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In a Jordanian industrial factory, inventory procedures were enhanced: a case of study

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ABSTRACT

Business expansion is rapid today and has a significant economic impact. Inventory administration is attributed to these companies appropriately and competently often. This project was conducted in the Jordan substance production unit, which has incomplete issues as frequently as possible as filled and overstock. The manufacturer aims to improve depot efficiency by considering a stock management modification. The objective of this test is to check the causes for wastage administration in meat industries and then follow the recommendations given. The entire cost decrease was significantly reduced following implementing the principles, methods, and techniques of inventory management and control systems like continuous and periodic control systems; consequently, the profit margin was considerably reduced without any price change to the product. In addition, the degree of client service was raised.

KEYWORDS

Inventory, management, stock, inventory control, customer, continuous review, periodic review, Jordan.

INTRODUCTION

Inventories are an essential part of any supply chain and logistics system; they must therefore be managed, planned, and regulated to meet the aims of reducing costs to an adequate level of investment and achieving the appropriate levels of customer pleasure. Inventory managing must be acknowledged. However, without addressing the logistics system, it cannot operate in isolation. Inventory management has an important impact on many of the interlinked operations, such as warehousing design and administration, distribution, and transportation networks through inventory methods.

INVENTORY MANAGEMENT

Efficient administration of inventories is a key to the progress of any operation or business [1-3]. To prevent unsafe inventory purchase, allow large bulk buying, minimize waiting time and increase transport efficiency and buffer against seasonal fluctuations, the discussion about inventories should depend on the understanding of the term of the inventory as the total stock kept at all wine storage points. In accordance with the production process, the inventory cycle may be categorized into three categories: raw materials, processes, and completed products [4,5].Thus, inventory management is the planning and inventory control procedures [6]. Inventory is a part of the major resources of the enterprises, and many firms thus concentrate on ways to maximize their investments in this asset [7]. The income on assets will considerably increase by minimizing stock, but the stock must not be lowered to the stockout level. To Reduce inventory assets without being out of stock, the inventory must thus discover a compromise [7].

However, managing stocks is not usually a simple mission as it appears at first sight, with many difficulties. For wholesalers and resellers who are in continuous touch with customers, the difficulty of forecasting and expectations of the customers' demand for the following period are the main challenge. In terms of color, design, packaging type, size, etcetera, the variety of items in the downstream distribution channel could make demand prediction incorrect. There really are two problems of overstocking and inventory stocks due to the difficulty in predicting requirements. The management aims to avoid losing sales from inventory; the tendency to overstock the inventory on the other side

is expensive to maintain, which definitely reduces the profit margin. However, the whole demand for the requested items must be predicted more closely to meet consumers' various needs, while combining the requirement greatly reduces the difficulty, complexity, and time consumption.

Problem Statement

The efficient management of inventory is the backbone of every company's success, irrespective of size. Inventory management matches inventory supply with customers demand in simple terms [8]. A manufacturer should have sufficient inventory to fulfill the needs of its consumers and thus not inventory shortage [9]. On the contrary, the corporation must not have too many items in its stores due to the high inventory costs of keeping and the opportunity. The main aim of inventory administration is to compromise afterward between maintaining enough inventory to meet demand and reducing inventory costs for holding and opportunity [7]. Stock control improves company effectiveness regardless of size and aims [10]. A Factory in Jordan has grown substantially over the previous several years and became one of Jordan's largest competing meat products production plants. This plant has a considerable size storage facility that is important, but in this warehouse, there is some difficulty; therefore, management and employees are trying to identify these challenges so that they may address them and become great competitors. The managers and the employees of the plant mentioned above face the following issues.

If they reduce the inventory level for components they have, to lower the holding expense, then the cost of purchases, namely the expenditures of ordering, will increase by raising the rate of sales; also, the decrease in inventory levels will increase the chance of being outsourced and therefore the person responsible would be responsible for such a shortage of items, The delay in responding to a specific order, which might have a considerable negative impression on the factory by losing the customer who will purchase the competitor product, is some of the issues reported during the first inventory visit. This reduced the share market in the factory, and the unspecified ordering time and re-order level made a conflict between the management staff and the company. This study will determine the optimum ordering amount, point of reordering, and the needed stock level of the items in the store in the facility. In this research, a compromise will thus be achieved between the expenses of holdings and requesting to achieve the optimum order level, order quantities, and the desired inventory baseline of every item in the warehouse. For these study purposes, the primary aim is to see how inventory organization may improve the entire process of the plant by offering its clients the most satisfactory service.

Research Objectives

The study aims to identify and analyze the factory storage difficulties and identify the causes of the factory's poor stock control. This investigation so focuses on showing how inventory management may increase the factory's effectiveness. Where the main secondary goals are the following:

- How stock administration strategies may be executed and changed to enhance inventory systems in the factory.
- Identifying the reordering time and level that may enhance the warehouse's operational effectiveness in the facility.
- Reduction of overall inventory costs by enhancing logistics operational performance.

METHODOLOGY

This study will utilize the ideas and approaches of stock management in warehouses, which have specific issues in solving them so that performance may be increased and customer satisfaction is maximized at all times. In contrast, customer requirements are satisfied without being running out of inventory. Figure 1 outlines the methodology and the procedures employed in our study. Where the following steps are taken in this study:

- Recognizing the difficulties facing storage management which could be summed up as not available (stock out) and occasionally overstock of certain products in which both are costly.

- The components for this quantity were checked inside the storage unit.
- To analyze the items using the ABC analysis, since objects up to expectations have a considerable influence on average inventory cost, the various classes of the stock
- gadgets are thus provided with the results that need distinct management and rule systems.
- Evaluate the improvement of the storage performance by going to compare the total expenses before and after the application of the relevant inventory strategy.
- Inventory assessment by two concepts; continuous evaluation and periodic reviews to select the final system volume and the expected rearrangement factor, make the normal price feasible as little, namely, utilizing the model with the lowest global charge.

The Required Tools

The analysis is simple to understand and less complicated in this study. In simple terms, the application and adaption in the warehouse, management of inventory, and improvement of the idea and approaches that were learned in the sector of industrial engineering would significantly enhance the inventory performance in that plant. Microsoft Excel is the software used for analyzing the data in this investigation. But various platforms are employed in this study; Microsoft Excel is a readily available program and may therefore be implemented by any warehouse without additional charge or conflict or error, which may be regarded as a good part of such research; the software is available simply.

