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Boosting Efficiency in Cosmetics Packaging Using Work Study Approach: A Case Study on Cycle Time Reduction at Naqaa Al-Enaya Factory

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Abstract

This study presents the application of Work Study techniques specifically Method Study and Time Study techniques to diagnose and improve operational inefficiencies in the filling and packaging line at Naqaa Al-Enaya Perfumes and Cosmetics Factory, a Saudi-based SFDA-licensed manufacturing facility. Preliminary investigation revealed an unexplained production slowdown in the manual filling operation, which handles small batches of fewer than 2,000 units. The Method Study procedure was systematically applied through four stages: selection, recording, critical examination and development of an improved method. The recording phase identified key inefficiencies, including a 2.7-meter transport distance per cycle, excessive static loading on the left hand (60% of cycle time in a holding state), workload imbalance among three operators, and non-value-added activities such as product refilling and wiping. The proposed method introduced a triangular bottle-holding base, a manual sticker-pressing tool, a repositioned weighing scale, a mobile trolley, heat-resistant gloves, and a reconfigured workstation layout. Work Measurement, conducted through a stopwatch time study across ten cycles with a 9% allowance factor, quantified the improvements. Results demonstrated a reduction in process steps from 11 to 9, a decrease in transport distance from 2.7 to 2.0 meters (26% improvement), and a reduction in standard cycle time from 130.04 to 97.58 seconds per bottle with 25% time saving. Total implementation cost remained minimal, requiring only low-cost ergonomic tools and workstation reorganization. The findings confirm that systematic application of Work Study techniques can yield substantial productivity gains in small-batch manual operations without significant capital investment, and the proposed method is recommended for formal adoption at the factory.

Keywords: Work Study; Method Study; Time Study; Flow Process Chart; Two-Handed Process Chart; Filling and Packaging; Cosmetics Manufacturing; Cycle Time Reduction

Introduction

Optimizing operational workflows requires a strategic focus on minimizing cycle times and maximizing system efficiency across any process. In this context, work study serves as a

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comprehensive framework encompassing methodology analysis and work measurement techniques designed to systematically evaluate human labor within any operational environment [1-5]. By examining the multi-faceted variables that govern task performance, this disciplined approach identifies inefficiencies and implements procedural enhancements. Consequently, work study functions as a primary driver of organizational productivity, enabling facilities to optimize output from existing resources with negligible capital expenditure [6,7].

Historically recognized as a foundational methodology for operational optimization, work study focuses on driving productivity through the comprehensive analysis of detailed process workflows. The discipline is fundamentally bifurcated into two core branches: method study and work measurement. While method study aims to systematically eliminate redundant operations and streamline tasks, work measurement focuses on identifying and mitigating operational delays and lost production time [8-11]. By eradicating resource waste, minimizing cycle times, and simplifying procedures, work study effectively maximizes system efficiency without requiring additional capital expenditure [12-15]. Consequently, contemporary research increasingly focuses on these straightforward yet impactful optimization techniques.

Recent literature highlights the adaptability of these tools across diverse operational environments. For instance, basic work study instruments, such as activity and process flow charts, have been successfully applied at motor vehicle inspection stations to isolate time-intensive bottleneck operations, leading to targeted structural improvements [17,18]. Similarly, the production capabilities of small-scale industries have been significantly enhanced through these frameworks; in one notable case involving the manufacturing of Francis turbine stay vanes, researchers utilized systematic observation, flow charting, and stopwatch time studies to uncover workflow anomalies, ultimately reducing both cycle times and the total number of sequential process steps [19]. Operational productivity can be enhanced through various strategic interventions, including the elimination of redundancies, the re-engineering of inefficient processes, method simplification, systemic optimization, variance reduction, and the minimization of setup times all while maximizing quality and responsiveness. Additionally, contemporary literature demonstrates that productivity yields can be realized by increasing the value-added content of products [7,8], minimizing unit production costs, reducing total work content, optimizing line balancing, or executing a strategic combination of these approaches [11,15]. Ultimately, productivity improvement operates as a continuous, iterative optimization process applicable to any organizational activity [2,3].

The primary objective of this study is to systematically apply Work Study techniques specifically Method Study and Work Measurement to analyze and improve the selected operation at Naqaa Al-Enaya Factory. The ultimate goal is to propose a practical, feasible, and cost-effective improved method that enhances productivity, reduces cycle time, minimizes worker fatigue, and supports the factory's vision of becoming the leading cosmetics manufacturer in Saudi Arabia

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Case Study

This study is carried out in Naqaa Al-Enaya Perfumes & Cosmetics Factory. Naqaa Al-Enaya Perfumes & Cosmetics Factory is a Saudi-based , SFDA-licensed manufacturing facility, founded by the pharmacist Dr. Manal Al-Ghamdi and specializing in perfumes, skincare, haircare, and natural soaps . The factory provides comprehensive Private Label manufacturing services, serving individuals and companies, the manufacturing process follows 6 stages: ideation, formulation, sampling, production, filling & packaging, delivery.

