

Implementation Of Garments Production Operating System Software With Interconnection Technology & Smart Computer Devices In A Textile Industry By Industry 4.0 Concept

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Abstract— Traditionally operated garment industries are facing problems is poor planning, monitoring & control system in knit & woven Garments. That's why we face low productivity, longer production lead time, high rework and rejection, poor line balancing, low flexibility of style changeover etc. These problems were addressed in this study by the implementation of G.PRO Planning software for Line planning, Line controlling, Production Follow-up and master planning according to industry 4.0 concept. After implementation of G.PRO Planning tools, results observed were highly encouraging. Some of the key benefits entail production cycle time decreased by 8%, number of operators required to produce equal amount of garment is decreased by 15%, rework level reduced by 40%, production lead time comes down to one hour from one day, work in progress inventory stays at a maximum of 300 pieces from around 500 to 1500 pieces. Apart from these tangible benefits operator multi-skilling as well as the flexibility of style changeover has been improved. This study is really helpful for reduce time. It's also helpful for one-time shipment. By this implementation Factory save 8% Money and save time 20% more. According to industry 4.0 concept this implementation really helpful for survive the Garments industry for future time.

Keywords— Industry concept 4.0, Planning tools, Strategic Solutions, Sustainable Solution, Improve Productivity.

I. INTRODUCTION

Industry 4.0 is used synonymously with the Fourth Industrial Revolution and represents a new level in the organization and management of the industrial value chain. Industry 4.0 describes intelligent networking of industrial machines and processes with the help of information and communication technology [1]. According to Industry 4.0 concept in this research work use GPRO smart planning software in garments industry because production planning is the very important department in garments industry. Production planning is the controlling aspect of garments industry [2]. It is involving everything & every task in the process to execution the delivery of goods within time frame. So, production planning is the controlling of production & manufacturing process determined by time frame [3]. Planning department plan every style to execution the order within time limit. Without time frame garment cannot sustain so garment industry must follow every task by scheduling. Each order has a delivery date & production plan department follow production plan on the base of delivery date [4]. They know when fabric & trims in-house in factory will. Basically some of fabric & trims come from Local & internationally. So, they plan both option on the base of delivery date [5]. A buyer can judgment by shipment percentage & where the vendor current position? So production planning department must follow some of the important tasks in the following.

1. Capacity planning
2. Time & Action (TNA)

3. Scheduling.
4. PP meeting.
5. Order Allocation.
6. Man power & M/C allocation.
7. Execution of every tasks.
8. Materials planning & In-house follow up.
9. Delivery Meet.

Due to the increasing labor wage in developed countries, the apparel manufacturing has been migrating from the high wage developed world to low wage developing countries [6].

Even though the labor cost is cheaper than in developed countries; due to the specific market nature of the garment industries for example: the short production life cycle, high volatility, low predictability, high level of impulse purchase, the quick market response; garment industries are facing the greatest challenges these days [7].

Garment industries in developing countries are more focused on sourcing of raw material and minimizing delivery cost than labor productivity because of the availability of cheap labor. Due to this, labor productivity is lower in developing countries than in the developed ones [8]. For example, labor is very cheap in Bangladesh but the productivity is poor among other developing countries. Now the worry is about labor productivity and making production flexible; because the fashion industry is highly volatile and if the orders are not fulfilled on time, the fear for losing business is real.

Even today, industries are getting the same or more volumes (orders), but the number of styles they have to handle has increased drastically. Earlier industries were getting bulk order so there is no need to worry; if the production line was set for the first time it would run for a month or at least a week or two. But nowadays due to small order quantities and complex designs, the garment industry has to produce multiple styles 13 even within a day; this needs higher flexibility in volume and style change over.

In some cases, it has been observed that, in developing countries the garment industries are run as family business lacking skilled personnel as well as capital to implement new technologies for improving productivity and flexibility. Because of this, industries have been running in a traditional way for years and are rigid to change. They are happy as long as they are sustaining their business. They don't have much confidence and will towards innovation over old processes. Now the time has come to struggle with global market demand and niche market in garment industries if they want to run it further.

So, this is very important to make a good plan. It is very difficult to plan manually a big volume order. Software can help to plan easily and monitoring easily.

1.1 Research goal

GPRO Planning Software create based on 10 years of industry experience, GPRO has been developing quality in house software and complementing hardware for the garment industry to increase their efficiency and Productivity.

This is flexible enough to address planning needs, it simplifies the planning process, maximizes factories resources and increases productivity.

- To create real time shop floor feedback and predictive projection features enable you to take on proactive actions ensuring on time delivery.
- Make Flexible planning with production constraints for a more realistic delivery.
- To improve internal communications across departments.
- Turn production floor into a systematic & predictable environment.
- Easy to Daily Capacity Planning.

- It is easy for simulation planning.
- To create an online base planning monitor.
- To monitoring worker efficiency.
- To create cutting plan tools based on sewing plan.

II. METHODOLOGY

2.1 G.PRO tracking procedure:

G.PRO Software is working start from cutting then sewing and finishing section. It's also work for planning software. First off all G.PRO software entry an order details. SO-Seles Order, MO-Manufacture Order, Style, Style image, Color, Size wise quantity.

When one Order any lay is cut from cutting then G.PRO make a bundle tag against par cutting bundle. That's tag have few information such as this is which SO bundle, which MO bundle, which style, which color, which size and size quantity.

This tag is creating data is given by a tag creator machine.



Fig: Tag Creator machine.



Fig: G.PRO tag coin

This tag normally makes 30 pcs, 40 pcs, 50 pcs, 100 pcs. But it can create any amount of quantity. This tag machine gives all data which is need to production report.

Then its tag is complete then it is binding from cut panel. Every tag bundle has different number.



Fig: Tag is bind from cut panel.

This tag number have details about this bundle. Then this bundle is store in cutting store rake.

When this tag bundle is plan for sewing line then it is out from cutting store and input in sewing line. This in and out is controlling by G.PRO punch machine this time no need to manually calculation.

When one bundle is entering in sewing line it is go squeal as per previous setup layout wise. This layout is setup by IE manger. This layout is different as per different style.

When operator complete his/her bundle then he/she need to punch in G.PRO punch machine. This way one bundle goes from sewing input to sewing output.

