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SCHEDULING PLANNING SOYBEAN COMMODITY DISTRIBUTION ACTIVITIES AT CV XYZ USING DISTRIBUTION REQUIREMENT PLANNING (DRP) METHOD

PERENCANAAN PENJADWALAN AKTIVITAS DISTRIBUSI KOMODITAS KEDELAI PADA CV XYZ MENGGUNAKAN METODE DISTRIBUTION REQUIREMENT PLANNING (DRP)

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ABSTRAK

CV XYZ adalah sebuah perusahaan yang beroperasi di bidang distribusi komoditas kedelai yang berlokasi di Kabupaten Tangerang. Perusahaan ini mendistribusikan produknya ke lima retail yang tersebar di wilayah Jabodetabek dengan menggunakan dua kendaraan operasional. Saat ini, CV XYZ menghadapi masalah dalam penjadwalan distribusi karena belum memiliki kebijakan yang tetap, sehingga kadang-kadang terjadi penambahan ritase pengiriman akibat kurangnya stok dan belum optimalnya sistem penjadwalan yang ada. Akibatnya, tingkat pemenuhan permintaan dari masing-masing retail hanya mencapai 93% dari target perusahaan sebesar 99%, sehingga ada gap sebesar 6% yang ingin diperbaiki oleh perusahaan. Untuk mengatasi masalah ini, perencanaan penjadwalan distribusi yang baru dibuat menggunakan metode Distribution Requirement Planning (DRP). Berikut cara Metode Distribution Requirement Planning (DRP) terdiri dari empat tahapan: pertama Netting untuk proses menghitung jumlah kebutuhan bersih, kedua Lotting untuk proses menghitung jumlah pesanan ideal, ketiga offsetting untuk menentukan rencana pemesanan, dan terakhir keempat explosion untuk proses perhitungan kebutuha kotor dalam distribusi. Hasil dari perencanaan baru ini menunjukkan peningkatan pemenuhan kebutuhan permintaan retail menjadi 99,8%. Selain itu, total biaya distribusi juga berhasil diminimalkan, turun dari Rp593.980.120 menjadi Rp551.934.498, menghasilkan penghematan sebesar Rp42.045.622 atau sekitar 7% dari total biaya distribusi sebelumnya.

Kata kunci: inventory, penjadwalan, distribusi, distribution requirement planning (DRP)

ABSTRACT

CV XYZ is a company engaged in the distribution of soybean commodities, located in Tangerang Regency. The company distributes its products to five retail outlets across the Jabodetabek area using two operational vehicles. Currently, CV XYZ faced issues with distribution scheduling due to the lack of a fixed policy, leading to occasional increases in delivery frequencies caused by insufficient stock and an inefficient existing scheduling system. As a result, the fulfillment rate of retail demands only reached 93% of the company's target of 99%, creating a 6% gap that the company aims to address. To resolve this issue, a new distribution scheduling plan was developed using the Distribution Requirement Planning (DRP) method. Distribution Requirement Planning (DRP) method consists of four stages: first Netting for the process of calculating the amount of net requirements, second Lotting for the process of calculating the ideal order quantity, third Offsetting to determine the order plan, and finally the fourth explosion for the process of calculating gross requirements in distribution. The results of the new plan show an increase in the fulfillment rate of retail demands to 99.8%. Additionally, total distribution costs were successfully minimized, decreasing from Rp 593,980,120 to Rp 551,934,498, resulting in a saving of Rp 42,045,622 or approximately 7% of the previous total distribution costs.

Keywords: inventory, scheduling, distribution, distribution requirement planning (DRP)

INTRODUCTION

CV XYZ is a company located in Tangerang Regency that is engaged in the distribution of soybean commodities. The company distributes its soybean products to various retail outlets spread across the Greater Jakarta area (Jabodetabek). Distribution in the supply chain involves the process of shipping and storing goods from suppliers to customers, including the movement of raw materials and components from suppliers to manufacturers, as well as finished products from manufacturers to end customers (Blanchard, 2021). Warehouses are an essential part of the supply chain, responsible for storing and managing products before they are distributed.

