

Report on
Inventory Management and Warehousing of Dhaka Water Supply
and Sewerage Authority (DWASA)

By
Md Shahid Nazir
18282023

This report is submitted to Brac Institute of Governance and Development (BIGD), Brac University in partial fulfillment of the requirements for the degree of Masters in Procurement and Supply Management (MPSM)

Brac Institute of Governance and Development (BIGD)

Brac University

September 2020

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Declaration

It is hereby declared that

1. This report submitted is my own original work while completing degree at Brac University.
2. The report does not contain material previously published or written by a third party, except where this is appropriately cited through full and accurate referencing.
3. The report does not contain material which has been accepted, or submitted, for any other degree or diploma at a university or other institution.
4. I have acknowledged all main sources of help.

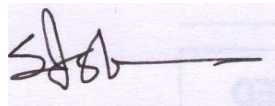
Student's Full Name and Signature:



Md Shahid Nazir

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Letter of Transmittal

Mohammad Sirajul Islam

Deputy Director, Executive Development Centre

BIGD, Brac University

66 Mohakhali, Dhaka-1212

Subject: Submission of Report on Inventory Management and Warehousing of DWASA.

Dear Sir,

This is my pleasure to submit my report based on my organizational attachment with Dhaka Water Supply and Sewerage Authority (DWASA). I have attempted my best to finish the report with the essential data and recommended proposition in a significant compact and comprehensive manner as possible.

I trust that the report will meet the desires.

Sincerely yours,



Md Shahid Nazir

18282023

BIGD, Brac University

29 September 2020

Non-Disclosure Agreement

This agreement is made and entered into by and between DWASA as the First Party and the undersigned student at Brac Institute of Governance and Development, Brac University as the Second Party. The First Party has allowed the Second Party to prepare a report on the former Inventory Management and Warehousing in partial fulfillment of the requirements for the degree of Masters of Procurement and Supply Management. The Second Party will have opportunity to work closely with the officials of the organization and have access to official data and information. Based on work experience and data and information collected the Second Party will prepare a report. The Second Party will use all sorts of data and information for academic purposes and will not disclose to any party against the interests of the First Party.


Student's Full Name and Signature:



Md Shahid Nazir

18282023

Organizational Supervisor's Full Name and Signature:



Md. Elias Uddin Mahmud,

Systems Analyst, DWASA

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I am grateful to all of my colleagues of Dhaka WASA who have helped me by giving various important data regarding store management. Their cooperation helped me and made easier to prepare this report.

My sincere thanks go to Mr. Ramsver Das, Executive Engineer for his encouragement and support, my professional supervisor System Analyst Mr Elias Uddin Mahmud, who has guided me into the right direction and has been a source of inspiration and valuable ideas. Finally, I want to thank my family members for great support they provided me and their belief in me and always inspired me to achieve my goals.

Executive Summary

Dhaka Water Supply and Sewerage Authority (DWASA) is a service oriented autonomous commercial organization in the public sector. Its main responsibility is to provide safe drinkable water to Dhaka city dwellers. Apart from water supply, DWASA is also responsible for drainage, sewerage system operation and maintenance, and other treatment plants under its jurisdiction. Though DWASA is a profitable public organization, but never achieved its ultimate target as expected because of corruption and inefficient system and procedures. But in recent times DWASA has been trying to focus all areas where automation and digitization can bring ultimate quality management. Previously, consumer billing system was fully manual paper-based, so bill collection never achieved at its desire level. By implementing digital billing system DWASA's bill collection increased in significant level, hence DWASA earns higher percentage of revenue compared to early years. Consequently, senior management expects every activity has to be automated to ensure efficiency everywhere. From 2017 DWASA also developed software based online inventory management system and Radio-frequency identification (RFID) is the latest inclusion. This report is based on present situation of store division of DWASA. The major responsibilities of store division are inventory management, warehousing and quality management of materials. By using store online inventory software report, senior management is able to know the present condition of inventory, forecasted demand, usage history of other divisions, total consumption report, even unused or wastage materials that could be repairable or actionable.

Previously, no such report has published and sometimes senior management is not aware of the actual scenario. So, situation has changed dramatically after implementation of information

technology and developing the inventory software and latest RFID technology. At present there are lots of academic research papers are available and best practices to achieve expected results. But it is really hard to implement those sophisticated technology because of organizational culture and internal conflicts. The report has structured by chapters. Chapter 1 describes the overview of the organization, chapter 2 presents the practices of inventory management of Dhaka WASA, chapter 3 describes the warehouse functions and finally in chapter 4 has some recommendations.

