Operational Improvement for Tribeca Coffee Company

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Executive Summary

Tribeca Coffee Company is a reputable business in the coffee roasting industry. With coffee being the second biggest annuity in the world today, Tribeca is experiencing a tremendous annual growth in demand. Together with increasing production and sales figures evidently come increased inventories and raw materials. Proper warehouse management is daily becoming a higher necessity and need for the company and the importance of proper inventory management and continuous facilities planning to maintain a competitive advantage in the market place. JP van den Berg (1999) explains that implementing proper warehouse management not only increases productivity levels through space, equipment and labour, but also reduces inventory costs and increases inventory control.

The aim of this project is to analyse and improve the warehouse operations and management of Tribeca and to evaluate and select alternative strategies to address their current operational issues. After a thorough analysis of current business processes is performed, a survey of best practices is done to evaluate current trends and to indentify certain constraints and gaps there may be in the current operations. Thus is not only present status assigned but also priority for the greatest opportunity for improvement. Through the assessment and summary of best practice approaches, methods and guidelines, improved inventory control sheets for both receiving and storage operations were designed together with improved facility layouts for both Green Coffee and Packaging warehouses. New and improved storage methods is also proposed that would optimize space utilization, productivity and efficiency throughout the company. Alternative material handling equipment that can be used throughout the facilities and operations is also identified, discussed and recommended that would contribute to the operational improvements for Tribeca Coffee Company.

Tribeca can most certainly make use of this opportunity and improve their inbound operations and facilities to achieve supply chain excellence and maintain a competitive advantage within the growing coffee industry.
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Chapter 1: Overview

1.1. Introduction and Background

1.1.1. Company

_Tribeca Coffee Company_ was founded by Martin Fitzgerald and Dale Mazon in 1996 in a small coffee shop in the Pretoria central business district. Since then, Tribeca has grown into a leading coffee roasting and state-of-the-art icon in the coffee industry with a network of 55 café’s nationwide, employing more than a thousand people.

The Tribeca Roasting Factory is located in the Highway Business Park in Centurion, where approximately 30 full-time employees are employed. Designed by Henk Bakker, the green coffee bean inspired the architect to the footprint and body of the spectacular design of the building.

With 12 different coffee blends of their own, Tribeca also produces 16 retail blends for Woolworths SA and their monthly production varies between 30-40 tons.

The processing plant is subjected to a very strict food hygiene code of practice and therefore the structure of the factory and machinery are designed in such a way that it can be easily kept clean and neat. The only way of accessing the factory area is through a special cleansing room.

1.1.2. Suppliers

Coffee is grown in over 70 countries around the globe, but **best** at high altitudes and mainly around the equator. This area is known as the “coffee belt” and includes countries such as Indonesia, Brazil, Colombia and East Africa. Tribeca receives their green coffee beans from 10 different estates throughout these countries, and from the 2 most commonly grown coffee’s, prefers Arabica Coffee. Orders are shipped in large containers (25-30 per year) and have a lead time of approximately 4-7 weeks. Packaging materials are mostly imported and shipped from 11 different suppliers around the world with a lead time now increased up to 12 weeks on packaging reels.

![Figure 1: Tribeca Coffee Company.](image-url)
1.1.3. Premises and Operations

In Figure 2 above, the Tribeca factory (A) and their green coffee warehouse (B), can be clearly seen. The smaller store room on site (A) is right next to the roasting room and can be easily accessed from the factory.

- Considering inbound and outbound logistics, smaller delivery trucks and vans access the premises via the main gate at (A) and drive up to the door of the dispatch area for collection and deliveries at the back of the building. Sufficient space is available for easy and convenient loading and offloading. Green beans orders arrive after ±7 weeks in large containers per truck which park in the street in front of the factory. These trucks are too big to drive up to the delivery area, and the coffee bags containing the green beans are offloaded by hand on to a forklift (only when the forklift is available) and moved closer to the warehouse by a smaller truck or van. Some of this stock can be stored in the main store room on the factory premises (A) itself, but the majority is taken to warehouse (B) until it's needed for roasting and then collected via a forklift and truck.

