

**ANALYSIS OF APPLICATION OF MATERIAL REQUIREMENT PLANNING (MRP) IN
HELMET PRODUCTION USING BILL OF MATERIAL (BOM) TO HELMET
AND BILL OF MATERIAL (BOM) VERSUS PRE ORDER APPROACH
AT PT.POLIPRIMA CIPTA UNGGUL**

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Abstract.

PT. Poliprima Cipta Unggul is a company in manufacturing which is a plastic injection molding company with one of its superior products is G2. The purpose of this research is to optimize the production process and ordering raw materials. Minimizing excess stock of materials and protecting out-of-stock safety. The first thing to do this research is the stocktaking of all materials starting from post 1 to post 4. List all existing POs, Next is the formation of future state mapping in identifying the type of waste that occurs in the company, the main type of waste is the type of waste of overproduction, waste of inventory and waste of overprocessing

Keywords: *MRP (Material Requirement Planning), current state mapping, future state mapping, kaizen, BOM to Helmet, BOM vs PO, FIFO (First in First Out) process cycle efficiency, pull system, Stockopname*

Introduction

The manufacturing industry is a group of companies whose main activity is to produce and process raw or semi-finished materials into ready-to-use or finished goods. The goods are purchased by the company from other companies or providers. The purpose of the manufacturing industry is to produce goods economically so that they can make a profit and can deliver the product on time. In addition, the manufacturing industry also ensures that the production process can be continuous and develop so that the survival of the company is guaranteed. Currently, companies are also required to be more competitive so that they can compete to seize the existing market.

PT. Poliprima Cipta Unggul is a manufacturing company which is a plastic injection molding company with one of its superior products being Helmet G2. PT. Poliprima Cipta excels which directly produces the helmet production process starting from the manufacture of helmet shells and visors, the buffing process, the painting process, the decal or sticker installation process, the varnish process and finally the assembly or assembly process. One of the efforts in increasing productivity and Optimizing Material Requirement Planning. In the production process there is some waste

Waiting, which does not require material items, or materials that are lacking. provide added value among others in every production process so that it is not effective and efficient. The waiting time or waste waiting does not add value to the helmet production process. So there is a long lead time in each process which causes a lot of waste. Waste is an indication of resource utilization that is not optimal. Waste minimization efforts can produce efficiency and reduce product lead time so as to increase output.

Library Review

• **Material Requirements Planning**

Material Requirement Planning (MRP) Is a technique or logical procedure for translating the induction production schedule (JPI) from finished goods or end items into net requirements for several components needed to implement JPI. This MRP is used to determine the amount of material requirements to support the master production schedule and determine when the material requirements are scheduled.

• **BOM To Helm**

The Bomb to Helm method is a stock monitoring method and the overall amount of material, to be able to conclude how many helmets will be ready to be made or ready to be assembled, from here we can see the overall available helmet models.

FOLIPRIMA PT POLIPRIMA CIPTA UNGGUL		FORM		TITLE		BY	DATE	21/10/2022
		MATERIAL CONTROL		MATERIAL REQUIREMEN PLANNING POS 1 - POS 3			UPDATE	21/10/2022
				POSITIONING MATERIAL STOCK READY TO ASSY			CONTENTS	
MATERIAL REQUIREMENT PLANING (BILL OF MATERIAL TO HELM)								
POSITIONING SUPPORT ITEM		POSITIONING WIP SHELL IN INJECTION AREA		PRODUKSI	QUANTITIES	STOCK INTERIOR		TOTAL HELM SIAP DIRAKIT
BOX MB 18	534	EXTERMINATOR SHELL	3.216	OPTIMAX	0	INTERIOR OPTIMAX	2.100	<div style="display: flex; align-items: center; justify-content: center;"> <div style="border: 2px solid green; padding: 10px; margin: 0 10px;">4280</div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="width: 10px; height: 10px; background-color: #90EE90; border: 1px solid black;"></div> SAFE</div> <div style="width: 10px; height: 10px; background-color: #FFD700; border: 1px solid black;"></div> WARNING</div> <div style="width: 10px; height: 10px; background-color: #FF0000; border: 1px solid black;"></div> DANGER