Keywords: Inventory management system; inventory software; store division; warehouse management; annual procurement plan.

ACRONYMS

APP	Annual Procurement Plan
BAS	Bangladesh Accounting Standards
BFRS	Bangladesh Financial Reporting Standards
BSTI	Bangladesh Standards and Testing Institution
BUET	Bangladesh University of Engineering and Technology
DWASA	Dhaka Water Supply and Sewerage Authority
MIRO	Movement in Receipt Out
MIST	Military Institute of Science and Technology
MLD	Million Liters water per Day
MODS	Management, Operations, Distribution and Services
PO	Purchase Order
VLMS	Visitor Log Management Services
WTP	Water Treatment Plant

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CHAPTER 1

AN OVERVIEW OF DHAKA WASA

1.1 INTRODUCTION

Dhaka Water Supply and Sewerage Authority (DWASA) is a service oriented autonomous commercial organization in the public sector under the Ministry of Local Government, Rural Development and Co-operatives. Its main responsibilities are to provide potable water supply, sewerage disposal and some portion of drainage service of Dhaka City. DWASA produces almost 2500 million liters water per day (MLD) with respect to total demand of 2450 million liters water per day. Dhaka WASA is an autonomous organization and currently running under WASA ACT 1996.

At present, the operation of Dhaka WASA is only limited to Dhaka metropolitan area. For better operation DWASA is divided into ten geographical areas, which is called MODS zones that means Maintenance, Operation, Distribution and Service (MODS) Zones. In parallel DWASA have ten revenue zones, their main responsibility is to collect revenue bills from domestic and commercial customers. Technical operation and maintenance activities are managed by the MODS zone offices.

1.2 VISION, MISSION and STRATEGIES

Vision

DWASA envisions to become the best water utility service provider in the public sector of South Asia.

Mission

Previously DWASA extracted 80 percent of water from underground and 20 percent from surface water. Now, DWASA come up with a mission to deduce the dependency from ground water to surface water for sustainable water supply system and implement the ongoing projects on time.

STRATIGIC PLANNING

For better customer service, DWASA took some targets in long term basis, those are:

- Launching district metered area (DMA) for keeping non-revenue water (NRW) below 10 percent and confirming 24/7 pressurized and potable water supply.
- Reducing NRW and ensuring 100 percent legal water supply to low income community (LIC) area
- Ensuring 100 percent sewerage system for safe environment
- Digitization of major activities

1.3 DWASA ORGANOGRAM

Dhaka WASA board comprises of 13 members from different professional organizations and Government officials, headed by the Chairman. DWASA can create post and determine salaries by approving from concern ministry according to the WASA Act 1996. According to the organizational setup of 2007, total number of approved posts and present employees are as follows:

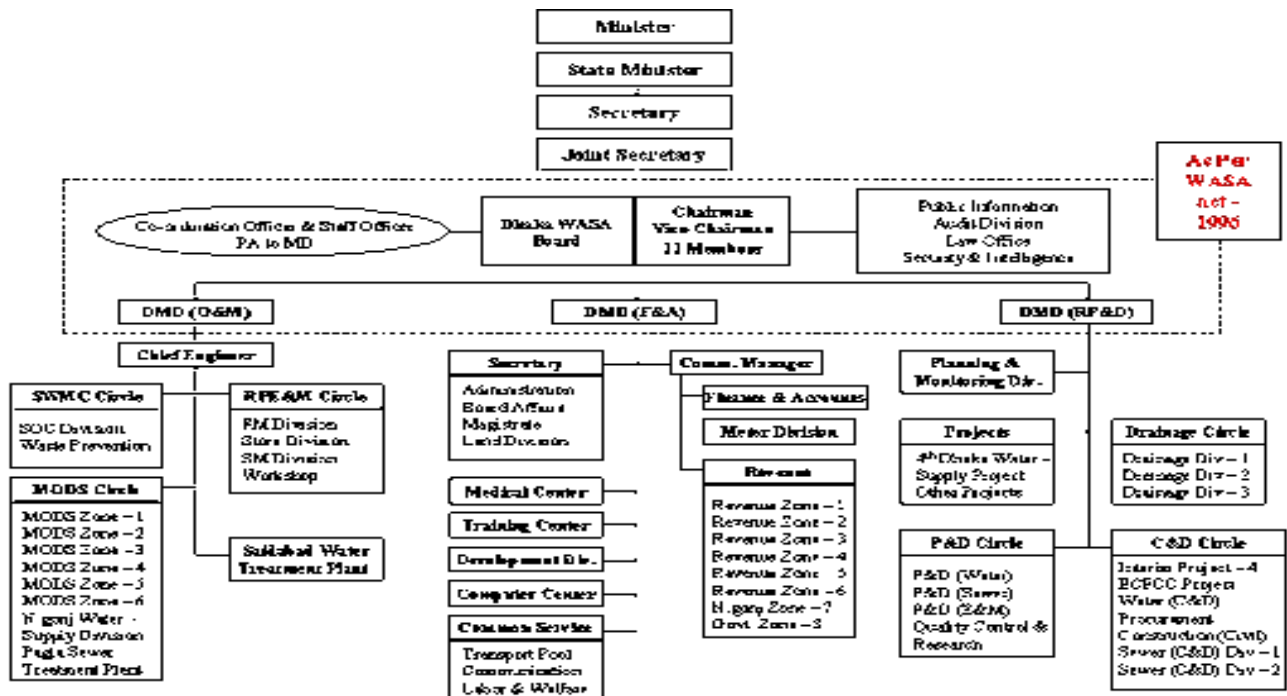


Figure 1.1: DWASA Organogram

1.4 MAJOR RESPONSIBILITIES

Dhaka WASA is solely responsible for producing potable water and supply to Dhaka City dwellers, apart from that DWASA is also responsible for some portion of Dhaka city’s storm water drainage service and sewerage disposal system.

CHAPTER 2

PRACTICE AND ASPECTS OF DWASA INVENTORY MANAGEMENT

2.1 INTRODUCTION

In traditional business operation inventories are considered the different stages goods or items that are going to be sold or resold, but in Dhaka WASA inventories are considered those items that are purchased from suppliers and stored for general business operation and use for daily water production, operation and maintenance. So those products are procured from supplier and stored for future use or the products that are used but somehow got faulty now need repair works for future use also considered as inventory. Hence it slightly differs with conventional general accounting terminology. However, from the revenue perspective the majority of shares come from selling water to city dwellers.

For Dhaka WASA, the largest portion of current asset is held by inventories. Almost 20-25 percent of total current asset are held by inventories, the amount is close to 950 crores in BDT. Considering the size of inventory, it is huge. So, it requires efficient and effective management to avoid unnecessary investment. Hence, proper inventory planning, control and monitoring is required for efficient use of inventories to ensure profitability of any organization.

2.2 OBJECTIVES OF INVENTORY MANAGEMENT

In broad aspect the objective of inventory management of Dhaka WASA is categorized in two parts one is financial and the other is operational. The operational objectives mean the availability

of materials and spare parts whenever it requires so that service work is not interrupted for lack of inventory. The financial objective means that the investment should not remain idle and maximum utilization is ensured.

2.2.1 OPERATIONAL OBJECTIVES

Dhaka WASA's main business objective is to ensure continuous flow of water for the city dwellers. So, water production is continuous and daily work in all over the pumps and plants. Thus, sufficient materials and spare parts have to stock for any emergency service outage. The following are the operational objectives of DWASA inventory management:

- a) Ensuring availability of materials
- b) Avoidance of abnormal wastage
- c) Promotion of manufacturing efficiency
- d) Avoidance of out of stock danger
- e) Better service to customers
- f) Designing poorer organization for inventory management

2.2.2 FINANCIAL OBJECTIVES

There are many public organizations who are not as much concern about their financial objectives, but in case of DWASA it has different philosophy. As it is commercial public organization, so higher management is always serious to ensure its profitability. The followings are the key financial objectives of DWASA inventory management:

- a. Economy in purchasing
- b. Reasonable Price

c. Optimum Investing and Efficient Use of capital

2.3 AUTOMATION OF INVENTORY MANAGEMENT SYSTEM

In past DWASA store divisions are not considered as vital department, and none enjoyed the posting at store division. But in recent times senior management takes it seriously and posted some promising officers, as a result many innovative solutions come into play.