Despite the factory's commitment to high-quality standards, natural ingredients, and its vision to become the leading destination for cosmetics manufacturing in the Kingdom with global-comparable quality, certain operational inefficiencies have been observed specifically; preliminary investigation has revealed a significant unexplained slowdown in production output. These inefficiencies not only hinder the factory's ability to meet growing customer demand but also increase worker fatigue and operational costs, ultimately threatening the factory's competitive edge and its reputation for timely delivery.

Plant Layout

The current workplace arrangement of the filling and packaging station is illustrated in Figure 1. The process starts at the Personnel Entrance, where workers enter with the products that will be packed. They place the products at the Manual Work Table, then go to the Packing Storage area to collect the required boxes or packaging materials and return to the work area. The products then move through the packaging process using the Liquid Filling Machine, Flow Wrapping Machine, Laser Coding Machine, and Manual Shrink Wrapping Station.

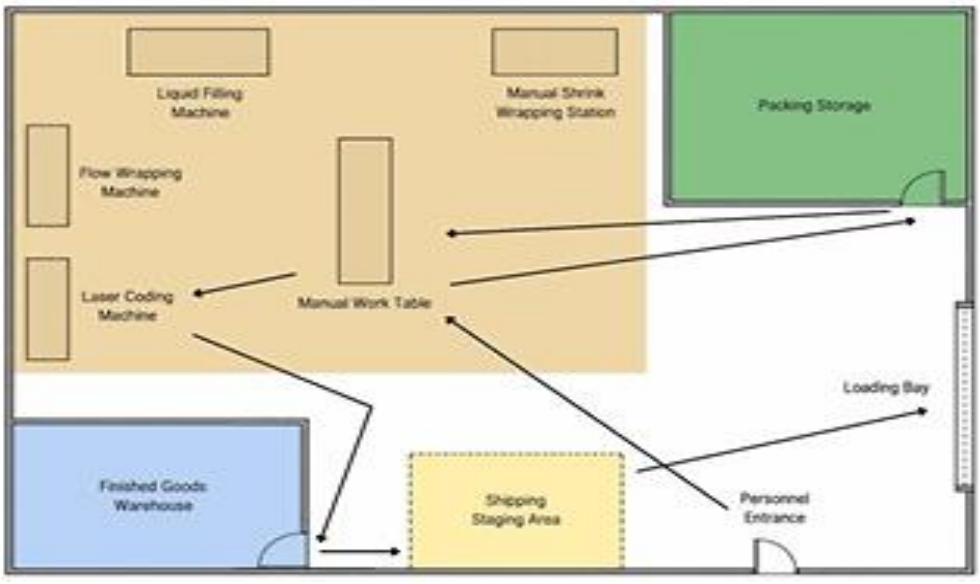


Figure 1. Workplace layout of the filling and packaging station at Nagaa Al-Enaya Factory.

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After packaging, the products are moved to the Finished Goods Warehouse, where they are stored until they move to the Shipping Staging Area for the next shipping stage. Finally, the products move to the Loading Bay for shipment. The beige area represents the main packaging area, the green area represents Packing Storage, the blue area represents the Finished Goods Warehouse, and the yellow area represents the Shipping Staging Area.

Methodology

Applying Work Study Procedure

This study presents the application of Work Study techniques specifically Method Study and Time Study techniques to diagnose and improve operational inefficiencies in the filling and packaging line at Naqaa Al-Enaya Perfumes and Cosmetics Factory, a Saudi-based SFDA-licensed manufacturing facility.

Method Study

The Method Study procedure was systematically applied through four stages as shown in Figure2: selection, recording, critical examination and development of an improved method.



Figure2 Stages of the Method Study procedure

1. Selection

Prior to any improvement, the operation requiring intervention must be identified, the systematic selection procedure of Method Study provides a structured framework for this purpose, To ensure objectivity and comprehensiveness; this selection will guid by three pillars : economic justification, human considerations, and technical practicality.

2. Recording

The recording stage is a critical phase in the method study, where the existing "Filling and Packaging" process is documented in detail to provide a factual basis for critical examination. To achieve a comprehensive analysis, two primary recording tools will be utilized: the Flow Process Chart (FPC) and the Two-Handed Process Chart.