- Production planning is done according to received orders and forecasting from the previous term. Woolworths SA sends a 2-week order report for all their products and the restaurants supplied by the Tribeca brand coffee, weekly. Tribeca has two Roasters in the factory with different batch capacities and the production schedule is compiled by the factory QA manager.

- Packaging materials are stored on the main premises and ordered when a certain level is reached. A weekly stock count is performed to obtain new stock levels and in most cases, the remaining reels that are not used efficiently have to be weighed to compare it with full reels and the remaining volume then calculated.
1.2. Problem Statement

Facilities Planning and Material Management

1.2.1. Green Coffee Warehouse

- Tribeca has no effective Inventory control system to keep track of available raw materials. A stock count is performed manually once a week and due to the circumstances and layout of the warehouses, very inaccurate and very time consuming.
- The space in the store room is insufficient to accommodate all the green bean bags and therefore no convenient layout can be accomplished to manage the materials in a productive way. As evident in Figure 3 below, there are also no isles allocated for forklift movement and the needed bags are difficult to access. This result in lots of manual effort to get the heavy bags onto the forklift.

![Figure 3: Store Room B with insufficient space.](image)

- Due to the lack of space in the store room, materials get stacked from back to front as they arrive, and the necessary FIFO (First-In-First-Out) policy cannot be performed. Materials nearest to the door are being used due to lack of time to take everything out to get to the back and the older stock then remains unused for an unacceptable long period.
- Green Coffee bags are often stacked to high onto a single pallet and falls over onto another pallet with a different product or batch, as can be seen in Figure 4. This not only causes major problems regarding stock control, but is also a safety risk.
- A lot of manual labour and lack of proper material handling equipment results in poor ergonomics and a loss in productivity as employees are exausted due to carrying the heavy bags on their shoulders and the forklift not always being available for this operation.
- Due to the distance of the warehouse from the factory, effort is wasted to fetch stock for production. Normally, 5 workers are ordered to go down to the warehouse with a van and a forklift.

![Figure 4: Coffee bags fall over onto other pallets.](image)
when bags are needed. The bags have to be loaded into the van and moved to the factory where it should be off loaded again. This can take up to 4 hours, occupying employees that are needed on the factory floor instead.

- Because of poor inventory management, it is difficult to prevent an overstocked warehouse.

### 1.2.2. Packaging Materials Warehouse

- The warehouse used to store packaging materials is part of the factory premises and is also used for all outbound operations (including the packing of orders).
- There is not efficient storing space to facilitate packed orders as well as all the packaging reels and other packaging materials. Because of this, nothing is organized and stored on specific locations.
- Due to the unorganized chaos, inventory control is a major challenge. Materials disappear when employees don’t know where to store specific materials and stock counts is not accurate at all.
- Reels are not used efficiently due to employees not finishing the current reels when larger batches are to be packed. This is another contribution to the stock control issue as none of the remaining reels are the same size and the heavy reels has to be weighed first to determine the stock levels.
- An increase in lead time of the packaging reels now results in larger batches to be ordered in an environment of already constrained storing space and inefficient inventory control.

### 1.3. Project Aim

The aim of this project is to analyze and improve the operations and material management of Tribeca and to determine alternative strategies and solutions to address the current operational issues they are experiencing.

In more detail the aim is to:

- Analyze and improve the facility layout of both the warehouses so space could be optimized for storing and forklift movement purposes and productivity are improved through easier accessing and handling of the green beans and packaging material.
- Suggest possible material handling equipment for the handling of heavy green coffee bags by employees during storing and fetching activities and to prevent manual labour.
- Compile documented Receiving and Storing procedures and policies so that standards and rules are set for these operations and chaos in the warehouse be prevented.
- Compile documented policies regarding the use of raw materials such as packaging reels and stickers so it is used and managed more efficiently and wastage are minimized.
- Look at Tribeca’s planning processes in order to determine the potential for possible improvements though out the different processes.
- Design requirements for a small Inventory Control system that could be used to manage stock levels in both warehouses (Green beans and Packaging materials) and use the available data in procurement (Preventing over stocked warehouses), sales (Balancing outbound vs. inbound) and production operations of the business.
1.4. Project Scope

As stated above, the main focus of this project will be on Facilities planning, from the receiving (Inbound) to the management, control and flow of raw materials.