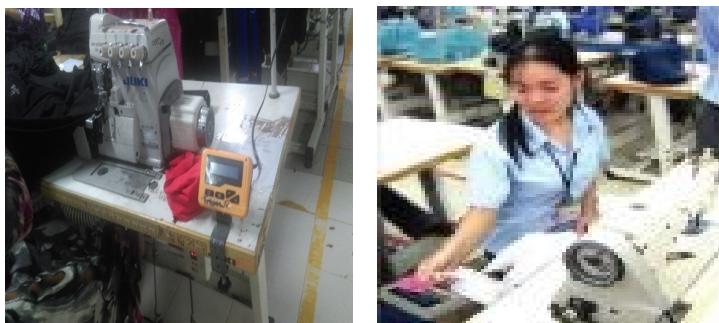


Fig: Sewing machine G.PRO punch.

This punch is creating automatic data generate, which is helpful for make real-time data and efficiency. By this process we can easily find out Buyer wise, order wise, color wise, style wise and size wise data we can receive. Line wise production report, cutting report, stock report, rejection report, man power report, etc. report can be get from this software.

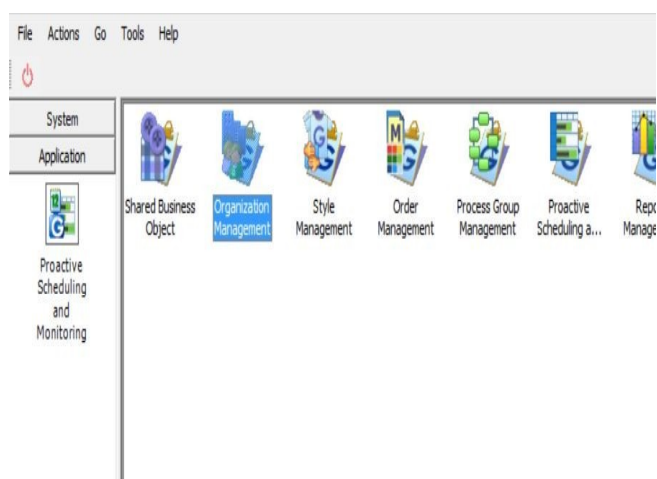
2.2 Using Procedure of Planning Board

2.2.1 Production, Planning and Control

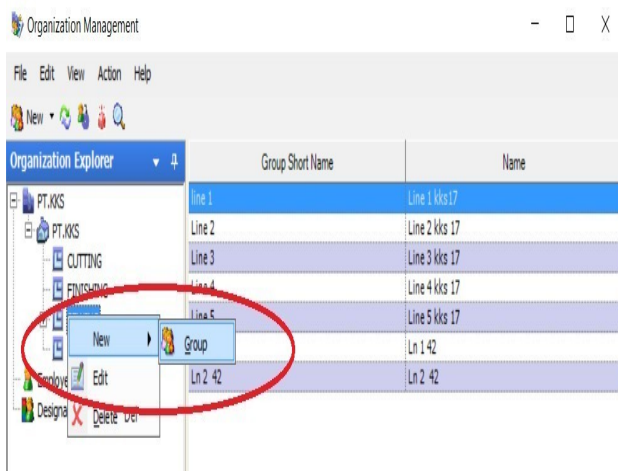
To start to planning for any factory, first we have to identify our production line.

Adding a New Production Line

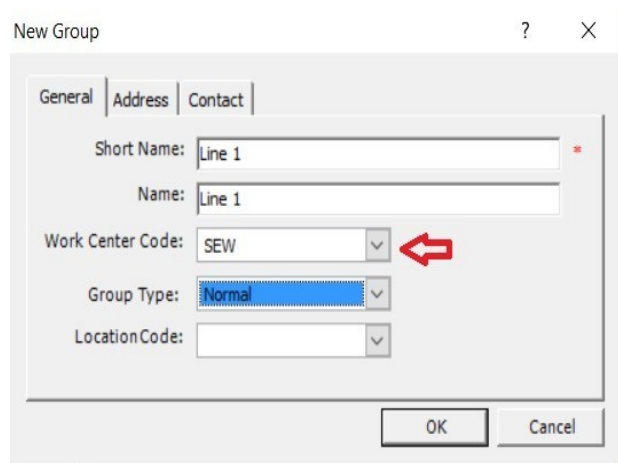
1. Open the Organization Management



2. Create our factory with the Department, Right click on selected department and Create > New > Group



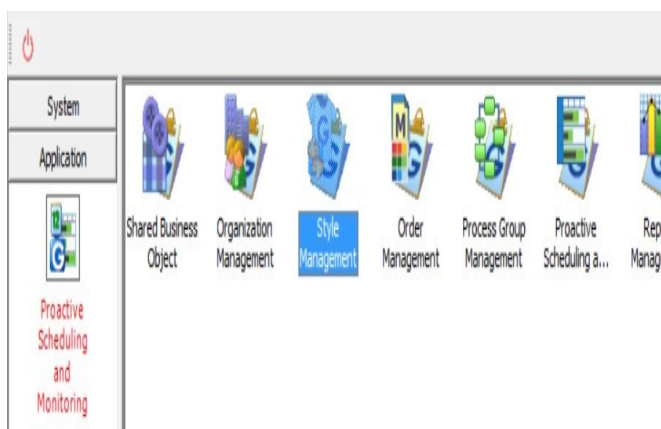
3. Insert our line information, and corresponding Work Center Code and select OK to Confirm.



