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Design Production lines Aiming to Increase the Rate Number of Clothing Pieces Produced by Ready Made Garment Factories for Knitted Fabrics

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Abstract:

The aim of this research is to develop the public sector factories existing in Egypt, in respect of the types of machines ,their numbers, and order lines, so that the raw materials can be handled in the shortest possible time, that can be reflected in the production increasing to reach ten thousand pieces in eight working hours , at ready -made garments factories for knitted fabrics, which contain six production lines, underwear women's top, underwear men's short, half-sleeve men's t-shirt, long sleeves men's t-shirts, men's polo -shirt, and women's trousers.

Keywords: *Knitted Fabrics , Operating Time , Order of production Stages.*

1-Research Introduction:

The industry is considered the fastest way to develop the economy of the country, and the truth is that the industrialization achieves for each country the independence and its self-sufficiency to a great extent, and guarantees at the same time its production balanced growth, as well as in general, leads to the spread of modern industry for exploitation of human energies and material resources , with the consequent in increasing the national income and strong push forward in the development wheal to achieve the society welfare (1).

2-Research Importance:

The technical study of any project is considered one of the most important subjects which recalls great attention from the state at the present time, and the investor is interested in such studies so that he can be assured to the results of his investment spending to achieve a suitable financial return. The Technical studies are submited to continuous reviews to identify the inputs required for every project from: raw materials , machines , labour required for production, as well as to estimate the expected production volume of each project through an integrated study on which basis the decision is taken to accept or reject any of the proposed projects (2).

3-Research Problems: Lack of production rate in the factories of the public business sector for ready-made garments of knitted fabrics in the Arab Republic of Egypt, resulting great financial losses.

4-Research Goals:

4.1- Developing public sector factories located in Egypt in respect of: types of machines,their numbers and arrangement, to allow the raw materials to be traded in the least time needed to increase the production.

4.2- Access to the production of about ten thousand pieces in eight working hours at ready-made garment factories for knitted fabrics, which contain six production lines: underwear women's top, underwear men's short, half-sleeve men's t-shirt, long sleeves men's t-shirts, men's polo -shirt, and women's trousers**.**

5-Research Hypothesis:

Arranging production stages to achieve the minimum time necessary for the movement and circulation of raw materials of knitted fabrics to increase the rate number of pieces produced per hour, so the daily required pieces for every line will be 1600 pieces. Rate of pieces per hour = 200 pieces

Daily required pieces for every line=

Rate of pieces per hour × actual number of working hours per day= 200 × 8 hours= 1600 pieces

6-Research Limits: The search area is limited to the following limits :

6.1- The construction of six production lines

* First and second lines: underwear (Typical clothes) .

6.1.1 - First Line: Women Top using 13 sewing machines put in straight production line

6.1.2 - Second line: men's short using 15 sewing machines put in straight production line .

* Third and fourth lines: men's T-shirt. (Typical clothes)

6.1.3-Third line: half-sleeve men's t-shirt using 20 sewing machines put in straight production line

6.1.4- Fourth line:long sleeves men's t-shirts using 21 sewing machines put in straight production line.

* Fifth and Six lines: outerwear. (Casual clothes)

6.1.5 - Fifth line : men's polo- shirt using 44 sewing machines put in U letter production line

6.1.6- Sixth line: women's trousers using 20 sewing machines put in straight production line.

6.2- Knitted fabrics such as: Single Jerrsy - Beka - Rib Lycra

6.3-High speed automatic recent machines such as: Lockstitch sewing machine - Overlock sewing machine (four threads) - Interlock sewing machine (tape binding - tape attaching) - Electric elastic attaching machine (3).

6.4- Working hours: 9 working hours. Actual working hours (the study subject) 8 working hours

6.5- The operating time was computed by actual practical experience, which is the time calculation of actual averages of amounts produced daily of different types in the production lines, through stop watch and comparing it with the existing global studies (4). With the repetition of these daily studies, the factory will have constant studies of typical and semi-fixed products of different models.

7-Research Methodology:

Analytical descriptive approach: which includes analysis interpretation of facts and informations relating to the production lines of knitted fabrics thus to reach designs for production lines aiming to reduce operating time .