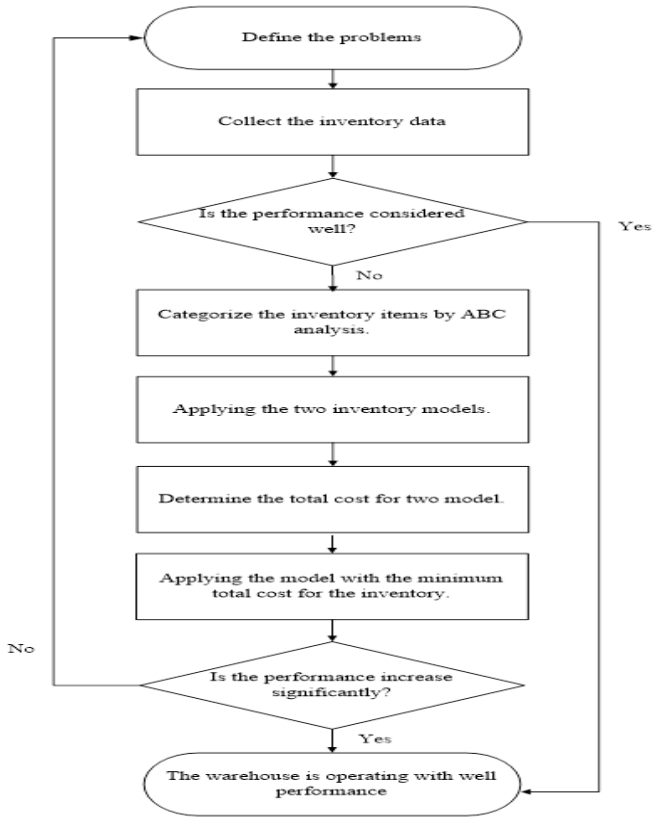

Figure 1. The proposed methodology for improving the performance in the Jordanian industry.

Administration of inventory Theory and Literature

The inventory administration for managers of all sorts of companies, regardless of their size, is a vital factor when inventory management directly affects the profit margin and the non-profit organization, such as hospitals, the control

of inventory has a substantial effect on customer service and satisfaction. The administration of inventories is a science that targets determining the form of stocks and their proportion. The material must be produced regularly and in the planned form at any plant section or supply chain. The stock administration concerns various inventory elements, namely: lead time of refilling, expenses of moving stock, keeping inventory cost, management of assets, inventory prediction inventory, physical inventory, available physical space, quality and quantity control. The discovery of a compromise between these opposing objectives leads to an ideal inventory at the least total inventory cost.

INVENTORY

The stock is indicated by items, components, and completed loading so that the gadgets they received or purchased out of withdrawal assemble between stores. The tension caused by high but paltry inventories will be described in the next paragraph. There are several primary reasons for maintaining a low inventory level; a list of these reasons is provided below:

(a) pastime, then there is the expense of opportunity,
(b) Costs of storage and assumption,
(c) (c) insurance, taxes, then shrinkage.

Shrinkage could be classified into three types:

1) Customers or employees pilferage and stock loss,
2) Obsolescence is seen as a massive rate of half items specifically in cloths, and
3) Deterioration by physical spoiling, then damage between Wronged value.

On the opposite side, despite the costs, Many challenges exist in extensive inventories. These challenges include customer service, purchase costs, shipping costs, labor costs, installation costs, and a quantity discount.

Inventory products categorization by ABC system.

In the classification items of three classes, the Analysis ABC is a stock categorization process, namely A, B, nevertheless, C, in keeping with their effect on the stock value.

Figure 2 shows the dividing line for the three groups.

In the ABC method, a manufacturer should rank stock goods between A and C according to the next guidelines [11]:

A) Category goods are the most crucial accessories with their annual ruin value, which is 50% of annual consumption charge of the company, because of just approximately 10% of stock items.
B) Class items are gadgets with modest annual ruin, as 40% of the annual destruction virtues generally account for 40% of volume inventories.
C) Class gadgets are outfitted with a negligible anniversary blasting cost, which is less than 10% of the yearly consumption cost usually owed for 50% of quantity stock goods.

where the yearly consumption is taken into account using the consonant equation:

$$\text{Annual consumption} = \text{Annual demand} \times \text{Item cost per unit} \quad (1)$$

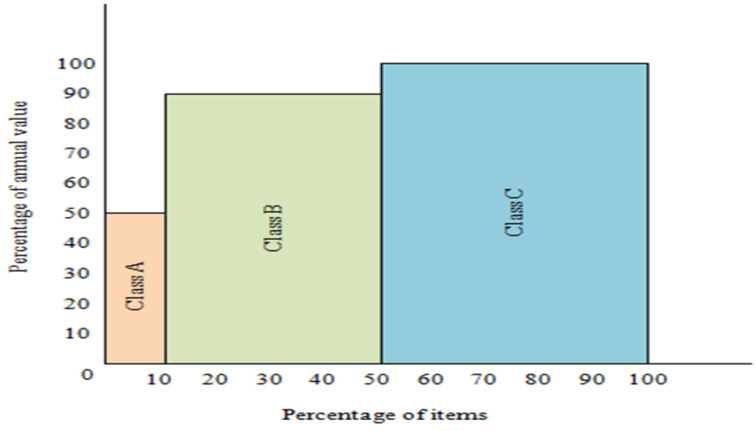

Figure 2. Typical chart for ABC analysis

Inventory Expenses

Storage costs are the expenses incurred in keeping and maintaining inventory during a specific time period. Inventory expenses are often discussed yearly [10]. The balance in keeping, purchasing, and shortfall costs should be achieved as the principal objective of stock management [5,10].

Figure 3 shows three major kinds of inventory costs.

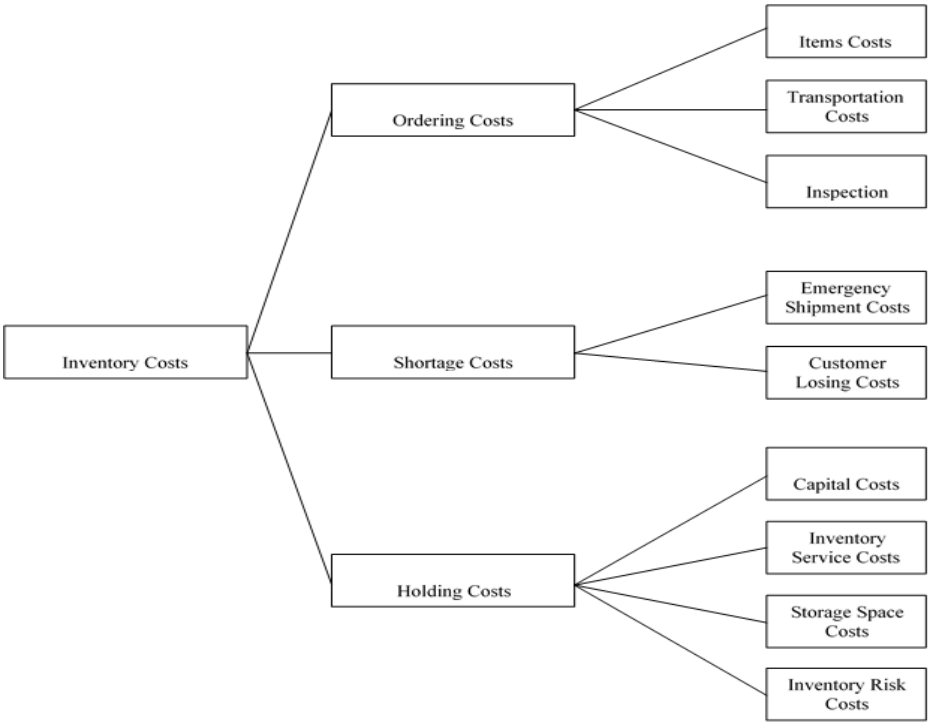

Figure 3. Outlines for the inventory costs

Inventory Control Methods

Inventory administration systems regulate the inventory level by identifying the replenishment grade and when to order. Periodic (fixed time) and continuous (fixed order quantities) systems may be distributed into the inventory