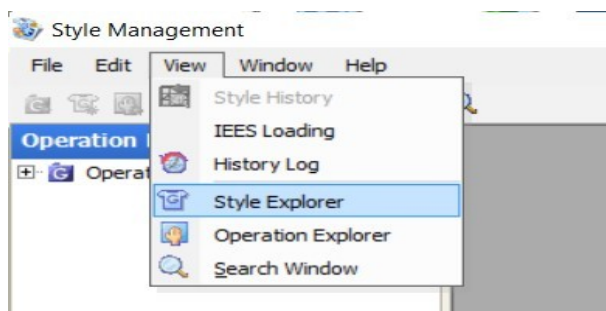
2.2.2 Adding a New style

Style is the identity of the type of Garment you are making, to start to add a New Style

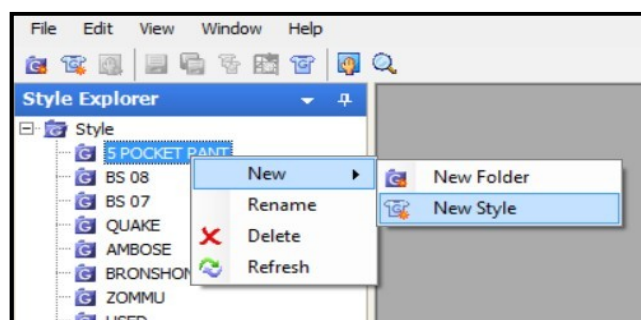
1. Open the Style Management



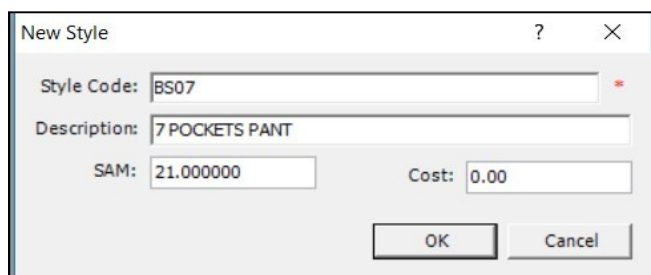
2. Press of the Icon showing below Select from View > Style Explorer



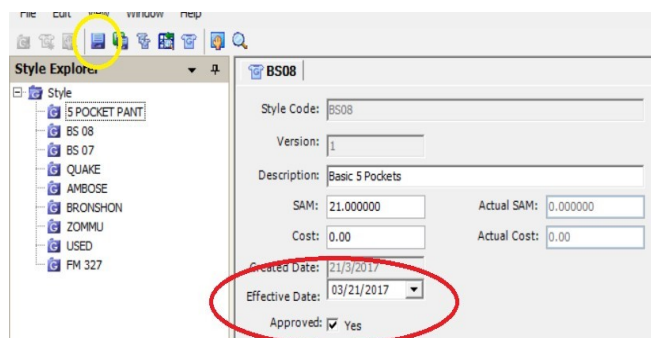
3. Choose or Create a Category folder, and then Right click on the corresponding folder, Select New Style to create a style that we preferred



4. Key in the Style information, given a Standard Allowance Minute (SAM) for the specific time. The SAM can be coming from the time study happened in Sample Dept. Select OK after Done



5. Select the Effective Start Date of the Style, and Select the Checkbox of Approved, after that press save.



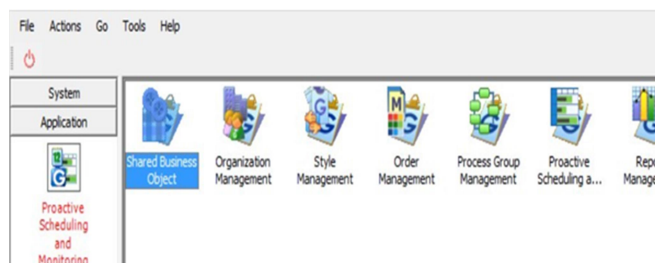
The Style have been created successfully

2.3 About working with orders

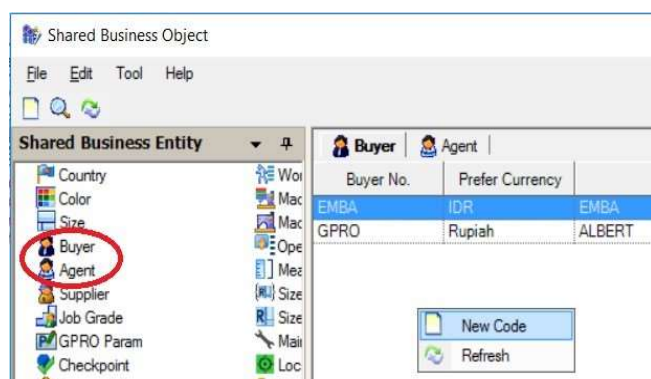
Order is the key point of the Business. To Manage in PSM, after you receive a Purchase Order (PO) You required to start generating our Sales Order (SO) and Manufacturing Order (MO) in GES system.

2.3.1 Create Buyer or Agent

1. Open the Shared Business Object



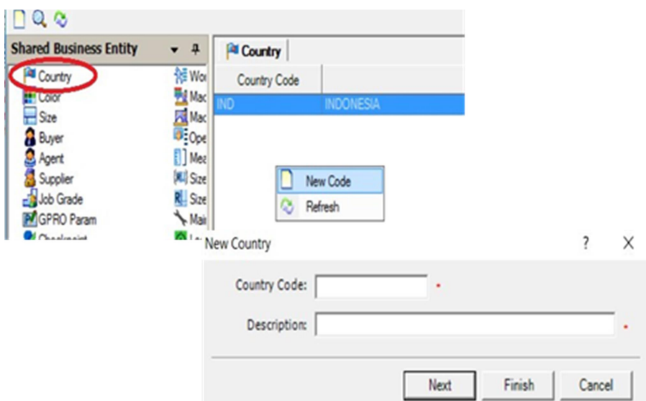
2. Choose Buyer or Agent Master File (Double-Click) to add New Buyer, Right Click on the empty space Select “New Code”



3. Key in the Buyer / Agent information, is the required field, others are optional for your reference

Buyer No.:	B001
Prefer Currency:	Rupiah
Name:	Buyer 1
Short Name:	Garment Brand 1
Address:	
Country Code:	IND

4. To Insert Country code Select Country in Share Business Object Right Click on empty space > Select New Code > Key in New Country information and Press Finish

