Overstock Improvement by Combining Forecasting, EOQ, and ROP

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Abstract

Optimum stock inventory level is an essential factor in inefficient production. Overstock is an obstacle to achieving optimum cost. The purpose of this paper is to provide solutions in overstock in the electronic spare parts industry by comparing the various approaches Forecasting, EOQ, ROP with DDMRP to get the best model to obtain the inventory level Optimally. The Reset is done on the material Copper wire 0, 14mm as the primary material, which is the most expensive material and widely used in production activities. The results of this study showed that the method of DDMRP could decrease the average amount of the supply of Copper wire 0, 14mm per month from 2779 kg to 1499 kg.

Keyword: Inventory level, Forecasting, DDMRP, Overstock, Optimal

INTRODUCTION

The pattern of consumer demand is dynamic and unpredictable. Long lead times, rapid product life cycle, inaccurate forecasts, significant product variations, volatile supply, impact poor production planning, and are unable to comply with current environmental demand conditions (Ptak & Smith, 2011). Such a situation has a significant impact on the complexity of the supply chain in a variety of corporate goods and services. According to a survey from the Aberdeen Group, in which forty-eight percent (48%) of the companies had signs of excessive pressure on the company due to the supply chain or the increasingly complex supply chain. Demand fluctuations and the risk of mismatch predictions with actual demand have an impact on changes in production planning made so far. Likewise, the current environmental conditions that are different from the decade provide a basis for planning to adapt to these changes. This phenomenon can be seen in the findings of the American Association for Production and Inventory Controls (APICS) published at the 2008 international conference. The focus of the survey is on volatility, which is due to factors such as inaccurate forecast, the long lead time part/components, dan demands for learner inventory.

Research related to production planning is often carried out as production planning research in limited inventory capacity which allows for the lack of storage allowed using dynamic programming models (Attarian et al., 2009), in this study the optimum production ratio is seen at the beginning and end of the process, minimum cost amount, optimal inventory level at the beginning of the period and optimal ratio of backorders. Manufacturers of Electronic Transformers have fluctuated in sales; the company's commitment is to provide customers with timely and high-quality transformers. Nevertheless, overstock stock or Overstock problems cost around 2 billion rupiahs or 11% more than the company's current target.

The number of inventory orders to suppliers is derived from previous sales forecasts using forecasts with its formula where the number of forecasts is derived from the average demand in the previous three months. The company has been using these calculations continuously to cause this phenomenon. This phenomenon has occurred over the years. Visible calculations determining the number of orders from suppliers do not match current
developments so that the PPIC team determines the volume of suspected orders by increasing the stock of 80% -100% of their forecasted output to meet the requirements of the subcontracting process that requires significant production hours. One month ahead.

Based on this phenomenon, this study aims to analyze inventory control with predictions from previous one-year demand data that is useful for determining the amount and when to order with suppliers to reduce overstock and optimize sales accurately. Based on previous studies, one way to predict demand fluctuations is to predict the future. So that it can predict future demand and help companies meet their needs and improve operational efficiency, based on yearly sales data have similarities based on a specific period, so that the pattern includes the type of stationery that can be used to use short-term forecast series. The simple transition method (SA), Moving Average (MA), Weight Moving Average (WMA), and Single Exponential Smoothing (SES) are using the time series function; this method requires the introduction of model approaches and initial estimates of parameters (Smith & Agrawal, 2014).

LITERATURE RESEARCH

Each method of forecasting involves two steps: (i) time series analysis and (ii) selection of the most suitable prediction model for the data. Overstock makes the company work hard to solve this problem by reducing inventory levels. For companies that know when to order to suppliers and how much inventory to expect by using the rebound points and reserve inventory level, also in terms of maximum inventory with minimum cost to determine the number of orders to suppliers can be determined by the Economic Order Quantity method (EOQ). Inventory levels also have to do with predictions and critical times (Senapati et al., 2012), companies must determine demand estimates to know how many products are available in the future, while the first time from the order, until the materials are received, is the need to determine the level of inventory. This study also uses MRP Demand Drive (DDMRP) theory to compare to produce the most efficient production planning and control methods in an environment with inaccurate and long-term forecasting accuracy. From several literature reviews, there is the opportunity to test MRP-Driven Demand (DDMRP) in the electronics component industry.

METHODOLOGY

The purpose of this study is to propose an appropriate and efficient production planning system for controlling inventory of materials so that stock inventory is optimal so that there is not too much stock in the company's inventory. This research is a case study in the transformer electronics manufacturing industry, where researchers focus on obtaining data from the company's inventory system, which converted to number units that still reflect the quantitative value of stock preparation in the company.