Figure 1. BOM to helm

Research Methods

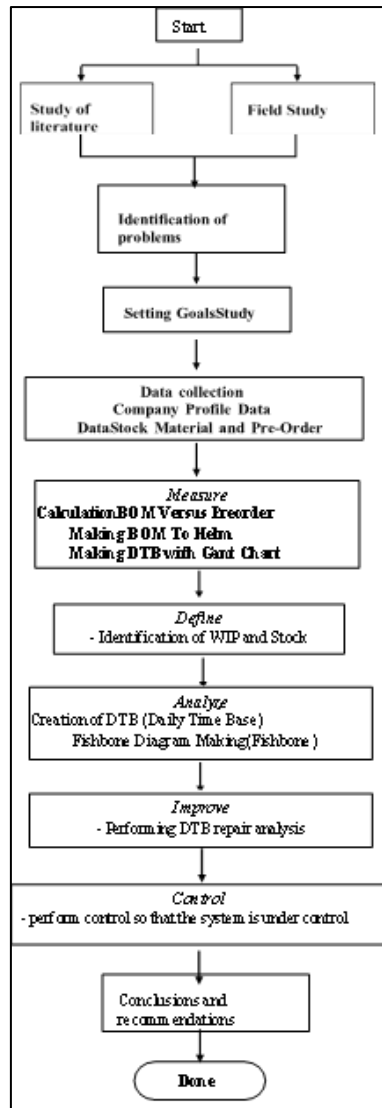


Figure 2. Research flow chart

Result and Discussion

A. Define

One of the efforts in increasing productivity and Optimizing Material Requirement Planning. In the production process there is some waste waiting, which does not require material items, or materials are lacking. provide added value) among others in every production process so that it is not effective and efficient. The waiting time or waste waiting does not add value to the helmet production process. So there is a long lead time in each process which causes a lot of waste.