CV XYZ has a warehouse used for storing products before they are distributed to retailers. After being stored in the warehouse, products are delivered to retailers using the company's operational vehicles. CV XYZ distributes soybeans to five retail outlets in the Jabodetabek area using two operational vehicles.

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The current distribution scheduling system at CV XYZ only initiates deliveries based on orders or requests from retailers. Deliveries are made daily to meet customer demand, but there is no fixed delivery schedule, leading to occasional delays that affect the ability to meet retail demand and disrupt retail sales activities. Additionally, sometimes the available stock is insufficient to fulfill all orders, necessitating additional deliveries. This issue indicates that the current distribution scheduling system at CV XYZ is not yet optimal.

The distribution carried out to each retail has different demand needs for each retail so that the product will be sold to consumers or end customers. The data comparing total demand and delivery realization in 2023 shows that for retail 1, there was a demand of 1,243,200 kg with a delivery realization of 1,575,650, resulting in a fulfillment rate of 93%. For retail 2, the demand was 1,064,700 kg, with a delivery realization of 999,200 kg, leading to a fulfillment rate of 94%. Retail 3 had a demand of 921,300 kg, with a delivery realization of 865.800. For retail 4, the demand was 1,329,450 kg, with a delivery realization of 1,209.400, resulting in a fulfillment rate of 91%. Lastly, for retail 5, there was a demand of 662,050 kg, with a delivery realization of 593,500, leading to a fulfillment rate of 90%.

This data indicates that CV XYZ has not yet maximized its ability to meet the demand needs of each retail outlet. With an average fulfillment rate of only 93%, there is a 6% gap between the current condition and the company's target service level of 99%. This gap highlights the need for improvements in CV XYZ's distribution activities, including issues of stock shortages at retail outlets, an average delivery fulfillment rate of just 93%, and unmet deliveries, resulting in outstanding delivery obligations.

In the Distribution Requirement Planning (DRP) method can be a solution for CV. XYZ to overcome the problem of scheduling distribution can be efficient where with a plan that helps manage when and how much is sent to each distribution so as to ensure demand is met optimally. And for the urgency of this problem lies in the fulfilment rate which is in the range of 93% so that the company's services have a gap between actual performance and the service level target of 99%. If it continues to be unresolved, it will interfere with retail operational costs and increase operational costs due to additional shipments that must be made to cover stock shortages. So it is necessary to implement DRP in CV. XYZ can create a more efficient scheduling system, deliver products according to the real needs of retail, reduce the frequency of emergency deliveries, and improve distribution performance so that deliveries can be made more economically and scheduled.

RESEARCH AND METHODS

In this study, a systems approach was used, where the entities consist of interconnected components working together to achieve a specific goal. This approach involves analyzing all critical factors affecting the system's success to find the most effective solution (Machfud and Abdurrafi, 2022). In this research, data collection involves gathering various pieces of information necessary for the study. This information is obtained from two main sources: primary data collected directly from the subjects being studied, and secondary data sourced from the internet and electronic media. The data used includes historical demand data for each retail outlet from January to December 2023, which is required to calculate the distribution costs for the year 2023. Additionally, the end-of-year inventory data for 2022 will be used as input for the Distribution Requirement Planning (DRP) calculations.