Dhaka WASA has an inventory plan for better storage management and minimizing losses. Previously there was no such inventory plan, as all recordings were manual. So, DWASA found it very difficult to make plan for inventory because of paper based manual system. Then top management decided to introduce software-based inventory system. To do that DWASA made a committee including IT expert from MIS division. Then working together two years from 2017, DWASA successfully launched online inventory software for inventory management. At present all the product requisition, issue, loan, and approval process are maintained through online inventory software. It reduces time cost and manpower. It ensures transparent and efficient management. Previously all the divisions were worried about proper usage of their products. Now, by using the software anyone can check their available product quantity and usage history. Higher management can check the product usage, ledger and current stock report.

2.4 INVENTORY MANAGEMENT STAGES OF DWASA

Inventory management process of DWASA is stated below:

- I. Generally, procurement division purchases the products based on the demand of others user divisions. Every financial year procurement division made annual procurement plan (APP), which is approved by Managing Director of Dhaka WASA.
- II. After APP approval procurement division goes for tendering process. However, all the procuring entity follows public procurement rule (PPR-2008).
- III. And after this procurement process is done, then the material purchased is received.
- IV. Inspection committee will check the quality of product, sometimes testing is done by either BUET, BSTI, Science Laboratory or MIST, which depends on product type and volume.
- V. After satisfactory testing then quantity is checked and received by store division
- VI. After purchasing, the products are stored in either central store or sub-stores. Then requisition slip comes from the user divisions to store division to dispatch as per requirement from user division. As soon as demand comes in store division the Executive Engineer or Assistant Engineer decides to approve or not.
- VII. Then requisition slip come from the user divisions to store division to dispatch as per requirement from user division. As soon as demand comes in store division the Executive Engineer or Assistant Engineer approves.

From the higher management instruction DWASA is able to deploy web-based online inventory management software. At present all the product requisition, issue, loan, and approval process are

maintained through online inventory software. It reduces time cost and manpower. It ensures transparent, efficient management. Previously all the divisions were worried about proper usage of their products. Now, by using the software anyone can check their available product quantity and usage history. Higher management can check the product usage, ledger and current stock report.

2.5 PURPOSE OF INVENTORY SOFTWARE

DWASA inventory management software is a software system for tracking inventory levels, orders, and deliveries. It is also used to create a work order, bill of materials and other inspection-related documents.

Inventory management through software

The online inventory software has separate modules from which any procuring entity can check their stock levels, previous purchase history and current usage. By using this historical data procuring division can prepare their annual procurement plan, these will help to maximum use of inventory. By using the software interface top management can also check the overall performance of any divisions. Figure 2.1 presents Dhaka WASA warehouse-wise product summary.