After identifying the problem of overstock, this study tries to focus on objects from the level of inventory of copper materials. The next step is to collect data on the value of the company's stock, 0.14mm copper wire material data, which is the most influential and material stock, inventory stock data, planning, requirements, and lead time of copper wire 0.14mm. Then the next step is to process the data through a comparison table between the actual stock and the planning parameters, requirements, crucial time, final stock. These comparisons are formed in a visual information format for easy analysis. The analysis is based on data pattern, comparison, order timing, deviation, MAPE, MAD so that the best value of inventory value is obtained.
RESULTS AND DISCUSSIONS

Copper wire 0.14mm diameter material is the most widely used and used type of production company. Table 1 is the data showing material transactions in 2018, in line with the output of the company's inventory program.

Table 1. Copper wire 0.14 mm Stock Data 2018

| No | Transaction of Copper Wire 0.14mm | UNIT | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Des | Total | Average |
|----|----------------------------------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-------|---------|
| 1  | Requirement Plan                 | Kg   | 1510| 1426| 1318| 1321| 1329| 1688| 1801| 1830| 2121| 2255| 2366| 1821| 20756 | 1729.66 |
| 2  | Material Purchase                | Kg   | 1195| 741 | 1593| 1000| 1113| 1090| 1592| 2202| 3645| 1701| 3610| 1999| 21481 | 1790.07 |
| 3  | Material Receipt                 | Kg   | 1574| 905 | 2309| 1247| 1000| 1113| 1592| 2202| 3645| 1701| 3610| 1999| 20710 | 1725.85 |
| 4  | Stock Target (Company Standard)  | Kg   | 1500| 1500| 1500| 1500| 1500| 1500| 1500| 1500| 1500| 1500| 1500| 1500| 18000 | 1500.00 |
| 5  | Actual Usage                     | Kg   | 1187| 1125| 692 | 1068| 1353| 3014| 1751| 1727| 2147| 1739| 1758| 436 | 17542 | 1461.83 |
| 6  | Final Stock                       | Kg   | 1873| 1653| 3271| 3450| 2810| 1296| 953 | 2870| 3822| 3349| 4543| 1999| 33344 | 2778.69 |
| 7  | Standard lead time                |      | 1   | 1   | 1   | 11  | 11  | 11  | 11  | 11  | 11  | 11  | 11  | 11  | 12    | 1.00    |
| 8  | Actual time                       |      | 1.25| 1   | 1   | 1.25| 1.25| 1   | 1   | 1.25| 1   | 1   | 1   | 13  | 1.08  |
| 9  | Final Stick divided Stock Target  |      | 1.25| 1.10| 2.18| 2.30 |1.87 | 0.86| 0.64| 1.91 |2.55 |2.26 |2.28 |3.03 |22.23  | 1.85    |
| 10 | Actual Usage divided Requirement Plan |    | 0.79| 0.79| 0.52| 0.81 | 1.02| 0.79| 0.97| 0.70 |1.01 |0.76 |0.75 |0.24 |10.15  | 0.85    |
| 11 | Actual Usage divided Material Receipt |    | 0.75| 1.24| 0.30| 0.86 | 1.64| 2.01| 1.24| 0.40 |0.69 |1.34 |0.98 |0.28 |11.74  | 0.98    |
| 12 | Actual time devided Standard Lead Time |      | 1.25| 1.00| 1.00| 1.25| 1.25| 1.00| 1.00| 1.00| 1.25|1.00 |1.00 |1.00 |13.00  | 1.08    |
| 13 | Material Receipt divided Requirement Plan |    | 1.04| 0.63| 1.75| 0.94 | 0.62| 0.89| 0.78| 1.74 |1.46 |0.58 |0.77 |0.86 |12.07  | 1.01    |
| 14 | Mean Forecast Error (MFE)        |      | -323| -300| -626| -253 | 24  | 1326.00| -50 | -558 |26  | -516 | -579 | -1385 | 3213.95 | 267.83 |
| 15 | Mean Absolute Deviation (MAD)    |      | 323 | 300 | 626 | 253 | 24  | 1326.00| 50  | 558  |26  | 516  | 579  | 1385 | 5965.13 | 497.09  |
| 16 | Mean Average Percentage Error (MAPE) |      | 27% | 27% | 90% | 24% | 2%  | 44% | 3%  | 44%  | 1%  | 30%  | 33%  | 318% | 6.42  | 54%     |

Source: Company Data, 2018
The above purchase plan is based on the company's current calculation method:

a. 1-month forecast: 6-month average demand
b. Total Order: (Forecasting + Security Stock) x (20%) - Stock.
c. Order Time: 1 Month or four weeks

Data processing is an attempt to find data patterns in solving problems of companies with too much material.

