Prozima : Vol. 6, No. 2, Desember 2022, 137-142
E. ISSN. 2541-5115
Journal Homepage: http://ojs.umsida.ac.id/index.php/prozima
DOI Link: http://doi.org/10.21070/prozima.v6i2.1580
Article DOI: http://doi.org/10.21070/prozima.v6i2.1580

Rearranging First-In First-Out (FIFO) Parts Layouts

Menata Ulang Tata Letak Bagian First-In First-Out (FIFO)

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ABSTRAK

Gudang lokomotif Surabaya merupakan bagian dari PT. Kereta Api Indonesia (Persero) sebagai tempat penyimpanan suku cadang untuk perbaikan dan perawatan khususnya lokomotif. Pelaksanaan pemeriksaan dan perbaikan tersebut tentunya membutuhkan suku cadang untuk memudahkan proses perawatan, yang umumnya ditempatkan di tempat penyimpanan atau gudang. Permasalahan pada Gudang Lokomotif Surabaya yaitu penataan spare part box bin untuk setiap jenis group tidak selalu tetap sehingga pencarian menjadi sedikit terhambat. Penelitian ini bertujuan untuk meninjau perbaikan berkala penempatan suku cadang bin box dengan menggunakan pendekatan First-In First-Out untuk memilah suku cadang bin box berdasarkan alur pergerakannya. Berdasarkan hasil analisis, pengelompokan bin box untuk masing-masing jenis grup rak suku cadang berdasarkan urutan alur pergerakannya adalah fast moving, medium moving, dan slow moving. Kotak suku cadang fast moving ditempatkan di rak baris paling bawah, kotak bin yang memiliki suku cadang medium moving ditempatkan di rak baris kedua dan ketiga. Sedangkan kotak kotoran yang memiliki bagian lambat akan diletakkan di rak paling atas. Setelah mengklasifikasikan bagian-bagian dalam kotak bin, area pengalamatan dibuat pada setiap baris rak untuk menentukan posisi bagian-bagian tersebut.

Kata Kunci : FIFO; Gudang; Lokomotif; Penyusunan kembali; Suku Cadang

ABSTRACT

The Surabaya locomotive warehouse is part of PT. Kereta Api Indonesia (Persero) as a storage place for spare parts for repair and maintenance, especially locomotives. The implementation of these inspections and repairs certainly requires spare parts to facilitate the maintenance process, which are generally placed in storage or warehouses. The problem with the Surabaya Locomotive Warehouse is that the arrangement of the box bin spare parts for each type of group is not always fixed so that the search becomes a little hampered. This study aims to review the periodic improvement of the placement of bin box spare parts by using a First-In First-Out approach to sort bin box spare parts based on their flow of movement. Based on the results of the analysis, the classification of bin boxes for each type of spare parts rack group based on the sequential flow of movement is fast moving, medium moving, and slow moving. Fast moving spare part boxes are placed on the bottom row of shelves, bin boxes that have medium moving spare parts are placed on the second and third row shelves. While litter boxes that have slow parts will be placed on the top shelf. After classifying the parts in the bin box, an addressing area is created on each shelf row to determine the position of the parts.

***Keywords** : FIFO; Warehouse; Locomotive; rearrangement; spare parts*.

Peer reviewed under responsibility of Universitas Muhammadiyah Sidoarjo.

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INTRODUCTION

The population of Indonesia changes every year, always changes due to population growth. The results of the Indonesian population census in 2020 increased by 32.56 million people in the last decade. This can have an impact on the increasing need for transportation facilities in Indonesia (Statistik, 2020). The increasing population, the greater the level of need. One of them is the need for transportation. The activities carried out by some people are inseparable from the need for transportation to make it easier for them to work. Of course, this includes moving places.

Indonesian residents are helped when carrying out their activities by means of transportation. Most Indonesians use land transportation as a means to speed up and simplify their activities. The land transportation consists of private vehicles or private ownership which includes bicycles, motorcycles and cars, and consists of public vehicles owned by a company to be operated by other people to transport passengers and/or goods such as buses, trishaws, taxi trucks, and train. However, some Indonesians use public transportation for long distances, especially trains, because it has a fairly high level of safety. In 2021, it is known that the total number of train passengers is 149,763,000 people (Statistik, 2021) .

