An examination of shortcomings in Inventory Management and Control in selected Saldanha Bay firms

by

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DECLARATION

I, Johannes Godfree Diergaardt, declare that the contents of this dissertation represent my own unaided work, and that the dissertation has not previously been submitted for academic examination towards any qualification. Furthermore, it represents my own opinions and not necessarily those of the Cape Peninsula University of Technology.

Signed

Date

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DEDICATION

I dedicate this work to Wilma and Jesse.

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GLOSSARY

Terms/acronyms/abbreviations

ABC analysis: This method is used to categorise inventory into groups based on certain activity characteristics. Examples of ABC stratifications include ABC by velocity (times sold), ABC by sales dollars, ABC by quantity sold/consumed, ABC by average inventory investment and ABC by margin. ABC stratifications are used to develop inventory-planning policies, set count frequencies for cycle counting, slot inventory for optimised order picking and other inventory management activities (<u>http://www.inventoryops.com</u>).

Actual cost: The inventory costing method is used in manufacturing environments. It is a method by which the actual materials costs, the machine costs and the labour costs are calculated for a specific work in order to calculate the cost of the finished item (http://www.inventoryops.com).

Available: This refers to the status of inventory, that is, its ability to be sold or consumed. Availability calculations vary from system to system, but a basic formula is to subtract any current allocations of holds on inventory from the current on hand balance. An example of an availability calculation is as follows: (Quantity available) = (Quantity on hand) - (Quantity on hold) - (Quantity allocated to sales orders) (<u>http://www.inventoryops.com</u>).

Carrying cost: Carrying cost is also referred to as holding cost. Carrying cost is the cost associated with having inventory on hand. It is primarily made up of the costs associated with the inventory investment and storage costs. For the purpose of economic order quantity calculations, if the cost does not change based on the quantity of inventory on hand, it should not be included in carrying cost. Carrying cost is represented as the annual cost per average on-hand inventory unit (<u>http://www.inventoryops.com</u>).

Cycle counting: This refers to the process of regular and scheduled inventory counts (usually daily) which "cycle" through your inventory. The user determines how often certain items/locations are counted (<u>http://www.inventoryops.com</u>).

Deficiency: A shortage as indicated by some set level or target (Damelin Education Group.

2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin.)

Demand: The need for a specific item in a specific quantity (<u>http://www.inventoryops.com</u>).

Economic order quantity: This is the result of a calculation that determines the most cost effective quantity to order (purchased items) or produce (manufactured items). The formula basically finds the point at which the combination of order cost and carrying cost is the least. The standard formula is EOQ = square root [2 * (annual usage) * (order cost) / (annual carrying cost/unit)]. The difficult part of implementing the formula is getting accurate values for order cost and carrying cost (<u>http://www.inventoryops.com</u>).

Fast moving inventory: This is a description of common high volume products such as bolts and nuts, hygiene product or cleaning supplies (<u>http://www.inventoryops.com</u>).

Forecasting: Forecasting is an estimation of future demand. Most forecasts use historical

demand to calculate future demand (<u>http://www.inventoryops.com</u>).

Inventories: Inventories are materials that fall into five main classes: Raw materials, purchased parts, in-process materials, finished goods or completed items, supplies (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Inventory: A detailed list of goods or materials (Damelin Education Group. 2000. *Storekeeping and stock control D0249.* Johannesburg: Damelin).

Inventory management: This refers to the direction and control of activities with the purpose of getting the right inventory in the right place at the right time, in the right quantity, in the right form and at the right cost (<u>http://www.inventoryops.com</u>).

Lead-time: This is the time required for an item to be available for use from the time it is ordered. Lead-time should include recommended order time, purchase order processing time, vendor processing time, in transit time, receiving time, inspection time and any pre-pack times (<u>http://www.inventoryops.com</u>).

Obsolete inventory: This is inventory which has had no sales or usage activity for a specific period of time. The period of time varies by company and industry and may even vary by product line within a specific company; it may range from weeks to years (<u>http://www.inventoryops.com</u>).

Operation: An operation is the overall work environment which includes the facility/facilities and all activities which occur within it (<u>http://www.inventoryops.com</u>).

Order cost: This is also known as purchase cost or set up cost. Order cost is the sum of the fixed costs that are incurred each time an item is ordered (<u>http://www.inventoryops.com</u>).

Physical inventory: This refers to the process of counting all inventory in a warehouse or plant. Operations are traditionally usually shut down during a physical inventory (<u>http://www.inventoryops.com</u>).

Plant: The equipment and building needed to manufacture a product (e.g. an industrial refrigeration plant required to manufacture ice on an industrial scale) (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Policy: A set of rules or guidelines, for example: The policy of the company may be to have a coding system for all items that have to be stored (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Procedure: This is a mode of doing business; a mode of performing a task; a series of actions conducted in a certain order or manner (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Purchase order: This refers to a document used to approve, track and process a purchased item. A purchase order is used to communicate a purchase to a supplier. It is also used as an authorisation to purchase. A purchase order will state quantities, costs and delivery dates. The purchase order is also used to process and track receipts and supplier invoices/payments associated with the purchase (<u>http://www.inventoryops.com</u>).

Receiving: This is the term used to describe the quick or expeditious receiving, identification

and the general inspection of all goods and materials coming into the warehouse (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Reorder point: This refers to the inventory level set to trigger reorder of a specific item. Reorder point is generally calculated as the expected usage (demand) during the lead-time plus safety stock (<u>http://www.inventoryops.com</u>).

Reorder quantity: This refers to the quantity to be ordered to replenish stock to its maximum level (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Safety stock: This refers to the quantity of inventory used in inventory management systems to allow for deviations in demand or supply. Safety stock calculations will take into account historic deviations and use a required service-level multiplier to determine the optimal safety stock level (<u>http://www.inventoryops.com</u>).

Stock counting: The activity of physically counting inventories (Damelin Education Group. 2000. *Storekeeping and stock control D0249*. Johannesburg: Damelin).

Unit of measure: This describes how the quantity of an item is tracked in an inventory system. The most common unit of measure is "eaches" (EA), which simply means that each individual item is considered one unit. An item that uses "cases" (CA or CS) as the unit of measure would be tracked by the number of cases rather than by the actual piece quantity. Other examples of units of measure include pallets (PL), pairs, dozens, and so on (<u>http://www.inventoryops.com</u>).

Warehouse: A large building where raw materials or manufactured goods may be stored (<u>http://www.inventoryops.com</u>).

ABSTRACT

The dissertation focuses on sharing experiences related to the shortcomings in the discipline of inventory management and control. The research was limited to inventory management and control practices in select manufacturing and production sites in Saldanha Bay on the Cape west coast. The shortcomings identified may be seen as holistic in inventory management and control and are thus not restricted to the Saldanha Bay area only.

The results of the research provide comprehensive insight into the elementary aspects of managing inventories in fast- paced, industrial manufacturing environment. The dissertation touches on the problems that arise when inventory managers do not understand the concept of inventory management. The researcher witnessed the shortage of schooled and skilled inventory managers in both the public and privates sectors in South Africa.

It is hoped that after reading the content of this research, the reader concerned with inventory management and control will be better equipped to address these issues.

CHAPTER ONE OVERVIEW OF THE RESEARCH

1.1 Introduction

Chapter one serves as an introduction to this dissertation and provides the structure for the dissertation. According to the Damelin Education Group (2000:12) (hereinafter referred to as the Damelin Group), "the stores department" or warehouse "is the firm's physical link with its suppliers. It is here where all materials delivered to the firm are physically received, checked, stored and ultimately issued to the 'user' departments such as production, engineering, sales and so on".

The researcher found that a significant number of inventory managers do not approach warehousing from a holistic perspective and appear to lack a thorough understanding of warehousing. The question that needs to be asked, therefore, is: "Why not?" It has been found that inventory managers do not fully understand their role in terms of warehouse layout and inventory discipline, and this, consequently, hampers the operational effectiveness of the warehouse. This results in

- non-optimal use of warehouse space
- lack of proper racking systems
- racks and bins not being properly marked
- inventory items being scattered over the floor
- inventory items not being properly marked
- difficulty in identifying inventory items during stock counts
- badly stacked casings, which makes proper stock counts impossible
- difficulty in dealing with obsolete inventory
- an increase in inventory discrepancies
- inventory accuracy becoming an illusion
- poor housekeeping (SAPICS, 2001).

Items such as structural steel sections and plates, heavy steel bars, rails, metal pipes, large iron castings, bricks, concrete products, heavy cables, large electrical insulators and machinery cannot be stored inside a warehouse and must, therefore, be stored outside.

The inventory manager's lack of understanding of how to manage and control the store yard is evident in the following ways:

- Inventory is scattered over a wide area, which makes effective control very difficult.
- Fraud and theft increase, because fencing or other means of enclosure are absent.
- Badly drained surfaces become waterlogged, which causes inventory to deteriorate.
- A lack of proper lighting impedes work in the yard at night.
- There is no differentiation between mechanical, electrical and chemical items.
- Housekeeping is poor (Damelin Group, 2000: 377).

The researcher's interaction with these inventory managers highlighted a common problem. They lack formal stores management education and some are reluctant to enrol for training in this or any other discipline (SAPICS, 2001). As a result, they fail to understand that they are

- central to quality decision making related to warehousing
- responsible for determining the volumes and nature of inventory in the warehouse
- responsible for determining the inventory value in the warehouse
- responsible for security-related measures in the warehouse
- required to give advice on loading bays, as well as on incoming and outgoing goods, marshalling areas, storage racks and bins, heavy goods storage areas, fast and slow-moving stock areas, and material handling equipment (Damelin Group, 2000: 371)

1.2 Symptoms of poor inventory management

According to Hugo, Badenhorst-Weiss and Van Biljon (2004b: 161), the following may indicate that inventory management is poor:

- "An increase in the number of stock-outs" over a period of time.
- "Lack of storage space" due to overstocked situations.
- An "excessive increase in inventory carrying cost compared with previous or budgeted figures".
- An "increase in obsolete inventory" and not dealing with the problem.

1.3 Major research questions

The two major research questions for this dissertation are as follows:

- i What is the impact of ineffective inventory management and control?
- ii What are the critical success factors for effective inventory management and control in competitive manufacturing and production companies in the Saldanha Bay region?

1.4 Inventory and production

Inventory management and control is a critical part of business in a manufacturing environment (ISO 9000 Resources, 2006).

Inventory management and production management work interdependently in achieving production targets. According to the Damelin Group (2000: 396), "production planning relies on inventory being available against a predetermined plan. If inventory is not secure, these plans will need constant reforming with all the losses in output and efficiency that it involves".

Hugo *et al.* (2004b: 136) support this and assert that "sufficient inventory ensures that production is continuous and at an economic level, contributing to a lower manufacturing cost per product unit through efficient use of equipment and labour". It is therefore important that production management inform inventory management in advance of critical future needs.

