Designing Templates to Support and Monitoring the Activities of Material Reequipment Planning (MRP)

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Abstract The main purpose of this paper is to design a template based on Excel as a support and monitor the operation of the MRP system, as well as optimize inventory value. The methodology done by identifying the MRP Objective targets that exist in the company and the raw material planning system process flow and comparing the achievement of the company's MRP objects with the results of calculations using templates. The results of comparison between the achievements of 2015 and 2016, then it can be concluded that the Excel template can be used to help the SAP system to delete junk data (fake) due to indiscipline user in inputting data can provide better performance. From the comparison result with using Template Excel company can achieve CSL > 95%, CSL Infull > 95% and Warehouse Inventory Value reduce until less than IDR 300 billion.

Keywords: Material Requirement Planning, Inventory, MRP Objectives, Safety Stock

1. Introduction
The level of market demand for personal products from year to year for each country is different and also changes significantly over time. Personal product industry companies must have the flexibility to demand that changes suddenly in order to continue to provide the best service to customers to be able to compete with other companies. Because improving service levels is the most important goal of Supply Chain Management and raw material planning is a key sub-area of Supply Chain Management, the Raw Materials Planning Department in a business is central to achieving the stated goals (Gulyassy, 2010). As such, raw material planning is important and must be able to anticipate changes in demand suddenly.

Excess raw materials outside of safety stock will affect inventory levels which will ultimately impact on warehouse costs (Brian Willcox, 2016). While the unavailability of raw materials at a certain time will result in the cessation of the production process which results in not fulfilling customer orders. Therefore raw material planning needs to be considered so as not to have an impact on the company's inventory level which will result in additional costs.
If the raw material planning system has been implemented and meets the company's MRP objectives, the raw material planning system can be said to be good. However, what if the raw material planning system cannot meet the objectives of the company's MRP? This research focuses on achieving the MRP objectives from the MRP implementation system.

1.1. Management of Raw Materials

Raw materials are very important resources that make a significant contribution to the costs incurred by the company and the impact on the production environment. During the production phase most of the resource efficiency initiatives and methods have been a major concern in making improvements measured by economic value. At present the need for a resource affinity level has expanded the scope of initiatives to consider a complete manufacturing and industrial system at an economic and environmental level (O Gould et al., 2016).

Study of advanced planning related to various planning processes and methods, such as; sales planning and operations. Production master scheduling, material planning capacity and control on the production floor (P Jonsson, et al., 2016)

Based on estimated sales and production plans, raw material planning and control can be carried out. Raw material planning can estimate the needs of each piece of raw materials, prepare raw material budgets, predict (estimate) the value of inventory levels, schedule ordering and monitor the performance of production and sales.

1.1.1. Purchasing. Included in the scope of purchase is the selection of suppliers, including in the case of purchases, allocation of purchase orders, follow-up to purchases, maintaining good relations with suppliers, evaluating suppliers and assigning values to each supplier.

1.1.2. Storage Management. Storage management involves controlling inventory, preserving stores, minimizing obsolete values and damage to raw materials through timely disposal and efficient handling, site maintenance, and storage. Stores are also responsible for verifying inventory values and collecting them in one recorded data. Stores play an important role in company operations.

1.1.3. Inventory Management and Control. Inventories generally refer to raw materials stored in warehouses. This is also referred to as an idle product in a company. Inventories are items that are ready to be distributed and also items that will be reused for the production process. The interval between receipt of items purchased and converted to final products will vary from industry to industry depending on the time of the manufacturing cycle (Murray, 2010).

![Figure 1. Overall Scope of Raw Material Management Raw Material](image-url)
1.2. Requirement Planning (MRP)

Computer equipment is a part in carrying out raw material planning in more detail as follows Willcox (2016):

- Computer Equipment
- Bill of Material (BOM)
- Inventory Notes
- MPS (Master Production Schedule)

The purpose of the calculation of needs is to determine the number of needs and the delivery date for the finished product. Usually, many of the different raw materials must be planned in one production. In addition, finished products, semi-finished products, raw materials, operating supplies, trading goods, spare parts, and other types of items can have a significant influence on characteristics such as the number of sales, number of orders, prices, forms of consumption, cycle conditions, leadtime changes, and production conditions (Gulyassy, 2010).