Transportation is one of the needs needed by humans to support the economic activities of the Indonesian people (Mekel et al., 2022). Transportation can also be interpreted as a vehicle used to advance human activities in moving places, which are driven by humans and animals (Louis & Putranto, 2019). From this it can be concluded that transportation is a means of transportation of human labor to advance activities in moving places, which is a basic need to support economic activities. The means of land transportation used by some Indonesian people is the train. The train is a public vehicle which consists of several series of trains to be moved by locomotives on the tracks to transport goods and people. Thus, the locomotive can be interpreted as one part of the train in which there is an engine that functions to move the train and as a supporter of the electrical and pneumatic system for the train (Maulana & Ridwansyah, 2010; NAPITUPULU, 2017)

The train is one of the facilities that require maintenance and repair. These maintenance and repairs are carried out to keep the locomotive running, prevent sudden engine failures that can affect the smooth operation and to restore component performance to its original condition to increase the locomotive's reliability when operating. Maintenance and repair of railway facilities can be divided into locomotives, trains and carriages. The locomotive company located in Surabaya is part of the PT. Kereta Api Indonesia (Persero) as a place for repair and maintenance workshops, especially locomotives. The locomotive company in the Surabaya area does not only carry out maintenance work assigned to the parent company, but also performs maintenance on locomotives owned by other parent companies. Maintenance and repairs carried out by locomotive companies in the Surabaya area are by checking the locomotives based on a periodic maintenance schedule based on a time base. Time to carry out routine maintenance such as daily maintenance (PH), 1 month of care (P1), 3 months of care (P3), 6 months of care (P6), and 1 year of care (P12).

The implementation of these inspections and repairs, of course, requires spare parts to facilitate the maintenance process. These spare parts are usually stored clearly and concisely in a storage area or warehouse and are grouped by type for easy retrieval. Warehouse is an area that is used as a place for inventory of goods in a company to store goods and provide reports on the condition of goods stored (Purnama & Manulong, 2020). Another definition of warehouse is a building erected to store goods (Agustina & Vikaliana, 2021). So that the warehouse can be interpreted as a building that was established in a company to store goods and provide information related to the goods stored. The main function of the warehouse is as a place for receiving ordered goods, as a place for inventory, as a place for placing goods into storage, and as a place for goods to be stored before a request is made (Pitoy et al., 2020). The locomotive company in the Surabaya area has a warehouse to store spare parts where there are various types of spare parts to meet the needs for maintenance and repair of locomotives. Spare parts themselves mean a collection of components that form a single unit that has a specific use (Mahdiansyah et al., 2021). To meet the need for spare parts during maintenance and repair work reliably, it is necessary to have a

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warehouse management system that facilitates warehouse operations. Warehousing management is the science that manages the storage and movement of materials in a warehouse (Zulkarnaen, W., Suarsa, A., & Kusmana, 2018).

The warehouse management system includes an understanding of the management of warehouse activities such as receiving goods from suppliers, material handling, releasing goods, ordering goods to forecasting demand (Lama, 2021). Warehousing management carried out at the locomotive company in the Surabaya area, in supervising incoming and outgoing goods, a stock take will be carried out every 3 months to reduce the difference in the calculation of inventory. Surabaya locomotive warehouse staff will monitor the balance of goods for spare parts procurement. However, in this case, if the spare part inventory is empty, the spare part bin box will be set aside and will be put back on the shelf when the spare part inventory is available again. The placement of the spare parts in the bin box will be placed in a row of empty shelves according to the type of spare part group. Thus, the placement of spare parts for bin boxes is not always fixed in each row of shelves.

The problem with the Surabaya locomotive warehouse is that the arrangement of bin box spare parts is not always fixed for each type of class. The irregular placement of bin box spare parts makes the search a bit hampered. Thus, this study aims to periodically validate the improvement of bin box spare parts placement in warehouses using the First-In First-Out (FIFO) approach. The approach using First-In First-Out (FIFO) estimates that if the cost of goods sold at the time of the first purchase is the first item to be marketed, and vice versa, namely the ending inventory of goods, it will be valued at the cost of goods sold at the last purchase (Yuliana & Rahayu, 2020).