systems [12-14]. in periodic systems, the method is put because the volume of a changing bunch is changed at a single normal interval, since the system is placed directly in a continuous system with the same constant amount at any time, in relation to mitt decreases according to a definite stage named reorder factor.

Continuous Inventory (Q) System

As shown in Figure 4, where the lead time and are demand rate constant, a continuous inventory system, also known as a stabilized order quantity system or reorder, reports the leftover inventory of an element every time a withdrawal is completed to know whether the inventory has reached a specified limit called the reorder level to release order or not. The constant evaluation has grown easier because of computerized system availability and electronic registers linked to inventories [2, 13]. When the inventory is examined, a decision on the stock grade for the checked item should be made, and if the system is low, a new command should be sent. The inventory position (IP) evaluates the item capability to meet future interest, including booked receipts (SR) that are a definite request, and not only closing down stock (OH) fewer time purchases (BO); accordingly, the following condition addresses the stock function:

IP=OH+SR-BO (2)

In case the stock level approaches or falls below the baseline is called a reorder point; demand should be made constantly (Q). This mean that the requested quantity is constant in the persistent survey model since the duration for requests varies. To choose whether a recent method is launched or not, the stock function and the reorder level should be compared, and the reorder should be kept resolved before the rearrangement stage. In the reorganization stage, somebody is making a bid at some point in a substantial period. However, as represented in Figure 5, when demand and lead time are not consistent, the need is not compatible, is not, in fact, definite. Therefore, the safe stock must be taken into consideration for variable demand and lead time.

Thus, The reorder factor can be calculated as below:

Reorder point= Average interest during lead time + Safety stock (3)

For the safety stock, the interest in the lead times is generally thought to be spread as Figure 6 shows; the common interest in lead durations is in the central section of the diagram, half of the region bending on the one side and a similar level on the second, concerning the simple words, the reordering point is the amount of the centerline. Therefore, to provide an assistance level that is more significant than half, the reorder must be higher than usual throughout a lead duration.

Therefore, by using a working degree (z) introduced in the accompanying condition, the safety inventory is calculated by replicating the standard separation from the vile (σL) variety:

Wellbeing stock=z σL (4)

The greater the expenditures of z, the higher should be the safe stock and the cycle management level. If there is no wellbeing stock below (z=0), however, stocks overseas might occur during half the kilter cycle. Therefore, it is essential to evaluate the exchange of interests to track the appropriate level of reordering and safe stock. This evaluation most frequently depends on the director's expertise and decision.

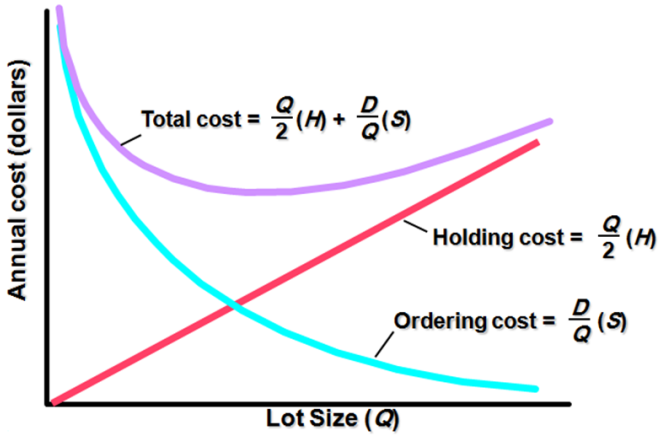

Figure 4. Inventory costs; Yearly holding cost, Yearly ordering cost, and Total Yearly cost.

Periodic Inventory Method

The provisional animadversion framework (P) or, from time to time, the so-called fixed-span reorganization or intermittent reorder system, which assesses the inventory situation on a sporadic basis rather than as an alternative always same way as in the strategy of continuous revision [9,15]. Thus, the newest request is continually located to complete each survey, and the period between orders(TBOs) is constant (P). The cluster volume (Q) can also change with durability in the fugitive system next to specific kilter, although the age between kilter is fixed. But it is needful to identify the key characteristics inside the fugitive system; the time for assessment or the target stock level, as seen in Figure 7. Stability In criticisms, the day is determined by a trade-off over the EOQ; thus, P and TBO are equal. As the claim is changeable, half the lot size is larger than the EOQ, then smaller. In compliance with the consonant equation, P is therefore computed. The kilter level should remain substantially sufficient according to needed inventory level (T) after the stock position has remained over the subsequent limit, namely P. Therefore, after checking the inventory quantity and according to determine the framework content, the inventory consequence must pause P periods so long that the level must be refilled yet it must answer to imitate the aim.

$$P = TBO = \frac{EOQ}{D} \tag{5}$$

T=d (P+L)+ safe stock for the insurance stretch (6)

safe stock=z σp+L (7)

$$\sigma_{p+L} = \sigma\sqrt{P+L} \tag{8}$$

As the regulation aims to issue not sooner than the lead time, a substantial extent must remain below the target level in conformity with the protection periods (P+L). Since the interest and lead times are unclear in the Q approach, the safe stock should be regarded as described in the next condition:

The wellbeing stocks should be calculated in a frequent survey strategy to cover the coverage (P+L) instead of L in the Q method. The safe stock level in the following condition is therefore introduced: The estimate of the standard deviation over periods (P+L) corresponds to the standard deviation of interest circulating, which is doubled by the guarantee duration, as it shows in the following condition: As in the periodic inventory method, the protection time is greater than the one in the continuous inventory method the safe stock is more extensive for the occasional system than for the continuous one.

Continuous and periodic inventory Methods comparative advantages

In this part, three advantages of Q and three benefits of the P system are presented. Each inventory system has its own advantages. The main advantages of the periodic review procedure are that the regulatory procedure has been helpful since recharges were executed in a set period. Product Request Items from the same source might be combined in a single purchase demand, thereby reducing request and delivery expenditures. The inventory situation should only be recognized when a review is carried out, which is more beneficial to an organization with no electronic distribution center system.