After current processes of Tribeca are documented and analyzed, a survey of best practices will be done in different forms to identify certain gaps there may be. Firstly a literature review will be done to identify current trends, ideas and methods regarding material management and facilities planning topics. Industrial visits will be undertaken to compare similar organizations, as well as personal interviews. The literature study will summarize all the research and published work up to date and will also provide Tribeca with helpful information regarding alternative solutions for their material management issues.

Production operations and planning will not be considered, except for the analysis of production planning processes that affects the inventory control issues and the impact of inaccurate stock records. Research and recommendations for a possible inventory control system to manage stock levels and balance inbound and outbound records will also be discussed.

Some constraints and boundaries needed to be taken into consideration for completing this project are:

- The possibility of finding a new and larger warehouse to accommodate all the green coffee in one store near the factory, if Tribeca chooses to do so.
- The proposed solutions need to fit the budget constraints of Tribeca for improvements to the company and facilities.
- The success of this project will depend on the enthusiasm of Tribeca to implement change in the business and to train or employ new staff to operate and manage warehouse and inventory control systems to ensure accurate data integrations throughout the business.

1.5. Deliverables

With completion of this project, the following could be expected:

- An improved facility layout for both warehouses that would optimize space and productivity during storing and collection of raw materials as well as everyday housekeeping.
- Suggested material handling equipment to make it easier for employees moving heavy bags in and out of the warehouse.
- Documented Receiving and Storing procedures and policies.
- Recommendations to fill possible gaps in planning operations and processes.
- Design specifications for an Inventory Control System to:
  - manage and keep track of stock levels at any time
  - Integrate available stock figures with sales
  - Integrate available stock figures with procurement
  - Integrate available stock figures with production scheduling
1.6. **Project Approach**

1.6.1. **Activities**

1. Analyze current operations at Tribeca Coffee Company (Industrial analysis)
   - Process data gathering
   - Document and assess current processes, policies and standards
   - AS-IS analysis

2. Survey best practices
   - In-depth Literature Study
   - Industry visits
   - Expert interviews

3. Identify Problems, constraints and gaps in the system and operations

4. Develop alternative solutions to fill gaps
   - New Facility layouts
   - Possible Material handling equipment
   - Receiving and storing procedures and policies
   - Design specifications for an Inventory control system

5. Evaluate, select and justify alternative solutions

6. Propose solutions and recommendations to Tribeca
Chapter 2: Evaluation of Best Practices

2.1. Introduction

This literature study summarizes in short the impact, significance and possible approaches towards Facilities Planning and Warehouse Management in today’s industry. This document will be further extended by additional information towards best practices in each topic that would be useful in comparing current operations to ideal operations and to identify gaps and room for improvement in the current operations. Sources of this review include books, journals and articles.

2.2. Facilities Planning

According to Tompkins (2003), the facilities we design today must help an organization achieve Supply Chain Excellence. As Facilities planning impacts so many activities – material handling and maintenance cost, employee morale, operating costs, capital investment, facility management, adapting to change, and satisfying future requirements – the importance of proper facilities planning will continue to grow and challenge the engineering profession.

2.2.1. The significance of facilities planning

Over the past decade, the subject of facilities planning has taken on a whole new meaning. Considering today’s highly competitive market place, the focus has moved from a primarily considered science to an extremely important strategy for navigating a competitive economy. (Tompkins, 2003) A massive increase in capital investments is noted all around the globe on new facilities and this could be justified through the importance of adaptability and the necessitate for constant improvements on existing facilities to maintain a strategic competitive advantage.

According to Tompkins (2003), the following questions could be considered to illustrate the breadth of facilities planning opportunities:

1. What impact does facilities planning have on handling and maintenance costs?
2. What impact does facilities planning have on employee morale, and how does employee morale impact operating costs?
3. In what do organizations invest the majority of their capital, and how liquid is their capital once invested?
4. What impact does facilities planning have on management of a facility?
5. What impact does facilities planning have on a facility’s capability to adapt to change and satisfy future requirements?