In figure 1, it is shown that the material in financing the material is a Copper wire or copper wire with a value of Rp. 3,209,121,449 per month, which is why it is the object of this study.

![Figure 1](image1.png)

**Figure 1.** The Company's Stock Value Pareto Diagram  
(Source: Data processing, 2018)

Figure 2 describes the type of material copper wire purchased and used. By using a Pareto diagram in Figure 2, the use of copper wire is the most in part No. 1120140TRF, namely COPPER WIRE 0.14 MM 2UEW, ROHS. With the purchase value of 1590 kg per month.

![Figure 2](image2.png)

**Figure 2.** The Most Significant Buying Amount of Copper wire  
(Source: Data Processing, 2018)
Based on the company’s data above, the author concluded, to solve the main problem of overstock material, the material copper wire 0.14 mm (part No: 1120140TRF) can be used as a research object for analysis in settlement Overstock problems in the enterprise.

In table 1, the data above, then calculated comparison between parameters. The main comparison to the stock performance measure is the difference between actual stock and target, as well as actual usage and planning. The following table 2 below is a comparison of the parameters in table 1 above.

| Table 2. Comparison of Stock Parameters |
|----------------------------------------|
| No | Data Processing Results | Different Target |
|----|-------------------------|------------------|
| 1  | Final Stock divided Stock Target | 85% 0% |
| 2  | Actual Usage divided Requirement Plan | 15% 0% |
| 3  | Actual Usage divided Material Receipt | 2% 0% |
| 4  | Actual time divided Standard Lead time | 8% 0% |
| 5  | Material Receipt divided Requiremet Plan | 1% 0% |
| 6  | Standard Deviation (Actual Usage) | 47% - |
| 7  | Mean Forecast Error (MFE) | 267.83 |
| 8  | Mean Absolute Deviation (MAD) | 497.09 |
| 9  | Mean Average Percentage Error (MAPE) | 54% |
| 10 | Cumulative Forecast Error (CFE) | -3213.95 |
| 11 | Tracking Signal | -6.47 |

(Source: Data Processing, 2018)

From the presentation of the above data can be found that there is an excess of material needs planning of 15% of the actual needs and delay of arrival of material by 8% from the specified time standard, this causes the excess or overstock of 85% of the specified stock target. So, it needs improvement on the existing planning method and needs evaluation system and a standard assessment against the supplier. In this study offered several combinations of planning methods as a corrective action in order to eliminate overstock. The first method is to choose the best forecasting method of the following four-time series methods, namely Moving Average (MA), Weight Moving Average (WMA), Single exponential Smoothing (SES), and exponential Smoothing With Trend (ES + Trend). The results of the actual data calculation of copper wire need 0.14mm in the period from January 2017 to December 2018 and the comparison of the four methods.

| Tabel 3. Comparison Results of Time Series Forecasting |
|-------------------------------------------------------|
| Month | Actual Demand | Forecast by 5-MA | Forecast by 3-WMA | Forecast SES | Forecast by ES+Trend |
|-------|---------------|-----------------|-------------------|-------------|---------------------|
| 1     | 1164          |                 |                   |             |                     |
| 2     | 923           |                 |                   |             |                     |
| 3     | 898           | 753             | 649               | 854         |                     |
| 4     | 760           | 971             | 748               | 951         |                     |
| 5     | 335           | 835             | 753               | 920         |                     |
| 6     | 854           | 816             | 582               | 586         | 663                 |
| 7     | 907           | 754             | 701               | 693         | 804                 |
| 8     | 1178          | 751             | 751               | 779         | 906                 |
### Tabel 3. Comparison Results of Time Series Forecasting