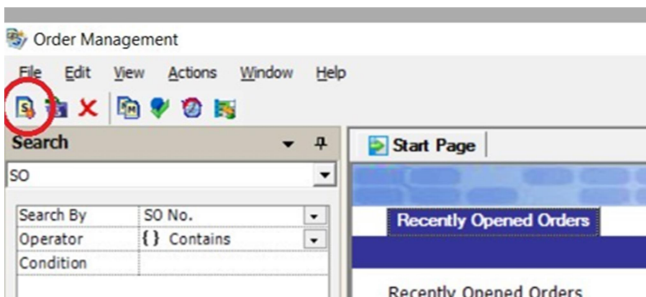


2.4 Adding a new Sales Order

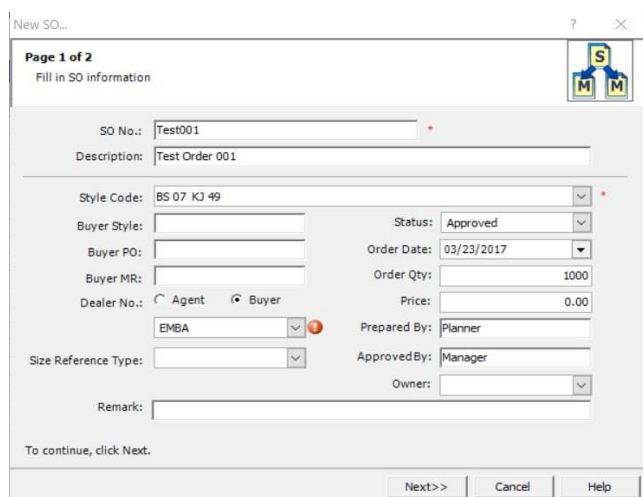
1. Open the Order Management



2. Select the Icon on the menu to Start Creating a New SO



3. Key in the information of the SO and Select Next to proceed



2.5 Adding a new Manufacture Order

1. After Process you can add the MO by pressing Add Button Key in the Mo Number and the quantity>

- Press OK if you only have single MO
- Press Next if you have another MO to input After Complete Click OK

New SO... Page 2 of 2 Split MOs

MO No.	Description	Order Qty	Seq No.
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Split MOs

MO No.: MO0001

Description:

Quantity: 1,000

Remaining: 1000

Seq No.: 1

Next OK Cancel

SO Order Qty.: 1000 To save SO, click Finish.

<<Back Finish Help

2. The Completed MO will be showed on the interface > Press Finish to Complete

MO No.	Description	Order Qty	Seq No.
MO0001		1000	1

3. The Completed SO and MO will be show on the interface, Select MO at Bottom top row

File Edit View Actions Window Help

Search

SO

Search By: SO No. Operator: {} Contains Condition

Search Clear

Result: 14 Record(s) found.

SO No.	Description
AMBOSE KJ 161	
BRONGHON KJ 129	
BS 07 KJ 162	
BS 07 KJ 49	
BS 08.1 KJ 109	
FM 327 KJ 104	
GPRO001	GPRO001
MO001	
QUAKE CP 18	
test0010	test0010
USED KJ 173	
USED KJ 171	
USED KJ 33	
ZOMMU KJ 59	

Start Page AMBOSE KJ 161

SO No.: AMBOSE KJ 161

Description:

Style Code: AMBOSE KJ 161

Buyer Style:

Buyer PO:

Buyer MR:

Dealer No.: Agent Buyer

Status: Approved

Order Date: 02/14/2017

Order Qty: 9200

Price: 0.00

Prepared By: ILIK

Approved By: MRLAMDI

Order Owner:

Size Reference Type:

Remark:

General MO

4. We can adjust the Shipment Date and other necessary information in the MO. After Complete, Select the Color, Size, Qty at the Bottom of the interface.

File Edit View Actions Window Help

Search

SO

Search By: SO No. Operator: Contains Condition:

Search Clear

Results: 14 Record(s) found.

SO No.	Description
AMBOSE KJ 161	
BROCHON KJ 129	
BS 07 KJ 49	
BS 08.1 KJ 109	
PM 127 KJ 104	
GPR0001	GPR0001
MO001	
QUAKE CP 18	
test010	test010
USED KJ 173	
USED KJ 171	
USED KJ 33	
ZOMMU KJ 59	

MO No.: 17/20037

Description:

Order Qty: 9,200 % Extra Quantity: 0.00 %

Extra Quantity: 0 Status: Approved

SO No.: AMBOSE KJ 161 Status Date: 03/22/2017

Shipment Date: 02/22/2017 Prepared By:

Order Date: Order Owner:

Style Code: AMBOSE KJ 161

Season: Country: IND

ERP Reference:

Fabric Type: Wash Type:

Remark:

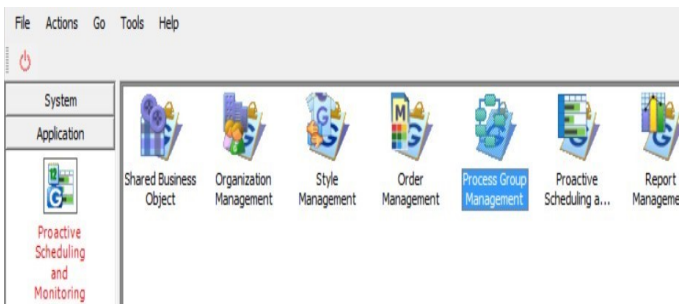
Seq No.: 1

Color, Size and Quantity

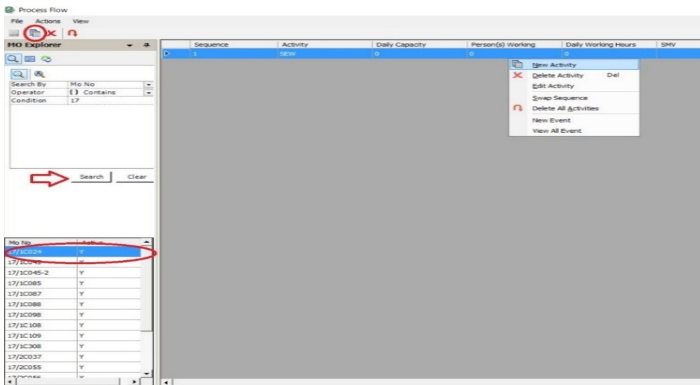
2.6 Process Group

In Order to Start Planning, Each MO must have their Own Process Group

1. Open the Process Group Management



2. Search the MO that you created, to start adding the Process Group Press New Activity Icon on Top or Right Click on the empty area and choose New Activity



New Activity

Id: 0 Sequence: 2

Activity: ACTIVITY1

Work Center: SEW Nature: Limited

Measurement Unit: Minutes ObservationPoint: 100

Dependent Process: SEW

Days: 0

Set estimated daily target by:

☒ Pieces: Complete 0 pcs/day, by 55 person(s) working 9.00 hrs/day

☐ SMV 1.000000 (person(s) x (working hrs per day x 60)) / complete pieces

Rate Per Quantity: 1

OK Cancel

By Default the SMV in style will be the time that use to estimate the complete date

*If we wish to make changes

Key in the Information that required, the planner will automatic compute required time.

