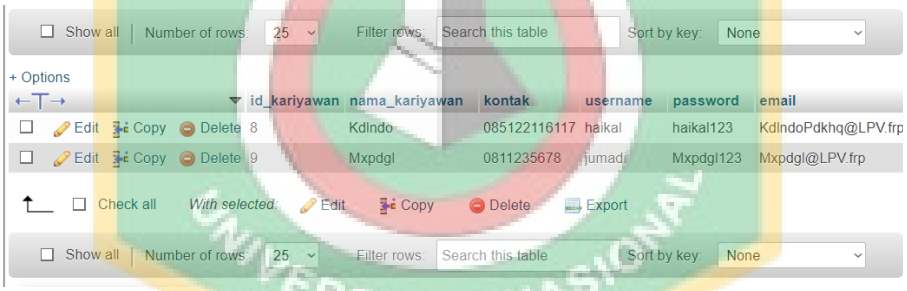

Figure 11. Plaintext Encryption Results to Ciphertext in the Database

3.3.1.2 Decryption process

Decryption is the process of returning the Caesar text value to a plaintext value, namely the input value given at the beginning, the process of running the decryption is retrieving data from the encrypted database and then decrypting it before displaying it back to the web page. The decryption formula is as follows:

$$P = D(C) = (C - k) \, mod(26)$$

Then the encryption value is entered into the decryption formula above, an example of an encrypted value is as follows:
Mxpdgl
Mxpdgl@LPV.frp
Mxpdgl123

From the above data, a decryption process will be carried out using the Caesar Chipper which will

then be displayed on the web, with the same key = 3 when encrypting the data above, so it will be as follows:
Mxpdgl
= ((12, 23, 15, 3, 6, 11)) - 3) mod26
= (9, 20, 12, 0, 3, 8)
= Jumadi
Mxpdgl@LPV.frp
= ((12, 23, 15, 3, 6, 11, @, 11, 15, 21, ., 5, 17, 15) -3) mod26
= (9, 20, 12, 0, 3, 8, @, 8, 12, 18, ., 2, 14, 12)
= Jumadi@IMS.com
Mxpdgl123
= ((12, 23, 15, 3, 6, 11, (1, 2, 3)) -3) mod26
= (9, 20, 12, 0, 3, 8, (1, 2, 3))
= Jumadi123

Then after doing a manual decryption of the sample data, then a computerized decryption will be carried out using the PHP programming language, the decryption source code can be seen in the image below.

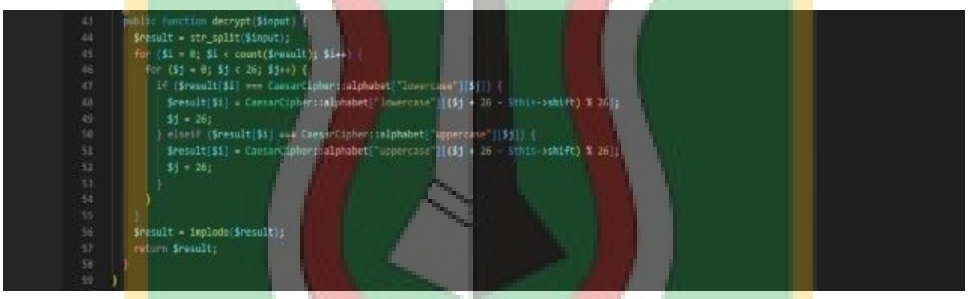

Figure 12. Source Code Chipertext Decryption Process to Plaintext

After going through the decryption process in the image above, the results will be obtained on the web view from the sample data fields taken, which are as follows:

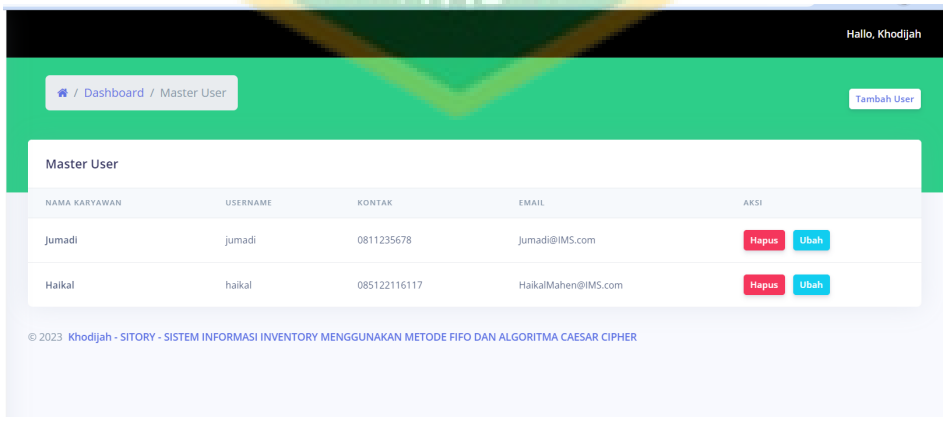

Figure 13. Master User Results of Chipertext Decryption to Plaintext

3.3.2 FIFO (First In First Out)

The FIFO implementation in this inventory system is where the admin will first enter the goods data