| Month | Actual Demand | Forecast by 5-MA | Forecast by 3-WMA | Forecast SES | Forecast by ES+Trend |
|-------|---------------|-----------------|-------------------|-------------|---------------------|
| 9     | 1933          | 807             | 1029              | 938         | 1106                |
| 10    | 1721          | 1041            | 1488              | 1336        | 1625                |
| 11    | 1082          | 1319            | 1638              | 1490        | 1783                |
| 12    | 581           | 1364            | 1455              | 1327        | 1508                |
| 13    | 910           | 1299            | 991               | 1029        | 1073                |
| 14    | 1057          | 1245            | 871               | 981         | 1012                |
| 15    | 933           | 1070            | 901               | 1011        | 1057                |
| 16    | 1211          | 913             | 958               | 980         | 1012                |
| 17    | 1546          | 938             | 1103              | 1072        | 1138                |
| 18    | 1231          | 1131            | 1309              | 1262        | 1389                |
| 19    | 1051          | 1196            | 1305              | 1250        | 1349                |
| 20    | 1312          | 1194            | 1220              | 1170        | 1224                |
| 21    | 1222          | 1270            | 1227              | 1227        | 1297                |
| 22    | 1187          | 1272            | 1202              | 1225        | 1284                |
| 23    | 1125          | 1201            | 1227              | 1210        | 1256                |
| 24    | 692           | 1179            | 1165              | 1176        | 1204                |
| 25    | 1068          | 1108            | 924               | 982         | 936                 |
| 26    | 1353          | 1059            | 988               | 1017        | 996                 |
| 27    | 3014          | 1085            | 1117              | 1151        | 1187                |
| 28    | 1751          | 1450            | 2112              | 1896        | 2204                |
| 29    | 1272          | 1576            | 1967              | 1838        | 2059                |
| 30    | 2147          | 1692            | 1827              | 1612        | 1707                |
| 31    | 1739          | 1907            | 1829              | 1826        | 1991                |
| 32    | 1758          | 1985            | 1724              | 1791        | 1916                |
| 33    | 436           | 1733            | 1851              | 1778        | 1880                |
| 34    | 1470          | 1470            | 1092              | 1241        | 1129                |

|       | MAD       | 397,8     | 376,2     | 359,9     | 386,4     |
|-------|-----------|-----------|-----------|-----------|-----------|
| MAPE  |           | 37%       | 32%       | 30%       | 30%       |
| m=3   |           |           | α = 0,5   |           |           |
| m=5   |           | W(1)=0,25 |           | α = 0,4   |           |
|       |           | W(2)=0,25 |           | β = 0,1   |           |
|       |           | W(3)=0,50 |           |           |           |

(Source: Data Processing, 2019)

The results of the calculations from four forecasting time series models compared to the current company's planning results, shown in the table 4.
Table 4. Comparison of Planning Results Indicators

| No | Description | Current Corporate Planning | Moving Average (MA) | Weight Moving Average (WMA) (w1:0.25; w2:0.25; w3:0.5) | Single Exponential Smoothing (SES) (α = 0.4) | Exponential Smoothing With Trend (ES+Trend) (α = 0.5; β = 0.1) |
|----|-------------|---------------------------|---------------------|-----------------------------------------------------|-----------------------------------------------|---------------------------------------------------------------|
| 1  | MAD         | 497.09                    | 397.77              | 376.22                                              | 359.93                                        | 386.45                                                        |
| 2  | MAPE        | 54%                       | 37%                 | 32%                                                 | 30%                                           | 30%                                                           |
| 3  | Result      | disagree                  | disagree            | disagree                                            | Agree                                         | disagree                                                      |

(Source: Data Processing, 2019)

Based on value consideration (%) Smallest MAPE (30%) And the value of MAD approaching ZERO (359.93), then at the Disconnect method selected is SINGLE EXPONENTIAL SMOOTHING (SES) with α = 0.4. The following calculation of the selected Forecasting method is Single Exponential Smoothing (SES) Considering the value of Economic Order Quantity (EOQ) and Re-Order Point (ROP) in order to obtain more optimal planning.

Table 5. Value of Economic Order Quantity (EOQ)

| No | Part No  | Description     | EOQ Theory | Frequency Order / Year | Old Order Method |
|----|----------|-----------------|------------|------------------------|------------------|
|    | 112014TRF | COPPER WIRE 0.14MM | 3742       | 5                      | 2509             |

(Source: Data Processing, 2019)

Calculation Data above, based on the following values:
- The Total planning of SES method is 18304
- Save Cost is Rp. 50
- The cost of work and transportation is Rp. 20,000,-

As for the Reader Point (ROP) calculation, the results is in the Table 6.

Table 6. Value of Reorder Point (ROP)

| No | Part No  | Description     | ROP (Teory) | Beginning Stock of company |
|----|----------|-----------------|-------------|----------------------------|
| 1  | 112014TRF | COPPER WIRE 0.14MM 2 UE W; ROHS FREE | 2393        | 1486                        |

(Source: Data Processing, 2019)

The ROP calculation data is based on the following supporting data:
- Safety Stock (SS) is 934
- Lead Time Supplier is one month
- The average purchase planning is 1458
- Service or service level towards the customer is 98% \(Z = 2.6\)
- Standard deviations planning is 359.2

The calculation result of the SES planning, considering the EOQ and ROP values, will result in stock inventory value as in the table 7.
From Table 7. Obtained that the common stock obtained by the company for Copper wire 0.14 mm is 2599 kg per month.