B. Measure

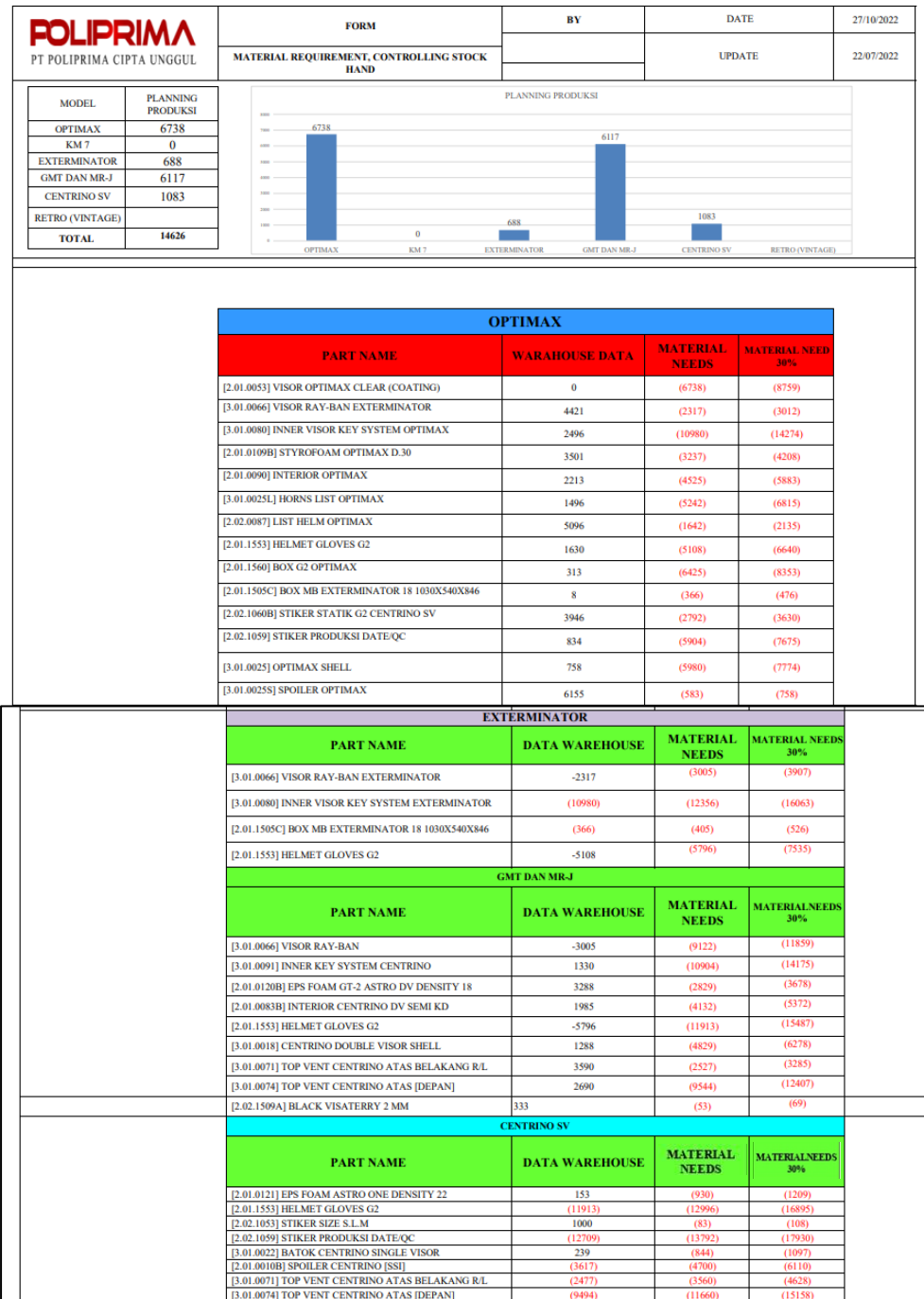


Figure 3. Material requirement

Table 1. Supporting material

Supporting Material		
[2.01.1553] SARUNG HELMET G2	1630	(12996)
[2.02.2001] LEM BATANG (SATUAN PCS)	2304	(1353)
[2.02.2002] LEM TETES	310	(275)
-	1000	0

Material Requirement Planning is a method which has a function to meet the material needed in a product, the method is very useful for increasing the quantity and tax time of the production pattern, not only that, this method also functions to reduce inventory waste, increase WIP behind. Material Requirement Planning can be seen from the total material needed. In Optimax the material that must be met is Visor OPTimax clear (coating) 8759, Visor Ray-Ban Exterminator 3012, Inner Visor key System Optimax 14274, Styrofoam Optimax D.304208, Interior Optimax 5883, List of Horns Optimax 6815, List of Helmets Optimax 2135, Holster Helmet G2 6640, Box G2 Optimax 8353, Box MB Exterminator 18 489, Static Sticker G2 Centrino SV 3630, Shell Optimax 7774, Spoiler Optimax 758, Exterminator Model Materials that must be fulfilled are Visor Ray Ban, Inner Visor Key System Exterminator, Glove G2 Helmet, For GMT and MRJ Models, Visor Ray Ban, Inner System Centrino 14175, Eps Foam GT-2 Astro DV Density 18 3678. Interior Centrino DV Semi KD 5372, Batok Centrino Double Visor 6278, Topvent Centrino TopRear 328 and Topvent Centrino Top (front) 12407. For Centrino Single Visor Eps Foam Astro Density 22 1209, Shell Centrino Single Visor 1097, Top Vent Top Rear and TopVent bag. For Supporting Materials, Helmet Holster 12996, Stem Glue (PCS Unit) 1353 and Drip glue 275 are needed.