3. Examination

The next step after recording was to critically examine all recorded data using the systematic questioning technique, this technique consists of two sets of questions. Primary questions to establish the necessity of each activity and Secondary questions to explore possible alternatives, each element of the operation was examined using the sequence: Purpose, Place, Sequence, Person, and Means.

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4. Develop

After implementing the recording techniques, the process issues that need modification became clear; consequently, we suggested targeted developments to improve it.

Work Measurement

The quantitative metrics and calculations derived from our time study report deliver critical insights and actionable data regarding the efficiency of the filling and packaging process. A key analysis of these findings indicates that the time demonstrated by the current operators closely matches the expected benchmark for a qualified worker executing the tasks. This correlation provides strategic advantages, allowing for enhanced workflow organization, precise labor distribution, and heightened operational output across the packaging station.

To collect this foundational data, we conducted a structured time study, closely monitoring each step of the filling line and registering our observations across multiple cycles. By pooling these specific measurements, we computed the average observed time required to complete one entire cycle. This average value formed the base for our core calculations. Multiplying this average observed time by the operator's performance rate allowed us to isolate the basic time needed for the tasks. For this study, the performance rate was set at a standard 100%, representing a normal, sustainable working pace. The primary mathematical relationship used is defined below:

Basic time=average observed time× performance rate

Following this, further necessary calculations were executed to complete our time study framework. The basic time was integrated with an allowance factor to account for inevitable human and operational variables. This percentage compensates for routine personal breaks, unavoidable fatigue, and localized environmental conditions. Authors assigned a cumulative allowance factor of 9%, specifically reflecting workplace factors such as ambient heat, humidity levels, and lighting intensity at the packaging station. The product of this calculation yields the definitive standard time, which establishes the formal time standard for a skilled worker to sustainably finish the job while accounting for baseline operational delays:

Standard time=basic time×(1+allowance factor)

By applying these calculated standards, management can execute precise, data-driven decisions concerning resource allocation and workstation balancing. It allows the team to pinpoint exact areas where layout distances can be compressed, eliminate non-value-added delays, and guarantee that the entire assembly line operates within a predictable, highly optimized timeframe.

Results and Discussion

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1. Selection

Economic Factors

The filling and packaging operation is a repetitive process performed daily across every production batch which makes it a potential high impact target for improvement, this operation involves two distinct production modes : automatic filling for batches of 2,000 units or more and manual filling for smaller batches below 2,000 units, the manual mode is particularly time consuming and labor intensive. Additionally; only one automatic machine is available alongside two manual filling units which could create bottlenecks when multiple small batches run simultaneously. Improving the manual filling and packaging process may yield significant cost savings by reducing labor time and increasing output per shift especially for the many small batch clients served by the factory.

Human Factors

Three workers are currently assigned to the filling and packaging section, all working in a seated position. These workers experience some fatigue due to repetitive motions of the hands. While the operators work at a fast and skilled pace, they do not use heat-resistant protective gloves while handling the heat-sealing packaging machine. From a safety perspective, introducing these gloves is important to prevent any future risk of burns and to secure the workspace. There is no resistance or fear of unemployment, as this study aims to improve safety and worker comfort, not to replace anyone. The workers are fully cooperative and welcome basic safety improvements and a more organized workplace layout.

Technical Factors

The machinery and equipment in this operation consist of one automatic filling machine, two manual filling units and one heat sealing packaging machine, all of which are standard and would not require complex modifications for improvement. The heat sealing machine presents a technical constraint as its high temperature operation demands caution, however; the absence of protective gloves is a procedural issue that could be resolved immediately. All technical details regarding bottle sizes, filling volumes, cap types and packaging materials are well documented and accessible. Potential improvements would focus on rearranging workplace layout, reducing reach distances, optimizing motion sequences, and providing basic safety equipment such as heat resistant gloves. None of these changes would exceed the capacity of existing machinery and any suggested modifications would be practical, low cost and immediately implementable without requiring costly new equipment or extensive technical overhauls. Based on these economic, human technical factors, the filling and packaging operation emerges as a strong candidate for method study.

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2. Recording

A. Flow Process Chart (FPC) – Material/Worker Type

The primary objective of using the Flow Process Chart is to provide a "Macro-view" of the entire operation. It is used to: Track the Sequence: Record all activities including operations, transportations, inspections, delays, and storage involved in the filling and packaging cycle. Identify Waste: Highlight non-value-added activities, such as the unnecessary transport distances between the filling area and the heat-sealing machine. Quantify the Process: Measure total distances traveled and time spent, which helps in identifying the "unexplained slowdown" mentioned in the preliminary investigation.