The major advantages for the Q System are again:

The continuous survey of everything might be individualized.
Limited component sizes could lead to quantitative limitations; some of load limit constraints, strategies-related materials, and others could also demand a Limited package.

INVENTORY ANALYSIS OF A JORDANIAN PLANT.

After some discussions with the director and the employees in the factory, the supervisor did not make new requests from his opinion and expertise, or when stocks were not found to be numerous, or as a function of visual inspection by employees working in the department of distribution. As a result, this action produces two inverse results:

1) The stock-out so the customers should sit patient, in the absence of a risk of canceling the request.
2) Overstock when the stock is still accumulating, which will be expensive and eventually unused. A codified or established stock-government regulation should thus be seen in imitation of resolution and should then avoid such problems as these.

ABC System.

The arrangement of the stock in classes A, B, and C, as described by Onwubolu [3] , should be as follow:

1) The yearly consumption quantity and cost for each piece must be determined.
2) Duplicating the annual amount usage of whole items by the expense of the object to calculate the entire yearly value usage of everything.
3) Add the total usage of value to estimate the full annual use of the dollar inventory.
4) Dividing up the overall annual use of all-out by the complete annual inventory such that the full use of all things is achieved.
5) Set the objects together accordingly to the total utilization level.
6) Categorizing inventory items for classifications A, B, or C where items with an annual dollar consumption of 50 %, which is approximately 10% of items, are listed as class A, items that have a yearly dollar use of 40%, which is approximately 40% of items, are listed as class B, and items that have an annual dollar use of about 10%, which is approximately 50% of items, are listed as class C.

Table 1 lists everything's annual usage and yearly use dollar following ABC investigation techniques.

The first seven elements (BB-500G, BB-1Kg, CE-7Ps, MAN-2.5Kg, CB500G, CB-1Kg, and LAN-200G) are categorized as "A" in Table 2, which has a priority and should thus be kept under observation more thoroughly in stock documents and more studies in the areas of quantification, requesting and requesting the guarantee of volumes need to be implemented. The next eighteen items (MAN-1Kg, BL-850G, MST-2.5, LAN-850G, MK-500G, RC-300, RF-300, MST1Kg, CE-24Ps, BC-400G, BF-400G, GF-400G, GC-400G, FB-500G, CL-850G, BL-200G, MAN500G, and MR-500G) correspond to the class B items and should be checked less frequently since they are medium in importance compared to A class. The final 19 pieces, the rest, have the least priority and are classed as C items, so they should have the least control and should be audited over a long time, and C items can be ordered within the same duration in enormous numbers, with more good stocks.

Table 1. The items in Almarai inventory and the sum value for each item.

Item	Item Code	Number sold	Unit Cost (JD)	Total Value
1	MP-500G	1500	21.00	31500
2	MP-250G	1800	20.00	36000
3	MR-500G	3000	19.20	57600
4	MC-2.5Kg	240	60.00	14400
5	MST-2.5Kg	8000	20.25	162000
6	MST-1Kg	8000	16.20	129600
7	CB-500G	10000	31.20	312000
8	CB-1Kg	10000	30.00	300000
9	CE-24Ps	4800	27.00	129600
10	CN-1Kg	480	42.50	20400
11	BB-20Ps	1800	20.00	36000
12	CC-300G	1500	20.40	30600
13	MAN-2.5Kg	12000	27.75	333000
14	MAN-1Kg	8000	23.40	187200
15	MAN-500G	3000	23.40	70200
16	BL-850G	8000	20.40	163200
17	BL-340G	2000	19.20	38400
18	BL-200G	5000	14.40	72000
19	CL-850G	4000	19.20	76800
20	CL-340G	500	18.00	9000
21	CL-200G	2500	14.40	36000
22	LAN-850G	8000	19.20	153600
23	LAN-340G	2000	19.20	38400
24	LAN-200G	16500	14.40	237600
25	BHD	3000	18.00	54000
26	CHD	3000	18.00	54000
27	CE-7Ps	12000	40.80	489600
28	FB-500G	2500	33.60	84000
29	FC-500G	600	38.40	23040
30	MK-500G	6000	25.00	150000
31	BC-400G	7000	18.00	126000
32	BF-400G	7000	18.00	126000
33	GF-400G	6000	21.00	126000
34	GC-400G	6000	21.00	126000
35	BB-500G	20000	28.80	576000
36	BB-1Kg	20000	27.00	540000
37	GS-400G	90	70.50	6345
38	MB-400G	750	47.00	35250
39	BN	160	62.40	9984
40	RC-300	3000	46.00	138000
41	RF-300	3000	46.00	138000
42	BK-1Kg	1200	20.00	24000
43	ZH-400G	1335	40.50	54068
44	ZH-1Kg	1200	40.00	48000
Total		226455		5603387

Table 2. Items classification according to ABC analysis

Item	Item Code	Number sold	Unit Cost (JD)	Total Value	Percent of Value (%)	Cumulative Value	Classification Category
35	BB-500G	20000	28.80	576000	10.28	10.28	A
36	BB-1Kg	20000	27.00	540000	9.64	19.92	A
27	CE-7Ps	12000	40.80	489600	8.74	28.65	A
13	MAN-2.5Kg	12000	27.75	333000	5.94	34.60	A
7	CB-500G	10000	31.20	312000	5.57	40.16	A
8	CB-1Kg	10000	30.00	300000	5.35	45.52	A
24	LAN-200G	16500	14.40	237600	4.24	49.76	A
14	MAN-1Kg	8000	23.40	187200	3.34	53.10	B
16	BL-850G	8000	20.40	163200	2.91	56.01	B
5	MST-2.5Kg	8000	20.25	162000	2.89	58.90	B
22	LAN-850G	8000	19.20	153600	2.74	61.64	B
30	MK-500G	6000	25.00	150000	2.68	64.32	B
40	RC-300	3000	46.00	138000	2.46	66.78	B
41	RF-300	3000	46.00	138000	2.46	69.25	B
6	MST-1Kg	8000	16.20	129600	2.31	71.56	B
9	CE-24Ps	4800	27.00	129600	2.31	73.87	B
31	BC-400G	7000	18.00	126000	2.25	76.12	B
32	BF-400G	7000	18.00	126000	2.25	78.37	B
33	GF-400G	6000	21.00	126000	2.25	80.62	B
34	GC-400G	6000	21.00	126000	2.25	82.87	B
28	FB-500G	2500	33.60	84000	1.50	84.37	B
19	CL-850G	4000	19.20	76800	1.37	85.74	B
18	BL-200G	5000	14.40	72000	1.28	87.02	B
15	MAN-500G	3000	23.40	70200	1.25	88.28	B
3	MR-500G	3000	19.20	57600	1.03	89.30	B
43	ZH-400G	1335	40.50	54068	0.96	90.27	C
25	BHD	3000	18.00	54000	0.96	91.23	C
26	CHD	3000	18.00	54000	0.96	92.20	C
44	ZH-1Kg	1200	40.00	48000	0.86	93.05	C
17	BL-340G	2000	19.20	38400	0.69	93.74	C
23	LAN-340G	2000	19.20	38400	0.69	94.42	C
2	MP-250G	1800	20.00	36000	0.64	95.07	C
11	BB-20Ps	1800	20.00	36000	0.64	95.71	C
21	CL-200G	2500	14.40	36000	0.64	96.35	C
38	MB-400G	750	47.00	35250	0.63	96.98	C
1	MP-500G	1500	21.00	31500	0.56	97.54	C
12	CC-300G	1500	20.40	30600	0.55	98.09	C
42	BK-1Kg	1200	20.00	24000	0.43	98.52	C
29	FC-500G	600	38.40	23040	0.41	98.93	C
10	CN-1Kg	480	42.50	20400	0.36	99.29	C
4	MC-2.5Kg	240	60.00	14400	0.26	99.55	C
39	BN	160	62.40	9984	0.18	99.73	C
20	CL-340G	500	18.00	9000	0.16	99.89	C
37	GS-400G	90	70.50	6345	0.11	100.00	C
Total		226455		5603387			