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8-Research Tools:

Field visits to private sector clothes factories, the names of these factories are as follows:

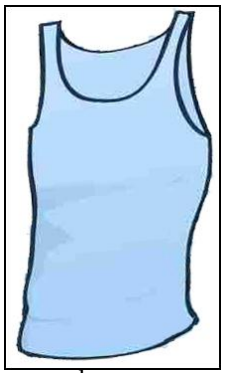
1-.Tiba Factory : Eng. Samir Riad, Shoubra El Kheima Area, Cairo

Underwear Women TOP

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour *	Types of Machines	Number of Machines**
1	Transfer Printing for the Size	18	200	Compressor	1
2	First Shoulder	18	200	Overlock Stitch	1
3	Neck Tape	18	200	Tape Binding	1
4	Second Shoulder	18	200	Overlock Stitch	1
5	Shoulder Fixation	18	200	Lockstitch	1
6	Armhole Tape	30	120	Tape Binding	2
7	Label Fixation	18	200	Lockstitch	1
8	Close both Sides	36	200	Overlock Stitch	2
9	Armhole Fixation	30	120	Lockstitch	2
10	Hem Flold	18	200	Interlock Stitch	1
		Total Time in Seconds 222	Rate Number of Pieces per hour 200		Total Number of Machines 13

2-Dice Factory: Eng. Nagy Touma, Gesr El Suez Area, Cairo

3- Christina factory : Eng. Mohamed Wahdan, 5 km area of Mahalla,Mahalla el-Kubra.



9-Results and Discussion

9.1 :Underwear Lines (typical clothes):

9.1.1 : Women Top:

Neck and armhole: tape binding

Hem: Interlock Sewing

*Number of pieces per hour for every stage= 60 ÷ Time of every stage in minutes

**Number of machines required for every stage= number of pieces per hour ÷ rate of pieces per hour

Daily required pieces for every line= Rate of pieces per hour × actual number of working hours per day

= 200 × 8 hours= 1600 pieces

Required pieces form every machine per day = required pieces per day ÷ total number of machines

= 1600 pieces ÷ 13 machines = 123 pieces

Underwear Men's Short

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour	Types of Machines	Number of Machines
1	Dart Closing	30	120	Overlock Stitch	2
2	Front Cut Sewing	36	100	Overlock Stitch	2
3	Overlock-Seam Covering the Front Cut	18	200	Interlock Stitch	1
4	Close the Inseam	24	150	Overlock Stitch	2
5	Overlock-Seam Covering the Inseam	18	200	Interlock Stitch	1
6	Hem Flold	36	100	Interlock Stitch	2
7	Preparation of Elastic Waist	18	200	Lockstitch	1
8	Fixing of Elastic Waist	36	100	Overlock Stitch	2
9	Sewing of Instructions Label	18	200	Lockstitch	1
10	Sewing of Elastic Waist	18	200	Interlock Stitch	1
		Total Time in Seconds 252	Rate Number of Pieces per hour 200		Total Number of Machines 15

Actual Time for every piece = total time in seconds ÷ 60 = 222 seconds ÷ 60 = 3.7 minutes

Practical Time for every piece = actual daily working hours in minutes ÷ Required pieces form every machine per day = 8 hours ×60 minutes(480 minutes)÷ 123 pieces = 3.9 minutes

9.1.2 :Men's Short:

(inner elastic without side sewing)

Waist: tape binding

Cut: Overlock-Seam Covering

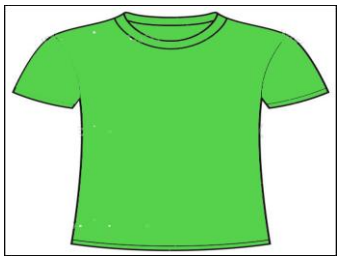
Hem: Interlock Sewing

Required pieces form every machine per day = required pieces per day ÷ total number of machines
= 1600 pieces ÷ 15 machines = 106 pieces

Actual Time for every piece = total time in seconds ÷ 60
= 252 seconds ÷ 60 = 4.2 minutes