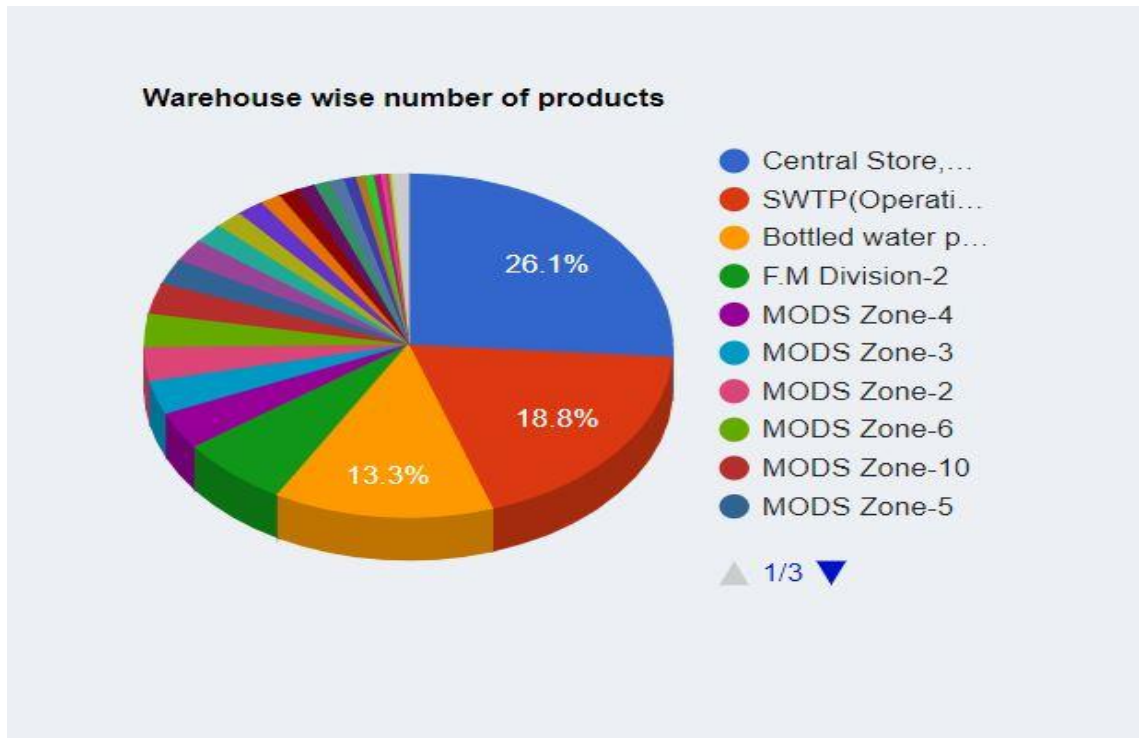


Figure 2.1: Dhaka WASA Warehouse-wise product summary (in terms of financial value)

Inventory tracking and visibility

After procurement, all products and materials are stored in central store division. So, whenever needs any materials or spare parts can easily send a requisition by using software, either using mobile or web interface. So, this tracking system makes the operation faster and users get uninterrupted service from DWASA.

Transfer management

DWASA has almost 12 sub-stores, multiple ongoing projects, ten operating zones, and twenty functional divisions. They purchase frequently based on their needs. So, product transfer from one user division to another is daily routine activities. In order to do this most effectively, DWASA uses this software-based transfer management system.

Purchasing

Purchasing is an incredibly important feature to any warehouse that heavily relies on vendor goods to produce their own. This feature mainly works to help users create and manage purchase orders (POs). Many systems include templates that automatically populate with existing data from other parts of the system. Users may also find it helpful to email suppliers directly from their inventory control system, which reduces the amount of time spent switching screens.

Control and command

DWASA inventory management software is one of the ways in which organization can accurately keep track of each item of their stock. By using this any zonal office or any departments can check how many stocks are stored in warehouse, and what portion of which are entitle to use. Even though if any particular division not been the user of any product, then zonal officer can place a loan request by maintaining some approvals.

Reporting and analytics

Analytics and reporting are most important tools that helps to plan properly and helps for taking perfect decisions. By using the analytics procuring divisions can forecast their demand for future. Predicting the demand reduces the safety stock and reduces the inventory losses and reduces other overhead costs. These analytics make the auditing easier and more transparency is ensured. Figure 2.2 shows online store inventory software dashboard.