Order Quantity

To detect and choose the optimum amount to request, the data should be analyzed to identify the most appropriate order quantity to replace the inventory for every item. Economic Order Quantity (EOQ): the calculation of the optimum order quantity following EOQ referring to this equation: where: d represents the yearly need in units per year; S: represents the ordering expenses for each order published; H represents a one holding unit expenditures in the inventory.

$$EOQ = \sqrt{\frac{2\,D\,S}{H}} \tag{9}$$

Order Quantity

To detect and choose the optimum amount to order, the data should be analyzed to identify the most appropriate order quantity to replace the inventory for every item. Economic Order Quantity (EOQ): the calculation of the optimum order quantity following EOQ referring to this equation: where: d is the yearly need in units per year; S: the ordering expenses for each order published; H a one holding unit expenditures in the inventory.

The costs of transporting or keeping stocks are the lot of the expenses as follow:

1) Money invested in stock, for example, the expenditure of capital or the risk expense of cash.
2) Actual location includes rental, taxes, operating expenses, costs of utility services insurance, etc.
3) Handling items costs.
4) The stock degeneration and outdated items costs.

The Jordanian factory owns and manages the warehouse a long time ago, while the other estimates of costs for every product take account of the averages and the degeneration of the number and the cartons volume in the warehouse. As the employees and the management at the plant approximated, and as outlined in Table 3, the total holding costs for every item are computed based on their percentage. On the opposite side, the expenditures of ordering include a set order release cost like the application costs and delivery expenses, and the releasing quantities costs directly based on the requested amount.

$$\mathrm{EOQ}_{\text{for item 35 in slack period}} = \sqrt{\frac{2 \times 1117 \times 13.37}{0.08}} = 602 \text{ units}$$

$$\mathrm{EOQ}_{\text{for item 35 in peak period}} = \sqrt{\frac{2 \times 2436 \times 13.37}{0.08}} = 889 \text{ units}$$

The fixed price is zero at this Jordanian plant, independent of the amount freed up; therefore, the expenditures of the products purchased must be taken into consideration, and so the expense of the order is shown in Table 3. Thus, the ordering, holding, and demand expenses were applied as set out in Table 3. Due to the susceptibility to the diverse levels of client assistance required and the incorrect figure, the secure stock should be established by experienced persons practicing, investigating, and investigating the change of interest, such as top supervisor in the plant. Furthermore, suppose the stock-out of specific items is essential to customers. In that case, the wellbeing stocks level must be higher if any significant impact on whole stock management and may thus be ignored. In our case of the Jordanian factory, the sum of orders may often be lower or higher than the quantity for every item referred to in Table 3 that the producer or manufacturer may offer in line with a discount or bid.

Table 3. The Ordering and Holding expenses and the EOQ for each item.

Item No.	Item Code	Ordering Cost	Holding Cost/Month	EOQ	
				Slack Period	Peak Period
35	BB-500G	13.37	0.08	602	889
36	BB-1Kg	16.63	0.01	1608	2345
27	CE-7Ps	8.51	0.11	324	478
13	MAN-2.5Kg	15.78	0.34	242	375
7	CB-500G	11.74	0.39	183	271
8	CB-1Kg	13.11	0.04	588	877
24	LAN-200G	15.96	0.01	2032	2970
14	MAN-1Kg	10.03	0.09	316	467
16	BL-850G	17.71	0.30	229	342
5	MST-2.5Kg	16.99	0.09	403	593
22	LAN-850G	13.82	0.23	232	343
30	MK-500G	17.36	0.47	158	234
40	RC-300	19.22	1.04	77	118
41	RF-300	13.38	1.06	55	105
6	MST-1Kg	17.31	0.47	183	268
9	CE-24Ps	19.27	0.36	160	261
31	BC-400G	3.28	0.62	63	96
32	BF-400G	4.15	0.62	69	109
33	GF-400G	15.20	0.39	157	241
34	GC-400G	8.73	0.46	108	170
28	FB-500G	4.78	0.58	48	71
19	CL-850G	3.23	0.13	104	161
18	BL-200G	11.93	0.54	108	167
15	MAN-500G	5.03	0.87	44	65
3	MR-500G	5.77	0.77	49	75
43	ZH-400G	4.51	2.70	15	24
25	BHD	29.30	1.44	78	126
26	CHD	23.67	0.80	96	151
44	ZH-1Kg	9.65	0.11	105	160
17	BL-340G	7.24	2.25	27	39
23	LAN-340G	9.68	2.14	31	48
2	MP-250G	15.52	1.79	40	63
11	BB-20Ps	17.80	1.54	46	73
21	CL-200G	12.82	0.12	167	268
38	MB-400G	6.32	3.29	12	20
1	MP-500G	8.69	1.02	36	57
12	CC-300G	26.35	0.20	134	232
42	BK-1Kg	15.01	2.28	29	44
29	FC-500G	24.11	1.46	30	52
10	CN-1Kg	7.58	1.15	18	28
4	MC-2.5Kg	25.23	7.05	10	14
39	BN	8.77	22.39	2	4
20	CL-340G	16.04	1.50	23	37
37	GS-400G	16.93	23.93	2	4

Ordering Time

After an interview with employees and managers of the Jordanian factory, it was found that the demand for the 44 items is not stable during the year, while the demand is rising significantly during the months of the summer season, from May to September and, as in the remaining months, appears to be constant with steadily fluctuating. Then, the review of the situation of the 44 items in monthly demand is shown in Table 4, where it is obvious that the interest in many items is varying per season. Undoubtedly, the leeway season is also added to the unbalanced interest plan; for example, 35 items (BB-500G) have a demand during the duration from May to September, which is more than twice as demand throughout the remainder of the month. For another class of items, the same phenomenon happens not only in class A items, for example, 14 items (MAN-1Kg) in class B and 43 items (ZH-400G) in class C items. There really are two systems, a continuous check, and periodic check, for deciding when to do a new order to make replenishment of the inventory. The two methods handle the problem "when to order," but two different results will be shown. And in this Jordanian manufacturing instance, the two outputs were compared to the best model.