The second method is to use the Demand Driven Material Requirement Planning (DDMRP) method. The determination and data required in the DDMRP calculation specify the following parameters 1) Strategic inventory positioning, obtained value a) Level 2 on the Copper wire in BOM structure. b) Leadtime Copper wire: 4 weeks (1 month), Long term category. c) Time buffer: 0 with consideration derived from a local supplier. d) Minimum Order Quantity (MOQ): 100 Kg. D) The average value of usage per week: 670 Kg, this is obtained from the usage data within one year divided by 52 weeks. 2) Buffer Profiles and Level, consisting of a) Material copper wire 0.14 mm, adhering to the longterm standard for the determination of the Buffer zone value, following the Ptak & Smith guidelines. (2011). B) Safety stock value: 80%. c) Red Zone value: 30%, with Top of RED value: 110%. d) Yellow Zone value: 40%, with the value of Top of Yellow: 150%. Green Zone Value: 30%, with Top of Green value: 180%. e) value of Order Spike Threshold: 40% (0.5 x Safety stock). The strategic positioning and buffer profile of the above planning system can be seen as in the table 8.

| Table 7. Result of Stock Calculation With SES, EOQ And ROP Methods |
|---------------------------------------------------------------|
| Forecasting SES ( $\alpha = 0.4$ ) | Economic Order Quantity (EOQ) | Re Order Point (ROP) | Final Stock |
| Dec-17 | | | 1486 |
| Jan-18 | 1225 | 0 | 2393 | 261 |
| Feb-18 | 1210 | 3742 | 2393 | 2793 |
| Mar-18 | 1176 | | 2393 | 1617 |
| Apr-18 | 982 | 3742 | 2393 | 4377 |
| May-18 | 1017 | | 2393 | 3361 |
| Jun-18 | 1151 | | 2393 | 2209 |
| Jul-18 | 1896 | 3742 | 2393 | 4055 |
| Aug-18 | 1838 | | 2393 | 2217 |
| Sep-18 | 1612 | 3742 | 2393 | 4347 |
| Oct-18 | 1826 | | 2393 | 2521 |
| Nov-18 | 1791 | | 2393 | 730 |
| Dec-18 | 1778 | 3742 | 2393 | 2694 |
| TOTAL | 17502 | 18710 | 28716 | 31185 |

Average Stock/ Month: **2599**

(Source: Data Processing, 2019)
Table 8. Data Strategic Positioning, Buffer Profiles and Level of Copper wire 0.14 mm in product BOM structure

| Level | Part No.  | Description                                      | Unit | Status    | Top of GREEN | Top of YELLOW | Top of RED | Time Buffer | Leadtime/Week | MOQ | Usage/Week |
|-------|-----------|---------------------------------------------------|------|-----------|--------------|---------------|-------------|--------------|---------------|-----|------------|
| 0     | MT523     | MT523G1 FINISH GOOD MT-523G/514-04-068-20          | PCE  | Stocked   | 18015        | 15013         | 11009       | 0            | 2             | 100 | 5505       |
| 1     | S MT523   | SETTING MT-523G                                   | PCE  | Non Stocked | 0            | 0             | 0           | 0            | 0             | 0   | 0          |
| 1     | JCMT523   | JOINTING CORE MT-523 G                            | PCE  | Non Stocked | 0            | 0             | 0           | 0            | 0             | 0   | 0          |
| 1     | JS MT523  | JOINTING SOLDER MT-523 G                           | PCE  | Non Stocked | 0            | 0             | 0           | 0            | 0             | 0   | 0          |
| 1     | WMT523    | WINDING MT-523 G                                  | PCE  | Non Stocked | 0            | 0             | 0           | 0            | 0             | 0   | 0          |
| 2     | 90L28781  | BOX L (280*250*90) MM                              | PCE  | Stocked   | 3374         | 2812          | 2062        | 0            | 2             | 50  | 1031       |
| 2     | 6438400HRF| HITACHI INSULATING VARNISH WP 2952 F-2G (H)/180    | KG   | Stocked   | 6692         | 5577          | 4090        | 2            | 8             | 6120 | 2045       |
| 2     | 9LL28781  | LAYER BOX L 270 X 235 X 3 MM                       | PCE  | Stocked   | 2543         | 2119          | 1554        | 0            | 2             | 50  | 777        |
| 2     | 4411046SRF| CLUMPER ATAS 41 X 10 BERDIRI (NO STAMP) CHRO       | PCE  | Stocked   | 64602        | 53835         | 39479       | 0            | 4             | 100 | 19739      |
| 2     | 4411049MRF| CLUMPER BAWAH 41 X 10 BERDIRI CHROME FREE           | PCE  | Stocked   | 64602        | 53835         | 39479       | 0            | 4             | 100 | 19739      |
| 2     | 3140415NRF| CORE E-41 RN-14 UN ANNEAL,ROHS FREE                | KG   | Stocked   | 9270         | 7725          | 5665        | 0            | 8             | 200 | 2832       |
| 2     | 3140415YRF| CORE I-41 RM-14 UN ANNEAL,ROHS FREE                | KG   | Stocked   | 2740         | 2284          | 1675        | 0            | 8             | 70  | 837        |
| 2     | 5002100TSA| TAPE CLEAR 10 MM T=0.025 MM ROHS FREE (LOKAL)      | MTR  | Stocked   | 44719        | 37266         | 27328       | 0            | 3             | 500 | 13664      |
| 2     | 04100M5NRF| BOBBIN COVER ROHS FREE                             | PCE  | Stocked   | 297115       | 247596        | 181570      | 0            | 8             | 1000 | 90785      |
| 2     | 64700NPB  | CF110VMS FLUX (TAMURA CV-330VH) 1 GALLON 20 KG     | KG   | Stocked   | 0            | 0             | 0           | 0            | 8             | 100 | 0          |
Table 8. Data Strategic Positioning, Buffer Profiles and Level of Copper wire 0.14 mm in product BOM structure (Continued)