If it happens we have any other work center to put in plan, we can insert the Dependent Process to referred.

Work Center

Work Center: CUT Nature: Unlimited

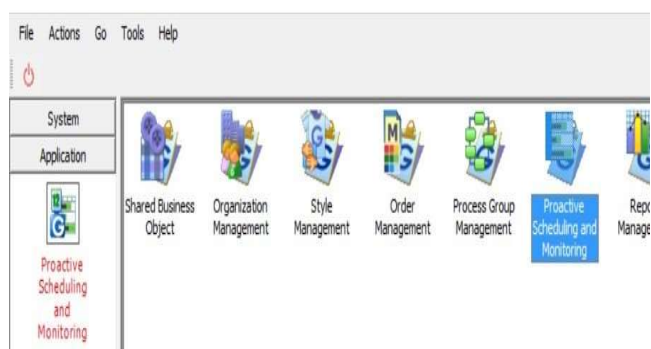
Measurement Unit: Piece ObservationPoint: 1

Dependent Process: SEW

Days: 0

2.7 Proactive Scheduling and Monitoring

1. Open the Proactive Scheduling and Monitoring



2. By Default is Loading Data From Server > Press OK

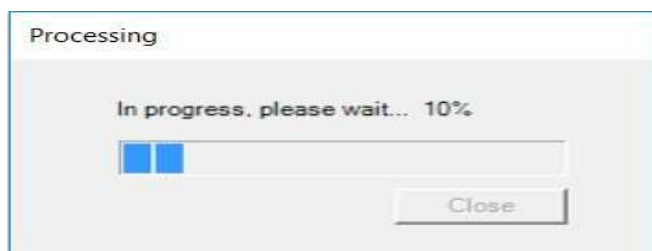
Select Data Source

☒ Load data from server

☐ Load data from local

☐ Default

OK Cancel

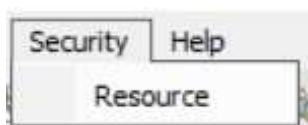


2.8 One Time Setup

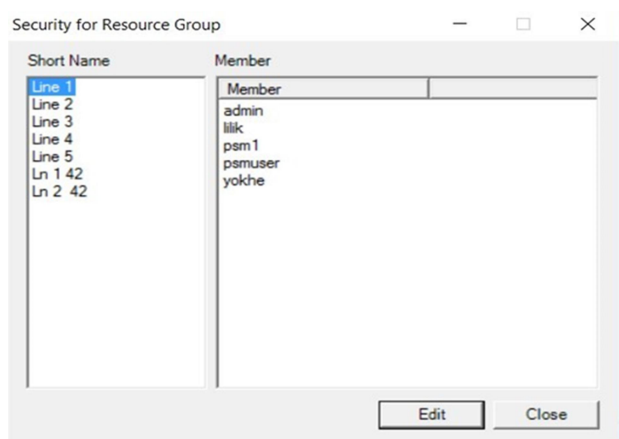
Due to User Access Level concern, by default, Non Resource will be showed on the interface, User have to do some One Time - Setup in Planning Board

1. Security Tab

In Order to Set User on viewing or editing particular Line, you can go to Security > Select Re-source

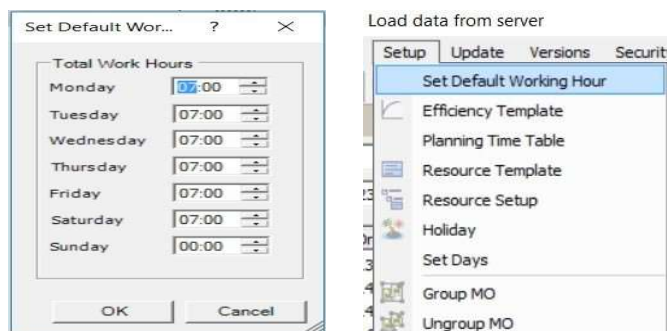


We can see the user that allow to access to every single production line. To make changes, select the Line and Press Edit



2. Set Default Working Hour

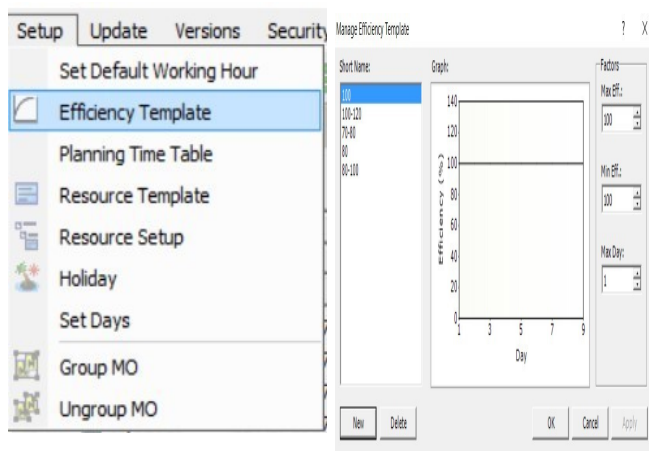
Go to Setup > Set Default Working Hour, to set the default employee working hour in the line. After completed, Press OK