1.5 Inventory and purchasing

The purchasing section is responsible for placing orders and ensuring that deliveries are made on time. One should use a controlled purchasing process to ensure ordering of the correct parts (ISO 9000 Resources, 2005).

According to the Damelin Group (2000: 24), "purchasing relies on stores for up-todate and accurate usage information" and "actual information on stock usage is very important in ensuring maximum efficiency of the purchasing department". According to Monczka, Trent and Handfield (2002:9), purchasing in relation to inventory is important because "purchasing can realise cost reduction or improvement, improved material delivery, shorter cycle time, access to product and process technology, and quality improvement".

Hugo *et al.* (2004b: 136) argue that "inventory may provide purchasing with a measure of autonomous decision making and remove the purchasing function from other departments". They further argue that inventory "creates the opportunity to plan and execute the purchasing of requirements independently of production and marketing, and synchronise the quantities purchased with suppliers' abilities, production plans and delivery better" (Hugo *et al.*, 2004b: 136).

1.6 Inventory and receiving

It is important that items received from suppliers are correct in terms of description, quantity, specification and quality. Those items not received and captured correctly may result in double handling at a later stage, which may cause production to be adversely affected.

The Damelin Group (2000:96) believes that "efficient control starts with the smooth reception of goods into the store". Proper receiving procedures must be in place to effectively control the receipt of goods and to minimise the business's exposure to risk.

When the receiving department is out of order, so is the rest of the warehouse. The contrary is that when the receiving department is operating at the top of its game, better performance will be noticeable throughout all departments (Exceed Consulting, 2006).

It is essential that inventory control is applied in the receiving area the moment goods are delivered by suppliers (ISO 9000 Resources 2005).

1.7 Inventory and issuing

It is important to issue items from the bin as indicated on the picking slip. According to the Damelin Group (2000: 129), "the 'issuing' function is simply the warehouse's response to user department's requests for items stocked in the warehouse". It states that "such items are issued only against requisitions and issue notes from user departments" and that "it is vital that only authorised personnel use such documents". It further states that "it is vital that nothing is removed from stock without being recorded in the stock records". Some corporations documented the frustration in collecting goods incorrect in quantity and specification from the warehouse (SAPICS, 2001).

All user departments must understand that stock items will only be issued on receipt of a properly authorised picking slip or an authorised handwritten requisition when the computers are off line (SAPICS, 2001). The issuer must ensure that the item code and bin location on the picking slip correspond with the item in the bin he or she issues from. After the items have been issued from the bin, a stock take of that bin must be done and the results compared with the available quantity reflected on the picking slip (SAPICS, 2001). If the quantity in the bin tallies with the picking slip, the issuer may initial the picking slip. Should a discrepancy be found, however, it must be noted on the picking slip and forwarded to the warehouse supervisor for investigation and correction. Items are handed to the recipient, who must sign to acknowledge receipt of the material; he or she must also enter his or her company name and date. The materials issuer must countersign the receipt and enter the date on the picking slip. The issuer must then enter details of the picking slip on the computer on the day of issue and file it for audit purposes (Damelin Group, 2000: 147).

1.8 Inventory classification

The researcher found that in some warehouses all inventory items generally receive equal attention from some inventory managers. This means that inventory items are not classified as "critical", "not so critical" or "inconvenient".

According to the Damelin Group (2000: 295), "inventory can be classified in different categories in terms of the impact it would have on production". Category A items are small in number, but have a high monetary and usage value. The unavailability of

these items when required may have a severe impact on the business, will result in a definite production loss and production is likely to shut down. Category B items are medium in number, and have a medium monetary and usage value. The unavailability of these items when required may cause a minor production loss and may hold a severe risk to total production. Category C items are highest in number, but have a low monetary and usage value; they are basically held for the sake of convenience.

Hugo *et al.* (2004b: 138) argue that "to execute inventory management practically, inventory items should be properly identified and classified". Two significant pillars in this regard are the inventory catalogue and the ABC analysis.

Classification of inventory in different categories is one of the oldest inventory management and control techniques. This method is very applicable to sound inventory control and management (SAPICS, 2001).

1.8.1 The inventory catalogue

It is important to keep an updated printed inventory catalogue in the warehouse. In the event of the computer system being off line, this catalogue will enable warehouse personnel and end users to obtain the correct materials from the warehouse.

According to Hugo *et al.* (2004b: 138), the inventory catalogue serves the following purposes: "It serves as a source of information on inventory items held in the store and is an important communication medium between various departments; it facilitates the selection of suitable parts or materials." They further state that "the inventory catalogue serves as an aid when selecting substitute parts and it facilitates control over inventory by reducing duplicate records for the same inventory" Hugo *et al.* (2004b: 138).

Essential to the inventory catalogue is the incorporating of item part numbers as a means of reference (ISO 9000 Resources, 2005).

1.8.2 ABC analysis

ABC analysis is a tool available to the inventory manager to simplify the management of different materials in the warehouse.

Hugo *et al.* (2004b: 139) state as follows: "Class A inventory items represent about 10% of the total number of items, but about 70% of the rand demand; Class B inventory items represent about 40% of the total number of items, but about 20% of the rand demand; while Class C inventory items include a full 50% of all items, but represent only 10% of the rand demand."

The methodology behind the ABC analysis is to count Class A inventory once per month, Class B inventory every three months and Class C inventory twice per annum (SAPICS, 2001).

1.9 Inventory accounting

Consistent counting of inventory is essential if the inventory manager is to have peace of mind and ensure absolute inventory integrity.

The Damelin Group (2000: 199) explains that "adequate inventory accounts are necessary for a variety of reasons of which the following are the most important: to indicate the value of stores in stock; to provide the basis for material costing; and to provide the means of operating stock control by value." It is important to make provision for obsolescence accounts, redundant accounts, and for surplus and loss accounts.

1.10 Inventory accuracy

Inventory accuracy is a goal every warehouse can strive for and achieve (Exceed Consulting, 2006).

The traditional approach to counting inventory in the warehouse once or twice a year has two primary disadvantages. Firstly, the computer may show an item as being available, but it cannot be found in the warehouse. Secondly, a wrong item may have been received and binned. This will most probably only be discovered when the item is needed for use in a critical part of the plant, such as when a 300kW motor is needed instead of a 400kW motor.

The Damelin Group (2000: 318) defines stocktaking as "the activity of physically counting materials". According Piasecki (2005), "one should count one's inventory on a continuous basis (cycle counting) to maintain high levels of accuracy". He

believes that "year-end physical inventories are tools used by accountants and do very little for inventory accuracy". According to him, one should always be counting to optimise the company's operations and achieve high levels of customer service.

The first step on the road to inventory accuracy is a proper assessment of the warehouse (SAPICS 2001).

The following could be regarded basic principles for inventory accuracy:

1.10.1 Attitude

Attitude is a determining factor when assessing good and bad inventory management practices. Even if one has perfectly trained people and perfectly designed product, one must have the correct parts at the right time to build or ship products (ISO 9000 Resources, 2005).

Piasecki (2005) believes that "maintaining inventory accuracy must be an integral part of the attitude of the organization. Like quality, customer service, and plant safety, accuracy must be promoted throughout the organization as everyone's responsibility. This attitude must start at the top levels".

1.10.2 Process definition

The processes within the organisation which affect inventory must be clearly defined. "While defining the processes one should be looking for errors and implementing changes to eliminate or reduce them" (Piasecki, 2005). Piasecki believes that "even the most accurate employee will make errors" and suggests that one should "get as many people involved in this step to ensure everyone has a complete and accurate understanding of the processes".

Inventory management is the process one must follow to ensure the business is keeping correct stock at all times (Small Business Mentoring Services Inc., 2005).

1.10.3 Procedure documentation

It is essential to have proper policies and procedures in place if one wishes to manage and control one's inventory. Piasecki (2005) asserts that process documentation is the "part where one would use the previously defined processes to document the procedures the employees will follow to maintain inventory integrity". He further states that "the procedures documented here should not be limited to inventory issues; they should be the complete procedure including quality, physical aspects, and safety. This documentation should be as clear and comprehensive as possible. It should be written for a specific task within a specific job responsibility. It should include everything the employee needs to know to complete the task and nothing else" (Piasecki, 2005).

If the procedure documentation process is not carried out, it is impossible to set the baseline for the implementation of inventory accuracy (SAPICS, 2001).

1.10.4 Employee training

A well-trained employee is always an asset in the inventory department. Piasecki (2005) emphasises the importance of setting a training schedule for employees to work through the procedures. He says that "enough time should be taken to ensure employees understand that the procedure document is the *only way* to perform the task" (Piasecki, 2005).

In some manufacturing warehouses, the most inexperienced, uneducated and untrained personnel are put in charge of probably the most valuable asset, namely inventory (SAPICS, 2001).

1.10.5 Monitoring processes for compliance

Employees in the inventory department should know how they are performing. The essence of the monitoring process should be to ensure inventory record accuracy (SAPICS, 2001).

Employees should receive regular feedback from their employer and should, therefore, know whether or not they are performing to standard. According to Piasecki, one "must begin to monitor the processes for compliance to the procedures immediately. Any actions observed which do not comply with the written procedures must be addressed immediately with the employees involved" (Piasecki, 2005). He warns, however, that to allow employees to "do it their own way" (even if their way is a better way) "will make it impossible to enforce compliance on other issues and also creates problems when changes are made to processes. If they have a better way, consider it for the next revision at which point it would then become 'the only way'" (Piasecki, 2005).

1.10.6 Setting standards

The researcher found that some inventory managers set up a programme merely to meet a corporate requirement of counting inventory at certain times during the year. This approach, however, is unlikely to result in effective count programmes.

According to Piasecki (2005), inventory management should set "minimum inventory accuracy standards wherever feasible". He encourages the inventory manager to "do research to ensure the standards set are high enough and yet still achievable". He believes that these standards are important and it is thus "critical to set them correctly" (Piasecki, 2005).

The main reason for the warehouse's existence is to provide customer service to various departments or external customers. A standard should be implemented to determine service levels to these customers (SAPICS, 2001).

1.10.7 Tracking accuracy

Accuracy tracking is a measuring tool and employees should know how their output affects the business. Piasecki recommends that "accuracy tracking should always be measured as a percentage of total transactions". He says, "accuracy tracking should be communicated to staff in a positive manner as it is a tool to facilitate improvement in processes and people" (Piasecki, 2005).

The most important aspect of cycle counting is that the process is carried out to identify system and procedure errors that inventory inaccuracies. Counting must be done regularly (SAPICS, 2001).

1.10.8 Accountability

Employees in the inventory department should be held responsible and accountable for inventory losses.

Piasecki (2005) stresses that "people must be held accountable for following documented procedures". He strongly suggests that "if someone is not following the procedures, they must be dealt with appropriate disciplinary action". He further states that one would "be amazed as to how much just one individual not following procedure can screw up your inventory". He says that "if you don't hold the employees accountable you may as well throw out everything you have done to this point. Mistakes are mistakes and everyone makes them, however not following a specified procedure is a conscious decision made by the employee to not do what he/she was instructed to do" (Piasecki, 2005).