DRP works by integrating various data in optimising inventory and distribution scheduling. In addition, DRP utilises historical retail demand data in predicting needs accurately so that year-end inventory data, lead times, and delivery realisations can be used as a basis for determining the optimal number and time of deliveries. Lead time data is very important to determine the optimal delivery time for each retail outlet because delivery lead time data is used as information in determining the right time to deliver to each retail outlet. Delivery realization data is used as a basis to compare the existing distribution conditions with the proposed conditions adjusted according to the DRP method (Xu *et al.*, 2023). Distribution cost data, including ordering costs, holding costs, and shipping costs, will be compared between the actual and proposed conditions. The service level, measured by the level of demand fulfillment, will be used as a reference for calculating Safety Stock for each retail outlet (Tadayonrad and Ndiaye, 2023). Once the data is collected, the next steps involve calculating Safety Stock, determining the appropriate Lot Sizing technique (using the EOQ method to calculate the optimal order quantity in minimising total costs, POQ to determine the order size according to the specified time period so that it is sufficient to meet the needs during the period, and LFL to always adjust production to the demand in that period so that there is no excessive stock in storage), and scheduling distribution activities using the DRP method based on On Hand Inventory, Safety Stock, and lead time data (Putri *et al.*, 2020). The final step is the planning of distribution scheduling using the DRP method.

RESULTS AND DISCUSSIONS

Safety Stock for Each Retail Outlet in CV XYZ

Safety stock is an additional inventory reserve kept to mitigate the risk of stockouts caused

by demand uncertainty or delivery delays (Silver *et al*., 2017). Safety stock serves as a safeguard against unexpected demand fluctuations or disruptions in delivery, allowing the company to continue meeting customer demand even when there is variability in the supply chain (Chopra and Meindl, 2016). Table 1 show the results of the monthly safety stock calculations for each retail outlet in 2023.

Table 1. *Safety Stock per retailer*

Safety stock					
Month	**R1**	**R2**	**R3**	**R4**	**R5**
Jan	664	1277	2116	405	432
Feb	1227	767	675	479	332
Mar	1410	402	1626	445	423
Apr	1958	545	2124	248	357
Mei	826	472	613	558	377
Jun	768	358	616	439	331
Jul	360	394	530	749	559
Aug	299	472	641	525	382
Sep	451	381	582	383	378
Okt	658	599	569	586	434
Nov	615	623	459	486	533
Des	426	670	607	414	472

Lot Sizing Technique Used in CV XYZ.

After calculating the safety stock, the next step is to select a lot sizing technique to determine the order quantity suitable for CV XYZ's shipments. This study employs the Economic Order Quantity (EOQ) method, which identifies the order quantity that minimizes the total annual variable costs, including ordering costs, holding costs, and purchase costs (Bahagia, 2006). EOQ is particularly useful when the demand is relatively constant or steady (Heizer *et al.,* 2020). Table 2 shows the results of the comparison of each lot sizing method, with an example from Retail 1 for the month of January.

Based on Table 2, which presents the distribution cost data for each method, the analysis indicates that the Economic Order Quantity (EOQ) method is the most optimal choice for CV XYZ in determining lot sizing for Retail 1 in January. Although the ordering cost for EOQ is Rp3,520,000. which is higher than both the Period Order Quantity (POQ) and slightly higher than Lot For Lot, EOQ provides a good balance between ordering costs, holding costs, and delivery costs. The holding cost for EOQ, amounting to Rp58,188,583, is significantly lower than Lot For Lot's Rp1,449,667,777 and more efficient compared to POQ's Rp84,718,646. This suggests that EOQ effectively optimizes the inventory levels, reducing the risk of excess stock and high holding costs. The delivery cost for EOQ, at Rp53,504,000, is intermediate between POQ and Lot For Lot, indicating an optimal delivery frequency. Selecting EOQ as the preferred method enables CV XYZ to minimize its total distribution operational costs. This method offers a balanced approach to inventory and delivery management, which can enhance the company's supply chain efficiency. By using EOQ, CV XYZ can optimize order quantities, reduce excessive holding costs, and ensure sufficient product availability to meet Retail 1's demand.

Scheduling Distribution Activities Under Proposed Conditions Using DRP

In the proposed conditions, where existing data is processed using the DRP method, the goal is to assess the changes in the situation after improvements are made to address the unmet demand issues present in the current setup (Sofyan and Khairani, 2013). Applying DRP to enable the company to handle future demand fluctuations. Table 3 illustrates the proposed scheduling of activities for Retail 1 in January.