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then the admin receives the incoming goods purchased in the purchase transaction. Then the employee makes a sale, when the process of selecting outgoing goods will be sorted based on the first incoming item taken from the smallest item id so that the stock and selling price will automatically change according to the order of incoming goods with the smallest item id. The following is the FIFO process source code for this inventory system:

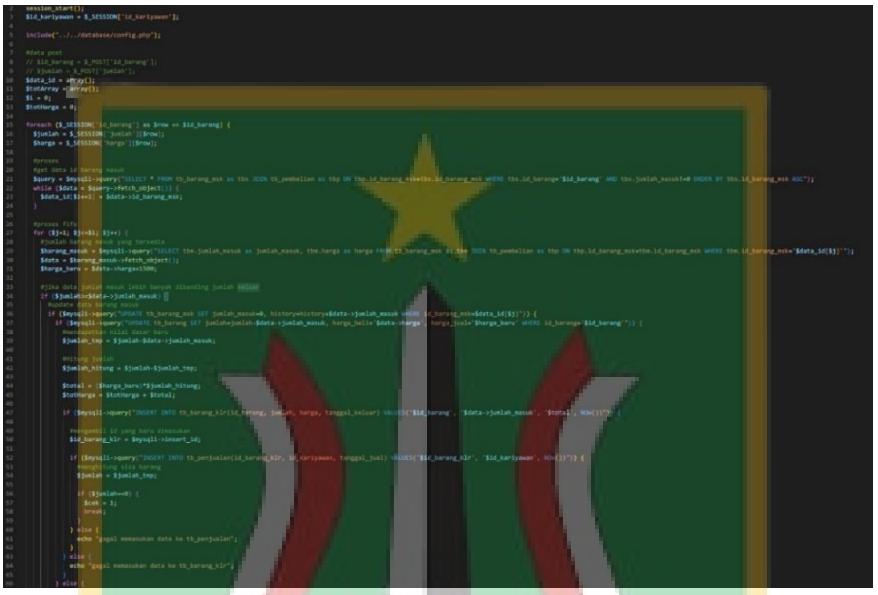

Figure 14. FIFO Automation Source Code on the System

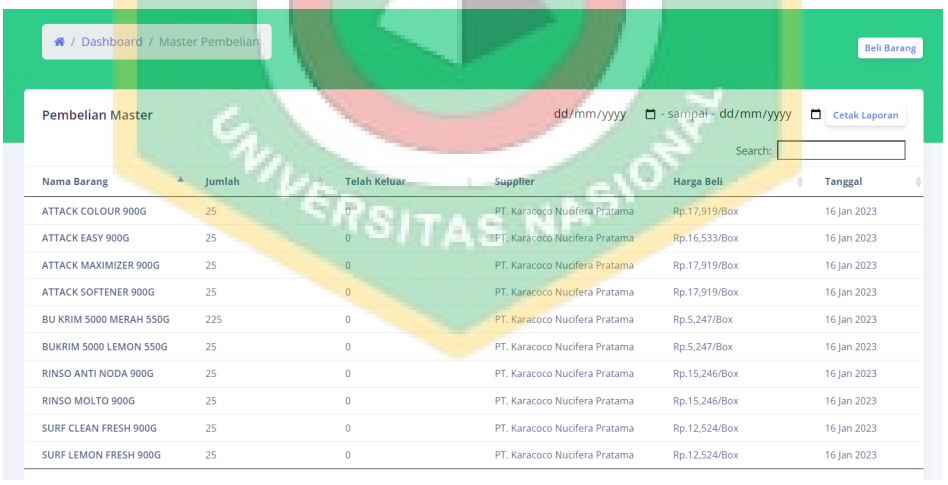

Figure 15. Display Purchase Transaction Menu

It can be seen in the picture above that the FIFO method can be seen on the purchase transaction menu, the number of stock items will decrease and the items that are reduced are the first items purchased or the first items entered.

4. Conclusion

The conclusions of the thesis entitled: "SITORY Web-Based Inventory System Using the FIFO (First In First Out) Method and Caesar Chipper Algorithm" are as follows:

1. The application that has been designed aims to make it easier for users to carry out transaction activities for buying goods and selling goods.
2. With this inventory application, can help users in the process of obtaining information and managing inventory data
3. The data search feature in the inventory information system makes it easy to search for item data to be carried out by the sales process.
4. Minimizing data input errors during the process of buying and selling goods, as well as minimizing data recapitulation errors.
5. This information system can help speed up the process of making reports because the data is already stored in the database so that it is neatly arranged.
6. Information systems accelerate company performance because the available information data is ready to be processed from the database.
7. Data security is safer due to added data security features in the database and does not take up much office space in the company because it is stored on the server.

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