Process Inefficiency: The necessity of a "Refilling" step (Step 5) confirms that the current manual filling method is highly inaccurate and lacks volume control, which causes an unnecessary increase in the total cycle time. Material and Resource Waste: Step 6 ("Wiping excess product") is a Non-Value-Added activity. It documents a continuous waste of cosmetic material due to over spilling, and adds extra costs for consumable cleaning tools (tissues). Workstation Bottleneck: Performing weighing (Step 4), manual capping (Step 7), and safety sticker application (Step 8) sequentially at the same manual workstation creates a major bottleneck, slowing down the entire production line. Excessive Human Handling: The current layout requires a total of 2.7 meters of movement per cycle, which is done entirely via manual transport and handling by the operators, leading to physical strain and lower productivity.

B. Two-Handed Process Chart

While the FPC looks at the overall flow, the Two-Handed Process Chart provides a "Micro-view" of the worker’s motions at the workstation. Its purpose is to: Analyze Manual Efficiency: Study the detailed movements of the left and right hands of the three seated workers during the manual filling and capping stages. Balance Workload: Identify periods of "Idle time" for either hand, ensuring that the manual work is distributed effectively to reduce fatigue. Apply Motion

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Flow Process Chart (FPC):

Flow Process Chart									Worker/Material/Equipment Type	
Chart No. Sheet No.										
Subject charted: Filling and Packaging Proces	Activity			Present					Proposed	Saving
	Operation	O		5						
Activity: Cosmetic Bottle (Product)	Transportation	⇨		2						
Method: Present/Proposed	Delay	D		0						
Location: Filling and Packaging Station	Inspection	□		2						
Operative(s): Clock No. See *Remarks column*	Storage	▽		2						
	Distance (m)			2.7m						
Charted by: Date:	Time (work-h)			3 Seated Workers						
Approved by: Date:	Cost Labor Material									
	Total									

Description	Qty. 1 Case	Dist-ance (m)	Time (min)	Symbol O	⇨	D	□	▽	Remarks
1. Empty bottles stored in work area								●	Initial raw material storage
2. Transport empty bottle to filling unit		1.5m			●				Manual movement
3. First Filling attempt (Manual)				●					Inaccurate manual filling
4. Place bottle on scale to check weight		0.2m					●		Quality control check
5. Refilling the bottle to adjust level				●					Repeated step / Time waste
6. Wiping excess product with tissue				●					Material waste / non-value added
7. Placing caps on bottles manually				●					Manual assembly
8. Applying safety sticker on the package				●					Final product protection
9. Final inspection of seal & cleanliness							●		Appearance and cleanliness check
10. Move finished product to packaging box		1.0m			●				Final transport to box
11. Finished product placed in storage								●	Ready for delivery and final storage
Total		2.7m		5	2	0	2	2	

Economy: Evaluate the current reach distances for bottles and caps, which were observed to be outside the normal working area, to optimize the workplace layout.

Severe Static Loading on Left Hand: The analysis highlights that the Left Hand is heavily utilized for static "Hold" (H) operations, acting as a manual fixing fixture for approximately 60% of the cycle timeThis prolonged static muscle tension is a primary contributor to worker physical

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fatigue. Extreme Workload Imbalance: There is a critical lack of motion synchronization between both hands. The Right Hand is highly dynamic, executing almost all value-added tasks (Filling, Refilling, Wiping, Capping, and Sticker Application), while the Left Hand remains restricted to a passive, holding state. Repetitive Delays (Idleness): The Right Hand experiences frequent Delay (D) steps, particularly during initial bottle retrieval and weighing movements. This indicates poorly balanced tasks within the workstation layout, resulting in lost capacity. Poor Motion Economy: The current manual method directly violates the principles of motion economy. The hands do not start or stop their motions simultaneously, and their movements are neither symmetrical nor non-consecutive, which ultimately increases the overall manual cycle time.