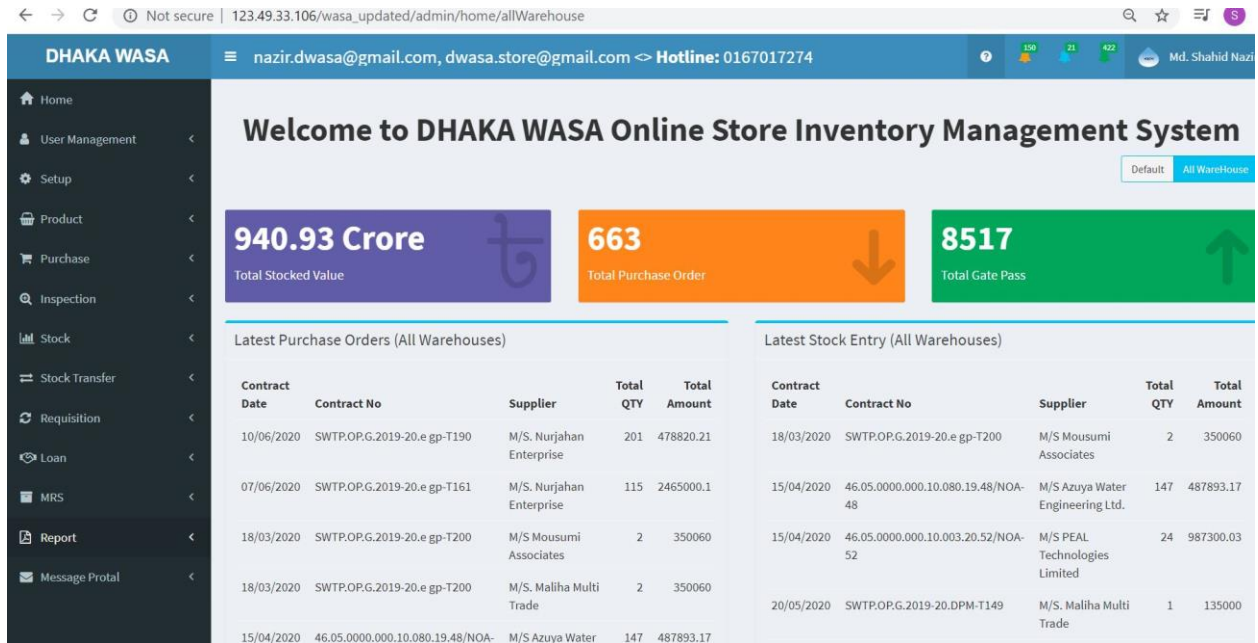


Figure 2.2: Online Store Inventory Software Dashboard

2.6 PRODUCT TYPE AND CATEGORIES

There are almost 4216 products in DWASA warehouses. Hence, for effective inventory management these huge number of products are classified into three types and under these three types items there are almost 42 categories and sub-categories of products. The major types are:

- Electromechanical
- Civil
- Stationary

Electrical items: These are most important or valuable items. Although they typically account for 20 to 25 percent by volume, they account for 30 to 35 percent of value of all inventory items. These items are given the highest priority when ordering and stocking.

Civil items: Important items that account for 60 to 65 percent by value but account for 65 to 70 percent of all inventory items.

Stationary items: Least important items, accounting for 5 to 10 percent of value but yet accounting for the greatest percentage of all inventory items by volume. These items are given least priority given their impact on service and value.

Figure 2.3 illustrates product type and categories of online store inventory software.

S/L	PID	Product Name	Product Type	Category	Sub Category	Countries	Brands	User Group	Stock QTY	Measure Unit	Unit Price	Total Price
1	6462	Air Blower With Hose	Electrical / Mechanical	Tools		N/A	N/A	MODS Zone	4	Nos	32940	131
2	6752	Connecting ring (P/N-100561)	Electrical / Mechanical	Gas generator Spare		France	N/A	Generator Division	1	Nos	23000	23
3	6704	Connecting rod (P/N-424942)	Electrical / Mechanical	Gas generator Spare		United Kingdom	N/A	Generator Division	20	Nos	112700	225400
4	6702	Connecting rod bearing (P/N-1231307)	Electrical / Mechanical	Gas generator Spare		United Kingdom	N/A	Generator Division	20	Nos	26100	52200

Figure 2.3: Product type and categories of online store inventory software.

2.7 ASSOCIATED RISKS AND RISK MANAGEMENT

Theft is one of the highest concerns for Dhaka WASA store division. As the total coverage area is huge nearly 423013 square m. In past there were many open pockets to enter the store area, so ultimately DWASA lost their valuable items every year. Then authority decided to ANSAR as security forces along with DWASA internal security staffs.

But again, product losses remained. Then higher management decided to restrict the movements of unwanted local people, finally in 2016 twenty-four IP cameras were installed to monitor the major areas where valuable items were kept. At present visitor and vehicle log management system has deployed to prevent any unwanted situations. Sometime products and materials got damaged or wasted because of longer period of stocking. To prevent those damages Dhaka WASA makes some action plans to sell the goods and try to reach our potential and old customer who once purchased those particular goods.

CHAPTER 3

DWASA WAREHOUSE MANAGEMENT SYSTEM

3.1 WAREHOUSE-OVERVIEW

DWASA needs different types of goods for operation and development projects. Generally, warehouses are used for storage of goods and distributed to user divisions within the organization. So, according to annual procurement plan (APP) the procuring divisions procure their goods and store them in our central warehouse, from where other goods are distributed to other sub-stores and warehouses. However, DWASA also needs some essential goods for their operation and production. Some of them may not be available all the time in market. But those items are needed throughout the year without any break. So, inventory needs to store. For example, Saidabad Water Treatment Plant (SWTP) is one of the mega projects for Dhaka WASA which produces daily around 450 MLD water, nearly 20 percent of total water production of Dhaka WASA. For continuous production SWTP needs Chlorine, Lime, Aluminum sulphate, Bleaching powder, Polymer etc. Hence these items have to always in hand for continuous water production. Dhaka WASA has 12 sub-stores and one central warehouse. These warehouses are used to preserve goods, minimize cost of transportation, attain economies of scale in purchasing and reduce response time.

