



Analysis of raw material planning in company using the material requirement planning

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ABSTRACT

One of the problems that often occur in industrial companies is related to the inventory of raw materials. It is closely related to the production process, which can speed up or slow down. The researchers analyzed the existing business process model and Material Requirement Planning (MRP) model and the transformation of the two business process models. The processing of primary and secondary data was carried out with the MRP model approach and showed that the Lot for Lot method provides savings in ordering and purchasing raw materials. Besides, it provides savings in raw material inventory costs from January 2020-December 2021. The need for a Bill of Materials is also more controlled using the MRP system model.

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INTRODUCTION

The industrial world continues to experience development from year to year which cause competition between companies to get tougher. It can be seen from the quality of goods produced from various companies or manufacturers with affordable prices (Basmar *et al.*, 2021). Products in the industry show that every company has a production planning system. Respectively, this system is used by companies to manage the production process so that it runs well. A good production process is a process that can minimize costs and maximize product yields and competitive selling prices (Rudiawan, 2021). The production process cannot be separated from the raw materials needed. The company must provide raw materials before the production process. The inventory or procurement of raw materials must be in accordance with production needs so that the production process can run well (Nugroho *et al.*, 2019).

The inventory of raw materials must be adjusted to production activities. Every company is required to have a raw material inventory strategy. Over inventory of raw materials can cause high production costs, which is in the form of storage costs for the remaining raw materials, while less inventory of raw materials can hinder the production process (Triono *et al.*, 2019). PT. XYZ is a company engaged in the frozen food industry. Based on the company's secondary data sources, the company had problems regarding the procurement of raw materials that were not controlled during the COVID-19 pandemic, in 2020 to 2021. Based on reports of excessive ordering of raw

materials, it causes a large amount of raw material residue and results in the company's expenses being increased, and the company has to incur storage costs for the remaining raw materials. Planning for the provision of raw materials to PT. XYZ is not well managed due to the high level of demand for volatile products.

One of the methods in raw material planning can be done using the Material Requirement Planning (MRP) method. MRP in planning the procurement of production raw materials is carried out by estimating the amount of production that will come, which of course is accompanied by knowledge of the price of materials that make up raw materials, materials needed, product structure, and costs needed to meet material needs. MRP is a method that can be implemented by companies to assist in planning the amount of raw material needs used in production activities (Lienardo & Jin, 2020). MRP provides an information system that companies can use to calculate the needs of materials used in the production process appropriately. MRP plays an important role in planning the raw materials needed by the company in accordance with the planned production amount (Hauhnafi, 2015; Hidayat *et al.*, 2020). This MRP can assist a company in planning and optimizing raw material orders tailored to the company's own production needs (Kortabarria *et al.*, 2018). In other words, this system is one of the solutions that companies can use to avoid the remaining raw materials in the production process which will greatly help the company to minimize the need for dependence on each item used and it certainly will not interfere with production activities (Suparno, 2018). The MRP method can be applied using the Lot Sizing method, namely Lot For Lot (LFL), Economic Order Quantity (EOQ), and Period Order Quantity (POQ). This techniques are used to reduce or eliminate storage costs and help companies order raw materials according to the amount needed by the company for each production process so that there is no problem happened, which is called the remaining raw materials. Thus, the gross needs will be equal to the net needs ordered and the raw materials that will come just in time (Anindita & Pudjiastuti, Agnes, 2016; Mangasa Sinurat; Audrey M. Siahaan; Ardin Doloksaribu; Halomoan Sihombing, 2020).

RESEARCH METHOD

The research was conducted with quantitative and qualitative approaches using a descriptive approach (Sugiyono & Sutopo, 2019). The research was conducted at PT. XYZ which started in November 2021. The data used in this study is data on the procurement of raw materials in 2 years, in the period from January 2020 to December 2021. The types of data used in this study are primary data and secondary data. Primary data came from data from experiments, surveys, and direct interviews to find out specific data to be analyzed. Meanwhile, secondary data was obtained from previous research data related, the study of literature and documentation, especially regarding to this research problem. After all the necessary data were collected, then the data will be processed with the aim of obtaining results in the form of expected material needs with the stages of data processing until it becomes a Material Requirement Planning (MRP) method. The data processing technique was by grouping data owned from historical companies using excel software. This is done with the aim that researchers could recognize the pattern of the data used, estimate the amount of production that will come and maximize the raw materials to arrive on time and compare inventory planning costs from the old method that has been applied by the company with the Material Requirement Planning (MRP) method in which there are many methods, including the Lot Sizing method, namely Lot For Lot (LFL), Fixed Period Requirement (FPR), and Fixed Order Quantity (FOQ). Data analysis techniques included data reduction, data presentation (display), and drawing conclusions. In this study, the researcher selected the data obtained at the time of the study (Sugiyono, 2017). Researchers created a framework by analyzing the existing business process model and MRP then created the efforts to analyze the transformation of the two business processes. Overview of existing business processes run by PT. XYZ is expected to be able to design measurements of cycle time and efficiency. In its implementation, business processes