Two-Handed Process Chart

Left Hand Description	H	D	□	⇨	O	O	⇨	□	D	H	Right Hand Description
Reach for empty bottle (long distance)					●				●		Wait (idle)
Grasp bottle and bring it to filling unit					●	●					Reach for filling nozzle/lever
Hold bottle under nozzle	●					●					Pull lever/start filling
Move bottle to the scale				●					●		Wait (idle)
Hold bottle on scale	●					●					Refilling / Adjusting level
Hold bottle firmly	●					●					Grab tissue and wipe excess product
Hold bottle	●					●					Reach, grasp and screw cap on bottle
Hold bottle	●					●					Apply safety sticker on the package
Assist in final inspection / Hold bottle		●				●					Final inspection of seal & cleanliness
Move finished product to packaging box				●			●				Release bottle

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	Summary	L.H	R.H
O	operation	2	7
⇨	Transport	2	1
D	Delay	1	2
H	hold	5	0
□	inspection	0	0

3. Examination

As shown in Table (1), the answers of the primary question confirmed that the filling and packaging operation is necessary, as no product can be delivered to clients without it.The systematic questioning technique revealed several issues contributing to the unexplained production slowdown,

First: unnecessary motions were observed, as workers repeatedly reach for bottles, caps, and packaging materials that are placed outside their normal working area.

Second: the current layout is inefficient with the heat-sealing machine positioned too far from the filling area, requiring unnecessary transport between stations.

Third: Not using heat-resistant gloves is a safety risk. Even though the workers are currently fast because of their experience, providing gloves is necessary to protect them from burns and to keep the workplace safe and reliable over the long term.

Fourth: the workload is inequitably distributed among the three workers, leading to idle time for some while others remain overloaded with tasks.

Fifth: a manual mode bottleneck occurs for batches under 2000 units, where manual filling using only two manual units creates a significant slowdown when multiple small batches are processed simultaneously.

These findings collectively point to substantial opportunities for improvement through layout reorganization, motion reduction, safety equipment provision, and workload balancing.

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Table (1) Recorded data using the systematic questioning technique

	Primary Questions	**Answer**	**Secondary Questions**	**Answer**
Purpose	What is done ?	Filling product into bottles, applying caps, heat-sealing packaging, placing into boxes	What else might be done ? Could some activities be combined or eliminated ?	Some activities could be combined. For example, capping and heat-sealing could be performed in a continuous sequence without putting the bottle down between operations .
	Why is it done ?	To prepare finished products for delivery to clients		
Place :	Where is it done ?	At the filling and packaging workstation	Where else might it be done ? Could the layout be rearranged to reduce reach distances ?	The layout could be rearranged. Moving the heat-sealing machine closer to the filling area would reduce transport distance and time .
Sequence :	When is it done ?	After formulation and production stages, before delivery .	When else might it be done ? Could certain activities be performed simultaneously rather than sequentially ?	Certain activities could be performed simultaneously , while one worker operates the filling machine, another could prepare packaging materials instead of waiting
Person :	Who does it ?	Three seated workers operating manual and automatic filling units .	Who else might do it ? Could tasks be redistributed among the three workers more evenly ?	Tasks could be redistributed more evenly among the three workers . Currently, one worker handles both filling and sealing while others have idle time .
Means :	How is it done ?	Manually (for batches <2000 units)	How else might it be done ? Could	Providing heat-resistant gloves ensures that the

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		or automatically (for batches ≥2000 units) , followed by heat-sealing .	heat-resistant gloves improve safety and support the current operation pace?	high production rhythm is maintained safely, allowing operators to handle the high-temperature sealing machine with full protection and compliance with workplace safety standards.

4. Develop

Inside the workstation:

1. Introducing a triangular plastic base designed to hold the small cream bottles securely to prevent any accidental spillage of the product during operations.
2. Utilizing a manual pressing tool to efficiently apply and fix the protective safety sticker onto the bottle opening.
3. Placing a weight scale directly under the manual filling machine to verify the exact product weight in real-tie as the lever is pressed to dispense the cream.

Outside the workstation:

1. Providing a simple mobile trolley next to the workstation to facilitate and speed up the transport of finished bottles between different machines.
2. Placing the waste bin directly beside the workstation to eliminate unnecessary movement
3. Providing heat-resistant protective gloves to ensure operator safety.

Comparison (Present vs. Proposed)

Table (2) summarizes the expected savings in time and effort after implementing the proposed improvements. As shown in Table (2) **Motion Waste Reduction**: Lowering transport distance by 26% minimizes physical material handling and accelerates overall workflow.

Enhanced Worker Ergonomics: Reducing static loading on the left hand significantly decreases muscle fatigue and strain .