A general problem experienced in some warehouses is that no access control measures are set up. Employees are allowed to wander inside the warehouse unaccompanied and help themselves to whatever they require. Inventory will never become accurate if such situation is allowed to continue. The inventory manager and staff should be held accountable for inventory losses (SAPICS, 2001).

1.10.9 Counting

Counting is required to ensure the availability of material and improve stock accuracy in a warehouse.

Certain key raw materials, such as fuels and liquid acids in tanks, bulk reagents and cement in silos are highly prone to variances. These variances are caused by the natural composition of these materials. These raw materials are critical to production processes and may need to be counted or measured every week (or day). Some very slow-moving finished inventory may only need to be counted once a year. An important element here is consistency.

A sure requirement for accurate counting is good housekeeping, correct item identification and marked bin locations (SAPICS 2001).

The inventory manager needs to carry out weekly random checks on popular high value items. This is to ensure goods not on the shelves have indeed been issued on an authorised picking slip (Small Business Mentoring Services Inc., 2005).

A typical example of a count programme is as follows:

- The stock controller and a warehouse assistant should be responsible for the counting and reconciliation of stock.
- The stock controller should prepare stock count sheets on a daily basis, following a daily count programme. The stock controller should count all items at least twice per annum and fast-moving items at least four times per annum. This applies to a warehouse housing approximately 6 000 items.
- The warehouse assistant should ensure that the correct stock is in the bin being counted and that the bin location is correct. Item part, model numbers and item descriptions must be compared to those on the count sheet. If this information is not correct, the warehouse assistant must rectify it.
- Immediately after counting, the physical stock balance should be compared to the computer balance on the computer stock system.
- The stock controller should do a full reconciliation of all items which do not balance and ensure that correct adjustments are made.
- Shortages normally stem from breakages, pilferage, and receiving and issuing errors, and should be investigated and corrected after a full investigation.
- Reconciliation should take the form of a physical stock count; issues not yet issued less receipts not yet captured must equal quantity on hand on the computer system.
- All adjustments should be authorised by the inventory manager before being captured on the system.
- Stock count sheets should be completed on the day on which the cycle count starts.
- All documentation related to stock counting, that is, count sheets, reconciliation sheets and stock adjustment reports, should be handed to the inventory manager for auditing purposes. The reasons for any adjustments should be written on the stock count sheets.

• All parties concerned should sign the stock count summary sheet, which should then be filed for future audit purpose.

According to Piasecki (2005), "this is one of the best ways of identifying problem areas on a timely basis and providing an environment conducive to continuous improvement".

1.11 Inventory control techniques

Economic order quantities will now be discussed using the Damelin Group (2000) and Coyle, Bardi and Langley (1996) as the primary sources. According to the Damelin Group (2000: 272), economic order quantity can be defined as "the size of an order that minimises the cost of acquiring and holding an inventory item". The Damelin Group (2000: 272) defines the ABC analysis as that "20% of the firm's customers or products [which] account for 80% of sales". The researcher found that a great number of inventory managers do not arrive at economic ordering quantities in a scientific way; rather, they use subjective reasoning to determine the required quantities. It remains the responsibility of the inventory manager to perform and to update these calculations unless the firm has a programme which assists in inventory control (i.e., by automatically calculating and updating re-order points and re-order quantities).

The economic ordering quantity is best illustrated best by Coyle et al. (1996:200):

V = R100 per unit

W = 25%

- S = R25 per unit per annum
- A = R200 per order
- R = 3600 units per annum

To solve Q, the example proceeds as follows:

EOQ =
$$\sqrt{\frac{2RA}{VW}}$$

EOQ = $\sqrt{\frac{(2)(3600)(R200)}{(R100)(25\%)}}$
EOQ = 240 units would be the most economical quantity to order per time.

1.12 Inventory maintenance

If inventory is not maintained in the correct manner, deterioration will set in.

1.12.1 Warehouse security

Inventory must be properly protected against unauthorised people. The Damelin Group (2000:396) believes that "warehouse security is vital for several reasons, all of which reflect both inventory value and its operational role within the organisation". It stresses that "inventory records as a means of control becomes meaningless if inventory is lost and not recorded". They also stress that "inventory control of any sort becomes impossible unless inventory records data is accurate, that production planning relies on inventory being available, and that inventory is representing a major part of the organisation's money" (Damelin Group, 2000: 396).

The inventory control process and protection to such inventory covers all inventory from the point of entering the warehouse until it leaves the warehouse (ISO 9000 Resources, 2005).

1.12.2 Custody of keys

It is important to apply effective access control measures in areas where inventory is stored. The Damelin Group (2000: 398) believes that "the stores or warehouse manager is responsible for all keys and locks in use within the warehouse". It further stresses that "all keys be numbered, individual members of the store be made responsible for certain keys and be held responsible for stock losses" (Damelin Group, 2000: 396).

Employees found inside the warehouse without the necessary permission is just as serious an offence as smoking in a dynamite factory (SAPICS, 2001).

1.12.3 Effective marking of inventory

A prerequisite for inventory control is the clear marking of items. The Damelin Group (2000: 400) argues that the clear marking of inventory "discourages theft as marked stock cannot easily be sold" and that "it ensures that if stolen inventory is discovered by police or other agencies, they will know whom the goods belong to".

When inventory is delivered to the warehouse, it must be accompanied with a delivery document. The delivery document should specify the number of units delivered, and the prices charged (Small Business Mentoring Services Inc., 2005).

The receiving clerk should endorse a unique item control number on the item or quote the purchase order number on the item. It is important that every item in store is marked with the company item number. Without this positive identification, mistakes can easily be made when picking, counting, binning, etc. (SAPICS, 2001).

1.12.4 Fire precautions

Smoking should be forbidden in warehouses. According to the Damelin Group (2000:401), "no-smoking signs must be clearly displayed in all parts of the store" and "fire-fighting equipment be placed in strategic positions throughout the store".

1.12.5 Prevention of inventory deterioration

Inventory management is responsible for ensuring that "storage installations are clean and damp free and that regular inspections are carried out on all doors, windows, ventilators, etc. for signs of leakage" (Damelin Group, 2000: 407).

1.13 Rationale and significance of the research

This research looks at shortcomings in inventory management practices, that is, shortcomings related to policies and procedures for ordering, receiving, issuing, storing, holding and maintaining stock. In cases where such policies and procedures are in place, the research determines the effectiveness thereof, as well as the level of compliance in the application of these guidelines. The value of this research is its significant theoretical and practical contribution to the field of inventory management and control.

1.14 Statement of the problem

The researcher found that few materials and inventory managers have a holistic understanding of inventory management and control. There is a tendency to accept incorrect inventory, in terms of quantity and items, and to issue inventory incorrectly. High levels of discrepancy are also common during stock counts, as well as numerous overstocking, understocking and stock-out situations. Numerous manuals have been written on the topic of inventory management and control, but few include any meaningful and/or practical ideas for inventory managers which will enable them to manage their inventories more effectively. Many materials and inventory managers also appear to be resistant to new ideas which may bring about much needed improvements.

For companies carrying inventory, inventory-holding costs and other inventoryrelated costs are, next to capital investment, the second largest investment these companies are burdened with. Many inventory managers do not understand how to balance inventory cost reduction and optimal customer service levels. The onus is, however, on inventory managers to add value to their companies through effective management, as this will ensure sound competitiveness.

According to Coyle *et al.* (1996: 158), "the entire effective and efficient management of inventory is critical to the satisfactory performance of the entire business logistics function".

A very traditional and outdated approach used by materials and inventory managers in South African manufacturing companies is the keeping of "just-in-case" inventories. Many have not shifted to and are reluctant to embrace the "just-in-time" approach.

Inventory, especially in manufacturing and production companies, is carried for a number of reasons. The main reason is that operational risks require the holding of inventory to guard against breakdown and production losses. Secondary to this is that delivery cannot be exactly matched to daily usage. According to Hugo *et al.* (2004b: 136), "sufficient inventory ensures that production is continuous and at an economic level".

Sound business practices require businesses to plan ahead in terms of production and manufacturing outputs. A business's operations plan gives an indication of what the business intends doing and the agreed upon timeframes by which these intentions will be fulfilled. The plan should incorporate maintenance schedules by mechanical, instrumentation, electrical and other supporting disciplines. Scheduled production and maintenance timeframes should be timeously communicated to the parties concerned. Production management should acknowledge and inform inventory management accordingly. An interesting observation is that some inventory managers generalise their inventories and apply the same business rules to different types of inventories. Many inventory managers follow a subjective approach with regard to re-order points (ROP) and re-order quantities (ROQ), and this results in overstock, understock and stock-out situations. The main objectives, that is, customer service, inventory investment and operating efficiency are thus jeopardised.

There is a need to research this phenomenon and determine the root causes of ineffective inventory management.

1.15 Concluding remarks

This chapter provided an introduction to the research. The background to the problem, the major research questions, the rationale and significance of the problem, and the statement of the problem were discussed. The focus of the research was explained and the problem of inventory management inadequacy was highlighted. An account was also given of the adverse effect thereof on sound inventory management.

The rationale or significance of the problem will determine deviation from and compliance with standard operating procedures and policies. Major research questions cover the impact of ineffective inventory management and control as well as critical success factors for manufacturing operations in the Saldanha Bay region. A review of the literature will be provided in chapter two.

CHAPTER TWO REVIEW OF THE LITERATURE

2.1 Introduction

Chapter two presents the literature related to inventory management and control. The review will focus on common shortcomings which support the rationale for the research. The review will focus on the literature which is almost identical to the research; it will include an overview of the literature's strengths and weaknesses, and will look at how their findings might be incorporated into or improved upon in the research. The review will be critical and will have bearing on the major constructs of the study.

2.2 Physical counting of inventories

Coyle *et al.* (1996) overlook a very important aspect of inventory management and control, namely, the physical counting of inventories. This can be regarded as a shortcoming. A prerequisite for effective inventory management is the physical counting of inventories. This ensures that physical inventories correspond with availability as indicated by the bin card or computer. It will also ensure management that stock items needed for operational requirements are indeed available.

The Damelin Group (2000: 323) summarises the reasons for physical stocktaking, namely, "to verify the accuracy of inventory records, to reveal any weakness in the system for control of inventory, to provide physical verification of the value of inventory shown in the balance sheet of the company, and to disclose any fraudulent actions, theft or loss". It states that "the number of surpluses and shortages, as revealed by the stocktaking, is usually a good indication of the efficiency of the storekeeping methods and systems used by the company" (Damelin Group, 2000: 323). It further states that "accurate and timely stocktaking promotes confidence in both management and staff that inventory is well managed and that everything concerning materials are under control" (Damelin Group, 2000: 323). These reasons given by Damelin significantly contribute to the sound management of inventories.