| Level | Part No.  | Description | Unit | Status  | Top of GREEN | Top of YELLOW | Top of RED | Time Buffer | Leadtime/Week | MOQ  | Usage/Week |
|-------|-----------|-------------|------|---------|-------------|--------------|------------|-------------|---------------|------|------------|
| 2     | 6E10925ARF| LABEL 9 X 25 NON KD;ROHS FREE  | PCE  | Stocked | 52209       | 43507        | 31905      | 0           | 2             | 500  | 15953      |
| 2     | 646002LF  | SOLDER BAR SN97% Cu3% (ASAHI)  | KG   | Stocked | 213         | 178          | 130        | 0           | 8             | 50   | 65         |
| 2     | 5002160TSA| TAPE CLEAR 16 MM T = 0.025 MM ROHS FREE (LOKAL) | MTR  | Stocked | 12516       | 10430        | 7649       | 0           | 3             | 500  | 3824       |
| 2     | 6423000TRF| THINER FLUX DIFLUENT 4520 TAMURA 1 Gin 20 KG | KG   | Stocked | 0           | 0            | 0          | 0           | 4             | 100  | 0          |
| 2     | 2AD1100BLF| UL-1007#AWG 22, 110 [10-10] MM BLACK LEAD FREE;M | PCE  | Stocked | 33784       | 28153        | 20646      | 0           | 4             | 200  | 10323      |
| 2     | 2AD1300WLF| UL-1007#AWG 22, 130 [10-10] MM WHITE LEAD FREE;M | PCE  | Stocked | 33784       | 28153        | 20646      | 0           | 4             | 200  | 10323      |
| 2     | 04110T5DRF| BOBBIN 41 X 10 + PIN SOLDER LIF-11 = 5 PCS; ROHS FREE | PCE  | Stocked | 106600      | 88833        | 65145      | 0           | 8             | 10000| 32572      |
| 2     | 1120100TRF| COPPER WIRE 0.10 MM 2UEW;ROHS FREE  | MTR  | Stocked | 511         | 426          | 312        | 0           | 4             | 100  | 156        |
| 2     | 1120140TRF| COPPER WIRE 0.14 MM 2UEW;ROHS FREE  | KG   | Stocked | 2194        | 1829         | 1341       | 0           | 4             | 100  | 670        |
| 2     | 1120550TRF| COPPER WIRE 0.55 MM 2UEW;ROHS FREE  | KG   | Stocked | 1379        | 1149         | 1149       | 0           | 4             | 100  | 421        |
| 2     | 5002180GSA| TAPE GREEN 18 MM T=0.025 MM ROHS FREE (LOKAL) | MTR  | Stocked | 23050       | 19208        | 19208      | 0           | 3             | 500  | 7043       |
| 2     | 2002070GSA| TAPE GREEN 7 MM T=0.025 MM ROHS FREE (LOKAL) | MTR  | Stocked | 3888        | 3240         | 3240       | 0           | 3             | 500  | 1188       |