METHOD

The type of data used in this study was obtained from observation data during training by working directly and using relevant literature references. FIFO is a goods storage system that is carried out with a system of goods that enter first, which is also issued first. The release of this item is done sequentially or according to chronological order. The FIFO system is generally used for goods that are less durable or if stored for a long time it will be damaged or reduced in quality. under value), if the price decreases, and the valuation is higher (over value), if the price increases. The FIFO method often does not directly show the physical flow of the goods because the retrieval of goods from the warehouse is based more on the arrangement of the goods. Thus the FIFO method is more visible in the calculation of the cost of goods. For the calculation of the price, the price of the stock of goods from the previous transaction is used.From the problems described above, the solution that can be done is to use the First-In First-Out (FIFO) approach. Therefore, FIFO will be used to sort bin box spare parts based on the flow of movement, starting from goods that have a faster movement or fast moving, medium moving, and slow moving. To determine which spare parts are included in the flow of goods movement that is fast moving, medium moving, or slow moving, this is done by looking for the frequency value of spare part usage from the last 3 months, namely from January 2022 to March 2022.

RESULT AND DISCUSSION

The Surabaya locomotive company has a warehouse for spare parts storage that is rectangular in shape and a total of 18 spare parts racks. Retrieval of spare parts does not use special material handling, but human resources are needed. Spare parts in the warehouse will be stored according to the different types, sizes, and properties that are stored on the shelves. On each shelf, spare parts have been stored according to the type of group. These spare parts include the following:

1. Spare parts of the wind class
2. Diesel class spare parts
3. Electric class spare parts
4. Mechanical class spare parts
5. KRDI class spare parts
6. Spare parts class v-belt
7. Spare parts for locomotive AC class
8. Flexible Hose
9. Spare parts for the common goods class

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10. Glass and flexible

Although these spare parts are categorized by type, the placement of bin box spare parts in each row of shelves is not placed permanently. This happens when the spare parts supply is empty, the spare parts bin box will be set aside first. Then, when the spare part supply has been met, it will be placed in a row of empty shelves depending on the type of group. However, this can take time for the warehouse staff to be a bit hampered in finding spare parts. Therefore, it is necessary to arrange spare parts for bin boxes in each row of shelves so that the placement of spare parts in each row of shelves is determined or patented using the First-In First-Out (FIFO) approach.

The Fisrt-In First-Out (FIFO) approach assumes that the first product purchased is the product that will be marketed first and the product in ending inventory is estimated for final cost. This is because in determining income, the previous costs are compared with the new income and costs will be used as an assessment material for the calculation of the report. The FIFO approach can be said to be stable with true cost flows, as commodity owners prove to be marketing old inventory for the first time. The FIFO approach is a frequently used approach to inventory valuation. In the FIFO approach, inventories of goods that go out for production needs or for products sold are valued at prices according to the initial acquisition sequence. In assessing the remaining inventory, this means that the price relies on the new price or the last order price (Yuliana & Rahayu, 2020).

Improvements in warehouse management must be carried out if the applied principles are not met, as in previous studies where there were problems with tire flow due to insufficient FIFO system and tires being mixed into one with different production codes. So it is necessary to solve the problem by implementing the flow of goods method and ABC classification. The implementation is carried out by categorizing goods into fast moving (A), medium moving (B), and slow moving (C) groups. In the fast moving category it has a 20% percentage calculation, medium moving has a 35% percentage, and slow moving has a 45% percentage based on the amount of existing inventory. Where the storage area for goods in category A is placed at the very front or close to the door and marked in red, goods in category B are placed in the middle of the warehouse marked with yellow, while goods in category C will be positioned in the back area of the warehouse marked in green . In addition, to support FIFO in this study, addressing area and rack identity was carried out. Addressing area functions in labeling the storage area to be known more quickly, while the shelf identity is used to provide information on which types of tires are stored on the rack along with the serial number, the FIFO of the tire can be controlled (Zulkarnaen, W., Suarsa, A., & Kusmana, 2018).

Improvements to the layout of the spare parts storage area can be done using the class based storage method. In this method the placement of goods is based on the suitability of the type of goods into a group. This is done to make it easier for technicians to find used spare parts. In addition, to support in facilitating the search, it is done by making a list of spare parts that will be stored in each row of shelves that have been given an identity code to find out where the spare parts are stored (Wirawati et al., 2017).