Distribution Cost Calculation for Each Retail Outlet

After planning the distribution scheduling for each retail outlet, the next step is to calculate the distribution costs for each one. The cost components considered include holding costs, delivery costs, and ordering costs (Gustafsson *et al.,* 2021). Table 4 presents the detailed results of the distribution scheduling cost calculations, which have been optimized using the DRP method.

Table 2. Distribution Cost Data for Each Method

Lot Sizing Method	**Ordering Costs**	**Holding Costs**	**Delivery Costs**
Economic Order Quantity	Rp3,520,000	Rp58,188,583	Rp53,504,000
Period Order Quantity	Rp270,000	Rp84,718,646	Rp4,104,000
Lot For Lot	Rp3,200,000	Rp1,449,667,777	Rp48,640,000

Table 3. Scheduling of activities for retail 1 in January under proposed conditions

On hand balance					**3.000**				***Lead time***					**1**		
Lot size EOQ					**198**				***Safety stock***					**664**		
`	**PD**	***Period***														
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
Gross Requirements		2,800	3,000	3,050	3,100	3,050	2,900	3,500	3,200	3,600	3,050	3,200	2,800	2,850	2,900	2,800
Schedule Receipts																
Projected on Hand	3,000	200	163	77	137	51	114	170	131	86	0	158	124	39	103	68
Net Requirements		464	3,464	3,551	3,687	3,577	3,513	4,050	3,694	4,133	3,627	3,864	3,306	3,390	3,524	3,361
Planned Order Receipts			2,963	2,963	3,161	2,963	2,963	3,556	3,161	3,556	2,963	3,358	2,766	2,766	2,963	2,766
Planned Order Release		2,963	2,963	3,161	2,963	2,963	3,556	3,161	3,556	2,963	3,358	2,766	2,766	2,963	2,766	2,963
		Period														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gross Requirements	2,900	2,900	3,100	3,200	3,350	3,550	3,150	3,000	2,650	2,450	2,400	2,500	3,000	3,100	3,000	2,950
Schedule Receipts																
Projected on Hand	132	195	58	19	27	33	44	7	123	44	14	82	46	106	70	83
Net Requirements	3,495	3,432	3,569	3,806	3,995	4,186	3,781	3,620	3,307	2,991	3,020	3,150	3,581	3,718	3,557	3,544
Planned Order Receipts	2,963	2,963	2,963	3,161	3,358	3,556	3,161	2,963	2,766	2,371	2,371	2,568	2,963	3,161	2,963	2,963
Planned Order Release	2,963	2,963	3,161	3,358	3,556	3,161	2,963	2,766	2,371	2,371	2,568	2,963	3,161	2,963	2,963	0

Table 4. Distribution costs under proposed conditions using DRP

Retail	***Frequency of Deliveries***	***Holding Costs***	***Delivery Costs***	***Ordering Costs***	***Total Distribution Costs***
R1	352	Rp 58,188,583	Rp 53,504,000	Rp 3,520,000	Rp 115,212,583
R2	352	Rp 54,817,630	Rp 53,504,000	Rp 3,520,000	Rp 111,841,630
R3	347	Rp 52,044,618	Rp 52,744,000	Rp 3,470,000	Rp 108,258,618
R4	353	Rp 59,465,419	Rp 53,656,000	Rp 3,530,000	Rp 116,651,419
R5	353	Rp 42,784,248	Rp 53,656,000	Rp 3,530,000	Rp 99,970,248

Demand Forecasting Method Used by CV XYZ

In this demand forecasting, the measurement used is the Mean Absolute Deviation (MAD) to assess the accuracy of forecasts by comparing them with actual values. Accuracy provides an indication of the magnitude of forecasting errors, though it does not address the overall direction of these errors (Vandeput, 2021). Table 5 shows the MAD values for each retail outlet using the four methods: simple moving average, weighted moving average, simple exponential smoothing, and double exponential smoothing.