were carried out according to the direction of the company's management and adjust to the conditions that occurred. This was done because there are often obstacles in terms of maintenance, procurement, and inventory of raw materials in production.

RESULTS AND DISCUSSIONS

Frozen Food processed from chicken meat raw materials is nugget food which will be distributed to agents or resellers. Likewise with beef that will be processed into slices as grill ingredients and burger fillings, as well as shrimp which will be processed into one of the foods known to the general public, namely shrimp meatballs.

The inventory control method aims to streamline the costs that must be incurred by the company related to the procurement of raw materials and become the sustainability of production carried out by a company. The following is a plan for the procurement of raw materials for 2020 to 2021, which is presented in Table 1.

Table 1 . Raw Material Procurement Plan for 2020-2021

Year	Percentage
2020	44%
2021	56%
Total	100%
Average	4%

Source: Primary Data 2020-2021

Based on Table 1, the raw material procurement plan for 2020 to 2021 is 304,615 Kg (100%), with an increase in orders in 2021 of 12% from the previous year and an average monthly order of 4%. The development during 2020 to 2021, can be seen in Table 2.

Table 2 . Development of Raw Material Inventory in 2020-2021

Year	Purchase (%)	Inventory (%)	Usage (%)	Final Inventory (%)	Average Inventory (%)
2020	44%	50%	45%	50%	50%
2021	56%	50%	55%	50%	50%
Total	100%	100%	100%	100%	100%
Average	4%	4%	4%	4%	4%

Source : Primary Data 2020-2021

Based on the table above, it is known that the inventory is from 2020 to 2021. The amount of the initial inventory and the final inventory of raw materials have different values. This happens because each production uses a certain and different amount. During 2020 to 2021 makes purchases according to calculated needs. Here are the booking frequencies from 2020 to 2021.

Table 3 . Booking Frequency

Year	Frequency
2020	625 times
2021	721 times
Total	1,346 times
Average	56,083 times

Source: Primary Data 2020-2021

Table 3 explains the frequency of raw material orders in 2020 as many as 625 times. Then, in 2021, there are 721 times. This frequency of purchases is related to the quantity of purchases, the inventory, and frequency of raw materials become larger and larger, this will cause the cost of inventory and the cost of purchasing raw materials to increase.

Table 4. Order Fee Per Order PT. XYZ Period January 2020 – December 2021

Types of Fees	Percentage (%)
Unloading	42
Transport	58
Total	100

Source : Processed Data, 2020-2021

The loading and unloading percentages is the percentage that compared to the company which is intended as a percentage for workers in charge of unloading and transporting raw materials from vehicles into the production warehouse, the percentage of loading and unloading issued by the company is 42%, then there is a percentage of transport. This percentage is the percentage that the company spends on vehicles in charge of ordering raw materials by 58%. besides, the percentage comparison can be estimated costs or wages by the shipping or procurement service.

Table 5. Calculation of Raw Material Storage Per Kg PT. XYZ
Period January 2020 – December 2021

Component Cost	Calculation of Frozen Food Raw Material Storage			
	Annual value (times)	Monthly value (times)	Value per week (times)	Value per day (times)
Raw Materials (Chicken, Beef and Shrimp)	696x	29x	7x	1x

Source: Processed Data, 2020-2021

It can be seen in the table above that the calculation of storage issued by the company every two years reaches 696x, where if calculated the storage per month is 29x, with the calculation of storage per week of 7x, and the calculation of storage per day is ensured to be done 1x. This storage calculation must be done by the company because there are raw materials left over from the previous production process or it can also be caused since the raw materials came not on time.

Inventory Calculation

Inventory calculation is a calculation carried out by the company to meet the inventory of raw materials. This inventory calculation includes ordering calculations and storage calculations or commonly referred to as variable calculations. Then, there is also a calculation that must be issued according to the amount of raw materials that will be needed or commonly referred to as fixed calculations (Fajriyah *et al.*, 2018).