According to Piasecki (2005), "counting inventories on a regular basis throughout the year (cycle counting), combined with a process for continuous improvement in inventory accuracy, is the best methodology for achieving accurate inventories". He

goes on to say that "one should be counting to optimize one's business operations and achieve high levels of customer service". Piasecki believes that "certain key raw materials critical to one's operation that are highly prone to variances, or variation in manufacturing processes, may need to be counted every week (or day), while some very slow-moving finished goods may only need to be counted once a year". He recommends that "one should get hung up on consistency" and that "one should spend time to develop methods for tracking accuracy to meet current and future needs". Piasecki is very exact in his approach to sound inventory management and emphasises a number of key elements.

McNaught (2000) makes no mention of inventory counting. This can be regarded as a definite shortcoming in the publication.

Burt, Dobler and Starling (2003), do not refer to the counting of inventory. The publication does not contribute to the literature on inventory counting. Inventory is a key element in the supply chain.

Monczka *et al.* (2002) do not address the physical counting of inventory and do not, therefore, contribute to the effective control of inventories.

Hugo *et al.* (2004b) do not address inventory counting. This is a shortcoming in the publication.

Inventory counting is also overlooked in *Practical inventory control* by Higgs (2001). This should be regarded as a weakness.

SAPICS (2001) contributes to inventory accounting by documenting that the counting procedures at some warehouses just focus on correcting on hand balances. Reasons for stock inaccuracies are not investigated.

Inventory counting must be addressed if one is to deal with inventory management in its practical totality.

2.3 Issuing of inventories

Coyle *et al.* (1996) do not address the issuing aspect of inventories in totality. The issuing of inventories from a warehouse in a production and manufacturing environment is a key element. There are elementary aspects of issuing which are not addressed in the publication. If the issuing of inventories in a warehouse is not governed by specific procedures, it creates opportunities for discrepancies, for items to be over issued, for items to be short issued or for the incorrect items to be issued. These authors, furthermore, do not mention the counting of the quantity in the bin after the issue has occurred to ensure that physical quantity corresponds with the quantity indicated on the bin card or computer-generated issue requisition. This omission by Coyle *et al.* (1996) should be regarded as a weakness.

The Damelin Group (2000:129) argues that "the stock held by the store represents the organisation's money and resources, that control of its issue is vital to avoid unnecessary financial losses, and that authorisation is the basic principle behind the control of stock". A great number of materials and warehouse managers do not seem to understand these basic concepts related to inventory management.

It is important that a procedure be established to determine which people in an organisation have permission to authorise stock issue requisitions. These authorisation documents must be included in the stores issuing procedure and displayed at the point of issue. It must also be available to all user departments within the organisation.

The warehouse manager and staff must be held responsible for any discrepancies that may occur, irrespective of the documentation that is used to issue stock from the warehouse. The Damelin Group (2000) stresses that controls must be in place to avoid financial losses and that the inventory represents the organisation's money. These aspects should be regarded as strengths in the quest for effective and efficient inventory management.

McNaught (2000) does not address the issuing of inventory from the warehouse and this should be viewed as a shortcoming in the quest for effective inventory control and management.

Burt *et al.* (2003), Monczka *et al.* (2002) and Hugo *et al.* (2004b) do not discuss the issuing of inventory. Their publications do not contribute to the aspect of inventory issuing and should thus be viewed as a shortcoming in the quest for effective inventory control and management.

SAPICS (2001) meaningful contributes to the issuing aspect by emphasising the importance of correct issues from the warehouse.

The aspect of issuing from the warehouse is also overlooked by Higgs (2001). This should be regarded as a weakness.

2.4 Receiving of inventories

Coyle *et al.* (1996) address the receiving of inventories in their chapter entitled "Inventory in the logistics system", but do not address the receiving of inventories or stock from suppliers into the warehouse. To inventory management, this is viewed as a shortcoming in the effective management of receiving of stock from suppliers into the warehouse.

McNaught (2000) does not discuss the receiving aspect of inventory management and this too should be viewed as a shortcoming in the area of the effective receiving of inventory from suppliers into the warehouse.

The Damelin Group (2000:96) admits that "efficient control starts with the smooth reception of goods into the store". They furthermore state that "deliveries must be checked immediately since it is vitally important to notify suppliers immediately of any short quantities, mistakes or damage to the goods". A key area to take note of is the fact that "the primary objective in receiving procedures is to ensure that goods are received in the right quantity, the right quality, at the right time, at the right place, at the correct price from the right supplier" (Damelin Group, 2000:96).

The receiving aspect of stock from suppliers into the warehouse and the return of stock from end users to the warehouse is overlooked by Higgs (2001). This is a definite weakness, because just as with issuing and stock counting, receiving is a practical and fundamental component of inventory management.

Burt *et al.* (2003), Monczka *et al.* (2002), Hugo *et al.* (2004b) and Higgs (2001) do not address the receiving of inventory. Their publications do not contribute to the area of inventory receiving.

Exceed Consulting (2006) states that if the receiving department is out of order the rest of the warehouse will also be out of order.

ISO 9000 Resources (2005) mention that incoming inspection, in-process testing and conformance checks should be performed at the receiving department. This is supportive to effective inventory management and control.

2.5 Classification of inventories

A sound inventory management approach will manage different inventory items differently and will not apply the same business rule to all inventories.

Coyle *et al.* (1996) state that "multiple product lines and inventory control require companies to focus upon more important inventory items and utilize more sophisticated and effective approaches to inventory management". They further assert that "inventory classification is usually the first step toward efficient inventory management". In documenting these aspects, Coyle *et al.* (1996) contribute significantly to enabling inventory managers in the area of effective inventory management.

In any manufacturing and production organisation, inventories range from very important and expensive items to not so expensive and/or less important items. A wide range of these items is insignificant from a financial point of view. According to the Damelin Group (2000:294), items are classified into the following three categories: "Category 'A' items, small in number, high in usage value --- the vital few from a production and financial point of view; Category 'B' items, medium in number, medium usage value --- normal item; and Category 'C' items, high in number, low usage value --- the trivial many".

The Damelin Group (2000) highlights an important aspect in the ABC classification, namely, the categorisation of different classes of inventory. It therefore contributes significantly to an improved understanding of inventory management.

According to Piasecki (2005), ABC stratification or classification is the "method used to categorize inventory into groups based upon certain activity characteristics". He explains that "examples of ABC stratifications would include ABC by velocity (times sold), ABC by sales dollars, ABC by quantity sold/consumed, ABC by average inventory investment, ABC by margin. ABC stratifications are used to develop inventory-planning policies, set count frequencies for cycle counting, slot inventory for optimised order picking, and other inventory management activities".

Piasecki (2005) reveals a direct and experienced understanding of ABC classification. His contribution should enable inventory managers to optimise their inventory management knowledge and skill.

According to McNaught (2000:14), "there are many different classes of items in a corporate inventory" and "each needs to be identified and managed according to its characteristics".

Higgs (2001:10) believes that "the question 'WHAT do we control?' must be dictated by company policy" and "it is not unusual that company policy covering which spare parts, consumables, etc. should be stocked and how they should be managed, does not exist". Higgs furthermore states that resources should be classified as follows: "A --- Most attention, B --- Average attention, C --- Least attention" (Higgs, 2001:10). He also gives guidelines on how to classify items, namely, by means of high unit cost, long purchasing lead-times, low annual usage, predictable and regular use, unpredictable usage but high volumes, high plant stopper potential and low cost.

Hugo *et al.* (2004b:138) believe that "to execute inventory management practically, inventory items should be properly identified and classified". Hugo *et al.* (2004:139) state as follows: "Class A inventory items represent about 10% of the total number of items, but about 70% of the rand demand; Class B inventory items represent about 40% of the total number of items, but about 20% of the rand demand; while Class C inventory items include a full 50% of all items, but represent only 10% of the rand demand." Hugo *et al.* (2004b) thus contribute meaningful to the classification of inventories.

Burt *et al.* (2003) and Monczka *et al.* (2002) do not mention anything about the classification of inventory. They do not, therefore, contribute to the area of inventory classification.

SAPICS (2001), states the ABC analysis as one of the oldest inventory management techniques. This method has proved to be very useful in sound inventory control practices.

2.6 Storing of inventories

Coyle *et al.* (1996) do not deal with the aspect of storing or warehousing of inventories. This can be regarded as a shortcoming.

The Damelin Group (2000:442) states that "floor load capacity should be checked". It advises against stacking against walls and recommends that loads be spread evenly. It furthermore advises that "care should be taken when handling flammable or corrosive materials, gasses, and fluids, and that these items should be stored in a special building or container". It contributes significantly to sound inventory management practices by providing advice on different storage locations for different types of inventory.

McNaught (2000:12) believes that "items should not lie around in workshops and somewhere else on site as such items could get lost". He does not elaborate on actual storage methods.

Burt *et al.* (2003), Hugo *et al.* (2004b), Monczka *et al.* (2002), Higgs (2001) and Piasecki (2005) do not address the issue of storing of inventory.

2.7 Inventory holding

Coyle *et al.* (1996), the Damelin Group (2000) and Piasecki (2005) do not discuss the aspect of inventory holding and, as such, do not contribute practically to the area of inventory holding.

McNaught (2000: 11) states that "an item could have a high usage history" and "it is frequently more economical to have items readily available on site rather than have staff ordering and obtaining items as they need them. Examples are stationery, safety gloves, etc". Items may have a high business impact "and are held in stock for use when an important item on site fails" (McNaught, 2000: 11). Some items have a long lead-time and "take a long period of time before they are delivered" (McNaught, 2000: 12). An example is a 400kW electrical motor in a very critical section of the plant.

Higgs (2001) does not provide reasons why inventory should be held in stock.

Burt *et al.* (2003), Monczka *et al.* (2002) and Hugo *et al.* (2004b) do not discuss the storing of inventory. They do not, therefore, contribute to the area of inventory holding.

Exceed Consulting (2006) does not contribute to the aspect of inventory holding. SAPICS (2001) recommends that inventory holding must be based on the first-in-first-out principle.

Small Business Mentoring Services Inc. (2005) contributes by documenting that the secret of good inventory management is to know how much of an item to keep in stock.

2.8 Inventory yards

Coyle *et al.* (1996) do not contribute to the literature on inventory yards; this should be viewed as a shortcoming, as inventory yards are sometimes used in large operations to store otherwise bulky stock.

The Damelin Group (2000:377) states that items normally kept in stockyards are "structural steel sections and plates, heavy steel bars, rails, metal pipes, earthenware pipes and fittings, timber, bricks, heavy cables, large electrical insulators, outdoor plant machinery, coal and coke".

Burt *et al.* (2003), Higgs (2001), Hugo *et al.* (2004b), McNaught (2000), Monczka *et al.* (2002) and Piasecki (2005) do not address the aspect of inventory yards for storage purposes.

Neither Exceed Consulting (2006) nor ISO 9000 Resources (2005) contribute to the aspect of inventory yards.

SAPICS (2001) contributes to the aspect of inventory yards by advising that good inventory layout goes hand in-hand with good housekeeping and good location control.
Small Business Mentoring Services Inc. (2005) does not contribute to the aspect of inventory yards.