Continuous Review method

Based on equation (3), The point of reordering is the usual interest when considering a restricted amount of secure stock during the leading period. Consequently, the common interest and safe stock level should be rectified first. Then, The point of reordering is decided simply when the interest is low and the lead time of the provider is reliable. But the situation is completely different in this Jordanian factory. The company now recognizes that inventory management difficulties are developing as the number of products in the warehouse increases. So, two reordering points should be determined for the 44 items because of the distinct seasonality in substantial quantity; The first is for the recession season, while the other is for the summer peak season (From May to September).

The ordering points of the 35 items are computed by considering the mean and standard deviation in Table 5 as follows:

$$\text{Reorder Point}_{\text{Slack}} = 1117 \times 0.067 + 1.645 \times 284 \times \sqrt{0.067} = 195;$$

$$\text{Reorder Point}_{\text{Peak}} = 2436 \times 0.067 + 1.645 \times 105 \times \sqrt{0.067} = 207;$$

The time limit is two days (0.0667 month), and the possibility not to be running out of stock is thus 95 %, the z-value is (1.645) where the mean and standard difference is shown in Tables 5 for each item. It was clearly visible that, as the standard deviation is more than twice the maximum time in idle seasons, no significant difference has found between slack and peak period reorder points but, if the reorder point is computed without taking the two durations, The point of reordering is equal to (414) that doubles the entire cost [16-18]. Table 5 provides the computation of the two reorder points for the rest items. If the level of stock becomes less or at that point, the inventory must be replenished by new orders. Thus, a continuous examination method is implemented to answer "when to order."

Table 4. Monthly demand for items.

Item No.	**Item Code**	**Monthly Demand**	**Number Sold**	**Classification Category**											
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
35	BB-500G	1000	800	1200	1020	2580	2300	2440	2480	2380	1700	1100	1000	20000	A
36	BB-1Kg	900	850	1150	1120	2500	2250	2440	2570	2300	1650	1190	1080	20000	A
27	CE-7Ps	600	480	720	612	1548	1380	1464	1488	1428	1020	660	600	12000	A
13	MAN-2.5Kg	720	480	610	600	1490	1300	1500	1600	1700	700	500	800	12000	A
7	CB-500G	500	400	600	510	1290	1150	1220	1240	1190	850	550	500	10000	A
8	CB-1Kg	510	500	550	450	1300	1120	1290	1290	1140	600	500	750	10000	A
24	LAN-200G	825	660	990	840	2130	1900	2010	2000	1925	1400	1000	820	16500	A
14	MAN-1Kg	400	320	480	408	1032	920	976	992	952	680	440	400	8000	B
16	BL-850G	440	280	390	440	1070	920	980	970	970	600	510	430	8000	B
5	MST-2.5Kg	680	440	400	420	1020	900	1000	940	1000	400	320	480	8000	B
22	LAN-850G	300	420	500	380	1010	1000	950	980	940	730	410	380	8000	B
30	MK-500G	300	240	360	300	775	700	730	745	710	510	330	300	6000	B
40	RC-300	150	120	180	150	380	345	365	370	425	200	165	150	3000	B
41	RF-300	100	130	110	120	460	490	420	430	360	130	120	130	3000	B
6	MST-1Kg	440	410	440	420	1030	920	980	970	940	500	480	470	8000	B
9	CE-24Ps	240	190	290	240	620	630	590	640	670	200	250	240	4800	B
31	BC-400G	350	280	420	350	900	830	840	880	900	500	400	350	7000	B
32	BF-400G	370	350	350	340	950	900	940	860	840	400	380	320	7000	B
33	GF-400G	300	240	360	300	780	690	730	750	810	410	330	300	6000	B
34	GC-400G	300	310	330	300	800	750	740	750	790	300	330	300	6000	B

28	FB-500G	135	100	150	130	330	290	300	310	300	140	160	155	2500	B
19	CL-850G	200	160	240	210	530	490	500	520	490	240	220	200	4000	B
18	BL-200G	250	200	300	220	650	630	610	620	640	340	290	250	5000	B
15	MAN-500G	150	120	180	150	390	350	360	370	380	240	160	150	3000	B
3	MR-500G	200	130	140	140	400	380	350	370	390	200	150	150	3000	B
43	ZH-400G	65	55	80	60	180	160	160	170	180	90	70	65	1335	C
25	BHD	150	120	180	150	410	390	370	380	400	160	150	140	3000	C
26	CHD	190	140	150	160	390	390	370	350	420	140	150	150	3000	C
44	ZH-1Kg	60	50	70	60	170	140	150	150	140	80	60	70	1200	C
17	BL-340G	100	80	120	100	260	230	240	250	230	170	120	100	2000	C
23	LAN-340G	160	130	100	100	270	250	230	270	230	70	90	100	2000	C
2	MP-250G	90	70	100	90	230	210	220	230	250	120	100	90	1800	C
11	BB-20Ps	130	80	90	70	250	200	210	260	240	100	90	80	1800	C
21	CL-200G	130	100	150	120	320	350	300	310	340	140	130	110	2500	C
38	MB-400G	30	30	40	30	100	90	120	90	100	50	40	30	750	C
1	MP-500G	70	60	90	60	200	180	190	180	210	110	80	70	1500	C
12	CC-300G	80	50	70	60	190	200	180	200	250	90	60	70	1500	C
42	BK-1Kg	60	50	70	60	150	140	160	150	150	80	60	70	1200	C
29	FC-500G	30	20	20	30	80	90	80	70	90	40	20	30	600	C
10	CN-1Kg	30	20	30	20	50	60	50	70	70	40	20	20	480	C
4	MC-2.5Kg	20	10	15	10	20	30	30	35	30	15	15	10	240	C
39	BN	10	5	10	10	20	25	20	20	20	5	10	5	160	C
20	CL-340G	30	20	40	20	80	50	70	60	60	30	20	20	500	C
37	GS-400G	5	3	4	5	12	15	10	13	10	5	4	4	90	C

Periodic Review Method

On certain occasions, the stock should be reviewed in a standard determined period, and a further request should be constantly placed at the finish of each survey. Also, the time between orders (TBO) should be fixed and is similar to the audit time (P).

(P) is self-asserted in that plant, and that handles most situations. It's customary to set (p) monthly for A items, one-off each quarter for B items, and one-off each year for C items per month without delay, but if this is implemented to our production line instance, it will be running out of stock more often.