Calculated inventory calculation is from how much inventory, storage, and purchases. Researchers used data in the period January 2020 - December 2021 as follows.

Table 6. Calculation of Raw Material Inventory for the January 2020-December 2021
Period using the Company's Actual Conditions

Booking frequencies 2020-2021	Inventory Calculation			
	Total one year (times) of bookings	A week (times) of ordering	Quantity of Inventory/Kg (Average)	Total one year (%)
1,346	673x	7x	16876,875	696x

Source: Processed Data, 2020-2021

Table 7

Comparison of Frequency, Quantity of Purchases, Inventory in Warehouses, Storage Calculations, Inventory Calculations, and Calculations of Purchasing Raw Materials January 2020 – December 2021

Description	Company	LFL
Frequency (times)	1.346	1.346
Purchase Quantity(kg)	304,615	304,615
Quantity of Inventory in warehouse	401,580	365,897

(Kg)		
Order Calculation (times)	673x	696x
Storage Calculation (times)/ month	29x	22x
Inventory Calculation (times)/week	7x	4x

Source : Processed Data, 2020-2021

From the table above, the total calculation of inventory issued is 7x in a week increments in 2 years and if calculated 728x inventory per 2 years. The total inventory calculation itself was obtained from the number of order calculations and storage calculations. Then, the calculation issued for ordering frozen food raw materials in the January 2020–December 2021 period was 696x in a year and the storage calculation of 58x per 2 years was due to the presence of previously produced residual materials. From the results of the calculations above, it can be seen that the calculation of raw material storage is higher than the calculation of the order. This shows that it is necessary to reduce the quantity of raw material purchases by not disturbing the smooth running of the production process with the aim that the company can optimize the calculation of expenditures in the supply of frozen food raw materials.

Discussion

The process of procuring raw materials in the system running at frozen food company is started with ordering several raw materials by submitting a request for raw material procurement and recording the needs of raw materials for production. If the stock of raw materials is available as needed, scheduling production and production is done without delay. However, frozen food company existing business processes still need to improve demand control, procurement, ordering, and storing of raw materials left over from production. Then, the researcher analyzed the running system using the Material Requirement Planning (MRP) model approach with the Lot Sizing method at frozen food company as an improvement of the existing business process, which still has weaknesses in demand control, procurement, ordering, and storage of raw materials left over from production and system approach that runs using MRP (Material Requirement Planning) at frozen food company as an improvement of existing business processes.

Through the control of the MRP (Material Requirement Planning) process, it will be very effective to reduce storage, where the storage in question is the remaining raw materials from ordering and cannot be produced either in conditions of raw material defects or excess demand at the demand stage. The remaining raw materials will be minimized by MRP because, after the completion of the production process, a performance review or measurement will be carried out and re-controlled through MRP for the following and repeated procurement process. The analysis results during the period January 2020 – December 2021 can be compared between the Lot For Lot method and the method used by the company. A summary of the calculations is presented in Table 7.

The calculation results show that inventory control with the MRP model of the Lot Sizing method results in lower inventory cost calculations. Thus, it allows the company to save the cost of frozen food raw material inventory. The gross need for raw materials will be the same as the clean needs of raw materials so that the company can reduce production costs, especially the cost of procuring raw materials. Storage costs will also be smaller than company techniques and may not even exist.

The analysis results with the Lot Sizing method show that MRP can be an alternative for companies that want to save on the cost of raw material inventory. This study's results are in accordance with research conducted by Asvin Wahyuni and Achmad Syaichu, which stated that the MRP method plays a role in the cost-efficiency of raw material inventory by 46.7%. In another study conducted by Eka Wahyuni Fajriyah, Mohammad Fuad Fauzul Mu'tamar, and Askur Rahman also stated that the MRP method using the Lot For Lot technique can save costs up to 44% more efficiently than the company's method. Then, in the research conducted by Putut Ade Irawan

and Achmad Syaichu, the same opinion that the MRP method causes cost efficiency of 10.25% (Fajriyah *et al.*, 2018; Irawan & Syaichu, 2016; Wahyuni & Syaichu, 2015).

CONCLUSION

The ongoing raw material inventory control and procurement system are known to be able to design measurements of cycle time and efficiency. However, it needs to be better structured. This is because the company uses a forecasting method based on sales targets. Ordering these raw materials is only based on the warehouse's needs and inventory of raw materials. The Lot Sizing method saves ordering costs on the frequency of raw material purchases. It provides savings in raw material inventory costs during the period January 2020-December 2021, more efficiently rather than the company's methods or forecasting methods applied by the company.