2.9 Inventory maintenance

Coyle et al. (1996) do not contribute to the literature on inventory maintenance.

The Damelin Group (2000:398-407) states that "the stores and warehouse manager has a direct responsibility for inventory in terms of security, control of entry into stores, marking of inventory, fire precautions and safeguarding inventory against deterioration". It does not, however, address the aspect of inventory maintenance.

Neither Exceed Consulting (2006) nor SAPICS (2001) contribute to the aspect of inventory maintenance. Small Business Mentoring Services Inc. (2005) does not contribute to the aspect of inventory maintenance either.

2.10 Safety practices in the warehouse

Coyle *et al.* (1996) do not discuss safety practices in the warehouse in terms of inventory management.

The Damelin Group (2000: 441) states that "all employees are reminded in terms of the Occupational Health and Safety Act of 1993 to take reasonable care for the health and safety of oneself and other persons who may be affected by one's acts or omissions". It also gives guidelines in terms of material handling safety, safe storage practices, warehouse discipline, fire precautions, protective clothing, health and first aid. Damelin makes a significant contribution to safety practices in the warehouse.

Piasecki (2005) makes mention of the Occupational Health and Safety Act (Act 85 of 1993) in terms of inventory management. He contributes meaningfully to safer practices in the inventory management environment.

Burt *et al.* (2003), Hugo *et al.* (2004b), McNaught (2000), Higgs (2001) and Monczka *et al.* (2002) do not address safety practices in the warehouse. This leaves a shortcoming in one of the fundamental aspects in the safe management of inventory.

Exceed Consulting (2006) does not contribute to the aspect of safety practices in the warehouse.

ISO 9000 Resources (2005) does not contribute to the aspect of safety practices in the warehouse.

SAPICS (2001) contributes to the aspect of inventory safety practices in the warehouse by documenting that warehouse procedures should take safety into account.

Small Business Mentoring Services Inc. (2005) does not contribute to the aspect of inventory yards.

2.11 Concluding remarks

This chapter served to present the literature relevant to inventory management and control. The chapter provided a review of the literature. It must be noted that the different authors focused on different aspects of inventory management and control.

Headings covered in the review were physical counting of inventories, issuing of inventories, receiving of inventories, classification of inventories, storing of inventories, inventory yards, inventory maintenance and safety practices in the warehouse.

Chapter three will include a discussion of the research methodology applied during the research.

CHAPTER THREE RESEARCH METHODOLOGY

3.1 Introduction

Chapter three, in essence, discusses the research methodology applied during the research. A structured, methodological approach in the form of a detailed interview was followed. Production and manufacturing sites in the Saldanha Bay area were physically visited. Subjects in the discipline of inventory management were interviewed about different aspects of inventory management and control. End users of the different sites were also interviewed to determine their views of the service rendered to them by their respective inventory managers.

3.2 Research plan and design

The research was qualitative in nature, meaning "its departure point is the insider perspective on social action" (Babbie & Mouton, 2001: 53). According to Babbie and Mouton (2001: 53), "the goal of the research is defined as describing and understanding". They believe that "the emphasis, therefore, is on methods of observation and analysis that stay close to the research subject".

Appointments were made with the general managers and inventory managers of manufacturing and production sites in the Saldanha Bay region. The research itinerary and a letter of recommendation from the researcher's supervisor, in the name of the Cape Peninsula University of Technology, were faxed or e-mailed to the relevant managers at the following production and manufacturing sites:

- Saldanha Steel
- Namakwa Sands
- Duferco Steel Processing
- South African Port Operations
- Sea Harvest
- St Helena Bay Fishing

The research was conducted in the following manner: Procedures relating to operational inventory aspects were viewed, and the inventory storage areas and physical store and store yard layout were assessed.

The following sites were visited:

- Duferco Steel, 1 September 2006, 13h00
- South African Port Operations, 6 September 2006, 13h00
- Namakwa Sands, 8 September 2006, 10h00

The research is also descriptive as it was aimed at reporting the phenomenon under study.

3.3 Research methodology and procedure

The research methodology and procedure covered the basic elements of inventory management and control. It gave the researcher comprehensive insight into any deviations from and compliance with procedures for effective inventory management. The research questions were structured as follows:

3.3.1 Issuing procedure

- a. Does the issuing department have an issuing procedure in place and, if so, do members comply with the procedure?
- b. Is the issuing procedure relevant to the physical execution of the issuing process?
- c. Does the procedure cover all the operational aspects of the issuing process?

3.3.2 Receiving procedure

- a. Does the receiving department have a receiving procedure in place and, if so, do members comply with the procedure?
- b. Is the receiving procedure relevant to the physical execution of the receiving process?
- c. Does the procedure cover all the operational aspects of the receiving process?

3.3.3 Stock counting procedure

a. Does the inventory department have a stock counting procedure in place and, if so, do members comply with the procedure?

- b. Is the stock counting procedure relevant to the physical execution of the physical counting process?
- c. Does the procedure cover all the operational aspects of the physical counting process?
- d. Does the counting procedure accommodate fast and slow-moving item intervals?
- 3.3.4 Redundant/obsolete stock procedure
- a. Does the inventory department have a stock counting procedure in place and, if so, do members comply with the procedure?
- b. Is the obsolete procedure relevant to the physical execution of the obsolete/redundant process?
- c. Does the procedure cover all the operational aspects of the obsolete/redundant process?
- 3.3.5 Viewing of the store in terms of store, row, rack and bin layout
- a. Is (are) the store(s) numbered?
- b. Does the layout follow the universal store, row, rack and bin principle?
- c. Is the bin layout logical in terms of starting at a point and then numerically and chronologically ending at a point?
- d. What is the impression of the store?
- 3.3.6 Optimisation of the store
- a. Are fast-moving items placed close to the point of issue within the store?
- b. Are slow-moving items placed furthest from the point of issue?
- 3.3.7 Re-order point and re-order quantity systems
- a. Does this system exist?
- b. Is it optimally managed?

3.3.8 ABC analysis

- a. Does the site make use of a system to differentiate between the most important and not so important items?
- 3.3.9 Access control
- a. Is access control exercised?
- 3.3.10 Optimisation of the store yard

3.4 Research population

The research population comprised employees in the inventory discipline. End users who deal directly with the inventory discipline were also approached and interviewed. This was to determine their views of the service rendered to them by the inventory discipline. The research entailed the measuring of inventory management and control practices on production and manufacturing sites in the Saldanha Bay region. The research population comprised 61 members.

3.5 Research sample

The sampling frame consisted of actual inventory management and control practices governing warehouses at production and manufacturing sites in the Saldanha Bay region.

3.6 Sampling technique

Probability sampling was an appropriate sampling technique to use, as it is not based on chance but "remains the primary method for selecting representative samples for social science research" (Babbie & Mouton, 2001: 166).

3.7 Sample size and representivity

The sampling frame consisted of warehouses in three manufacturing and production sites in Saldanha Bay. The phenomenon under study was the inventory management and control discipline in these warehouses. It was representative of the elementary aspects of inventory management and control in the inventory discipline. The results were based on a representative sample of 36 employees in the inventory discipline and 25 end users on site dealing directly with the inventory discipline. One-on-one interviews took place during September 2006.

3.8 Research instruments

The measuring instrument was a detailed interview that had bearing on the management and control of inventory.

3.9 Design and development of instruments

The aim was to structure the interview logically so that it was uncluttered. The target group were interviewed in their mother tongue. The researcher was from the same area, so there was no geographical difference. The researcher was familiar with the interview questions. The study did not suffer and no unfair burden was placed on respondents.

3.10 Validity and reliability of instruments

According to Babbie and Mouton (2001: 125), "validity refers to the extent to which a specific measurement provides data that relates to commonly accepted meanings of a particular concept". In the case of inventory management and control, the instrument, that is, the detailed interview was valid.

According to Babbie and Mouton (2001: 125), "reliability refers to the likelihood that a given measurement procedure will yield the same description of a given phenomenon if that measurement is repeated". Reliability in this research in terms of the questions relating to inventory management and control is reliable, although the results will not always be the same. The interview questions could, in the broader sense of inventory management and control, be utilised for effective management and control, as they are specific in the quest for sound inventory management.

3.11 Research procedure

Data was physically collected on site by means of participant observation and sighting of standard operating procedures. The researcher first determined whether or not procedures for the different segments of inventory control and management were in place. Once these procedures were in place, compliance with or deviation from the procedures was determined. The researcher did that by requesting, for example, the issuing personnel to do a physical issue from the bin whereupon he verified the steps according to the prescribed procedure. When the procedure was followed in the correct sequence, the researcher ticked the points followed as being correct. In cases where a point was omitted, the researcher made a note of it. In cases where the issuer did something in the issuing process that was relevant to the physical issue, but was not noted as part of the procedure, the researcher made a note of it. The validity of this point was discussed and if it was found to be applicable to the issuing process, incorporation into the issuing procedure was recommended.

The probability that some of the managers of the production sites would not allow research to be undertaken in their inventory stores could not be excluded. This limited the research, as maximum representivity could not be enjoyed. This was regarded as a constraint on the inventory communities at these sites, because they did not form part of this "knowledge sharing" and benchmarking exercise.

3.12 Brief outline of data analysis procedure

The data analysis procedure followed the outline hereunder:

- Identifying of the research question
- Choosing of samples for analysis
- Determining the type of analysis
- Determining the relationships
- Interpretation of deviations from and compliance with procedures

The researcher chose to analyse the data using a qualitative approach, because it allowed him to participate in the research setting. He could present the data in words, unlike quantitative analysis that requires the data to be presented in numbers. Qualitative analysis allows small samples to be used during the research, while quantitative analysis requires larger samples. A characteristic of qualitative analysis is that reliability is low and validity is high.

3.13 Concluding remarks

Chapter three discussed the research methodology applied during the research. A structured and methodological approach in the form of a detailed questionnaire was followed. Procedures in terms of inventory operational aspects were viewed. The physical store layout was sighted, as were the physical store, store yard layout and inventory storage. A layout of the interview procedure was given. Research sampling, population and sampling technique were addressed. The research design and development of instruments, the research procedure, and the validity and reliability of instruments were discussed and elaborated upon. Data analysis was briefly explained and is dealt with in the following chapter.

CHAPTER FOUR DATA ANALYSIS AND RESULTS

4.1 Introduction

Chapter four provides an analysis of the data and the results of the research. The research was qualitative and entailed that observation in the discipline of inventory management on different sites was recorded. The qualitative approach was chosen, because the data is presented in words, the samples are small, reliability is low, validity is high and meaning can be derived. This approach allowed the researcher to actively participate in the research. Individual interviews could also be conducted.

According to Babbie and Mouton (2001:270), "the primary goal of studies using this approach is defined as describing and understanding, rather than explaining human behaviour". "Qualitative studies will use qualitative methods of gaining access to research subjects (e.g. theoretical selection of cases, snowball sampling): qualitative methods of data-collection (e.g. participant observation, semi-structured interviewing, the use of personal documents to construct life stories): and qualitative methods of analysis (e.g. grounded theory approach, analytical induction, narrative analysis, discourse analysis)" (Babbie & Mouton, 2001:270).