3. Efficiency Template

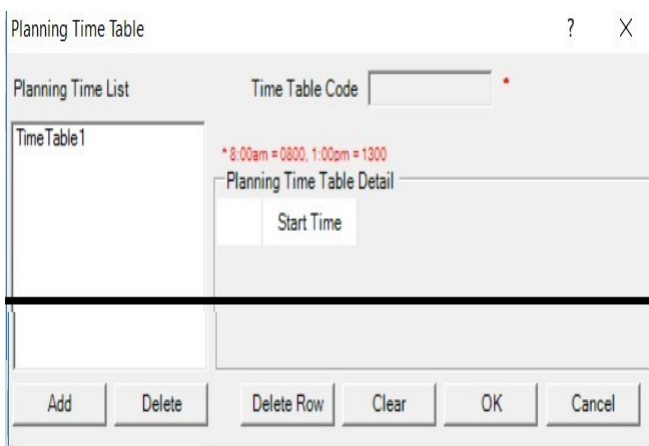
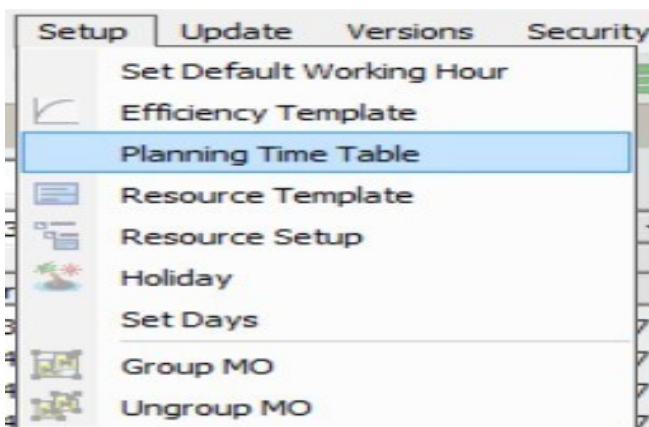
Go to Setup > Efficiency Template, to set the template of the operator efficiency flow.

You also can apply learning curve of how many day operator can move from Minimum efficiency to Maximum , if not you can just enter the same efficiency value in both field



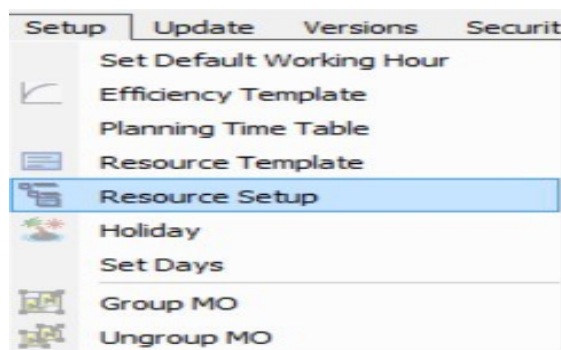
2.9 Planning Time Table

1. Go to Setup > Planning Time Table, to insert the detail of operating time & breaks

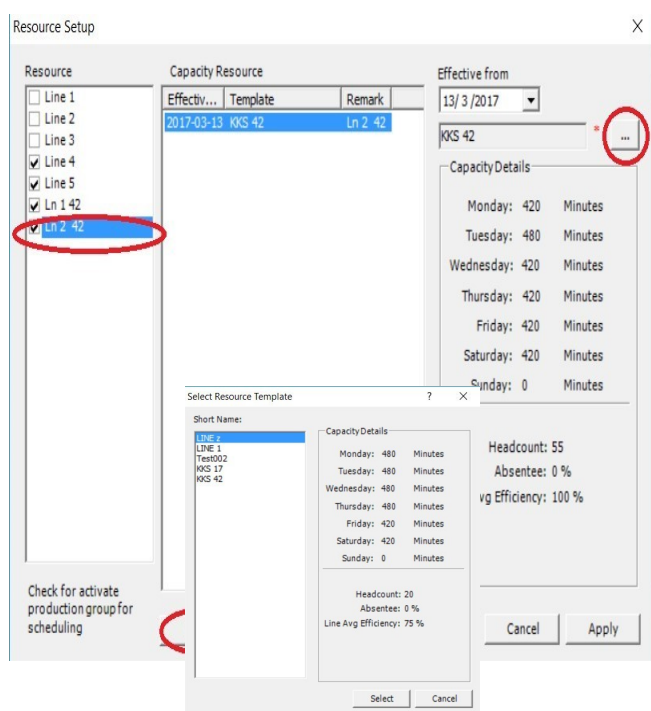


2.10 Resource Setup

Resource Setup will allow user to view or set plan the Production Line with the resource template made before. To do this Go to Setup >Resource Setup,



To able to View the Line Tick the Check the line, Press New to start input the Template. Apply the Effective date for the Line to Start, and press on the Template browser button "...", Select the Template to apply. After completed, Press OK.



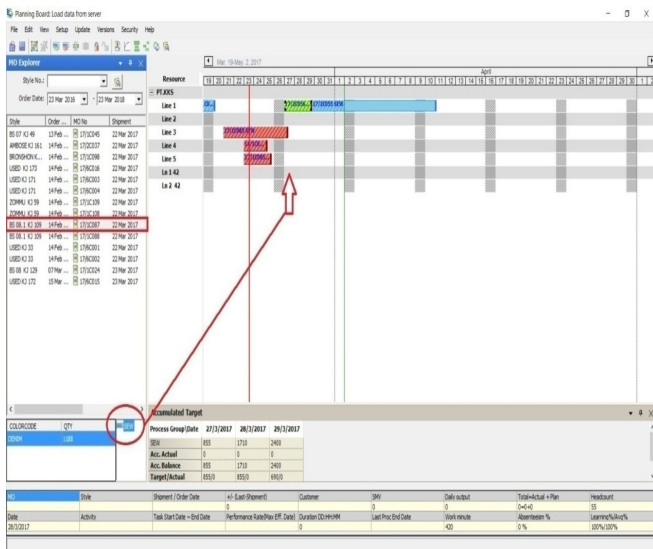
User will be able to view the line after these setups been done

2.11 Start Planning

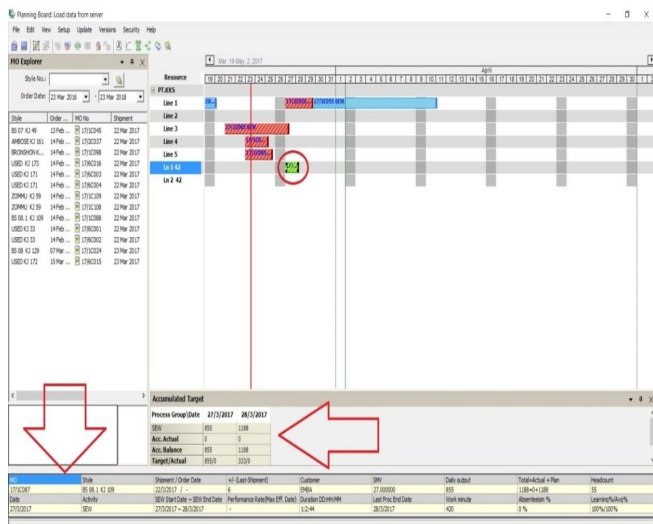
Planning Board interface allow user to drag and drop to locate the start time of the order, according to the setting done before , it will auto calculate the complete date.