Table 5. MAD for each retail outlet

Retail 1				
Month	**SMA**	**WMA**	**SES**	**DES**
Jan	200	205	206	200
Feb	249	261	218	218
Mar	474	469	466	495
Apr	535	542	548	540
Mei	313	311	306	343
Jun	295	291	290	324
Jul	201	202	207	225
Aug	139	141	129	134
Sep	208	211	189	200
Okt	268	272	237	268
Nov	285	284	277	297
Des	152	155	145	156
Average	276.583	278.667	268.167	283.333

Based on the Table 5, the average MAD for each method indicates that Simple Exponential Smoothing has the smallest MAD, which is 268.167. Therefore, this method is selected for future forecasting.

Demand Forecasting

After selecting the forecasting method based on the error measures of each approach, forecasting is performed using historical data from January to December 2023, January is chosen as an example, with demand forecasting results for each retail outlet over 31 days,

DRP Tabulation for Forecasting Period

After completing the demand forecasting, the next step is to schedule activities using the Distribution Requirement Planning (DRP) method. This process involves the same steps as before: calculating safety stock, determining the lot sizing technique, and scheduling distribution activities with DRP (Jacobs *et al.*, 2005). Table 7 show for the distribution activity scheduling for the forecasting period for Retail 1.

Analysis of Comparison Between Actual Delivery Performance in Existing and Proposed Conditions

The existing conditions at CV XYZ, which do not apply the DRP method, indicate that there is no well-established distribution activity scheduling or delivery policy for each retail outlet (Rushton *et al*., 2017). This lack of a structured approach can lead to discrepancies between total demand and actual delivery performance, meaning CV XYZ is not yet able to meet each retail outlet's demand optimally. The presence of additional delivery backlog highlights issues within the existing distribution system at CV XYZ. Implementing the Distribution Requirement Planning (DRP) method can assist CV XYZ in managing inventory, identifying daily scheduling needs for each retail outlet based on current demand, and overall improving the distribution system (Sofyan and Khairani, 2013). Table 8 show the comparison of actual delivery performance before and after implementing the DRP method.

Table 6. January demand forecasting

Date	**R1**	**R2**	**R3**	**R4**	**R5**
1	2,820	1,375	1,805	2,475	1,485
2	2,818	1,625	1,855	3,100	1,467
3	2,836	2,250	1,894	3,175	1,445
4	2,858	2,825	1,955	2,975	1,455
5	2,882	3,175	2,039	2,850	1,430
6	2,899	3,025	2,075	2,875	1,422
7	2,899	2,775	1,868	3,000	1,420
8	2,959	2,600	1,901	3,100	1,453
9	2,983	2,500	1,891	3,000	1,487
10	3,045	1,975	1,852	2,975	1,494
11	3,045	1,900	1,797	3,050	1,504
12	3,061	2,400	1,737	3,025	1,519
13	3,035	2,150	1,683	2,875	1,517
14	3,016	1,750	1,515	2,750	1,495
15	3,005	1,550	1,483	2,850	1,491
16	2,984	1,925	1,485	3,000	1,457
17	2,976	2,475	1,472	2,925	1,466
18	2,968	2,875	1,444	2,725	1,444
19	2,981	3,225	1,480	2,675	1,430
20	3,003	2,650	1,332	2,825	1,447
21	3,038	2,100	1,454	2,800	1,452
22	3,089	2,750	1,553	2,775	1,477
23	3,095	3,100	1,618	2,825	1,444
24	3,086	2,850	1,646	2,775	1,460
25	3,042	2,475	1,762	2,700	1,474
26	2,983	2,400	1,940	2,800	1,457
27	2,925	2,625	2,041	3,000	1,431
28	2,882	2,400	2,152	2,975	1,423
29	2,894	2,125	2,262	2,800	1,431
30	2,915	2,500	2,246	2,825	1,447
31	2,923	3,250	2,246	3,050	1,473

Based on the Table 8, the data shows a significant improvement in demand fulfillment and delivery performance between the existing and proposed conditions for the five retail outlets studied. Initially, the fulfillment rates ranged from 90% to 94%, with Retail 5 at the lowest and Retail 2 and 3 at the highest.