According to Babbie and Mouton (2001:270), qualitative research distinguishes itself from quantitative research in the following ways:

- "Research is conducted in the natural setting of social factors.
- A focus on process rather than outcome.
- The actor's perspective is emphasized.
- The primary aim is in-depth descriptions and understanding of actions and events.
- The qualitative researcher is seen as the 'main instrument' in the research process."

4.2 Data analysis and interpretation

The results will be discussed and presented in table format. The results are descriptive of the collection of data from the various sites. The data indicates whether the necessary procedures were in place and also indicates compliance to or deviation from the procedures. This format also allows for the incorporation of "Best Practice" comment columns. These columns contain extracts from authorities who have extensive theoretical and practical knowledge in the discipline of inventory management and control. The "Best Practice" columns have been included in an effort to afford the reader a possible solution to a possible problem he or she might experience in the management and control of his or her inventory.

The results are discussed and presented in table format as follow:

- Issuing of inventories
- Receiving of inventories
- Physical counting of inventories
- Redundant/obsolete stock procedure
- Viewing of the store, row, rack and bin layout
- Optimisation of the store
- Re-order point and re-order quantity systems
- ABC analysis
- Access control
- Optimisation of the store yard

These criteria were decided upon on the basis of literature by (Damelin, Higgs, McNaught and Piasecki), who indicate that organisations that follow best practices in inventory management and control, should cover all or at least most of these criteria. The observations made by the researcher on how the targeted organisations applied these criteria are presented in the tables hereunder.

Table 4.1: Issuing of inventories

Organisation observed	Observation made
Duferco Steel Processing	The warehouse made use of a work instruction sheet, which served as the standard operating procedure for the issuing of inventories. Inventory staff members were familiar with the content of the work instruction sheet and complied with it. Although the researcher determined that the work instruction sheet was relevant to the physical execution of the issuing process, it did not cover all the operational aspects of the issuing process. Some practical shortcomings were evident, namely, that it did not instruct the issuer to do an immediate bin count once an issue had been made. Furthermore, it did not instruct the issuer to write down the counted quantity of the bin on the issue voucher or picking list. This practice calls for immediate investigation to solve discrepancies and to improve inventory accuracy.
Namakwa Sands Ltd	The issuing department had an issuing procedure in place and warehouse personnel were aware of it and understood it very well. The issuing procedure was relevant to the physical execution of the issuing process. The procedure covered all the operational elements of the issuing process.
South African Port Operations	This site did not have an issuing procedure. The planner issued a job card with a work order number on it to the issuing department. The issuer then issued items according to the request as per the job card. The job card was forwarded electronically to the supervisor of the requesting department who completed the job card. On completion, the supervisor forwarded the job card electronically to the store. The store representative captured the job card on the SAP system and filed the hard copy in work order number sequence.

Table 4.2: Interpretation of findings on actual practices in issuing of

inventories

Organisation observed	Interpretation of observations
Duferco Steel Processing	A work instruction sheet served as the standard operating procedure for issuing. A practical and relevant shortcoming of the work instruction sheet was that it did not instruct the issuer to do an immediate bin count once an issue had been made. It also did not instruct the issuer to write down the counted quantity of the bin on the issue voucher or picking list. A sure step in the direction of inventory accuracy maintenance would be the logging of the bin quantity on the issuing voucher during the issuing process. Should there be a discrepancy, the issuer would then be able to investigate immediately and correct such a discrepancy. This approach will help in improving inventory accuracy.
Namakwa Sands Ltd	The issuing department had an issuing procedure in place and warehouse personnel understood it very well. The issuing procedure was relevant to the physical execution of the issuing process and the procedure was found to cover all the operational aspects of the issuing process.
South African Port Operations	Issuers did not make use of an issuing voucher or picking slip to issue items from the store. It was done by means of a job card.
Best practice	According to Piasecki (2005), an issuing procedure must be in place. According to the Damelin Group (2000:129), "the 'issuing' function is simply the warehouse's response to user department's requests for items stocked in the warehouse". It further states that "such items are issued only against requisitions and issue notes from user departments" and that "it is vital that only authorised personnel use such documents". It furthermore states that "it is vital that nothing is removed from stock without being recorded in the stock records". According to SAPICS (2001), "There is nothing more frustrating than collecting your goods from the store and finding there are mistakes when you get back to the work place". SAPICS (2001), further states that the picking slip or issuing voucher must be treated like "a cheque in the banking system. Just like the bank the store man should have a copy of the personnel authorised to sign for goods drawn from the store. SAPICS (2001) advocates that, "without an authorisation list, the store man cannot be held accountable for items issued to unauthorised persons".

Correct procedure in issuing of inventory and correct issue from the store is crucial. It is known that inaccurate inventory records can lead to profit loss in a manufacturing organisation (Uckun *et al.*, 2005).

Table 4.3: Receiving of inventories

Organisation observed	Observation made
Duferco Steel Processing	This site had a receiving procedure in place and staff in the receiving department understood it and complied with it. The receiving procedure was relevant to the physical execution of the receiving process. A shortcoming observed by the researcher in the receiving procedure was that it did not cover the inspection of items of a technical nature by a technical inspector in terms of quality and conformance to standards on receipt.
Namakwa Sands Ltd	The receiving department had a receiving procedure in place and staff in the receiving department understood it and complied with it. The receiving procedure was relevant to the physical execution of the receiving process and covered all the operational aspects of the receiving process.
South African Port Operations	The warehouse had a receiving procedure in place and staff in the receiving department understood it and complied with it. The receiving procedure was relevant to the physical execution of the receiving process.

Table 4.4: Interpretation of findings on actual practices in receiving of

inventories

Organisation observed	Interpretation of observation
Duferco Steel Processing	The warehouse had a receiving procedure in place and members in the receiving department understood it and complied with it. The receiving procedure was found to be relevant to the physical execution of the receiving process. A shortcoming observed by the researcher in the receiving procedure was that it did not cover the aspect of inspection of items of a technical nature by a technical inspector in terms of quality and conformance to standards on receipt.
Namakwa Sands Ltd	The receiving department had a receiving procedure in place and members of the receiving department understood it and complied with it. The receiving procedure was found to be relevant to the physical execution of the receiving process and covered all the operational aspects of the process.
South African Port Operations	The warehouse had a receiving procedure in place and members of the receiving department understood it and complied with it. The receiving procedure was found to be relevant to the physical execution of the receiving process. The procedure was found to be adequate in covering all the operational aspects of the receiving process.
Best practice	The Damelin Group (2000: 96) states that "efficient control starts with the smooth reception of goods into the store". Proper receiving procedures must be in place so as to effectively control the receipt of materials and to minimise the company's exposure to risk. SAPICS (2001), states that for the importance of security and accuracy, it is important that "the receiving and issuing areas of the store are separate". Exceed Consulting (2006), documents that "when receiving is out of order, so is the rest of the warehouse. When receiving is operating at the top of its game, better performance is noticeable throughout the warehouse". Exceed Consulting (2006), further advocates that receiving is a critical area because if goods are incorrectly received and registered, it will impact on accuracy and future productivity.

From the above it is evident that the receiving department is the second most important link with suppliers. It is important to ensure that items received are indeed correct in quantity, that it is the item as ordered and that it conforms to specification (Small Business Mentoring Services Inc., 2005).

Organisation observed	Observation made
Duferco Steel Processing	The inventory manager had a stock counting procedure in place and staff appeared to understand the procedure. The stock counting procedure was relevant to the physical execution of the physical counting process. The procedure covered all the operational aspects of the physical counting process. The counting procedure did not, however, accommodate fast and slow-moving item counting intervals. Inventory items at this warehouse are counted biannually, namely, at the end of March and again at the end of September. No mention was made of the counting of fast and slow- moving items. The same business rule applied to the different types of inventory.
Namakwa Sands Ltd	The inventory department had a stock counting procedure and stores personnel complied with the physical stock counting procedure. Slow-moving items are counted twice a year, whereas fast-moving items are counted four times a year. The rule was that fifty items needed to be counted per day. Discrepancies were investigated and, if necessary, adjustments were made within twenty-four hours. This is an excellent means of being constantly in the know of the state of your inventory.
South African Port Operations	The stock counting procedure was kept by the financial manager. The stores personnel complied with the physical stock counting procedure. The procedure covered all the operational aspects of the physical counting process. Authorisation for adjustments was clearly evident and reflected a chain of command. The counting procedure did not accommodate fast and slow- moving item counting intervals. Inventory items are counted annually, namely, at the end of March. No mention was made of the counting of fast and slow- moving items. The same business rule was applied to the different types of inventory.

Table 4.5: Physical counting of inventories

Table 4.6: Interpretation of findings on actual practices in physical counting of inventories

Organisation observed	Interpretation of observation
Duferco Steel Processing	The inventory manager had a stock counting procedure in place and staff appeared to understand the procedure. The stock counting procedure was relevant to the physical execution of the physical counting process. The procedure appeared to cover all the operational aspects of the physical counting process. Inventory items are counted biannually, namely, at the end of March and again at the end of September. No mention was made of the counting of fast and slow-moving items. The same business rule applied to the different types of inventory. The inventory department had a bar-coding scanner on which physically counted quantities were entered at the point of count. After a physical count, a report on the physical count was printed. This report indicated the variances of the count and, if necessary, a second count would then be performed.
Namakwa Sands Ltd	The inventory department had a stock counting procedure and the relevant personnel complied with the physical stock counting procedure. The stock counting procedure was found to be relevant to the physical execution of the physical counting process and covered all the operational aspects of the physical counting process. The counting procedure also accommodated fast and slow-moving item counting intervals. The total inventory comprised 6 000 line items. Slow-moving items are counted twice a year, whereas fast-moving items are counted four times a year. The rule was that 50 items needed to be counted per day. Discrepancies were investigated and, if necessary, adjustments were made within twenty-four hours. This is an excellent means of being constantly in the know of the state of your inventory.
South African Port Operations	The stock counting procedure was kept by the financial manager. The relevant personnel complied with the physical stock counting procedure. The stock counting procedure was found to be relevant to the physical execution of the physical counting process. The authorisation process for adjustments was clear and reflected a chain of command. Inventory items are counted annually, namely, at the end of March. No mention was made of the counting of fast and slow- moving items. The same business rule was applied to the different types of inventory.

