

## PRODUCTION PLANNING AND SCHEDULING IN KNITTED GARMENT MILL

تخطيط الإنتاج في مصانع ملابس التريكو الجاهزة

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ملخص عربي

أن عملية تخطيط الإنتاج في مصانع الملابس الجاهزة تعتبر من المراحل الهامة التي لابد ان تدرس جيدا قبل البدء في الإنتاج. و في السنوات الأخيرة تعاني معظم المصانع داخل مصر من التغيرات السريعة في أذواق العملاء خلال الموسم الواحد مما يجعل مواكبة هذه التغيرات و اللحاق بمواعيد تسليم الطلبات امرًا صعبًا. لهذا فان الغرض من هذا البحث هو توفير برنامج كمبيوتر يساعد مهندسي التخطيط في المصانع على عمل تخطيط دقيق و سريع للوصول الى الكفاءة المطلوبة وخفض الفاقد في الوقت و المواد الخام ومن ثم تحقيق متطلبات العملاء بدون اى تأخير.

### Abstract

Production planning is an integrative process of coordinating the demand for finished product with available resources. Production planner may work several months ahead of planned delivery to ensure that specific materials, production capacity, and reliable quality management are available when needed. Long-term planning (months or selling periods) is based on forecasts, merchandise plans, and budget. Short term planning (days or weeks) is based on customer order. Egyptian mills should be prepared to become manageable with rapid changes in order styles and quantities and start adapting the concept of mass customization. This study tries to get the best production planning and control system in knitted garment mill to achieve higher efficiency to reduce time waste and control of raw material supply and different processes.

Key words: Production planning, scheduling, knitting, Garment, database.

### **1. Introduction**

During the last century garment mills all over the world sold the products they were able to produce, products were almost standard and fit most of the consumers. Starting from this century customers buying behavior have changed dramatically requiring more differentiated taste.

Egyptian mills should be prepared to become manageable with these changes and start adapting the concept of mass customization. Garment industry is one of the industries, which has a great amount of requirements that are used in garment mills. The main factor which has an important influence is the operators who are needed with higher numbers. This makes it important to the economy of the country and presents a great potential for future growth and improvements. Besides, it forms largest part of the existing textile industry.

Knitted garment manufacturing involved applications of different process which have to be pre-controlled like: raw material quantities, number of machine required for the order and the delivery date. Moreover, it involves several operations starting from spreading, cutting, sewing, ironing and finally packing.

### **2. Review of Literature:**

Martin Lockett[1] studied the current lead times in the clothing industry, it was found around

three months. Retailers have as a result little opportunity to vary orders in response to sales information mid-season. Special garments have identified opportunities to reduce that lead time to three weeks, permitting retailers the luxury of fashion experimentation with minimal risk of end-of season reductions. This has been achieved through the combination of computer-aided scheduling, specification preparation and a radically upgraded customer liaison function to ensure optimum balancing of available capacity and a production program that commences on schedule. In addition a major restructuring of finishing capacity was required to achieve the target lead times. Results show that this will permit complete integration into the manufacturing process ensuring tighter scheduling and quality control. In addition, duplicated examination, preparation and pressing operations can be eliminated, reducing costs significantly.

In other research Illeez et al [2] discussed the problem of lean manufacturing as it requires small batch sizes and higher product variation. This requires the problem of set-up time to be solved as it is a non- value added time. The setup times and their categories were found for several knitted sports wear goods and methods of elimination were also stated.

On the other hand Larson [3] stated that customization has logistical benefits such as: minimized inventory level and high inventory turns over, this makes it possible to respond fast to true customer demand. The article discusses the prerequisites for a demand chain of customized knitted garments and the challenges means for logistics.

### **3. Aim of the work**

This study tries to achieve the best production planning & control system to get the higher efficiency to reduce down time in processes and control raw material supply and different processes. As this represent a good start to become manageable with rapid changes in orders and styles and start adapting the concept of mass customization.

### **4. Experimental work**

Production planning is very important to any apparel knitting mill. Therefore, a program was created, using access data base program. This program can

arrange the processes and evaluate the requirements for each process showing the available machines in the required time so the user can choose the available machine and know the end date of each process.