To do so, first select the MO and from the process group "SEW" user can drag it to the date spot.

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When we select the task that had already apply in the planning board, the information will show as below. Including per day planning, completion date etc.



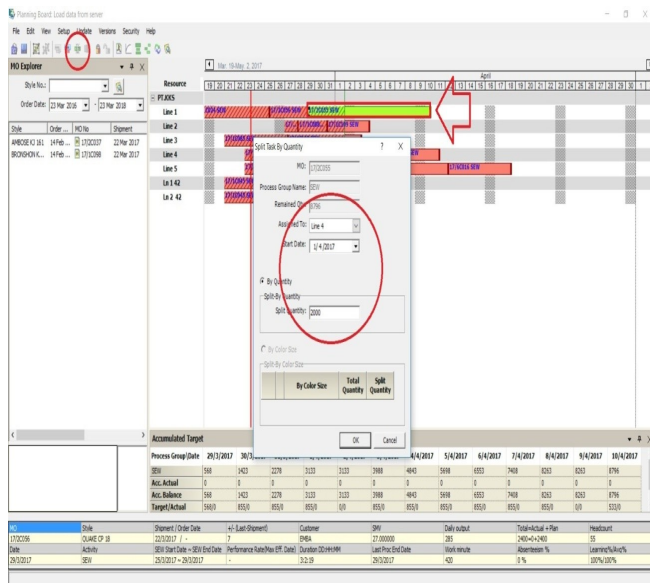
The planning board allow to separate color planning in different production line.

Split MO

To Split MO to plan in different Production Line.

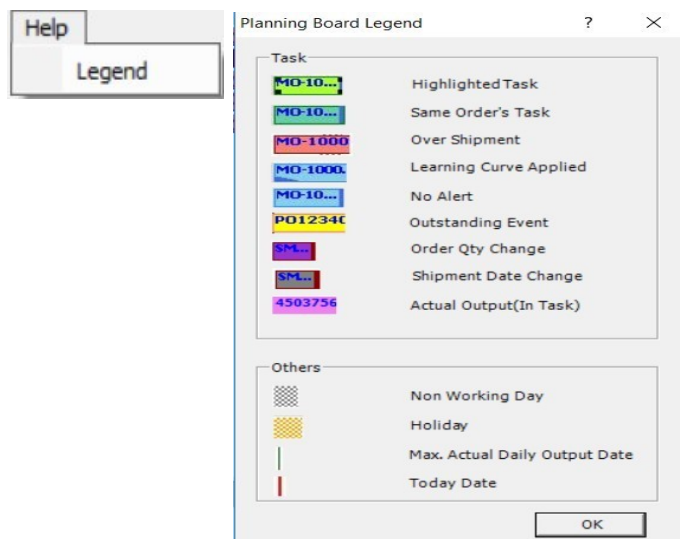
1. Select the MO Task appointed
2. Click on Split MO icon on top
3. Input which line to split, Start Date, and Split quantity > After Completed, Press OK

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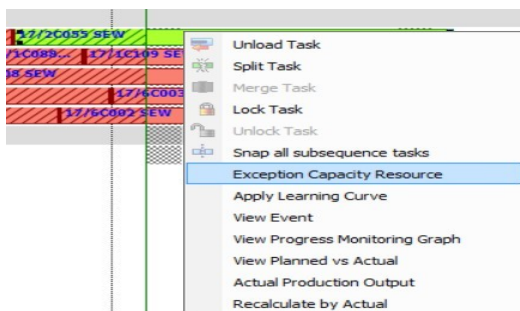
Legend

Every Single Color that show on the planning board have own meaning. To know more Select Help > Legend.



2.12 Exception Capacity Resource

If there are some urgent changes to be apply on the assigned Task, right click on the MO task > Select Exception Capacity Resource



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We can easily make changes to the Headcount field or Work Minute field, to adjust the line condition, in order to plan to complete more production to the adjustable factors.

Date	Headcount	Work minute	Qty	Original Headcount	Original Work minute	Original Qty
29/3/2017	55	279	568	55	279	568
30/3/2017	55	420	855	55	420	855
31/3/2017	55	420	855	55	420	855
1/4/2017	55	420	855	55	420	855
2/4/2017	0	0	0	0	0	0
3/4/2017	55	420	855	55	420	855
4/4/2017	55	420	855	55	420	855
5/4/2017	55	420	855	55	420	855
6/4/2017	55	420	855	55	420	855
7/4/2017	55	420	855	55	420	855

Set /Remove Holiday

1. If there is of Holiday event to update, Choose Setup > Holidays, Select the Date to update, choose Set Holiday to apply.

Setup | Update | Versions | Security

Set Default Working Hour
Efficiency Template
Planning Time Table
Resource Template
Resource Setup
Holiday
Set Days
Group MO
Ungroup MO

Define Holiday

Date: March 2017

Su Mo Tu We Th Fr Sa

26 27 28 1 2 3 4
5 6 7 8 9 10 11
12 13 14 15 16 17 18
19 20 21 22 23 24 25
26 27 28 29 30 31 1
2 3 4 5 6 7 8

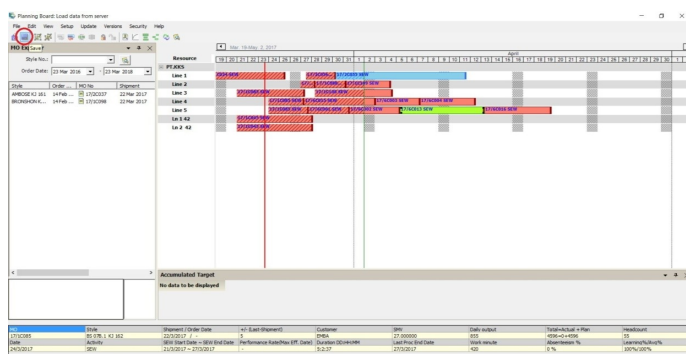
Set Holiday
Clear Holiday
Close

To Remove a Holiday, Follow the same as above, Select Clear Holiday to apply

System will automatic adjust the production status; it will affect the task that contain of the date selected as holiday.