C. Analyze

Require Planning Analysis Using Daily Time Base is an overview of the overall material that comes, there is a visualization of when the material will come based on the existing DTB. In fulfilling or meeting the existing material needs, the pattern comes in rhythm with the existing production pattern, from Styrofoam, Interior, Shell and others as follows:

Table 2. Display

								Display Week:	1
TASK	ASSIGNED TO	CAPACITY REQUIRED	SHIPPING POWER	STORAGE	LEADTIME	START	END		
KEDARANJAN MATERIAL									
Task 1	INTERIOR OPTIMAX	5.883	400	2.600	2	7/28/22	8/26/22		
OUTPUT DAILY		300							
	BALANCE								
Task 2	INTERIOR CENTRINO DV	5.372	3000	900	2	7/28/22	7/31/22		
OUTPUT DAILY		500							
	BALANCE								
Task 3	INTERIOR CENTRINO SV	2.205	1750	1300	1	7/28/22	7/29/22		
OUTPUT DAILY		1.000							
	BALANCE								
Task 4	INTERIOR EXTERMINATOR	8.759	1000	1900	4	7/28/22	9/1/22		
OUTPUT DAILY		300							
	BALANCE								
Phase 2 Etc									
Task 1	BOX G2 OPTIMAX	8.353	800	4200	4	7/28/22	9/7/22		
OUTPUT DAILY		300							
	BALANCE								
Task 2	BOX G2 EXTERMINATOR	16.895	2800	1630	3	7/28/22	8/15/22		
OUTPUT DAILY		1.000							
	BALANCE								
Task 4	BOX MB EXTERMINATOR 18	526	210	8	5	7/28/22	8/9/22		
OUTPUT DAILY		28							
	BALANCE								
Task 5	BOX MB EXTERMINATOR 24	7.774	1008	758	1	7/28/22	8/4/22		
OUTPUT DAILY		300							
	BALANCE								
Phase 3 Title									
Task 1	SPOILER OPTIMAX	758	1550		1	7/28/22	7/28/22		
OUTPUT DAILY		300							
	BALANCE								
Task 2	EPS FOAM GT-2 ASTRO DV DENSITY 18	3.678	1500	3288	2	7/28/22	8/1/22		
OUTPUT DAILY		500							
	BALANCE								
Task 3	EPS FOAM GT-2 ASTRO DV DENSITY 22	1.209	1000	153	2	7/28/22	7/30/22		
OUTPUT DAILY		100							
	BALANCE								
Task 4	CENTRINO DV SHELL	5.372	1008	1288	1	7/28/22	8/2/22		
OUTPUT DAILY		500							
	BALANCE								
Task 5	CENTRINO SV SHELL	1.209	1008	239	1	7/28/22	7/29/22		
OUTPUT DAILY		100							
	BALANCE								
BAHAN PENDUKUNG									
Task 1	GLUE STICK	1.630	2000	2304	3	7/28/22	7/30/22		
OUTPUT DAILY		250							
	BALANCE								
Task 2	DRIP GLUE	275	310	310	3	7/28/22	7/30/22		
OUTPUT DAILY		40							
	BALANCE								