(Source: Data Processing, 2019)
Results of the DDMRP calculation of Copper wire by following the data obtained can be seen in the following table:

| Week | Date       | Part   | On Hand | On Hand Alert | Today planning | Open Supply | Demand | Available Stock | Stock Alert | Action Result |
|------|------------|--------|---------|---------------|----------------|-------------|--------|----------------|-------------|---------------|
| 1    | 01/01/2018 | CW014  | 299     | 299           | 1895           | 1895        | 1187   | 299            | 2194        | ORDER 1895   |
| 2    | 08/01/2018 | CW014  | 299     | 299           | 1895           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 3    | 15/01/2018 | CW014  | 299     | 299           | 1895           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 4    | 22/01/2018 | CW014  | 299     | 299           | 1895           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 5    | 29/01/2018 | CW014  | 2194    | 2194          | 0              | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 6    | 05/02/2018 | CW014  | 1069    | 1069          | 1125           | 1125        | 1125   | 1069           | 2194        | ORDER 1125   |
| 7    | 12/02/2018 | CW014  | 1069    | 1069          | 1125           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 8    | 19/02/2018 | CW014  | 1069    | 1069          | 1125           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 9    | 26/02/2018 | CW014  | 1069    | 1069          | 1125           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 10   | 05/03/2018 | CW014  | 1502    | 1502          | 692            | 692         | 692    | 1502           | 2194        | ORDER 692    |
| 11   | 12/03/2018 | CW014  | 1502    | 1502          | 692            | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 12   | 19/03/2018 | CW014  | 1502    | 1502          | 692            | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 13   | 26/03/2018 | CW014  | 1502    | 1502          | 692            | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 14   | 02/04/2018 | CW014  | 1126    | 1126          | 1068           | 1068        | 1068   | 1126           | 2194        | ORDER 1068   |
| 15   | 09/04/2018 | CW014  | 1126    | 1126          | 1068           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 16   | 16/04/2018 | CW014  | 1126    | 1126          | 1068           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 17   | 23/04/2018 | CW014  | 1126    | 1126          | 1068           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 18   | 30/04/2018 | CW014  | 2194    | 2194          | 0              | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 19   | 07/05/2018 | CW014  | 841     | 841           | 1353           | 1353        | 1353   | 841            | 2194        | ORDER 1353   |
| 20   | 14/05/2018 | CW014  | 841     | 841           | 1353           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 21   | 21/05/2018 | CW014  | 841     | 841           | 1353           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 22   | 28/05/2018 | CW014  | 841     | 841           | 1353           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 23   | 04/06/2018 | CW014  | -820    | -820          | 3014           | 3014        | 3014   | -820           | 2194        | ORDER STRIKE 3014 |
| 24   | 11/06/2018 | CW014  | -820    | -820          | 3014           | 3014        | 3014   | -820           | 2194        | ORDER STRIKE 3014 |
| 25   | 18/06/2018 | CW014  | 2194    | 2194          | 0              | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 26   | 25/06/2018 | CW014  | 2194    | 2194          | 0              | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 27   | 02/07/2018 | CW014  | 443     | 443           | 1751           | 1751        | 1751   | 443            | 2194        | ORDER 1751   |
| 28   | 09/07/2018 | CW014  | 443     | 443           | 1751           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 29   | 16/07/2018 | CW014  | 443     | 443           | 1751           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 30   | 23/07/2018 | CW014  | 443     | 443           | 1751           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 31   | 30/07/2018 | CW014  | 2194    | 2194          | 0              | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 32   | 06/08/2018 | CW014  | 922     | 922           | 1272           | 1272        | 1272   | 922            | 2194        | ORDER 1272   |
| 33   | 13/08/2018 | CW014  | 922     | 922           | 1272           | 2194        | 2194   | NONE 0         | NONE 0      |               |
| 34   | 20/08/2018 | CW014  | 922     | 922           | 1272           | 2194        | 2194   | NONE 0         | NONE 0      |               |

Source: Data Processing, 2019
Table 9. Demand Driven – MRP calculation (Continued)