Seamless Flow: Synchronizing tasks onto a unified line layout ensures continuous bottle movement, prevents product accumulation, and yields a 20% total cycle time saving

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Table (2) the expected savings in time and effort after implementing the proposed improvements

Activity	Present	Proposed	Saving
Operations (O)	5	4	1
Transportation (⇒)	2	3	-1
Delay (D)	0	0	0
Inspection (□)	2	0	2
Storage (▽)	2	2	0
Total Distance (m)	**2.7m**	**2.0m**	**0.7m (26% Improvement)**
Total Cycle Time (Est.)	**100%**	**80%**	**20% Time Saving**

The proposed chart shows a clearer and more organized workflow for the process. By combining the weighing step directly with filling and adding the manual pressing tool, we completely removed the extra operational steps. Also, rearranging the layout and using the trolley reduced the total walking distance to 2.0 meters. Overall, these changes simplified the operation into 9 smooth steps, which reduces worker effort and improves production speed.

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Flow Process Chart (FPC)(Proposed):

Flow Process Chart				**Worker/Material/Equipment Type**					
Chart No. Sheet No.									
Subject charted: Filling and Packaging Proces	Activity			Present		Proposed		Saving	
	Operation	O		5		4		1	
				2		3		-1	
Activity: Cosmetic Bottle (Product)	Transportation	⇨		0		0		0	
Method: Present/Proposed	Delay	D		2		0		2	
Location: Filling and Packaging Station	Inspection	□		2		2		0	
Operative(s): Clock No. See *Remarks column*	Storage	▽							
	Distance (m)			2.7m		2.0m		0.7m	
	Time (work-h)			3 Seated Workers		3 Seated Workers			
Charted by: Date:	Cost								
Approved by: Date:	Labor								
	Material								
	Total								

Description	Q	Dist-ance (m)	Time (min)	Symbol O	⇨	D	□	▽	Remarks
1. Pouring the mixture into the filling machine								●	
2. Bringing the required bottles to the workstation		1.0m			●				
3. Filling product into bottles with real-time weighing				●					
4. Using a manual pressing tool to fix the safety sticker				●					
5. Placing caps on bottles				●					
6. Applying product labels onto the bottles				●					
7. Transporting bottles to the laser coding machine for date printing		0.5m			●				
8. Move finished product to packaging box		0.5m			●				
9. Final product placed in storage								●	
Total		2.0m		4	3	0	0	2	

Work Measurement Calculations before improvements

Work Measurement is an industrial engineering technique used to determine the exact time a qualified worker needs to complete a specific task at a normal pace. By using tools like stopwatches and adding standard allowance factors for fatigue or breaks, this technique helps management set accurate time standards, balance the workload among workers, and improve scheduling efficiency. The initial time study shows that the current workflow has several inefficiencies. Based on the 10 recorded cycles as shown in Table (3) , the total average observed time for the 11 operational elements is 120.22 seconds. After adding the 9% standard allowance factor for human fatigue and environmental conditions, the final standard time required to complete one cosmetic bottle under the old layout is 130.04 seconds.

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Work Measurement Calculation after improvement

The time study for the proposed method shows a clear reduction in time. By combining steps and improving the workstation layout, the process was simplified into 9 elements. As shown in Table (4) the total average observed time dropped to 90.32 seconds. After incorporating the same 9% allowance factor, the final standard time was reduced to 97.58 seconds. This modification successfully saves 32.46 seconds per bottle, proving that the new method is faster and requires less worker effort.

Table (3) Work Measurement Calculation before improvement

Department : Production Department section: Filling and Packaging Line	Study No :
Operation : present layout MS No :	Sheet No : 1 of 2
Part/Machine No :	Time of : Time on : Elapsed Time :
Tools and gauges : Manual Filling machine, Manual capping, and Separate Heat-sealing machine	
Product / Part : Cosmetic Bottle No :	Operative : Clock No :
DWG No : Material : Liquid/Cream and Plastic Bottles	Studied by : Date :
Quality : Working	Checked :