D. Analysis on Optimax Material Arrival Pattern

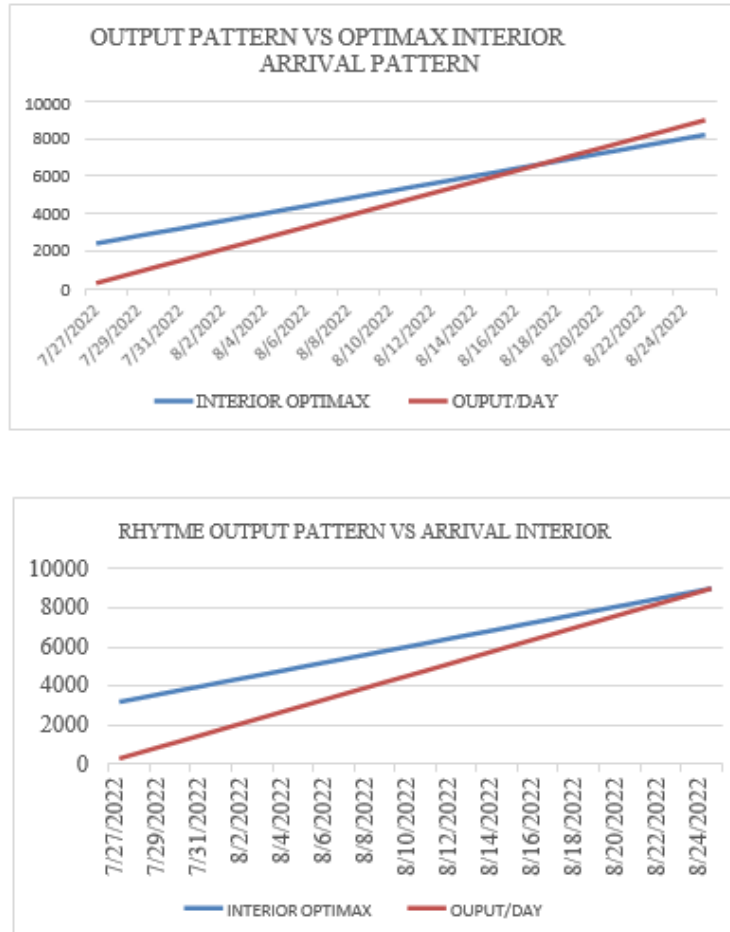


Figure 4. Analysis on Optimax Material Arrival Pattern

In the Optimax interior material arrival pattern to achieve material needs and rhythmically to the Optimax output pattern per day, on the graphic line it is shown that on 20/08/2022 did not find the same rhythm pattern, then the daily output is reduced or hampered, because the material output pattern is not rhythmic. The solution to solve this rhythm problem, must have a buffer behind 3000 of the interior set and the resulting rhythm with a buffer of 3000.