Tompkins (2003) also states that one of the most effective methods for increasing plant productivity and reducing costs is to reduce or eliminate all activities that are unnecessary or wasteful. A Facilities design should accomplish this goal in terms of material handling, personnel and equipment utilization, reduced inventories and increased quality.
2.2.2. Facilities Planning Process

As the facilities planning process is frequently re-implemented and facilities improved due to consistently changing objectives, the process is better understood by placing it in the context of a facility lifecycle and using it in conjunction with the traditional engineering design process. The facility is constantly improved to satisfy its continuous change in requirements until the facility is torn down.

2.2.2.1. The Engineering design process

1. Define the problem
2. Analyze the problem
3. Generate Alternatives
4. Evaluate Alternatives
5. Select the preferred design
6. Implement the design

2.2.2.2. Facilities life cycle (Tompkins, 2003)

![Facility Life cycle diagram]

Figure 5: Facility Life cycle
2.3. Warehouse Management

According to Tompkins (2003), the first objective of warehousing has always been to maximize the effective use of space, equipment and labour. This objective thus imply that productivity is not only labour performance, but also equipment, space and a combination of factors all contributing towards increased productivity.

Furthermore, JP van den Berg (1999) explains that implementing proper warehouse management not only increases productivity levels through space, equipment and labour, but also reduces inventory costs and increases inventory control. For instance, intelligent inventory management may result in reduced inventory levels that not only reduce inventory costs, but also improve the efficiency of order-picking operation within the warehouse. He also states that a planning policy defines a framework for the control of warehouse processes, while inventory management and storage policies determines when materials arrive and where they should be stored.

2.3.1. Warehousing Decisions

Coyle (2003) explains some basic warehouse decisions involved in warehouse management as:

- Ownership?
- Number?
- Size?
- what products?
- where?

Normally, the criterion used to make these decisions are total costs, including service impacts on lost sales.

In addition to the above warehouse decisions, companies are also faced with the interior layout of their warehouses. Decisions such as aisle spaces, shelving, material handling equipment and all other physical dimensions of the interior needs to be made. Principles regarding layout and design will be discussed in more depth.

Furthermore, warehousing decisions also interrelate very closely with areas of the logistics system.
2.3.2. Warehouse Operations

As stated by Rouwenhorst (2000), the flow of materials through a warehouse could be divided by several operations or processes namely:

- **The receiving process**
  The inbound carrier delivers ordered goods at the receiving area at a specific time where the unloading is executed as soon as they arrive to maintain labour productivity and efficiency.

- **The Identification, inspection and sorting process**
  An extension of the receiving process when supplier goods are normally inconsistent in quantity or quality and the necessary inspections or lab tests are performed before goods are put away for storage.

- **The Put away process**
  This process includes the activities of material handling and placement of goods in storage.

- **The Storage process**
  The physical containment of goods (normally raw materials at this stage) while it is awaiting demand. The storage operation utilizes different material handling equipment such as forklifts, conveyors, and storing racks to move and hold the goods.

- **The Orderpicking**
  This process normally requires warehouse personnel to select the specified goods needed by manufacturing operations or customer demands. In some cases, AS/R warehouse systems are installed which automatically (partly) stores and retrieves goods with automated material handling equipment.

- **The Shipping process**
  Final movement of goods occurs at the shipping operation. After the outbound carries has arrived the goods are moved from the staging/holding area to the loading area into the carrier’s vehicle. The carrier indicating receipt of the goods from the shipper signs a bill of lading and the warehouse inventory system is updated.

2.3.2.1. Operations Assessment

An assessment of warehouse operations can provide a good evaluation of current performance. According to James A. Tompkins (1998), the ten categories in a typical operation assessment are:

1. **Customer service**: Primary concern in any business. Goals must include input and acceptance from a percentage of important customers.

2. **Control systems**: Evaluates paperwork used, integrity of data maintained, duplication of efforts and paperwork, how effective control systems are used.

3. **Inventory accuracy**: Critical aspect because customer service, resupply from vendors, labour utilization as well as systems integrity rely on inventory accuracy and availability.

4. **Space utilization**: Overall utilization is calculated by taking the utilization and square footage of each functional area and comparing it to the total square footage of the entire warehouse. Measured utilization is then compared to the maximum efficiency utilization.
5. **Labour productivity**: Measures how effectively labour is utilized relatively to proper established standards and procedures.