References

- Anindita, R., & Pudjiastuti, Agnes, Q. (2016). Konsep Dasar Ekonomi Manajerial. *Modul 1 Universitas Terbuka*, 1-26.
- Basmar, E., Purba, B., Damanik, D., & Rumondang, A. (2021). Ekonomi Bisnis Indonesia. *Yayasan Kita Menulis Buku Kita.Com*, 16(1), 11-18.
- Fajriyah, E. W., Mu'tamar, M. F. F., & Rahman, A. (2018). Perencanaan Persediaan Bahan Baku Rajungan Menggunakan Metode MRP (Material Requirement Planning) (Studi Kasus : UD. Gerald Unedo). *Rekayasa*, 10(1), 9. <https://doi.org/10.21107/rekayasa.v10i1.3599>
- Hauhnafi, M. (2015). Konsep Dasar dan Perkembangan Teori Manajemen. *Managemen*, 1(1), 66. <http://repository.ut.ac.id/4533/1/EKMA4116-M1.pdf>
- Hidayat, D., Darsawati, E., & Sofiani, V. (2020). Pengendalian Persediaan Bahan Baku dalam Efisiensi Biaya Produksi. *BUDGETING: Journal of Business, Management and Accounting*, 2(1), 230-241. <https://doi.org/10.31539/budgeting.v2i1.1621>
- Irawan, P. A., & Syaichu, A. (2016). Pengendalian Persediaan Bahan Baku Dengan Metode Material Requirement Planning (MRP) Pada PT. Semen Indonesia (PERSERO), Tbk. *Journal Knowledge Industrial Engineering (JKIE)*, 04(01), 15-22.
- Kortabarria, A., Apaolaza, U., Lizarralde, A., & Amorrortu, I. (2018). Material management without forecasting: From MRP to demand driven MRP. *Journal of Industrial Engineering and Management*, 11(4), 632-650. <https://doi.org/10.3926/jiem.2654>
- Lienardo, D. A., & Jin, O. F. (2020). Analisis Perbandingan Metode Material Requirements Planning (Mrp) Dengan Metode Pengendalian Material Di Proyek a. *JMTS: Jurnal Mitra Teknik Sipil*, 3(2), 223. <https://doi.org/10.24912/jmts.v3i2.7045>
- Mangasa Sinurat; Audrey M. Siahaan; Ardin Doloksaribu; Halomoan Sihombing. (2020). Akuntansi Biaya. *Akuntansi Biaya*, 147.
- Nugroho, A., Andwiyan, D., & Hasanudin, M. (2019). Analisis dan Aplikasi MRP (Material Requirement Planning) (Studi Kasus PT. X). *Jurnal Ilmiah FIFO*, 10(2), 51. <https://doi.org/10.22441/fifo.2018.v10i2.006>
- Rudiawan, H. (2021). Peranan Manajemen Produksi dalam Menyelaraskan Kinerja Perusahaan. *Jurnal Manajemen FE-UB*, 9(2), 66.
- Sugiyono. (2017). *Metode Penelitian Kuantitatif, Kualitatif Dan R&D*. Bandung: Alfabeta.
- Sugiyono, & Sutopo. (2019). *Metode Penelitian Kuantitatif, Kualitatif, dan R&D (1st ed)*. Bandung: Penerbit Alfabeta.
- Suparno, S. (2018). Analisis Penerapan Material Requirement Planning (Mrp) Dengan Mempertimbangkan Lot Sizing. *NJCA (Nusantara Journal of Computers and Its Applications)*, 2(1). <https://doi.org/10.36564/njca.v2i2.33>
- Triono, T., Tobing, F. A. T., & Ariyanto, D. W. (2019). Sistem Informasi Monitoring Permintaan Dan Pengiriman Bahan Baku Produksi. *Jurnal Sisfotek Global*, 9(1). <https://doi.org/10.38101/sisfotek.v9i1.213>
- Wahyuni, A., & Syaichu, A. (2015). Perencanaan Persediaan Bahan Baku Dengan Menggunakan Metode Material Requirement Planning (Mrp) Produk Kacang Shanghai Pada Perusahaan Gangsar Ngunut-Tulungagung. *Spektrum Industri*, 13(2), 141. <https://doi.org/10.12928/si.v13i2.2692>