Best practice	The Damelin Group (2000: 323) emphasises the reasons for physical stock taking, namely, "to verify the accuracy of inventory records, to reveal any weakness in the system for control of inventory, to provide physical verification of the value of inventory shown in the balance sheet of the company, and to disclose any fraudulent actions, theft or loss". It states, "the number of surpluses and shortages, as revealed by the stocktaking, is usually a good indication of the efficiency of the storekeeping methods and systems used by the company". It furthermore states that "accurate and timely stocktaking promotes confidence in both management and staff that inventory is well managed and that everything concerning materials are under control" (2000: 323). These reasons, as given by the Damelin Group, contribute significantly to the sound management of inventories. According to Piasecki (2005), "counting inventories on a regular basis throughout the year (cycle counting), combined with a process for continuous improvement in inventory accuracy, is the best methodology for achieving accurate inventories". He goes on to say, "one should be counting to optimize one's business operations and achieve high levels of customer service". SAPICS (2001) advocates that housekeeping in
	methodology for achieving accurate inventories". He goes on to say, "one should be counting to optimize one's business operations and achieve high levels of customer service". SAPICS (2001) advocates that housekeeping in
	the store is a very basic measure. A messy store spells
	inaccuracies where a neat store signals that the store men
	are taking pride in their work. Inventory accuracy almost
	becomes a by-product of good housekeeping.

Annual stock taking in itself is not enough to maintain proper control of inventory in the warehouse. Daily and weekly checks must be carried out to maintain proper control over inventory (Small Business Mentoring Services Inc. 2005).

Organisation observed	Observation made
Duferco Steel Processing	A redundant/obsolete inventory procedure was in place and inventory personnel indicated that they understood it and complied with the procedure. The procedure was very comprehensive and covered all the operational aspects of the obsolete/redundant process. According to the inventory manager, a list of items that have not been used for a past year is circulated to the respective engineers so that a decision can be made as to whether to retain or phase out the listed items.
Namakwa Sands Ltd	This site did not have a redundant/obsolete stock procedure.
South African Port Operations	A redundant/obsolete inventory procedure was in place and inventory personnel indicated that they understood and complied with the procedure. The procedure was very comprehensive and covered all the operational aspects of the obsolete/redundant process.

Table 4.8: Interpretation of findings on actual practices in managing

redundant/obsolete stock

Organisation observed	Interpretation of observation
Duferco Steel Processing	The inventory department has a redundant/obsolete inventory procedure in place and inventory personnel indicated that they understood and complied with the procedure. The redundant/obsolete procedure was relevant to the physical execution of the obsolete/redundant process. The procedure was very comprehensive and covered all the operational aspects of the obsolete/redundant process. According the inventory manager at the time of the researcher's visit, a list of items that had not been used during the past year was circulated to the respective engineers so that a decision could be made as to whether to retain or phase out the listed items.
Namakwa Sands Ltd	The inventory department did not have a redundant/obsolete procedure. The inventory control personnel identified obsolete stock together with the end users.
South African Port Operations	A redundant/obsolete inventory procedure was in place and inventory personnel indicated that they understood and complied with the procedure. The redundant/obsolete procedure was relevant to the physical execution of the obsolete/redundant process. The procedure was very comprehensive and covered all the operational aspects of the obsolete/redundant process.
Best practice	According to Piasecki (2005), "obsolete inventory is stock that has had no sales or usage activity for a specific period of time. The period of time varies by company and industry and may even vary by product line within a specific company and may range from weeks to years". Phasing out obsolete inventory is good, because it will allow more space within the warehouse. According to SAPIC (2001), it is the responsibility of the warehouse personnel to highlight obsolete inventory in the warehouse and to "badger management until decision is taken to dispose of the obsolete inventory". Johnson <i>et al.</i> (1987) document obsolete inventory as inventory which have lost potential to be sold or used.

When business is bad, obsolete inventory is a sure killer. It is therefore appropriate to continuously identify obsolete inventory and dispose it off on a regular basis. (Morebusiness, 2007).

Table 4.9: Store, row, rack and bin layout

Organisation observed	Observation made
Duferco Steel Processing	The store was not numbered, because there was only one central store. The bin layout was logical, because it started at one point and numerically and chronologically ended at another point. The impression created, in respect of the utilisation of storage space, was that of bad planning. Inventory items in the store were not always neatly and orderly placed.
Namakwa Sands Ltd	The physical numbers were not displayed on the different stores, but the warehouse and inventory database had this information. The bin layout was logical in terms of starting at a point and numerically and chronologically ending at a point. The layout followed the universal store, row, rack and bin principle.
South African Port Operations	The stores were not numbered during the time of the researcher's visit and interviews. The layout did not completely follow the universal store, row, rack and bin principle. The bin layout was logical in terms of starting at a point and numerically and chronologically ending at a point.

Table 4.10: Interpretation of findings on actual practices in store, row, rack andbin layout

Organisation observed	Interpretation of observation
Duferco Steel Processing	The store was not numbered, as there was only one central store. Numbering of the store in this instance was not necessary. The store layout followed the universal store, row, rack and bin principle. The logic in bin layout in terms of starting at a point and finishing chronologically at a point was not observed. The impression left on the researcher, in respect of the utilisation of storage space, was that of bad planning. Inventory items in the store were not always neatly and orderly placed.
Namakwa Sands Ltd	The stores were not physically numbered, although it was indicated as such on the warehouse and inventory database. The bin layout followed the universal store, row, rack and bin principle. The logic of the bin layout, in terms of starting at a point and chronologically ending at a point, could be seen.
South African Port Operations	The stores were not numbered during the time of the visit and interviews. The layout generally followed the universal store, row, rack and bin principle. The logic of the bin layout, in terms of starting at a point and chronologically ending at a point, could be seen.
Best practice	"In planning the store or warehouse building, many factors should be given consideration. These include, size of plot, size of building, layout, flexibility, growth, expansion, materials handling methods, aisles, service area location, column spacing, clear stacking height, floors, doors, docks, lighting, ramps, elevators, and construction methods" (Damelin Group, 2000: 357). If the store does not have an effective bin location system, customer service can suffer. It is important that stock can be located accurately and quickly (SAPICS, 2001).

Proper marking of storage locations and bins contribute to overall accuracy. An alternative would be to verify that inventory was put away in the correct location. This practice eliminates inventory problems during the pick process where the time constraints to correct are much higher (Exceed Consulting, 2006).

	Table 4.11:	Optimisation	of the store
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Organisation observed	Observation made
Duferco Steel Processing	According to the issuing personnel at the time of the researcher's visit, fast-moving items were not placed closest to the point of issue. This was also evident to the researcher. Fast and slow-moving items were placed together and were not separated. According to the inventory manager at the time of the researcher's visit, the store was in the process of being optimised.
Namakwa Sands Ltd	Fast-moving items were not placed closest to the point of issue. Slow and fast-moving items were mixed.
South African Port Operations	According to the store's personnel at the time of the researcher's visit, fast-moving items were placed closest to the point of issue. Slow-moving items were stored separately from fast-moving items at the furthest point of the store. This was evident to the researcher.

Table 4.12: Interpretation of findings on actual practices in optimisation of t	he
store	

Organisation observed	Interpretation of observation		
Duferco Steel Processing	The store seemed to be underutilised. According to the issuing personnel at the time of the researcher's visit, fast-moving items were not placed closest to the point of issue. This was also evident to the researcher. Fast and slow-moving items were placed together and were not separated. According to the inventory manager at the time of the researcher's visit, the store was in the process of being optimised.		
Namakwa Sands Ltd	At this site, fast-moving items were not placed closest to the point of issue. Slow and fast-moving items were mixed. Fast-moving items were at the back of the store, inconveniently far from the point of issue, while slow or non-moving items were close to the point of issue.		
South African Port Operations	According to the relevant personnel, fast-moving items were placed closest to the point of issue. The personnel also showed the researcher around to substantiate this point. Slow-moving items were stored separately from fast-moving items at the furthest point of the store.		
Best practice	"Items in the store should be placed in the most convenient place for issuing. This means that the FIFO principle should be followed as well as fast-moving items being close to the point of issue. Medium and slow- moving items should be placed central and furthest in the store" (Higgs, 2001: 75).		

Strategic placing of different inventory is essential. Fast and slow moving items must be stored in the correct areas to allow for efficient picking (SAPICS, 2001).

Organisation observed	Observation made		
Duferco Steel Processing	The equivalent to the re-order point and re-order quantity system is a minimum and maximum system. According to the inventory manager at the time of the researcher's visit, it is a "not so user friendly" system and, as such, made optimal use by them, impossible.		
Namakwa Sands Ltd	Inventory management made use of the minimum and maximum system. It interfaced with an optimisation system, but did not appear to be the most effective system. It gave two different opinions about the same situation. The amounts reflected on month-end reports were given in millions of South African rand value. The difference between the two opinions was thousands of rand. According to the inventory group leader at the time of the researcher's visit, this was a small and isolated problem. This problem required the inventory controller to carry out in-depth investigations which were extremely time-consuming. The two systems running parallel caused much confusion, because they provided different data at month end. The inventory group leader did not pay much attention to this problem, because he had limited knowledge and understanding of dealing with such challenges.		
South African Port Operations	The inventory department made use of the minimum and maximum system.		

Table 4.13: Re-order point and re-order quantity systems

Table 4.14: Interpretation of findings on actual practices in re-order point and
re-order systems

Organisation observed	Interpretation of observation		
Duferco Steel Processing	At this site, the equivalent of the re-order point and re- order quantity system was the minimum and maximum system. According to the inventory manager at the time of the researcher's visit, this system was a "not so user friendly" system and, as such, made optimal use by them, impossible.		
Namakwa Sands Ltd	Inventory management made use of the minimum and maximum system. It interfaced with an optimisation system, but did not appear to be the most effective system. It gave two different opinions about the same situation. The amounts reflected on month-end reports were given in millions of South African rand value. The difference between the two opinions was thousands of rand. According to the inventory group leader at the time of the researcher's visit, this was a small and isolated problem. This problem required the inventory controller to carry out in-depth investigations which were extremely time-consuming. The two systems running parallel caused much confusion, because they provided different data at month end. The inventory group leader did not pay much attention to this problem, because he had limited knowledge and understanding of dealing with such challenges. The primary month-end reporting system at the materials department gave inaccurate figures.		
South African Port Operations	The inventory department also made use of the minimum and maximum system.		
Best practice	According to Piasecki (2005), "the re-order point is generally calculated as the expected usage (demand) during the lead-time plus safety stock". According to Higgs (2001: 75), "the re-order point is calculated using a combination of Working Stock (Usage X Lead-time) plus Safety Stock".		

The utilising of an objective means in determining of re-order point and re-order quantity is essentially important in managing and controlling inventory accurately (Small Business Mentoring Services Inc., 2005).

Table 4.15: ABC analysis

Organisation observed	Observation made
Duferco Steel Processing	The inventory department did not have a system to differentiate between the most important and the less important items. According to the inventory manager, this task was scheduled for a date in the future.
Namakwa Sands Ltd	The inventory department made use of the ABC analysis system. Items were categorised according to production stoppers, partial production stoppers and no impact items. The inventory group leader placed the same weight on all categories in terms of importance. A modern and sound approach would be to focus on those items that could stop production.
South African Port Operations	The inventory department made use of a system to differentiate between the most important and the least important items. Focus was placed on items which could jeopardise the operation. Items of less or no importance were not warehoused, but were directly purchased for immediate use by end users.