The inputs to this program differ according to the type of the process. Each process has an individual page. The user must deal with each page individually then the program will give the final result. The next section shows different processes that the program deals with, which are:

- 1- The main page (order page).
- 2- Knitting order.
- 3- Sewing order.
- 4- Packing order.
- 5- Accessories purchasing.
- 6- Finally summery report

### **5. Results and Discussion:**

The sequence of entering data is very important because the program need a certain sequence to evaluate the different equation without any missing data. So the data must enter according to the sequence of the following figures:

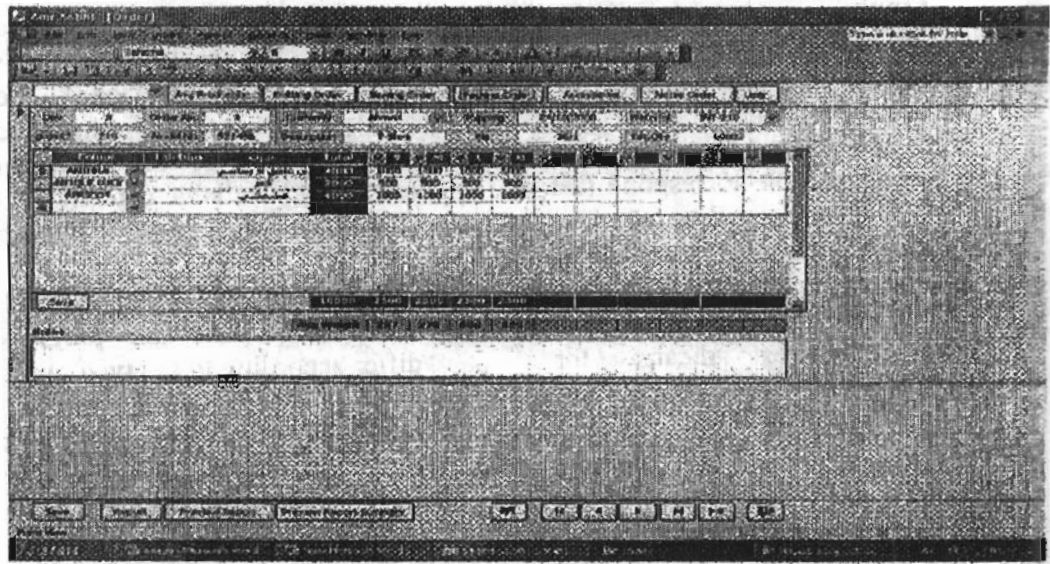


fig1

Figure (1) Main order Form

Figure (1) contains all the main information about the order such as the required quantity, sizes, type of fabric, yarn count; shipping date i.e. the customer order is entered to the program.

Figure (2) shows the average production page. This page helps the program to evaluate the required weight of the fabric with minimum waste to minimize the final cost of the product.

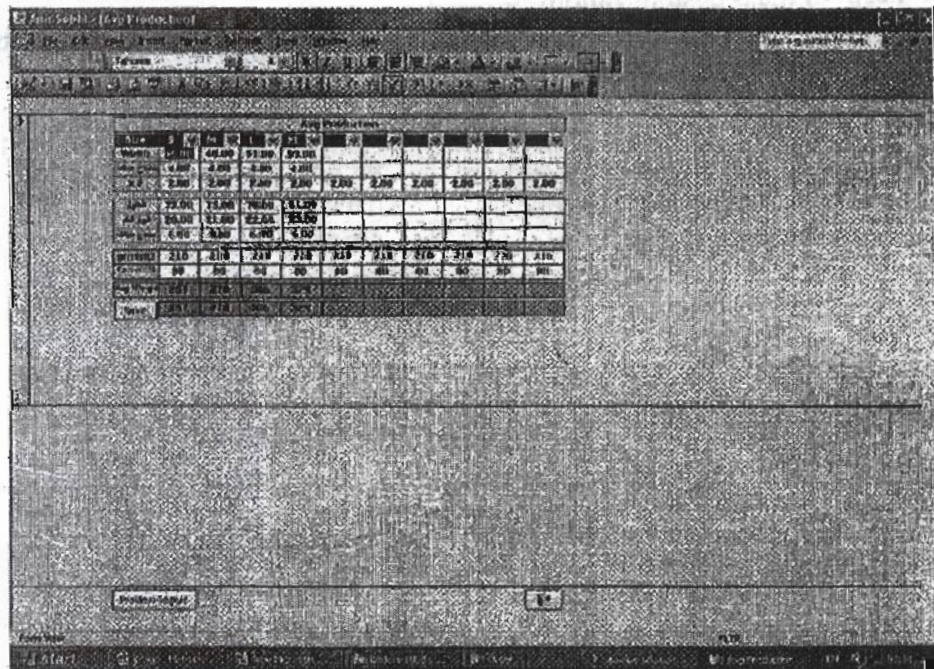


fig 2

Figure (2) Average production form

The out put of these two forms can be summarized in the next form which shows average

production material for each size, as shown in figure (3).