Table 7. Distribution activity scheduling for the forecasting period for retail 1 in January

On hand balance				0			*Lead time*							1		
Lot size EOQ				196			*Safety stock*							188		
`	PD	*Period*														
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Gross Requirements		2,820	2,818	2,836	2,858	2,882	2,899	2,899	2,959	2,983	3,045	3,045	3,061	3,035	3,016	3,005
Schedule Receipts																
Projected on Hand	0	126	58	169	61	125	173	24	11	171	72	170	55	163	94	35
Net Requirements		3,008	2,880	2,966	2,878	3,010	2,962	2,915	3,124	3,161	3,063	3,161	3,080	3,168	3,041	3,100
Planned Order Receipts		2,946	2,750	2,946	2,750	2,946	2,946	2,750	2,946	3,143	2,946	3,143	2,946	3,143	2,946	2,946
Planned Order Release	2,946	2,750	2,946	2,750	2,946	2,946	2,750	2,946	3,143	2,946	3,143	2,946	3,143	2,946	2,946	3,143
		Period														
	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
Gross Requirements	2,984	2,976	2,968	2,981	3,003	3,038	3,089	3,095	3,086	3,042	2,983	2,925	2,882	2,894	2,915	2,923
Schedule Receipts																
Projected on Hand	194	164	143	108	51	156	14	61	118	23	182	7	72	124	156	179
Net Requirements	3,137	2,971	2,992	3,027	3,083	3,175	3,121	3,270	3,213	3,112	3,149	2,931	3,063	3,011	2,979	2,956
Planned Order Receipts	3,143	2,946	2,946	2,946	2,946	3,143	2,946	3,143	3,143	2,946	3,143	2,750	2,946	2,946	2,946	2,946
Planned Order Release	2,946	2,946	2,946	2,946	3,143	2,946	3,143	3,143	2,946	3,143	2,750	2,946	2,946	2,946	2,946	0

This indicates a 6-10% gap between demand and actual delivery that needed to be addressed. After implementing the DRP method, there was an increase in demand fulfillment. All retail outlets now achieve fulfillment rates above 99%, with Retail 3 leading at 99.95%. This improvement reflects the success of the proposal in minimizing the gap between demand and delivery performance, leaving less than a 1% difference for all retail outlets. The increase in service level is evident across all retail outlets, with improvements ranging from 5.9% to 9.8%. Retail 5, previously the lowest performer, recorded the largest increase of 9.8%. On average, there was a 7.45% increase in service level across all retail outlets. This indicates that the proposed solution positively impacted the improvement in meeting each retail outlet's demand and achieving the desired service level targets (Rajani *et al.*, 2022).

Analysis of Distribution Costs in Existing and Proposed Conditions

Distribution costs are a crucial aspect of supply chain management. In the existing conditions, the company sometimes fails to meet demand, leading to a backlog of deliveries for unmet requests (Tyagi and Agarwal, 2014). This can negatively impact distribution costs, causing them to increase rather than be minimized. Therefore, accurate planning and scheduling of distribution activities are essential to minimize distribution costs and ensure optimal distribution operations. After implementing the DRP method, the distribution costs for the proposed conditions were calculated. Table 9 show a comparison of the existing and proposed distribution costs.

Distribution costs, which encompass all expenses related to moving products from producers to consumers, consist of three main components: ordering costs, holding costs, and delivery costs. The data indicates a significant reduction in total distribution costs from Rp593,980,120 to Rp551,934,498, resulting in a savings of 7% or Rp42,045,622. The largest decrease was observed in holding costs, which fell from Rp299,970,120 to Rp267,300,498, suggesting improvements in inventory management. This reduction is likely due to more efficient delivery scheduling, which has allowed the company to reduce the time products spend in storage. The efficiency of scheduling is also reflected in the decrease in delivery costs from Rp275,880,000 to Rp267,064,000, indicating optimized delivery frequency.