Organisation observed	Interpretation of observation
Duferco Steel Processing	The inventory department did not make use of a system to differentiate between the most important and the less important items. According to the inventory manager, this task was scheduled for a date in the future.
Namakwa Sands Ltd	Items were categorised in production stoppers, partial production stoppers and no impact items. The inventory group leader placed the same weight on all categories in terms of importance.
South African Port Operations	Focus was placed on items that could jeopardise the operation. Items of less or no importance were not warehoused, but were purchased directly by the end user for immediate use.
Best practice	According to the Damelin Group (2000: 294), "ABC analysis is based on the 80:20 rule. As a rule, it will be found in any store or stockyard. About 80% of the total value of issues in a year will account for perhaps 20% of the items. The recognition for this approach enables a differential approach to be taken to categories of inventory, with control accorded to the usage value of each item". A modern and sound approach would be to focus on those items that could stop production.

 Table 4.16: Interpretation of findings on actual practices in ABC analysis

Inventory in the warehouse needs to be categorised into its ABC categories. This categorisation allows for proper inventory management and control (SAPICS, 2001).

Table 4.17: Access control

Organisation observed	Observation made		
Duferco Steel Processing	Access control was exercised. The researcher observed that an end user was allowed into the store if he or she needed to view an item for a specific reason. The store representative escorted the end user to the respective bin. Once the end user had viewed the item, the store representative escorted him or her out of the store. The access point was unlocked and locked behind the end user. Each member of the store had his or her own key for access to different sections of the store. These keys cannot be duplicated, as they have serial numbers engraved on them. A serialised key register was also kept. All inventories were kept behind lock and key. Inventory yards were managed according to the same principle.		
Namakwa Sands Ltd	Access control was exercised. The researcher observed that master keys were in the possession of the store personnel. End users wishing to view inventory items inside the store or the store yard did so by first consulting with the relevant personnel.		
South African Port Operations	Access control was exercised. The researcher observed that master keys were in the possession of the warehouse personnel. End users wishing to view inventory items inside the store or the store yard did so by means of a pre-appointment with the warehouse personnel.		

Organisation observed	Interpretation of observation		
Duferco Steel Processing	Access control was exercised. The researcher observed that an end user was allowed into the store if he or she needed to view an item for a specific reason. The store representative escorted the end user to the respective bin. Once the end user had viewed the item, the store representative escorted him or her out of the store. The access point was unlocked and locked behind the end user. Each member of the store had his or her own key for access to different sections of the store. These keys cannot be duplicated, as they have serial numbers engraved on them. A serialised key register was also kept. All inventories were kept behind lock and key. Inventory yards were managed according to the same principle.		
Namakwa Sands Ltd	Access control was exercised. The researcher observed that master keys were in the possession of the store personnel. End users wishing to view inventory items inside the store or the store yard did so by first consulting with the relevant personnel.		
South African Port Operations	Access control was exercised. The researcher observed that master keys were in the possession of the store personnel. End users wishing to view inventory items inside the store or the store yard did so by first consulting with the relevant personnel.		
Best practice	"Protect with maximum protection the materials and other goods in storage" (Damelin Group, 2000: 13). Maximum protection means that there should not be unauthorised access to stock. Gates and doors to stock should be kept locked to protect stock against unauthorised personnel.		

 Table
 4.18: Interpretation of findings on actual practices in access control

Inventory accuracy will not be achieved if inventory is not protected against unauthorised interference. Inventory must be protected at all cost (SAPICS, 2001).

Table 4.19: C	ptimisation	of the	store	yard

Organisation observed	Observation made
Duferco Steel Processing	The inventory yards were fenced off and equipped with lighting this allowed personnel to work in the yards during late afternoon, early morning or at night. Items were neatly binned and access control was maintained. Items like transformers were covered with sails. The yards were also paved so as to allow for proper drainage and to avoid possible deterioration of materials.
Namakwa Sands Ltd	The inventory yards were not well-fenced off. The yards were also not paved. During winter months, materials stood in water and deteriorated. It was clear that no planning was done prior to constructing the store yard. The store yard was also not fitted with lighting for work during the winter months.
South African Port Operations	The inventory yards were equipped with lighting to allow for work during the night. The yards were also neatly and practically paved to allow for proper drainage and to avoid possible deterioration of materials. Inventory in the store yard directly in front of the main store did not appear neat and well binned.

Table 4.20: Interpretation of findings on actual practices in optimisation of the store yard

Organisation observed	Interpretation of observation
Duferco Steel Processing	The inventory yards were fenced off and equipped with lighting this allowed personnel to work in the yards during late afternoon, early morning or at night. Items were neatly binned and access control was maintained. Items like transformers were covered with sails. The yards were also paved so as to allow for proper drainage and to avoid possible deterioration of materials.
Namakwa Sands Ltd	The inventory yards were not well-fenced off. The yards were also not paved. During winter months, materials stood in water and deteriorated. It was clear that no planning was done prior to constructing the store yard. The store yard was also not fitted with lighting for work during the winter months.
South African Port Operations	The inventory yards were equipped with lighting to allow for work during the night. The yards were also neatly and practically paved to allow for proper drainage and to avoid possible deterioration of materials. Inventory in the store yard directly in front of the main store did not appear neat and well binned.
Best practice	"Where significant quantities of inventory are held in the open, a proper stockyard should be designed, constructed and operated in an efficient manner. An efficient layout permits the use of modern handling methods and this in turn usually produces significant economies in the employment of labour" (Damelin Group, 2000: 378).

A good store yard layout goes hand in hand with good housekeeping and good location control. A store yard must be designed to suit the type of storage systems used as well as the materials handling equipment required to pick and put items away (SAPICS 2001).

4.3 Concluding remarks

In this chapter, the findings of the research were interpreted and presented. The different approaches to the same topic came strongly to the fore. The interviewees were partially schooled, which means that they did not obtain a post-school or tertiary qualification after leaving school. This was particularly true in the case of the inventory management of Namakwa Sands Smelter Division. Although only a small number of sites were affected by the research, differences were exposed with regard to how inventory management and control was implemented. In all instances, however, the inventory personnel seemed to understand and comply with the relevant procedures.

The researcher's overall impression of the inventory/materials managers was a lack of enthusiasm and drive.

Best practice requires that procedures be put in place and that tasks are performed according to detailed specifications. Some sites are falling short of this standard. The research shows that some materials managers and those in the inventory discipline do not holistically understand the inventory management concept and, consequently, do not follow the best practice approach.

Recommendations for further research in the discipline of inventory management and control will be discussed in the next chapter.

CHAPTER FIVE DISCUSSION, RECOMMENDATIONS AND CONCLUSION

5.1 Introduction

Chapter five includes a discussion of the research, as well as recommendations and the conclusion of the research. This research on the management and control of inventory took the form of physical visits to select production and manufacturing sites in the Saldanha Bay region.

5.2 Discussion

The research, although conducted on a very small segment of the production and manufacturing population, highlighted certain basic shortcomings. It underlines the reasons why the senior management of Namakwa Sands Ltd deemed it necessary to fly inventory management consultants from Australia to school inventory employees on the subject. It may be said that South Africa is lagging behind its overseas counterparts in terms of a holistic understanding and application of inventory management and control practices.

It may also be said that a manufacturing company operating without well-defined procedures, does not have proper control of its operations. The same applies to a warehouse which operates without proper policies and procedures in place. If these guidelines are, firstly, not in place and, secondly, are not followed or managed, situations of overstock and stock-outs may be experienced. The management policies and procedures in a well-run company are developed rationally, which enables polices and procedures to be developed for each function of the business.

The effective utilisation of storage space was found to be problematic at some of the sites. By implication, it means that ready access to all materials and goods in the store is essential in order to provide a maximum service. To achieve this level of service, it is essential that the design and layout of the store provide ready access to all goods and materials. Ideally, fastmoving items need to be handled the most and should also be moved over the least distance. Space in a warehouse costs money. It is therefore essential that inventory managers ensure that storage space is utilised optimally. The development and maintenance of an effective information system is of the utmost importance. The store provides a service to all user departments of the business. Inventory managers must, therefore, be aware of the different types of materials that are required by these departments. The measure of how well a business is utilising its labour and equipment is its output or productivity. In materials management, the inventory and purchasing information system must accurately report on its activities in terms of history and current data.

5.3 Recommendations

It is recommended that procedures be put in place for tasks performed on a regular basis in the warehouse. The responsibility lies with materials management and should not be neglected.

From a research point of view in the discipline of inventory management and control, continuous research in this field, in a South African context, is strongly recommended. Authors from first-world countries such as Australia, Canada and Great Britain have the ability to express their to-the-point experience in this field with great confidence and authority. Research into inventory management and control is needed in South Africa and interested South Africans could passionately embrace this opportunity.

5.4 Conclusion

In conclusion, it may be said that this research provides different views on the same subject. Although all three sites have an inventory segment, the practical application and viewpoints are different. It may also be said that a system that works well on one site will not necessarily produce the same results at another site.

5.5 Challenges encountered in the course of the research

The research aimed to include all the main manufacturing and production sites in the Saldanha Bay area. The researcher made appointments with the general managers and inventory managers of these sites. The researcher explained his intent and requested permission to conduct his research at their sites. The research itinerary, together with a letter of recommendation from the researcher's supervisor, in the name of the Cape Peninsula University of Technology, was faxed or e-mailed to the members concerned.

The following sites were affected:

- Duferco Steel Processing
- Namakwa Sands
- Saldanha Steel
- Sea Harvest
- South African Port Operations
- St Helena Bay Fishing

The inventory manager at Saldanha Steel seemed willing to give consent for the research to be conducted, but explained that he would need to submit the request to his head office for approval. He explained that feedback in this regard could take months. The researcher declined.

The purchasing manager at Sea Harvest was also in charge of the inventory segment. He explained they were busy rebuilding their warehouse and was, therefore, reluctant to allow research to be undertaken in his inventory discipline.

The financial manager at St Helena Bay Fishing was also in charge of inventory. He was not comfortable with the idea of an "outsider" doing research in his warehouse and, consequently, refused permission for the researcher to conduct his research. The researcher was disappointed. He was convinced that this was the site where he would have been confronted with many inventory management and control-related challenges.

5.6 Suggestions for further studies

The researcher strongly suggests that research into inventory management and control be embarked upon on a larger scale. Hugo *et al.* (2006: 249) believe that "research on purchasing and supply management is becoming increasingly important". This statement also holds true for research in inventory management and control.
5.7 Advantages of further studies

According to Hugo *et al.* (2006: 249), the following advantages for research in purchasing and supply management are evident. (This will be modified in support of the suggestion for further studies in inventory management and control).

- "New technology may be introduced" to streamline inventory management and control.
- "Improved management and control performance is a strong possibility."
- "Specialist expertise can be acquired."
- "Better decisions can be made."
- Further studies could serve as "training for personnel".

Further research would represent a wider community and the researcher believes that this would result in a better understanding of the subject.

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