Save Planning Board

To Save the Planning Board, just Press Save. System will take the later update as the latest planning board status.



2.13 Floor Controlling Procedure

By using GPRO software, we can easily control the floor, shipment, floor efficiency and man efficiency.

In the planning board we can check the line wise current production status

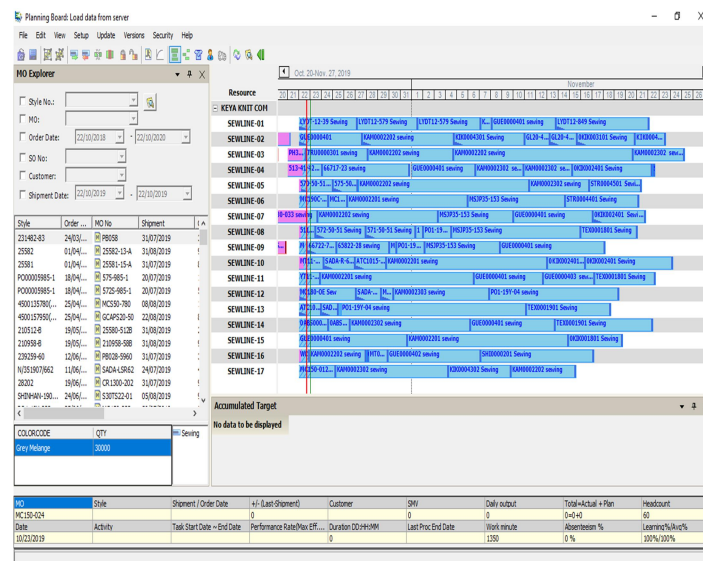


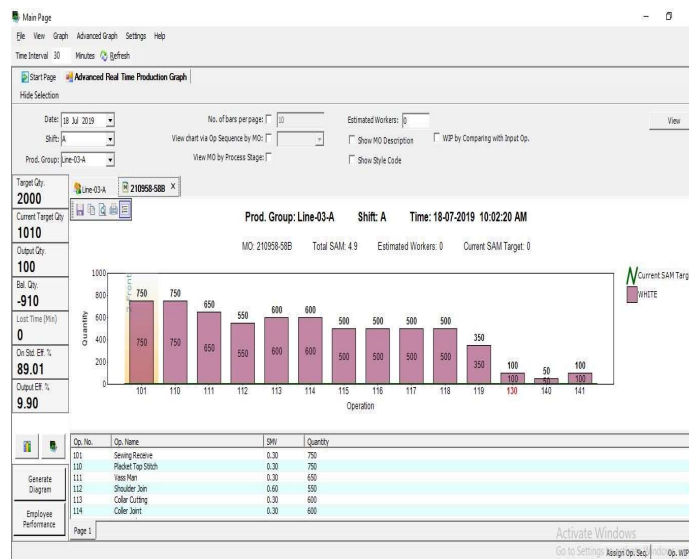
Fig: Planning board

This is the planning board status we can easily find which order and which color production is running in floor. Which color is run in floor that's strip color is go to change in pink.

That's make to easy to plan and make easy to meet shipment.

2.13.1 Floor Lay out Check and Check the efficiency

We can also find the line wise layout and operator wise current production in the floor and also find their efficiency.



2.13.2 Operator Efficiency

By this software we also can find the operator efficiency and that's way we can easily find out the week operator and good operator. And if we want to week operator make train up for make them strong. We also find which operator is run which number machine and his/her id and picture we can find easily.

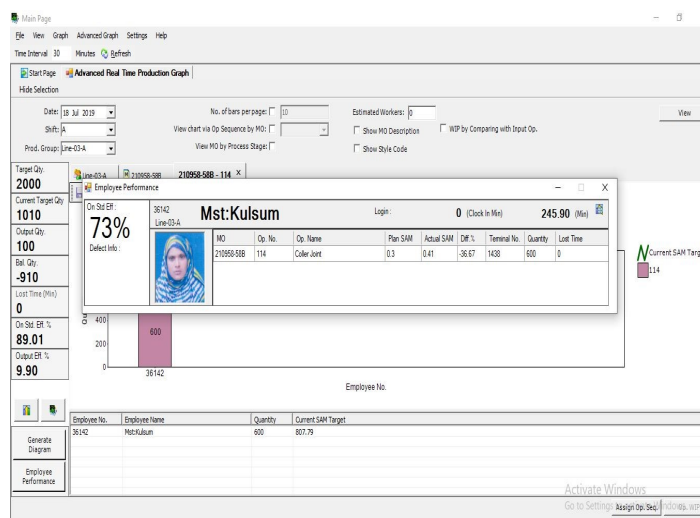


Fig: Operator Efficiency

We also separate the today total present and absent operator. And also find the process wise how many operators have in our factory, etc.

III. CONCLUSION

As Bangladesh is a developing country and Bangladesh most income value is come from Textile sector that's why we need to modernize our garments sector by following industry 4.0 concept and using those type of software. It's really easy our garments planning sector. Though its first investment is high but its long time run can give us more benefit. That's why we like this software so much and we hope who can use this software few days he also be easily find its benefits.

Bangladesh is an emerging market for textile & apparel industry. A holistic strategy will be adopted by the apparel industry in Bangladesh. There has been a realization that tax benefits and similar incentives go only so far and do not ensure sustainable growth. Domestic competitiveness, cost of doing business, workplace safety, product and market diversification, skilled labor force, foreign direct investment and technological advancement and automation in production process are also seen as key to retaining the momentum in apparel export growth.

Another issue is that of lead time. This would be a matter in readymade garment exports in future as the country might lose the cost advantage in coming days. The fact that Bangladesh's exporters have not really made efforts to ensure a living wage for workers also places the industry at a competitive disadvantage compared with other Asian countries. While apparel workers in Cambodia work for 47 hours a week, in Bangladesh it is 60 hours a week. Moreover, 54 per cent of workers are paid below the minimum wage. To reap fair prices for export product, a strategy will be adopted to improve negotiation skills at both the entrepreneur and the government level and to empower local exporters to develop a relationship with global buyers on an equal footing.

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