E. Graphical Analysis of the Visot Optimax Pattern

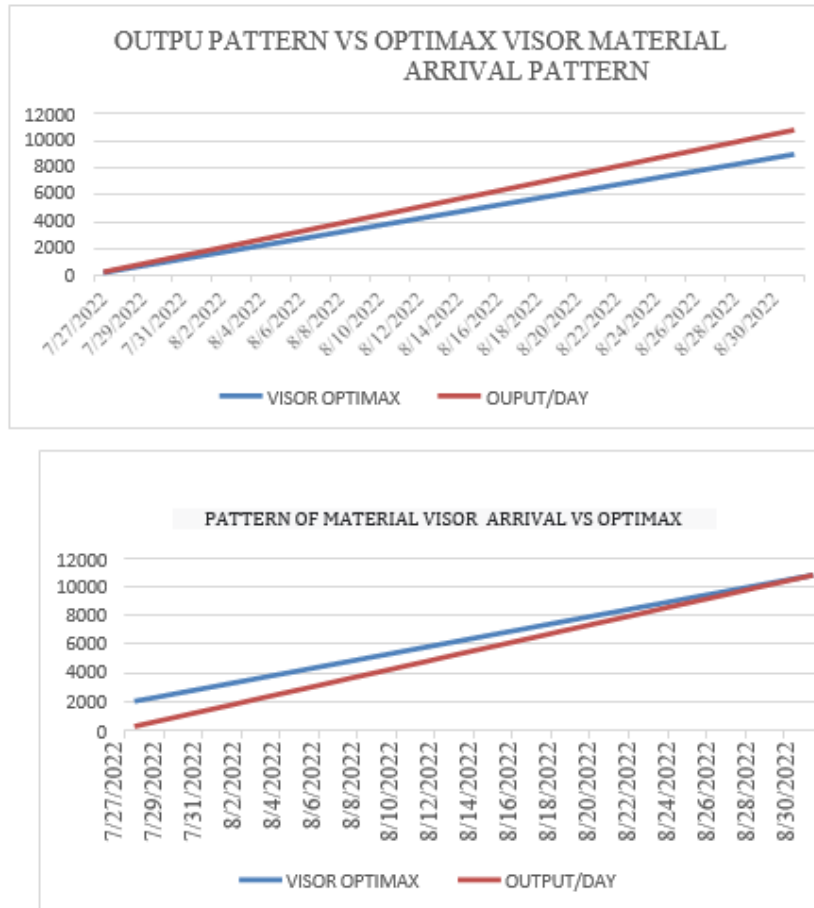


Figure 5. Graphical Analysis of the Visor Optimax Pattern

In the pattern of arrival of the Optimax Visor material to achieve material needs and rhythmically on the daily Optimax output pattern, the graphic line shows that on 02/08/2022 did not find the same rhythmic pattern, then the daily output is reduced or hampered, because the material output pattern is not rhythmic. The solution to solve this rhythm problem, must have additional Vendors for buffers behind 1800 pcs of optimax visors following rhythm results with buffers.

F. BOX G2 Optimax Pattern Graphic Analysis

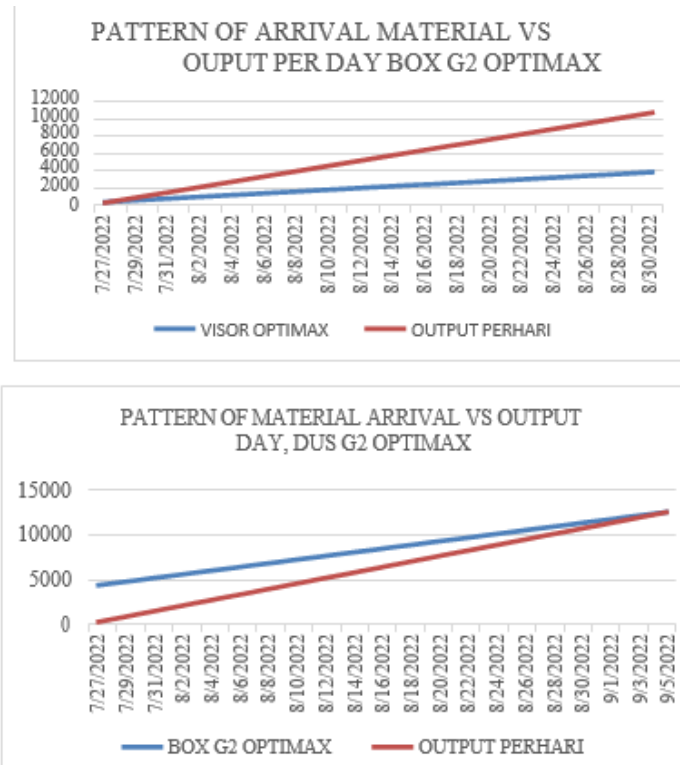


Figure 6. BOX G2 Optimax Pattern Graphic Analysis

In the pattern of arrival of the Optimax Visor material to achieve material needs and rhythmically on the daily Optimax output pattern, the graphic line shows that on 02/08/2022 did not find the same rhythmic pattern, then the daily output is reduced or hampered, because the material output pattern is not rhythmic. The solution to solve this rhythm problem, must have additional Vendors for buffers behind 1800 pcs of optimax visors following rhythm results with buffers.