Ordering costs also saw a slight decrease from Rp18,130,000 to Rp17,570,000, attributed to better ordering planning in conjunction with more efficient delivery scheduling. Optimal scheduling enables the company to place orders more timely and accurately, reducing unnecessary ordering frequency. Improved delivery scheduling has led to a reduction in long-term storage needs, thereby lowering holding costs (Xu, 2020). Overall, the enhancements in delivery scheduling have significantly contributed to the efficiency of distribution costs. This approach not only optimizes each cost component individually but also creates synergies among them, resulting in a more cost-effective and efficient distribution system.

In forecasting and data collection, there are some limitations that need to be considered. Demand data only covers the period from January to December 2023, thus under-representing long-term trends. Lead time is assumed to be constant for 24 hours, without considering potential disruptions that could affect delivery. Deliveries are made daily based on demand, which can make efficient planning difficult and increase operational costs. In addition, delivery costs were calculated per retail for one vehicle, without considering route optimisation, which may affect the accuracy of the cost calculation

Table 8. Comparison of actual delivery performance in existing and proposed conditions

	Sum of Demand	**Existing Delivery Performance**	**Proposed Delivery Performance**	**% Fulfillment (Existing)**	**% Fulfillment (Proposed)**
Retail 1	1,243,200	1,157,650	1,240,243	93%	99.8%
Retail 2	1,064,700	999,200	1,063,517	94%	99.9%
Retail 3	921,300	865,800	920,983	94%	99.95%
Retail 4	1,329,450	1,209,400	1,326,212	91%	99.8%
Retail 5	662,050	593,500	660,731	90%	99.8%

Table 9. Comparison of existing and proposed distribution costs

Condition	**Order Costs**	**Holding Costs**	**Delivery Costs**	**Total Distribution Costs**
Actual	Rp 18,130,000	Rp 299,970,120	Rp 275,880,000	Rp 593,980,120
Proposed	Rp 17,570,000	Rp 267,300,498	Rp 267,064,000	Rp 551,934,498
Difference				Rp 42,045,622
% Difference				7%

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

From the research conducted on distribution scheduling planning using the Distribution Requirement Planning (DRP) method, it was concluded that this approach efficiently addresses the challenge of meeting demand at each retail outlet. Previously, the average delivery performance was 93%, resulting in a 6% gap from the company's desired service level of 99%. However, after implementing the DRP method, the proposed scheduling plan achieved an average fulfillment rate of 99.8% across all five retail outlets. Additionally, the use of DRP for scheduling activities resulted in a 7% reduction in total distribution costs compared to the existing conditions. The distribution costs decreased from Rp593,980,120 to Rp551,934,498, resulting in a savings of Rp42,045,622. The advantages of this research are the improvement of the distribution activity schedule in meeting demand needs so that it can minimise the total distribution cost while the disadvantages of this research are the limitations of varying lead times that affect the optimisation of distribution activity scheduling so that a constant lead time is needed compared to previous research where only the improvement of the activity schedule can meet demand needs, and achieve the desired service level but not by minimising the total distribution cost.

Recommendations

CV XYZ should adopt the Distribution Requirement Planning (DRP) method for scheduling distribution activities to accurately assess and manage the inventory levels required for each retail outlet according to their specific demand. Regular inventory checks should also be conducted to review stock levels, ensuring the company can effectively meet consumer demands and maintain adequate inventory to prevent shortages. In addition, monitoring is needed to ensure that the distribution schedule goes according to plan and performance evaluation is adjusted if there is a mismatch between prediction and realisation. And for the long-term implications of implementing DRP, there is an increase in operational efficiency which can reduce the frequency of emergency deliveries and reduce operating costs, reduce stock shortages and excess inventory so that it helps optimise inventory, increase service levels because it meets retail demand in a timely manner so that customer satisfaction increases, and better decision making so that the results of DRP can help CV. XYZ to make more strategic decisions regarding inventory and distribution in the future.

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