EL No	Element (description)	Observed Time (OT): 1	2	3	4	5	6	7	8	9	10	Total OT	average OT	PR	BT	% Allw	Standard time
1	Empty bottles stored in work area	5.4	3.6	4.3	4.2	5.7	5.5	6.2	3.8	4.8	3.6	47.1	4.7	100%	4.7	9%	5.12
2	Transport empty bottle to filling unit	7.2	8.0	6.6	7.1	8.4	8.1	7.2	8.3	8.9	6.5	76.3	7.6	100%	7.6	9%	8.28
3	First Filling attempt (Manual)	25.9	25.6	24.5	24.0	26.4	24.5	23.8	23.8	26.0	25.3	249.8	25.0	100%	25.0	9%	27.25
4	Place bottle on scale to check weight	10.9	10.7	10.1	11.4	9.6	10.2	11.0	10.4	11.1	10.2	105.6	10.6	100%	10.6	9%	11.55
5	Refilling the bottle to adjust level	15.6	13.6	14.2	14.4	13.7	14.2	13.8	14.3	15.4	14.6	143.8	14.4	100%	14.4	9%	15.7
6	Wiping excess product with tissue	7.6	7.1	7.3	9.3	8.4	8.3	7.0	8.7	7.0	7.6	78.3	7.8	100%	7.8	9%	8.5
7	Placing caps on bottles manually	11.5	10.4	10.2	10.6	11.0	10.8	9.2	8.6	9.4	9.3	101.0	10.1	100%	10.1	9%	11.01
8	Applying safety sticker on the package	11.1	13.3	13.1	11.4	12.5	11.7	13.2	11.9	11.3	11.2	120.7	12.1	100%	12.1	9%	13.19
9	Final inspection of seal & cleanliness	15.2	14.3	15.3	16.2	14.7	14.2	16.5	15.0	13.8	13.6	148.8	14.9	100%	14.9	9%	16.24
10	Move finished product to packaging box	5.8	7.4	7.9	6.8	5.7	6.6	8.5	7.1	8.4	8.1	72.3	7.2	100%	7.2	9%	7.85
11	Finished product placed in storage	3.5	5.7	5.5	5.1	4.3	5.4	3.8	4.8	4.9	6.4	49.4	4.9	100%	4.9	9%	5.34
	TOTAL																130.04s

Table (4) Work Measurement Calculation after improvement

Department : Production Department					section: Filling and Packaging Line								Study No :				
Operation : proposed layout					MS No :								Sheet No : 2 of 2				
Part/Machine					No :								Time of :				
Tools and gauges : Manual Filling machine, Manual capping, and Separate Heat-sealing machine													Time on :				
Product / Part : Cosmetic Bottle					No :								Elapsed Time :				
DWG No :					Material : Liquid/Cream and Plastic Bottles								Operative :				
Quality :					Working								Clock No :				
													Studied by :				
													Date :				
													Checked :				
EL No	Element (description)	Observed Time (OT):										Total OT	average OT	PR	BT	% Allw	Standard time
		1	2	3	4	5	6	7	8	9	10						
1	Pouring mixture into filling machine	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	Bringing bottles to workstation	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	79.6s	7.96s	100 %	7.96s	9%	8.68s
3	Filling bottles + realtime weighing	45.74	45.74	45.74	45.74	45.74	45.74	45.74	45.74	45.74	45.74	457.4s	45.74s	100 %	45.74 s	9%	49.86s
4	Manual pressing tool (Safety sticker)	11.93	11.93	11.93	11.93	11.93	11.93	11.93	11.93	11.93	11.93	119.3s	11.93s	100 %	11.93 s	9%	13.0s
5	Placing caps on bottles	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	79.6s	7.96s	100 %	7.96s	9%	8.68s
6	Applying product labels onto bottles	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	7.96	79.6s	7.96s	100 %	7.96s	9%	8.68s
7	Transporting to laser coding machine	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	39.8s	3.98s	100 %	3.98s	9%	4.34s
8	Move finished product to box	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	3.98	39.8s	3.98s	100 %	3.98s	9%	4.34s
9	Final product placed in storage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	TOTAL																97.58s
OT : Observed Time , PR: Performance Rating , BT , Basic (normal) Time , % Allw: Percent Allowances																	

Final Results & Recommendations:

The study analyzed the filling and packaging line to improve operational efficiency. Under the old method, the process suffered from severe imbalances, unnecessary manual handling, and time waste because operations like weighing, capping, and sticker application were done sequentially at an inefficient layout. The reasons for this change were to eliminate critical bottlenecks, reduce material waste from over spilling, and lower the physical strain on operators caused by extreme static loading on the left hand. As shown in Figure 3 the new method successfully simplified the workflow into 9 organized steps by integrating the weighing process directly into the filling stage and introducing targeted ergonomic tools. The primary advantages of the new method include a streamlined, continuous line layout that dropped the total transport distance from 2.7m to 2.0m and successfully cut the total standard cycle time from 130.04 to

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97.58 seconds per bottle. However, a minor limitation is that it requires initial worker adaptation to the modified workstation routine. In terms of expected savings, the new layout yields notable reductions in material waste through controlled dispensing, cuts labor time requirements by approximately 20%, and lowers operational overheads by maximizing hourly station throughput. The tools and equipment required to implement this improved setup consist of a steady triangular plastic base to prevent spills, a manual pressing tool for safety stickers, a compact digital weight scale, a mobile tool trolley, and heat-resistant protective gloves. Finally, the total cost of installing the new method remains minimal and highly practical. It only covers the low-cost purchase of these basic new tools, immediate workstation re-layout, a brief period for training the three operators on the synchronized movements, and the budget for improving overall working conditions and safety at the packaging station.