Practical Time for every piece = actual daily working hours in minutes ÷ Required pieces form every machine per day = 8 hours ×60 minutes(480 minutes)÷ 106 pieces = 4.5 minutes

9.2 :Men's T-shirt (Typical Clothes):



9.2.1 : Half-Sleeve Men's T-Shirt:

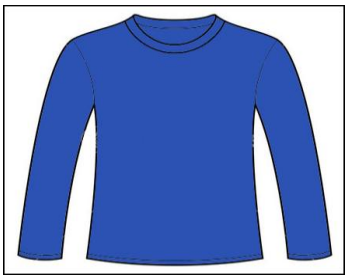
Half-Sleeve: Interlock Sewing **Hem:** Interlock Sewing

Neck : Cote Lycra **Neck Tape :** tape binding

Required pieces form every machine per day = required pieces per day ÷ total number of machines
= 1600 pieces ÷ 20 machines = 80 pieces

Actual Time for every piece = total time in seconds ÷ 60 = 330 seconds ÷ 60 = 5.5 minutes

Practical Time for every piece = actual daily working hours in minutes ÷ Required pieces form every machine per day = 8 hours ×60 minutes(480 minutes)÷ 80 pieces = 6 minutes



9.2.2 : Long- Sleeves Men's T-Shirt:

Long-Sleeves: Interlock Sewing

Hem: Interlock Sewing

Neck : Cote Lycra

Neck Tape : tape binding

Required pieces form every machine per day = required pieces per day ÷ total number of machines
= 1600 pieces ÷ 21 machines = 76 pieces

Actual Time for every piece = total time in seconds ÷ 60 = 344 seconds ÷ 60 = 5.7 minutes

Practical Time for every piece = actual daily working hours in minutes ÷ Required pieces form every machine per day = 8 hours ×60 minutes(480 minutes)÷ 76pieces = 6.3 minutes

Half-Sleeve Men's T-Shirt

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour	Types of Machines	Number of Machines
1	Transfer Printing for the Size	18	200	Compressor	1
2	Close the Shoulders	30	120	Overlock Stitch	2
3	Preparation of Rib Neck	18	200	Lockstitch	1
4	Neck Sewing	36	100	Overlock Stitch	2
5	Neck Tape	18	200	Tape Binding	1
6	Fixing both Ends of Neck Tape	30	120	Lockstitch	2
7	Neck Tape Sewing	18	200	Lockstitch	1
8	Sleeves Sewing	45	80	Overlock Stitch	3
9	Side Preparation of Label	15	240	Lockstitch	1
10	Side Label Sewing	18	200	Lockstitch	1
11	Close both Sides	36	100	Overlock Stitch	2
12	Sleeves Fold	30	120	Interlock Stitch	2
13	Hem Flold	18	200	Interlock Stitch	1
		Total Time in Seconds 330	Rate Number of Pieces per hour 200		Total Number of Machines 20

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Long-Sleeves Men's T-Shirt

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour	Types of Machines	Number of Machines
1	Transfer Printing for the Size	18	200	Compressor	1
2	Close the Shoulders	30	120	Overlock Stitch	2
3	Preparation of Rib Neck	18	200	Lockstitch	1
4	Neck Sewing	36	100	Overlock Stitch	2
5	Neck Tape	18	200	Tape Binding	1
6	Fixing both Ends of Neck Tape	30	120	Lockstitch	2
7	Neck Tape Sewing	18	200	Lockstitch	1
8	Sleeves Sewing	45	80	Overlock	3
9	Side Preparation of Label	15	240	Lockstitch	1
10	Side Label Sewing	18	200	Lockstitch	1
11	Close both Sides	50	100	Overlock Stitch	3
12	Sleeves Fold	30	120	Interlock Stitch	2
13	Hem Flold	18	200	Interlock Stitch	1
		Total Time in Seconds 344	Rate Number of Pieces per hour 200		Total Number of Machines 21

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9.3 :Outerwear (Casual Clothes): 9.3.1: Men's Polo-Shirt:

Collar and Cuff (Polo) : Ready-made

Hem: Interlock Sewing

Men's Polo-Shirt

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour	Types of Machines	Number of Machines
1	Spare Button Preparation	12	300	Button	1
2	Label Preparation	12	300	Lockstitch	1
3	Spare Button Fixation	18	200	Lockstitch	1
4	Cuff Cleaning	18	200	Overlock Stitch	1
5	Cuff Sewing	36	100	Overlock Stitch	2
6	Front Band Sewing	36	100	Lockstitch	2
7	Shoulders Closing	30	120	Overlock Stitch	2
8	Straddle Stitch on the Shoulders	24	150	Interlock Stitch	2
9	Collar Cleaning	18	200	Overlock Stitch	1
10	Fixation of Collar With Front Band	51	70	Lockstitch	3
11	Collar Sewing	36	100	Overlock Stitch	2
12	Neck Tape	36	100	Tape Binding	2
13	Badge Sewing	30	120	Lockstitch	2
14	Neck Tape Sewing	36	100	Lockstitch	2

Required pieces form every machine per day = required pieces per day ÷ total number of machines
= 1600 pieces ÷ 44 machines = 36 pieces

Actual Time for every piece = total time in seconds ÷ 60
= 715 seconds ÷ 60 = 11.9 minutes

Men's Polo-Shirt

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour	Types of Machines	Number of Machines
15	Right Front Band Sewing+ Left	36	100	Lockstitch	2
16	Straddle Stitch on the Edge of Band	36	100	Lockstitch	2
17	Sewing the Horizontal Egde of Front Band	20	120	Lockstitch	2
18	Straddle Stitch on the Horizontal Egde of Front Band in a Box shape	20	120	Lockstitch	2
19	Cleaning Horizontal Edge of Front Band	18	200	Overlock Stitch	1
20	Sleeves Sewing	36	100	Overlock Stitch	2
21	Close both Sides	36	100	Overlock Stitch	2
22	Sleeves Fixation	30	120	Lockstitch	2
23	Hem Flold	18	200	Interlock Stitch	1
24	Band Buttonholes	36	100	Buttonhole	2
25	Band Buttons	36	100	Button	2
		Total Time in Seconds 715	Rate Number of Pieces per hour 200		Total Number of Machines 44

Practical Time for every piece = actual daily working hours in minutes ÷ Required pieces form every machine per day = 8 hours ×60 minutes(480 minutes)÷ 36pieces = 13.3 minutes

6.3.2 : Women's Trousers:

Waist: External Waistband

Hem: Interlock Sewing

Required pieces form every machine per day = required pieces per day ÷ total number of machines
= 1600 pieces ÷ 20 machines = 80 pieces

Actual Time for every piece = total time in seconds ÷ 60
= 333 seconds ÷ 60 = 5.5 minutes

Practical Time for every piece = actual daily working hours in minutes ÷ Required pieces form every machine per day = 8 hours ×60 minutes(480 minutes)÷ 80pieces = 6 minutes

Women's Trousers

	Order of Production Stages	Time in Seconds For Each Stage	Number of Pieces per hour	Types of Machines	Number of Machines
1	Front and Back Rise Sewing	30	120	Overlock Stitch	2
2	Back Label Sewing	18	200	Lockstitch	1
3	Close Both Sides	51	70	Overlock Stitch	3
4	Close the Inseam	36	100	Overlock Stitch	2
5	Hem Flold	36	100	Interlock Stitch	2
6	Waistband Closing	18	200	Overlock Stitch	1
7	Elastic Waist Closing	18	200	Lockstitch	1
8	Fixing Waistband with Elastic Waist	36	100	Interlock Stitch	2
9	Waistband Determination	24	150	Tape Attaching	2
10	Waistband Sewing	36	100	Overlock Stitch	2
11	Label Sewing + Badge	30	120	Lockstitch	2
		Total Time in Seconds 333	Rate Number of Pieces per hour 200		Total Number of Machines 20

10-Conclusion: From the aforesaid six production lines, the researcher had selected these machines arrangement that allowing the best flew of raw materials in the production stages , as well as the number and types of machines, and required pieces per day from every machine in the least time necessary for movement and circulation of raw materials.

Daily Total Prodution in the Six Lines= Total Prodution in one Line × Six lines × Eight Hours =

6×8 ×200 = 9600 pieces daily (10000 approximately)

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