| Week | Date       | Part | On Hand Alert | On Hand Today | Demand Planning | Open Supply | Demand | Available Stock | Stock Alert | Action Result |
|------|------------|------|---------------|---------------|-----------------|-------------|--------|----------------|-------------|---------------|
| 35   | 27/08/2018 | CW014| 922           | 922           | 1272            | 2194        | 2194   | NONE 0         | 0           |               |
| 36   | 03/09/2018 | CW014| 47            | 47            | 2147            | 2147        | 2194   | ORDER 2147    | 2194        | NONE 0        |
| 37   | 10/09/2018 | CW014| 47            | 47            | 2147            | 2194        | 2194   | NONE 0         | 0           |               |
| 38   | 17/09/2018 | CW014| 47            | 47            | 2147            | 2194        | 2194   | NONE 0         | 0           |               |
| 39   | 24/09/2018 | CW014| 47            | 47            | 2147            | 2194        | 2194   | NONE 0         | 0           |               |
| 40   | 01/10/2018 | CW014| 455           | 455           | 1739            | 1739        | 2147   | ORDER 1739    | 2147        |               |
| 41   | 08/10/2018 | CW014| 455           | 455           | 1739            | 2194        | 2194   | NONE 0         | 0           |               |
| 42   | 15/10/2018 | CW014| 455           | 455           | 1739            | 2194        | 2194   | NONE 0         | 0           |               |
| 43   | 22/10/2018 | CW014| 455           | 455           | 1739            | 2194        | 2194   | NONE 0         | 0           |               |
| 44   | 29/10/2018 | CW014| 2194          | 2194          | 0               | 2194        | 2194   | NONE 0         | 0           |               |
| 45   | 05/11/2018 | CW014| 436           | 436           | 1758            | 1758        | 436    | ORDER 1758    | 2194        |               |
| 46   | 12/11/2018 | CW014| 436           | 436           | 1758            | 2194        | 2194   | NONE 0         | 0           |               |
| 47   | 19/11/2018 | CW014| 436           | 436           | 1758            | 2194        | 2194   | NONE 0         | 0           |               |
| 48   | 26/11/2018 | CW014| 436           | 436           | 1758            | 2194        | 2194   | NONE 0         | 0           |               |
| 49   | 03/12/2018 | CW014| 1758          | 1758          | 436             | 436         | 1758   | ORDER 436     | 2194        |               |
| 50   | 10/12/2018 | CW014| 1758          | 1758          | 436             | 2194        | 2194   | NONE 0         | 0           |               |
| 51   | 17/12/2018 | CW014| 1758          | 1758          | 436             | 2194        | 2194   | NONE 0         | 0           |               |
| 52   | 24/12/2018 | CW014| 1758          | 1758          | 436             | 2194        | 2194   | NONE 0         | 0           |               |
| 53   | 31/12/2018 | CW014| 2194          | 2194          | 0               | 2194        | 2194   | NONE 0         | 0           |               |

(Source: Data Processing, 2019)

From the calculation of DDMRP obtained, an average value of stock copper wire 0.14 mm is 1499 Kg, with a total purchase of 18250 Kg. Adjustment buffer value in this DDMRP study is manual adjustment done and in review with time Following the level of urgency, under normal conditions done three months. The action performed when the stock copper wire is in the position of Red Zone or near Deadline, the things done are as follows: contacting a Person In Charge (PIC) supplier, via Phone, Email or message, meeting to create a new deal Purchase Order Status, agreement document assignment, follow and control the result of the meeting.

After calculating the planning system using SES, EOQ, and ROP methods, and obtaining results from the DDMRP calculation, the determination of the best method is done. Here is a table comparing both of these methods.

Table 10. Comparison With Previous Research

| Data 2018                      | Old Company Method (Kg) | SES - EOQ - ROP (Kg) | Demand Driven MRP (Kg) |
|--------------------------------|-------------------------|----------------------|------------------------|
| Total of Requirement Plan (Year) | 20756                   | 18710                | 18250                  |
| Total of Actual Usage (Year)    | 17542                   | 17542                | 17542                  |
| Average Stock (Month)           | 2779                    | 2599                 | 1499                   |

Judgement Not Selected Not Selected Selected

Source: Data Processing, 2019
From table 10, the DDMRP method is chosen as the best method of planning as it can produce the average stock value of the smallest inventory, which is 1499 Kg per month.

CONCLUSION
In this study, the results of the stock planning comparison system with forecasting time series single Exponential smoothing (SES), EOQ, and ROP methods compared to the DDMRP method were obtained that the DDMRP method produce a better stock of inventory value. The results of this study showed that the method of DDMRP could decrease the average amount of the supply of Copper wire 0, 14 mm per month from 2779 kg to 1499 kg. It is expected to decrease the overstock experienced by the company so that it can be achieved the desired stock target company. The limitations faced in this research are limited only in one of the electronic spare parts companies producing transformers that are in the industrial area Cikarang, West Java. Research can be done to other electronic companies to provide variations in the influence of the management system of DDMRP planning to improve the competitiveness of the company itself as well as the competitiveness of companies in Indonesia Overall. This research only focuses on one item of inventory stock of electronic spare parts to see the total inventory of the company. Calculation of research using Ms. Excel software, which allows can be developed using the more complex inventory Software so that it is easily integrated into the enterprise System inventory.

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