In the periodic review system, the review period (P) and the goal inventory level are the essential factors to take into consideration, while any replenishment should increase the stock to that needed level. However, it is crucial to note that the amount of the order is not constant.

The time between orders (P) is obtained using equations 6 and 8 for the forty-four items; however, it must be noted that there is an obvious with substantial seasonality. Two (Ps) must be calculated: the first one is in the period of slack, and the second during the summer peak periods (From May to September). For instance, by evaluating the EOQ stated in Table 3 as follows, the review times of the 35 item are calculated: In Table 6, which provides the review durations for the other items.

$$P_{\text{Slack Period}} = \frac{EOQ_{\text{Slack Period}}}{D} \times \left(30 \ \frac{\text{days}}{\text{month}}\right) = \frac{602}{1117} \times 30 = 16 \text{ days}$$

$$P_{\text{Peak Period}} = \frac{EOQ_{\text{Peak Period}}}{D} \times \left(30 \ \frac{\text{days}}{\text{month}}\right) = \frac{889}{2436} \times 30 = 11 \text{ days}$$

The second essential factor is the targeted inventory level (T), in which a protection interval equivalent to the total lead time and period of review (L+P) should be established for the needed inventory level.

Consequently, based on equation (6), the calculating (Ts) of the thirty-five item is the following:

$$T_{\text{Slack Period}} = 1117 \times \left(\frac{16+2}{30}\right) + 1.645 \times 284 \times \sqrt{\frac{16+2}{30}} = 1040$$

$$T_{\text{Peak Period}} = 2436 \times \left(\frac{11+2}{30}\right) + 1.645 \times 105 \times \sqrt{\frac{11+2}{30}} = 1165$$

The targeted inventory level is greater by (12%) in the peak time than in the idle duration and guarantees that the inventory will not stock out during the peak duration.

The question now is which one of the two approaches, continuous inspection, and periodic inspection systems, must be utilized for that factory.

To solve this issue, the key parameter for choosing one of the approaches is the entire expense, with the system with the least overall cost regarded to be the better approach.

To determine the overall cost, use the following equation :

Absolute cost= Annual holding cost+ Annual requesting cost (10)

$$C = \frac{Q}{2}(H) + \frac{D}{Q}(S) + SS(H) \quad (11)$$

Where; (C) every year's out costs, (Q) size of the parcel, (H) expenditures of keeping one unit in storage for a year, (D) the demand, (SS) stand for safety stock, and (S) ordering cost.

$$C_{overall} = \sum_{i=1}^{44} \left(\left(\frac{Q_i}{2}\right)(H_i) + \frac{D_i}{Q_i}(S_i) + SS_i(H_i) \right)$$

$$C_{\text{item } 35} = \frac{602}{2}(0.08 \times 7) + \frac{1117 \times 7}{602}(13.37 \times 602) + 1.645 \times 284 \times \sqrt{0.067}(0.08 \times 7) + \cdots + 1.645 \times 105 \times \sqrt{0.067}(0.08 \times 5) = 267814$$

This equation must be used for all items, and then the combination is the entire cost (COverall), as follows:

The total costs are therefore computed for the continuous reviewing method, with the first two for the slack duration and the other two terms for peak duration as follows:

$$C_{\text{item } 35} = \frac{1117 \times \left(\frac{16}{30}\right)}{2}(0.08 \times 7) + \frac{1117 \times 7}{1117 \times \left(\frac{16}{30}\right)}\left(13.37 \times \left(1117 - 1117 \times \frac{16}{30}\right)\right) + 1.645 \times 284 \times \sqrt{\frac{2+16}{30}} \times (0.08 \times 7) + \cdots + 1.645 \times 105 \times \sqrt{\frac{2+11}{30}} \times (0.08 \times 5) = 127287$$

Considering that, values stated are per month, the holding expenses and the monthly consumption in Table 3 are multiplied by months' number in slack and peak durations, also, the requesting expense is raised by the total interest for the periods slack and peak, as it is computed per unit and given in Table 7 for every item [19-22]. Similarly, the overall total expense of the periodic audit method is computed, wherein the first three terms are for the slack duration: The first holding expense term for the average inventory quantity, The second one for each order cost when the order is issued where its amount multiplied is equivalent to the variance among both the target and the request during the review period, The last three terms are for the optimum period, as seen below:

The expense of holding and the monthly request given in Table 3 will double in idle and peak periods by the month's number, since the prices are listed monthly and the revision and lead periods are changed into months, in order to bring the units into one. Finally, the entire cost is computed and given in Table 8 for each item.

The entire expense is used to distinguish between the two methods given and assist the plant in choosing one of these two options. Given that the whole expense of the periodic audit method (1,331,049) is less than the continuous review method expense (3,050,996), it is the periodic evaluation that best suits the inventory system specified in the plant. On the opposite side, the difference in cost is 129% if it follows the other method.

As a class (A) in the inventory depict more than 50 % of its total inventory cost, the method implemented in that class must be the periodic examination method because the variation between the continuous and periodic frameworks is more than 150%, equivalent in the continuous and periodic methods to the difference among total items expense of class (A). Similarly, for class B, it is around 112%. The variance between the two methods for class C is approximately 113% [23-28].

Table 5. The reorder point for every item

Item No.	**Item Code**	**Slack Period**	**Peak Period**				
		Mean	**Standard Deviation**	**Reorder point**	**Mean**	**Standard Deviation**	**Reorder point**
35	BB-500G	1117	284	195	2436	105	207
36	BB-1Kg	1134	261	186	2412	134	218
27	CE-7Ps	670	170	117	1461.6	63	124
13	MAN-2.5Kg	630	117	92	1518	149	164
7	CB-500G	559	142	98	1218	53	104
8	CB-1Kg	551	99	79	1228	90	120
24	LAN-200G	934	236	162	1993	90	171
14	MAN-1Kg	447	114	78	974.4	42	83
16	BL-850G	441	99	71	982	54	89
5	MST-2.5Kg	449	113	78	972	50	86
22	LAN-850G	446	139	89	976	30	78
30	MK-500G	334	86	59	732	30	61
40	RC-300	159	26	21	377	30	38
41	RF-300	120	12	13	432	49	49
6	MST-1Kg	451	33	44	968	42	82
9	CE-24Ps	236	33	30	630	29	54
31	BC-400G	379	70	55	870	33	72
32	BF-400G	359	27	35	898	48	80
33	GF-400G	320	54	44	752	46	70
34	GC-400G	310	14	27	766	27	63
28	FB-500G	139	20	18	306	15	27
19	CL-850G	210	28	26	506	18	41
18	BL-200G	264	49	38	630	16	49
15	MAN-500G	164	38	27	370	16	31
3	MR-500G	159	29	23	378	19	33
43	ZH-400G	69	12	10	170	10	16
25	BHD	150	18	18	390	16	33
26	CHD	154	17	18	384	26	37
44	ZH-1Kg	64	10	8	150	12	15
17	BL-340G	113	29	20	242	13	22
23	LAN-340G	107	29	20	250	20	25
2	MP-250G	94	15	13	228	15	21
11	BB-20Ps	91	20	14	232	26	26
21	CL-200G	126	17	16	324	21	30
38	MB-400G	36	8	6	100	12	12
1	MP-500G	77	18	13	192	13	18
12	CC-300G	69	13	10	204	27	25
42	BK-1Kg	64	10	8	150	7	13
29	FC-500G	27	8	5	82	8	9
10	CN-1Kg	26	8	5	60	10	8
4	MC-2.5Kg	14	4	3	29	5	4
39	BN	8	3	2	21	2	2
20	CL-340G	26	8	5	64	11	9
37	GS-400G	4	1	1	12	2	2