According to him to meet this need it is necessary to automate the planning of many items, while other items require monitoring in more detail, so that the MRP parameters must be studied in more depth to optimize the planning tools (systems) used. The MRP parameters that affect inventory value: a) Production Type, b) Determination of Storage Level (Inventory), c) Consumption, d) Parameters, e) Procedure Safety Stock, f) Forecasting Strategies and g) Item Classification and Product Analysis

According to him MRP (the literature also makes frequency references for program-oriented methods) is an accurate procedure for determining needs. This procedure follows a demand program where independent needs or planned market demands take the form of warehouse requests or sales requests. Planning procedures based on consumption values are usually used in areas without in-house production or in manufacturing companies for the purpose of planning class B or C materials in operations supply. The application of determining the needs process depends on the control class export specific. Warehouse is the one that provides value added process and has been recognized as a service, where companies can provide the most tailored services and gain competitive advantage (Arsinijevic et al, 2018)

The third option, in addition to determining MRP and determining needs based on consumption value, is determining needs based on demand / ordering (often known as raw material planning based on demand / ordering). Based on customer orders / requests in the form of POs, the determination of needs is carried out to fulfill POs of consumers. This determination will lead to the determination of individual needs. This will only occur in 'type production make-to-order' where the product will only be produced for consumers. Production Make-to-order can also be used if a company does not want a lot of excess inventory, out of, or stocks safety stock on a material, or if the company wants to convert a fulfillment of demand to a demand that has been ordered (PO).

2. Methods

Main step of this research is identified the objective of the company's MRP targets and the flow of the raw material planning process that was already underway. These objective targets will then be compared with the achievements of the current MRP system.

Supporting templates are designed using Microsoft Excel by using formulations in accordance with MRP calculations. From the results of data processing done on the template compared with the MRP output system by SAP. For this reason, testing is carried out at the same time on the current raw material planning system (SAP MRP system) and the excel comparison template.

Tests have been carried out from the beginning of January 2016 and as proof of the end, carried out screenshots were for each stage of the two systems on December 9, 2016 which were carried out on raw material 10165950. Both results of each system will be displayed to describe the parts that constitute weaknesses / deficiencies be identified.
3. Result and Discussion

*Template Excel* is designed as a comparison to clean up garbage data (dirty) that exist in the current MRP system as a result of indiscipline user fulfill its function so that the performance of the performance of an MRP system is currently providing much better results against objective MRP companies, especially the value of the inventory warehouse.

3.1. Display of Need Value Differences between System and Actual

The net requirement calculation between SAP system and *Excel template* produces the same results, but in making decisions for the status of raw material values are very different. Figure 10 shows the total MRP requirement displayed from the SAP system for December 9, 2016 for 10165950 raw materials is 104,888.62 KG (663,592 KG + 7,931,845 KG + 4,793,139 KG + 6,402,056 KG + 85,097,983 KG).

![Figure 2. Display of SAP 10165950 on December 9, 2016](source: capture from SAP)

Display of needs in the *Excel template* also displays the same basic needs, which are 104,888,616 KG which can be seen in Figure 2. However, the inventory values between the two systems show different statuses. In the SAP system shows that the company experienced a shortage of raw materials on December 9, 2017 to 167,911 KG as indicated by the presence of a negative sign in the column *Available Qty*. Whereas in the *Excel template* the status of raw materials in the warehouse is now sufficient and can be seen in Figure 3 for SOH 1 (values stock on hand).

![Figure 3. SOH Display 1 Excel Template 10165950](source: capture form Template Exel)
When checked on the production line and in the warehouse, it turns out that there are no deficiencies with raw materials. Because if the raw material status is experiencing a shortage as shown in SAP's appearance, then on December 9, 2016 there should be a production stop at the company on that day. However, the conditions in the field stated that there were no signs that the factory was experiencing a shortage of raw materials 10165950 at that time.

3.2. **BOM Exchange with a Bureaucratic Exchange (Approval Request)**

In the SAP system, if you want to condition a BOM exchange, it takes days to get approval from various related documents even though the decision has been mutually agreed through the results of the meeting and has been confirmed using minutes of meetings that have been shared in electronic mail. Waiting for this process will take a high amount of time which will add up to the leadtime of the raw material itself.