DWASA has almost 72 procuring entities and 104 divisions based on the characteristic of their role. When any procuring division purchases any goods, there are some procedures to store in the warehouse. If the volume of product is high then it requires some tests, generally Bangladesh University of Engineering and Technology (BUET), Military Institute of Science and Technology (MIST), Bangladesh Standards and Testing Institution (BSTI) etc. are the common institutes frequently asked for testing. Then based on the testing reports inspection committee decides. If all are satisfactory then finally products are stored in the warehouse. DWASA has almost 426 types of products, over the years the products purchased for the water and sewer lines are very common. For example, products like motor, valve, meter, different types of pipes and fittings are very essential items and used very frequently. So according to annual procurement plan (APP), central procurement division and other procuring entity purchase these products throughout the year and the user divisions made request for issue based on requirement to DWASA central store division. Then store division approves the issue request depending on availability of product.

3.2 NECESSARY OF WAREHOUSING

Warehousing is critical to DWASA because of the subsequent reasons:

Seasonal demand:

DWASA has some historical statistics of product and materials usage. Usually in summer time underground water levels goes down and water consumption gets higher. So, to meet some extra demands few extra pump, pipe, fittings, motor, generator, and transformer are required. Therefore, to fulfil the extra demand probable materials and spare parts have to keep in advance. Whereas,

during rainy season precaution taken from drainage division. So, there is a need to store these goods in a warehouse to make them available at the time of need.

Large-scale production:

Now-a-days production takes place to satisfy the existing as well as future demand of the products. For example, DWASA has a bottle plant, their primary job is to produce mineral drinking water bottle. So necessary items like polystyrene, ethylene and propylene etc. always have to be in hand to produce potable water bottle. As the production capacity depends on plant capacity as well as human resources and raw materials. So, at the beginning of year essential and regularly products are purchased according APP, then stock those items in warehouse.

Continuous production:

DWASA's one of the primary objectives is to produce and supply of water to Dhaka dwellers. Therefore, continuous production of water is very essential for them, to do this they have to stock bulk amount of bleaching powder, chlorine, Aluminum sulfate etc. These products are used regularly in all the plants of DWASA. To ensure continuous production always have to think about the stock level and some of the items are very explosive like chlorine and aluminum, these items are risky to stock and handle, so warehouse management is considered a key part of the continuous production.

At the early 80s there were many sub stores around different places in Dhaka City and central warehouse was located at Shegun Bagicha. In 1992 the central warehouse is shifted to Shyampur area. The place is about 348000 sqm and out of it 52800 square meter is allocated for central store.

Considering the space, it covers huge area, just beside of highway. Here all the facilities are available.

3.3 FUNCTIONS OF WAREHOUSES

DWASA warehouses preserve goods on a large-scale in a systematic and orderly manner. They provide protection to goods against heat, wind, storm, moisture, etc. and also cut down losses due to spoilage, wastage etc. This is the basic function of every warehouse. In addition to this, DWASA warehouses perform the following functions:

- I. **Storage of goods:** The main function of warehouses is to stock the goods for future use. In the central warehouse there are 19 godowns, 12 open-sheds and almost 52800 square meter area are used store. These goods are stored from the purchase to the final use. However, there are other products and spare parts used to store in the warehouses, after repair works these products are available for reuse. Even all the wastage products are also kept for auction purpose.
- II. **Protection of goods:** DWASA warehouses provide proper protection to goods from excess heat, moisture and dust etc. Even some explosive materials kept under special arrangement. For instance, Chlorine is an explosive item, so to preserve such items separate godowns and sheds are built.
- III. **Risk bearing:** DWASA has a unique setup of employees for warehouses who are highly trained workforce for handling and packaging of goods. After procurement the products are kept in warehouses for storage, then responsibilities shift to store division, as they are specialized of keeping these products secured and good condition. DWASA warehouses

are modernized with forklifts, automated guided vehicles, excavators, visitor log management services (VLMS) etc. These machines are helpful to handle heavy and large volume of goods

- IV. **Inspection:** Generally, when the products are procured by procuring divisions then the inspection committee do their scrutiny at DWASA central warehouse compound. Most of the inspection committees are formed by inclusion of store Engineer (SAE/AE/SDE/XEN)
- V. **Transportation:** In recent time, DWASA has introduced transportation to some of the selected divisions on trial basis, and got very positive feedback because it saves time and resources. In future Dhaka WASA have a plan to arrange transport facilities to rest of the divisions for prompt service to other divisions.