Improvements to the layout of spare parts storage can be made in order to use storage space more effectively. In previous studies, the effective use of storage space for mechanical spare parts was based on the class based storage method which functions to organize warehouses based on the same type and size. In the case of problems that arise is the irregular storage of spare parts which are placed arbitrarily not in accordance with the type of material and the content of the basic ingredients. To manage the warehouse by applying the class based storage method, it is done by placing goods according to the frequency of requests for these goods so that when they are needed they can be easily found out quickly because they are located close to the entrance. In this case, spare parts are categorized into two, namely fast moving and slow moving (Husaeni, 2020).

Based on a review of previous research, the placement of spare parts in the implementation of the FIFO system with the concept that spare parts take precedence must also be published first. This is done by classifying spare parts into three categories, namely fast moving, medium moving, and slow moving. Spare parts included in the fast moving category are placed near the entrance, spare parts included in the medium moving category are placed in the middle of the warehouse, while spare parts included in the slow moving category are placed in the back area of the warehouse. To indicate spare parts that are categorized as fast moving and slow moving, it can be used by placing a mark on the shelf. Another action that can be taken to support the FIFO system is to create an addressing area to find out the list of spare parts names that are stored in the rack row to find out where the spare parts are stored. So it can be easier to search for spare parts.

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The suggestion that can be given for the Surabaya locomotive spare parts warehouse is to rearrange the spare parts bin box based on the flow of material movement. Thus, spare parts racks that are neatly arranged according to the type of group are also sorted by bin boxes in each row of racks according to the flow of movement. Based on the flow of movement, it can be categorized into three categories, namely fast moving, medium moving, and slow moving. Data on the number of units of goods that will be entered sequentially are: 1,3,2,4,6,5,7,9,8,11,10 as follows :

A Rack	10	10	10	10	5	5	5	5	1	1
B Rack		7	7	7	7	7	3	3	3	3
C Rack			9	9	9	9	2	2	2	2
D Rack				8	8	8	8	4	4	4
E Rack					6	6	6	6	6	6
Inventory	1	3	5	7	2	4	6	8	9	10

From the table above it can be explained that, In its distribution, spare parts that are in the fast moving category show that spare parts have the largest movement time of 20%, the medium moving category shows that spare parts have a movement time of 35%, and the slow moving category shows that spare parts have a movement time of 45%. To find out that spare parts can be categorized as fast moving, medium moving, and slow moving, a calculation is carried out by finding the percentage value of the frequency of use of each spare part in the last 3 months, namely from January 2022 to March 2022. Fast moving spare parts will be placed on the shelf. row number 4 or bottom shelf which can be easier to reach. Spare parts that have a medium moving nature will be placed on a row of shelves after fast moving or on rack rows number 2 and 3. While spare parts that are slow moving will be positioned on the top row of shelves. in this case, consideration is taken of the size of the weight of the spare parts which will later be placed on the bottom row of shelves (fast moving). By using this grouping, it can be used to make it more efficient in taking time because the placement of spare parts is based on the frequency of use.

Another suggestion that can be given is to create an addressing area. Each row of shelves is assigned a shelf identity along with a list of spare parts names in that row of shelves. This is in order to find out where the spare parts are stored and so that the location of the spare parts bin box also remains in accordance with the original position. So that the search will also be easier.

Topik utama pada pembahasan disesuaikan dengan hipotesis dalam pendahuluan. Semua pustaka yang dikutip dalam bagian ini harus dapat mendukung argumen tentang hasil.

CONCLUSION

Based on the results of the analysis description above, it can be concluded that it is necessary to rearrange the spare parts of the Surabaya locomotive warehouse binbox. This rearrangement can be done by classifying the bin boxes in each type of spare part rack group based on the flow of movement in sequence, namely fast moving, medium moving, and slow moving. In bin boxes, spare parts that are fast moving or goods with fast movements will be placed on the bottom row of shelves. In bin boxes that have medium moving spare parts, they will be placed in the row of shelves after the fast moving or the second and third rows of shelves. Meanwhile, bin boxes that have slow-moving spare parts will be placed on the top shelf. After classifying the spare parts in the bin box, an addressing area is made for each row of the rack containing information on the shelf identity with a list of spare parts names stored in that row in order to determine the location of the spare part position.

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