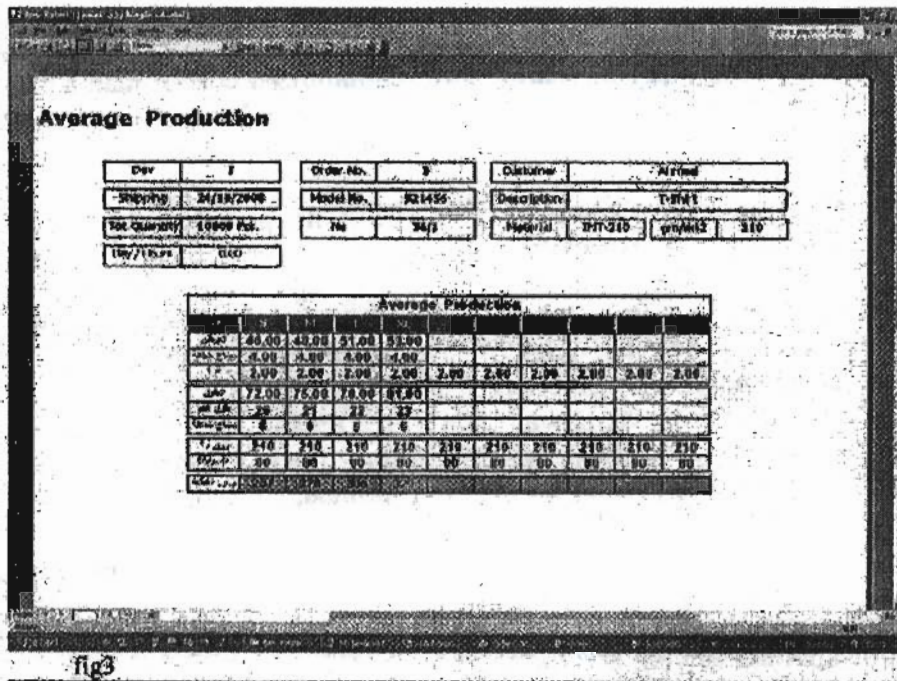


Figure (3) Average production summary form

After calculating the average fabric weight required for each size in the last forms, the knitting

order can be established as shown in figure (4).

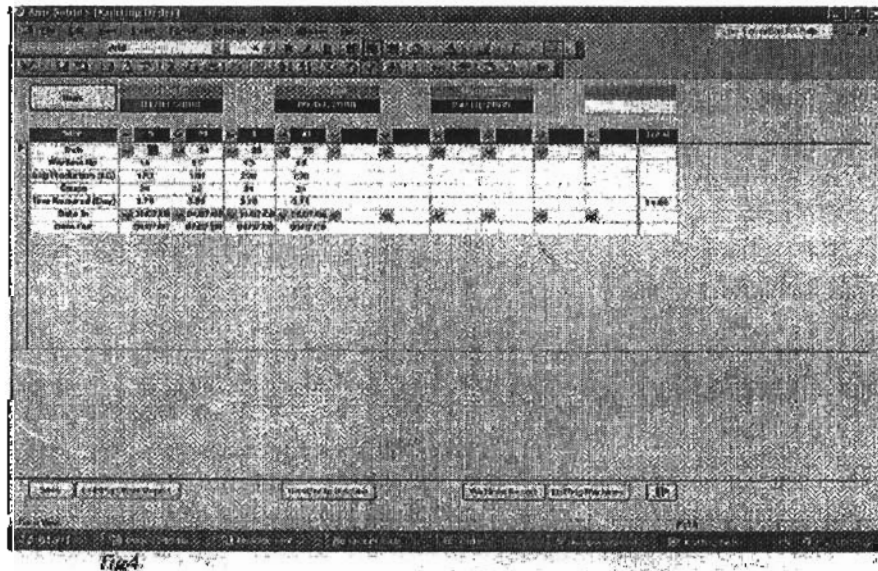


Figure (4) the Knitting order form

This form helps the user to know the time required to produce the fabric needed and the available knitting machine to produce the order on. This part has many variables like the diameter and gauge of the knitting machine, time schedule of each machine.

The program control knitting, sewing, accessories and packing orders individually then match them together to give the required schedule for the order that gives the end product before the shipping date with minimum waste. And if the order can't be done before shipping date the program will refuse that order.

The output pages of the program contains start and end dates of knitting, sewing and the date of shipping to be sure that the order will be ready before shipping date.

By controlling the last

processes, and arranging the sequence of them, the program can control new orders and add them to the main schedule of the factory to be produced on time, not only this but also with minimized cost of manufacturing by reduced down time and waste of fabric.

The previous part discusses each order form and mentioned the inputs and outputs of them and how to deal with the program to get the required results.

Finally, the next part shows the final reports that can be printed, they are:

- 1- The final knitting report.
- 2- The final sewing order.
- 3- The order report
- 4- The summery report, which are shown in figure (5) to figure (8) respectively.