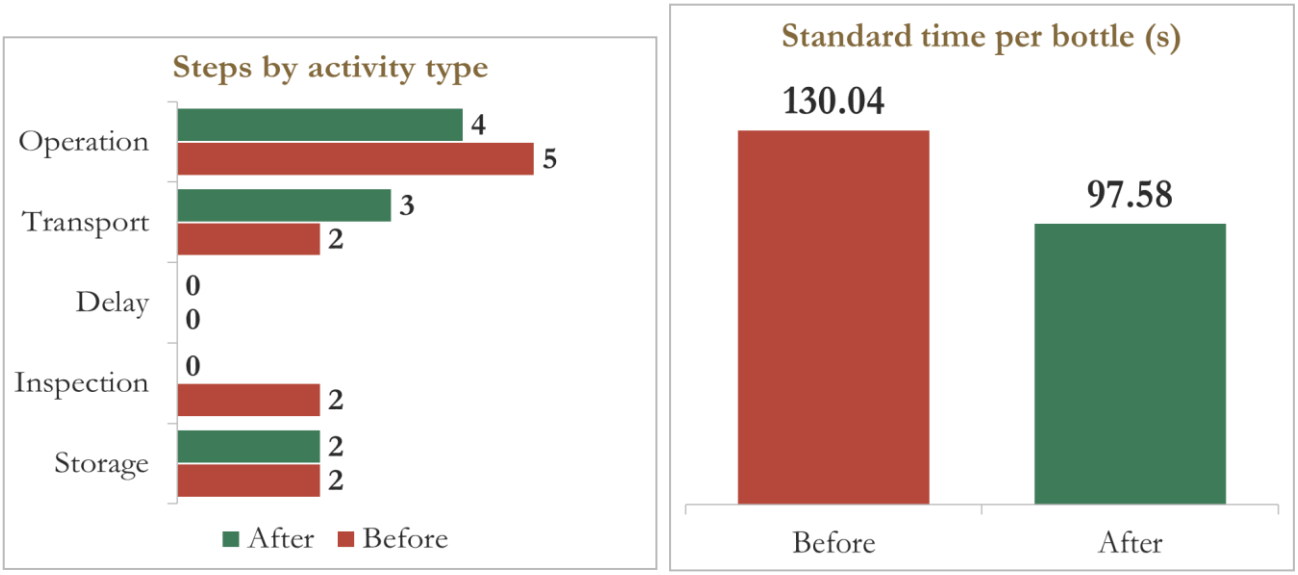


Figure 3 Comparison (Present method vs. Proposed method)

The proposed changes need only a small budget. The holding base, sticker-pressing tool, repositioned scale, and heat-resistant gloves are estimated to cost about 110 to 470 SAR (roughly $29 to $125) in total, or around 250 SAR (about $67) in a typical case, because the waste bin already exists and the workstation re-layout costs only labor time. A mobile trolley is optional: if the factory reuses an existing one it adds nothing, but buying a new one would add about 150 to 500 SAR ($40 to $133), which brings the total to roughly 260 to 970 SAR ($69 to $259).

Conclusion

This study successfully demonstrated the effectiveness of applying Work Study techniques, including Method Study and Work Measurement, to analyze and improve the filling and packaging process at Naqaa Al-Enaya Factory. Through systematic observation, recording, and

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critical examination, the key factors contributing to operational inefficiencies were identified, including unnecessary movements, poor workstation layout, unbalanced workload distribution, and non-value-added activities. The proposed improvements which focused on layout redesign, motion optimization, and the introduction of simple supporting tools such as a triangular plastic base fixture, a manual pressing tool, and heat-resistant gloves resulted in significant enhancements in overall process performance. The reduction in process steps from 11 to 9, the decrease in transportation distance from 2.7 to 2.0 meters, and the 20% reduction in total cycle time clearly reflect the success of the implemented changes. Additionally, these interventions contributed to better workplace ergonomics, minimized static loading, reduced worker fatigue, and ensured a more efficient utilization of human resources. The findings of this study highlight that even low-cost and practical modifications can lead to substantial gains in productivity and operational efficiency without requiring major capital investments. Therefore, it is strongly recommended that the proposed method be formally adopted and continuously monitored to ensure sustained performance improvement. In conclusion, this project confirms that Work Study remains a powerful, data-driven approach for identifying hidden inefficiencies, optimizing manual assembly sequences, and supporting the continuous improvement goals of modern industrial systems.

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