G. Improve

After the BOM (Bill Of Material) analysis was carried out, improvements were made to the BOM vs PO and BOM To Helm research, the following are the recommended steps towards increasing Production and improving Material Requirement Planning as follows:

1. Make a visualization of the pattern of material arrivals vs. output per day
2. Make material stock in order to know the age of the material.
3. Add or find new vendors so that daily time accumulates well
4. Reducing demand for materials that are in excess of what is needed
5. Implementing 3 M (Muda Mura Muri)

Conclusion

1. Based on the Visualized Bomb to Helmet from all available materials from Heading 1 and Heading 3 we can make Optimax 0, KM 7 200, Exterminator 1248, Centrino DV 665, and Centrino SV 153 from the total existing material accumulated we can produce 2,266 Helmets on 25/07/2022.
2. Based on the results of BOM Vs PO, the entire model has a Material Requirement Planning Material Requirement that can be seen from the total required material. In Optimax the material that must be met is Visor OPTimax clear (coating) 8759, Visor Ray-Ban Exterminator 3012, Inner Visor key System Optimax 14274, Styrofoam Optimax D.30 4208, Interior Optimax 5883, List of Horns Optimax 6815, List of Helmets Optimax 2135, Holster Helmet G2

6640, Box G2 Optimax 8353, Box MB Exterminator 18 489, Static Sticker G2 Centrino SV 3630, Shell Optimax 7774, Spoiler Optimax 758, Exterminator Model Materials that must be fulfilled are Visor Ray Ban, Inner Visor Key System Exterminator, Glove G2 Helmet, For GMT and MRJ Models, Visor Ray Ban, Inner System Centrino 14175, Eps Foam GT-2 Astro DV Density 18 3678. Interior Centrino DV Semi KD 5372, Centrino Shell Double Visor 6278, Topvent Centrino Top Rear 328 and Topvent Centrino Top (front) 12407. For Centrino Single Visor Eps Foam Astro Density 22 1209, Shell Centrino Single Visor 1097, Top Vent Top Rear and Top Vent bag. For Supporting Materials, Helmet Holster 12996, Stem Glue (Unit PCS) 1353 and Drip Glue 275 are needed..

3. In the Optimax interior material arrival pattern to achieve material needs and rhythmically to the Optimax output pattern per day, on the graphic line it is shown that on 20/08/2022 did not find the same rhythm pattern, then the daily output is reduced or hampered, because the material output pattern is not rhythmic. The solution to solve this rhythm problem, must have a buffer behind 3000 of the interior set and the resulting rhythm with a buffer of 3000
4. In the pattern of arrival of the Optimax Visor material to achieve material needs and rhythmically on the daily Optimax output pattern, the graphic line shows that on 02/08/2022 did not find the same rhythmic pattern, then the daily output is reduced or hampered, because the material output pattern is not rhythmic. The solution to solve this rhythm problem, must have a buffer behind 1800 pcs of optimax visors along with rhythm results with buffers.
5. In the pattern of arrival of the Visor BOX G2 Optimax material to achieve material needs and rhythm it to the Optimax output pattern per day, the graphic line shows that on 31/07/2022 did not find the same rhythm pattern, then the daily output is reduced or hampered, because the material output pattern is not rhythm. The solution to solve this rhythm problem, must have a buffer behind 4200 pcs Box G2 Optimax and have 2 different vendors along with rhythm results with buffers
6. BOM vs PO Is a Visual Description of all Material Requirements Needed plus 30% safety on the required materials, Bomb Vs Po is useful for reducing Waste Inventory and reducing material Arrival Pattern errors, Material Arrival Pattern errors can cause production delays Due to materials running out at the time Production.

Table 3. Material

Material name	Causes of Unrhythm	Solution
Optimax interior	Too Little Warehouse Buffer, and Vendor strength does not meet the Daily Time Base Output Daily production standard	Adding a Warehouse Buffer at the back of at least 3000 or adding an Interior Vendor to be in tune with the Production Pattern
Optimax Visor	No Warehouse Buffer or 0, due to Vendor not Sending or Late Request Process	Adding a Warehouse Buffer in the back (safety Stock) of at least 1800, and using Stock Limit material so that requests are not late
Box G2 Optimax	Too Little Warehouse Buffer Due to Late Processing Requests or Unmonitored Cartons, and Lack of Vendors	Adding a warehouse buffer behind (safety stock) of at least 4200, funds using Stock Limit so that it is monitored and can be processed on box requests

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