**Knitting Order**

Order ID	Date	Status	Value 1	Value 2	Value 3
10001	2009-01-01	Open	100	200	300
10002	2009-01-02	In Progress	150	300	450
10003	2009-01-03	Completed	200	400	600
10004	2009-01-04	Open	250	500	750
10005	2009-01-05	In Progress	300	600	900
10006	2009-01-06	Completed	350	700	1050
10007	2009-01-07	Open	400	800	1200
10008	2009-01-08	In Progress	450	900	1350
10009	2009-01-09	Completed	500	1000	1500
10010	2009-01-10	Open	550	1100	1650
10011	2009-01-11	In Progress	600	1200	1800
10012	2009-01-12	Completed	650	1300	1950
10013	2009-01-13	Open	700	1400	2100
10014	2009-01-14	In Progress	750	1500	2250
10015	2009-01-15	Completed	800	1600	2400
10016	2009-01-16	Open	850	1700	2550
10017	2009-01-17	In Progress	900	1800	2700
10018	2009-01-18	Completed	950	1900	2850
10019	2009-01-19	Open	1000	2000	3000
10020	2009-01-20	In Progress	1050	2100	3150

Fig 5

Figure (5) Knitting order

**Sewing Order**

Order ID	Date	Status	Value 1	Value 2	Value 3
20001	2009-01-01	Open	100	200	300
20002	2009-01-02	In Progress	150	300	450
20003	2009-01-03	Completed	200	400	600
20004	2009-01-04	Open	250	500	750
20005	2009-01-05	In Progress	300	600	900
20006	2009-01-06	Completed	350	700	1050
20007	2009-01-07	Open	400	800	1200
20008	2009-01-08	In Progress	450	900	1350
20009	2009-01-09	Completed	500	1000	1500
20010	2009-01-10	Open	550	1100	1650
20011	2009-01-11	In Progress	600	1200	1800
20012	2009-01-12	Completed	650	1300	1950
20013	2009-01-13	Open	700	1400	2100
20014	2009-01-14	In Progress	750	1500	2250
20015	2009-01-15	Completed	800	1600	2400
20016	2009-01-16	Open	850	1700	2550
20017	2009-01-17	In Progress	900	1800	2700
20018	2009-01-18	Completed	950	1900	2850
20019	2009-01-19	Open	1000	2000	3000
20020	2009-01-20	In Progress	1050	2100	3150

Fig 6

Figure (6) sewing order

**Order Summary**

Order ID:       Status:

Date:       Warehouse:

Quantity:       Unit:

Supplier:       Unit Price:

Order Date:       Order Type:

Order Status:       Order Type:

Order Date:       Order Type:

Order Status:       Order Type:

Fig 7

Figure (7) Order summary

**Order Discretion**

Order ID	Date	Status	Value 1	Value 2	Value 3
30001	2009-01-01	Open	100	200	300
30002	2009-01-02	In Progress	150	300	450
30003	2009-01-03	Completed	200	400	600
30004	2009-01-04	Open	250	500	750
30005	2009-01-05	In Progress	300	600	900
30006	2009-01-06	Completed	350	700	1050
30007	2009-01-07	Open	400	800	1200
30008	2009-01-08	In Progress	450	900	1350
30009	2009-01-09	Completed	500	1000	1500
30010	2009-01-10	Open	550	1100	1650
30011	2009-01-11	In Progress	600	1200	1800
30012	2009-01-12	Completed	650	1300	1950
30013	2009-01-13	Open	700	1400	2100
30014	2009-01-14	In Progress	750	1500	2250
30015	2009-01-15	Completed	800	1600	2400
30016	2009-01-16	Open	850	1700	2550
30017	2009-01-17	In Progress	900	1800	2700
30018	2009-01-18	Completed	950	1900	2850
30019	2009-01-19	Open	1000	2000	3000
30020	2009-01-20	In Progress	1050	2100	3150

Fig 8

Figure (8) Order discretion

## 6. Conclusion

Integrating all this forms, finally, the right production planning can be achieved given all connection in all manufacture department and the most important is the right delivery time, which a great problem in Egyptian garments causing the order to delivered by airplane to meet the customer delivery date, which increase the end product cost and minimize the profit margin of the mill. Therefore, the program has a lot of benefits, which can be summarized in the

following points:

- 1) High system connectivity.
- 2) On time order delivery time.
- 3) High accuracy.
- 4) No more work load.
- 5) Less effort spending in reporting.
- 6) High productivity.
- 7) Low unit overhead cost.
- 8) Stock items easily identified.
- 9) Accurate calculation of martial usage & purchase.
- 10) Higher visibility to company performance.

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