Templates Excel can be customized (arranged) as easily as possible to see an overview of the status of raw materials so that efforts to order raw materials can be done more quickly. In this case ordering of raw materials is still carried out using SAP. But the decision making process to order how much is needed can be immediately known by utilizing Excel template the existing.

3.3. **There are many Purchase Orders "Garbage" (Invalid)**

PO return is a condition where the PO seems to be returned (withdrawn) even though the actual conditions in the field there is no withdrawal of raw materials in the warehouse. This is usually done for several purposes, one of which is the team Finance to overcome the gap that is found in the process stock taking or it can also be due to the process of price differences between the system and the agreed price of the supplier.

In the SAP system, all PO values return will be considered as if the raw materials were actually withdrawn so that they must reduce the value of inventory in the warehouse. In fact, in the case of PO returns, there is no need to do anything (ignored) so that the value of raw materials will look good. This is the basis of mistakes so that many mistakes are found in making decisions. When referring to the SAP system, a raw material planner is required to encode the raw material at a negative price as shown in Available Qty and can be seen in Figure 11.
Figure 5. SAP 10165950 display for PO returns (source: capture from SAP)

In the excel template, all POs return or PO that is negative will be assumed to be zero so the system excel will not give results in the calculation process. In this case, of course decision making is easier to manage. The following display PO returns in the excel template can be seen in

Figure 6. Display Excel template 10165950 for PO returns (source: capture from Tempate Excel)

Template Excel template will only define all remaining POs as raw material inventory on order. For this reason, all negative values will be defined as the number of zeros to ensure that SOH2 calculations will be maintained properly. The same thing happened to purchase requisition.

3.4. Not Flexible with New Scenarios The current

Inflexibility of the MRP system against new scenarios is also identified in one of the MRP's objective factors which cannot be modified, namely the specific raw material consumption factor. The key user explained that there were some raw materials that could be used as substitutes for other raw materials if they experienced a quality issue. For example, raw material 49991049/10134481 which is a raw material for skimmed milk powder dry, if it cannot meet the SMP standard dry, then it can be used as a SMP wet. So that the display of raw material inventory in the warehouse can be increased. However, this cannot be done on an SAP system due to bureaucracy approval to the long. For this reason the Excel template can be used to fulfill this request with details can be seen in Figure 6 shown in highlights yellow.
With all the weaknesses / weaknesses of the SAP system being met due to discipline user that can be helped by the excel template, the test is declared successful if the results of excel template this are able to meet MRP objectives to the company. Therefore, the comparison of achievement between Objective MRP in 2015 and Objective MRP in 2016 with details as follows:

a. Level of Customer Service (CSL ontime)
b. Availability of Raw Materials (CSL infull)

Table 1 shows the second objective of the MRP, the level of customer service and availability of raw materials. Both of these MRP objectives increased in 2016, although in 2015 they also met the company's MRP Objective targets, showing that the excel template can help the performance of the existing MRP system in SAP in cleaning up waste data.

| Num | Category                           | Achieve   |
|-----|------------------------------------|-----------|
| 1   | Customer Service Level (CSL)       | >95%      |
| 2   | CSL Infull                         | >95%      |
| 3   | Warehouse Inventory Value          | < IDR 300 billion |

Inventory value owned by the company has increased from time to time. This time and this are not in accordance with the company's objective targets to minimize the value of inventory. The existence of an Excel template gives a good change from time to time. Figure 13 describes the information that the value of inventory owned by the company has shown a better direction.

4. Conclusion

Template excel designed as a comparison to clean up garbage data (gross) which is in an MRP system is currently a lack of discipline user fulfills its function so that the performance of the performance of an MRP system now yield which is better towards the company's MRP objectives, specifically the value of warehouse inventory. For this reason, testing is carried out at the same time on the current raw material planning system (SAP MRP system) and the excel template comparison.
With the results of comparisons between 2015 and 2016 achievements, it can be concluded that the Excel template can be used to help SAP systems delete junk data (fake) due to indiscipline user in inputting data can provide better performance. The Excel template is only used as a tool supplementary, not a replacement system because the database on the SAP system is a special standard global that can monitor the company's overall profit and loss.

For smaller scale companies that have not been able to have an MRP calculation system because the price of the MRP system (for example SAP) is not cheap, this excel template can be used as an MRP system that can assist planners in making decisions for procurement of raw materials.

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