Table 6. The review duration and the aimed inventory level

Item No.	**Item Code**	**Review Period**	**Aimed Inventory Level**		
		Slack Period	Peak Period	Slack Period	Peak Period
35	BB-500G	16	11	1040	1165
36	BB-1Kg	43	29	2207	2731
27	CE-7Ps	14	10	577	641
13	MAN-2.5Kg	12	7	413	614
7	CB-500G	10	7	367	398
8	CB-1Kg	32	21	798	1089
24	LAN-200G	65	45	2676	3287
14	MAN-1Kg	21	14	511	583
16	BL-850G	16	10	383	465
5	MST-2.5Kg	27	18	615	725
22	LAN-850G	16	11	437	441
30	MK-500G	14	10	283	313
40	RC-300	14	9	118	173
41	RF-300	14	7	77	178
6	MST-1Kg	12	8	250	373
9	CE-24Ps	20	12	222	336
31	BC-400G	5	3	144	177
32	BF-400G	6	4	115	204
33	GF-400G	15	10	245	339
34	GC-400G	10	7	144	245
28	FB-500G	10	7	79	105
19	CL-850G	15	10	152	213
18	BL-200G	12	8	181	224
15	MAN-500G	8	5	90	103
3	MR-500G	9	6	89	117
43	ZH-400G	7	4	30	43
25	BHD	16	10	111	168
26	CHD	19	12	129	205
44	ZH-1Kg	49	32	130	191
17	BL-340G	7	5	61	66
23	LAN-340G	9	6	67	81
2	MP-250G	13	8	64	92
11	BB-20Ps	15	9	76	115
21	CL-200G	40	25	209	322
38	MB-400G	10	6	22	37
1	MP-500G	14	9	63	83
12	CC-300G	59	34	170	294
42	BK-1Kg	14	9	45	61
29	FC-500G	33	19	45	69
10	CN-1Kg	22	14	32	44
4	MC-2.5Kg	22	15	16	23
39	BN	9	6	6	7
20	CL-340G	27	17	38	56
37	GS-400G	17	10	4	7

Table 7. The entire cost and the overall expenditures for the continuous review method.

Item No.	**Item Code**	**Cost for Continuous review**		
		Slack Period	Peak Period	Total cost
35	BB-500G	104784	163029	267814
36	BB-1Kg	132165	200693	332858
27	CE-7Ps	40107	62335	102442
13	MAN-2.5Kg	70006	120214	190220
7	CB-500G	46299	71774	118073
8	CB-1Kg	50708	80603	131310
24	LAN-200G	104357	159099	263456
14	MAN-1Kg	31498	48970	80468
16	BL-850G	55047	87239	142286
5	MST-2.5Kg	53519	82730	136249
22	LAN-850G	43409	67670	111079
30	MK-500G	41002	63845	104848
40	RC-300	21791	36605	58396
41	RF-300	11477	29281	40758
6	MST-1Kg	55052	84146	139198
9	CE-24Ps	32030	60955	92985
31	BC-400G	8947	14444	23391
32	BF-400G	10627	18885	29512
33	GF-400G	34337	57444	91781
34	GC-400G	19148	33675	52823
28	FB-500G	4765	7430	12195
19	CL-850G	4800	8221	13022
18	BL-200G	22348	37815	60163
15	MAN-500G	6020	9485	15504
3	MR-500G	6598	11073	17670
43	ZH-400G	2430	4054	6484
25	BHD	31241	57645	88886
26	CHD	25867	45784	71652
44	ZH-1Kg	4385	7282	11668
17	BL-340G	6120	9039	15158
23	LAN-340G	7680	12447	20127
2	MP-250G	10577	18030	28607
11	BB-20Ps	11729	21014	32744
21	CL-200G	11354	20849	32202
38	MB-400G	1793	3408	5201
1	MP-500G	4876	8515	13392
12	CC-300G	12751	27005	39756
42	BK-1Kg	7052	11544	18596
29	FC-500G	4766	10100	14866
10	CN-1Kg	1466	2380	3846
4	MC-2.5Kg	2719	3994	6713
39	BN	854	1254	2108
20	CL-340G	3045	5307	8352
37	GS-400G	768	1370	2138
	Overall cost for continuous model	3050996		

CONCLUSION

For most businesses, stock management is the main management perspective but is crucial for organizations that are intended to develop and achieve a high level of success. Many of those organizations, if not most, confront exceptional stock management challenges. This actual version tries to interface the conjecture with a factual situation and suggests that the factory can execute that to enhance its management of the stock and increase overall income and be a strong competitor. The ideas regarding inventory administration for such businesses recalled for hypothetical structure are undoubtedly connected when implemented to the situational study in this formation, where seasonality is managed flawlessly without any dispute, shortages, or delays in client orders. In different terms, applying stock administration theories and practices is practical for the Jordanian inventory system. Therefore, to enable that factory to achieve its goal, the appropriate application in this study of the learned principles and procedures of inventory administration is implemented.

The outcomes and merits are noted below:

The ABC investigatory method was used to combine various stock items, to allocate legitimated inventory time and cash, where the treatment of inventory items is different from their respective categories. Therefore, more focus and control must be taken into consideration to Class A, as it accounts for the higher inventory cost of over 50%.

- Continuous and periodic inventory management methods are implemented, and it is found that the best approach is the periodic reviews that could be utilized to support managers in determining whether to make new stock replenishment requests, and the amount for the request is determined.
- To raise the profit margin by decreasing the overall inventory costs while holding product prices with free of change, cost analyses of the continuous and periodic review methods for the complete item in the inventory assist in picking the optimum systems to use.
- As management estimations from the previous year, the overall inventory costs of this plant have been lowered considerably from (3,400,000) to (1,331,049), and that difference above (2) million is employed for other investment.

In conclusion, this study will improve the effectiveness of the warehouses in this plant; thus, it is regarded as the key for improving the total production productivity for the entire plant and achieving another success. Consequently, it will grow and extend in Jordan and the region of the middle east.

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