CHAPTER 4

RECOMMENDATIONS AND CONCLUSION

Inventory is important to any organization for production activities, maintenance of plant and machinery as well as other operational requirements. This leads to docking of cash or capital that could have been used additional profitability. Inventory is part of the company assets and is always reflected in the company's balance sheet. Although DWASA introduced some good practices but still lot to do for effective inventory management system. There are lots of models and analysis. DWASA should incorporate those well-established models, such as economic ordering quantity (EOQ), ABC analysis, Parato Principle, JIT Philosophy etc. They should make much greater use of predictive analytics for inventory management. Predictive analysis can be used to forecast demand more accurately, determine appropriate replenishment levels, and improve inventory availability.

Moreover, the data generated will be joined to key performance metrics and displayed in dashboards, thereby enhancing visibility of inventory plans and performance. This can also lead to improved budgeting processes because resources are allocated based on optimal inventory levels, correct usage trends, and projected replenishment needs. Adoption of predictive analytics

in inventory management can also facilitate data sharing within an organization and with suppliers, thereby substantially improving inventory management.

They should follow international accounting principles and practices and those prescribed by the Government's accounting laws and regulations and inventory is one of the key part to determine the financial status. Considering inventory concept, some of the items are not considered as inventory according to Bangladesh Financial Reporting Standards (BFRSs) and Bangladesh Accounting Standards (BASs) and its interpretations, rather it's better to say materials and supplies in place of inventory. So, inventory calculation results are not as accurate considering some local accounting standards such as BFRS or BAS.

The communication between logistics personnel and staff can be strengthened to improve inefficient inventory management. I learned that anticipated material requirements for any field operations are not always communicated to logistics personnel in a timely manner. Instead, item requirements are communicated on very short notice, which means logistics personnel stock more excess items than necessary to mitigate uncertainty. At the store division, I found that most logistics personnel develop their skills entirely on the job from the time they are recruited by DWASA. This insular approach for hiring and developing logistics staff reportedly obstructs the DWASA's adoption of innovative practices for inventory management. Because many public sector inventory processes are not streamlined or clearly delineated, my suggestion is that government organization should adopt a process mapping approach not only to identify weaknesses but also to standardize effective processes and practices.

In this approach, the current processes are reviewed and defined so as to identify problem areas and opportunities for improvement. This is a low-cost approach that also facilitates employee bonding and team-work. Among the key steps in process mapping are:

- Identifying (mapping) the process (ask why things are done the way they are)
- Having a cross-functional team to gather information on processes
- Identifying problem areas and opportunities
- Identifying and implementing solutions

Alongside process mapping, I recommend adoption of “A-B-C” classification approach—a prioritized value system—to enable better understanding of the importance of different inventory items in providing services and more effective resource allocation. Without this understanding, it is likely that highly critical items could be missing when orders for less critical items are prioritized. A-B-C classification (premised on the Pareto principle or the 80/20 rule) is a commonly adopted inventory management approach. It is useful in prioritizing inventory handling and replenishments because items are segmented into three categories based on their level of importance or criticality to service provision, value, usage, or cost. By using this approach, A-items will be given highest priority compared to B- and C-items. This segmentation can enable more tailored planning and resource allocation by inventory category. Besides A-B-C classification, there is need for regular cycle counting, an approach involving a physical count of inventory to ascertain records and correct any inaccuracies, ultimately improving inventory records. As previously noted, inventory record accuracy is a major concern, in part because of the way inventory data are captured. Performing cycle counts can clean the inventory database and identify weaknesses in inventory processes that contribute to high inventory data inaccuracy. It

can also reduce overstocking inventory, as items in stock will be more accurately accounted for. Undoubtedly, better understanding of inventory levels, usage patterns, and the importance of different items could reduce inventory waste because unused inventory in one center could be transferred to another center in need, thereby reducing the risk of inventory obsolescence.

Lastly, DWASA should establish a culture of continuous improvement in inventory management to fully exploit process mapping and benchmarking potential, government agencies should establish a strong organizational culture regarding continuous improvements in inventory processes. Because continuous improvement is employee-driven, it can be very effective for making changes to inventory processes at a very low cost. Frontline employees will lead the effort of not only identifying problem areas or weaknesses in current processes, but also in suggesting potential improvement actions. To encourage staff, buy-in, establish incentives such as system-wide recognition or possibly monetary awards for teams, units, or facilities that come up with the most innovative or effective improvements in a given period of time. Enhancing a sense of ownership of process improvements is critical for continuous improvement to succeed.

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