6. **Facilities layout**: Rates how well facility objectives are met.

7. **Equipment methods**: Refers to the appropriateness of types of equipment used.

8. **Equipment utilization**: Calculated for each group of equipment.

9. **Building facilities**: Evaluates the essential areas of a facility.

10. **Housekeeping and safety**: Attention to issues is directly related to professionalism and is measured against operational, industry and governmental standards of performance.

James A. Tompkins (2008) states that it is of utmost importance to define your current operations and where you are today before you begin to make changes to any operations.

By rating each category on a scale of 1 to 5 (based on a qualitative and quantitative assessment), it not only defines present status, but also allows you to prioritize areas with the greatest opportunity for improvement. After each category is rated, a weight factor is assigned to each category to reflect its relative importance. The total of all weights is 200, together with each category rating yielding a maximum score of 1000 points. A target rating for each category is also assigned for the situations where the realistic maximum rating for a certain category is less than five. The category rating and target ratings are then multiplied with the category weight to obtain a category score and target score. After this is done, the total category score is divided by the category target to obtain the performance index. The figure below illustrates the results of a typical audit and calculation of performance index.

![Figure 6: Calculation of performance index](image)

With the performance index being the first part of the analysis, Tompkins (2008) also explains that the other part in determining the warehouse class is the consistency of ratings. The number of categories with a rating of 3 or less is observed, and a drop in class is caused if the number exceeds the limit. The figure below describes this method of classification.

![Figure 7: Warehouse Classification Method](image)
This operation assessment will often precede the process of warehouse planning.

2.3.3. Warehouse design approaches

P. Baker (2009) writes in his literature study specifically on warehouse design approaches, that in spite of the importance of warehouse design, a number of literature reviews have concluded that relatively little has been written in academic journals on the systematic approach for warehouse design. Thus, in the absence of a defined and accepted methodology, most warehouse designers have developed their own approach.

Listed below are a few design approaches developed over the years and in some cases modified specifically for warehouse approaches only.

2.3.3.1. Apple

Around 1977, Apple observed that a facilities designer faces a complex task because of the interaction and relationships between each design activity and therefore suggested a 20-step approach that can be adapted to 12 steps as below for warehouse design.

1. Procure Data
2. Analyse Data
3. Design Processes
4. Plan material flow pattern
5. Calculate equipment requirements
6. Plan individual work areas
7. Select material handling equipment
8. Determine storage requirements
9. Plan service and auxiliary activities
10. Determine space requirements
11. Allocate activity areas to total space
12. Construct the master layout

2.3.3.2. Rowley and Rushton et al

A basic framework of steps is set out by Rowley (2000) and Rushton (2000) that further expands the approach developed by Oxley in 1994. They state that a design process typically runs through a sequence of consecutive phases. However, they group these steps into a framework based on a top-down approach, thus identifying strategic, tactical as well as operational decisions. They propose that this group of decisions be considered in sequence.

1. Define system requirements and design constraints
2. Define and obtain data
3. Analyze data
4. Establish unit loads to be used
5. Propose basic operations and methods
6. Consider possible equipment types
7. Calculate equipment quantities
8. Calculate staffing levels
9. Prepare possible building and site layouts
10. Evaluate design against requirements
11. Identify the preferred design

2.3.3.3. **Hassan**

Hassan (2002) provides a series of design steps which are similar to previous authors, but focuses more on the design aspect of facilities layout.

1. Specify type and purpose of warehouse
2. Forecast and analyze expected demand
3. Establish operating policies
4. Determine inventory levels
5. Form classes of products
6. Departmentalize (into areas) and establish general layout
7. Partition into storage areas
8. Design material handling, storage and sorting systems
9. Design aisles
10. Determine space requirements
11. Determine input/output points
12. Determine docks
13. Determine the storage arrangements
14. Form Picking zones

As the basic frameworks of all the above approaches are very similar, any one of them could be followed during the design or improvement stages of a warehouse. In the case of this specific project, the Hassan approach would most probably be used because of the main focus on facility layout, productivity and warehouse efficiency.

2.3.4. **Warehouse Layout Design**

2.3.4.1. **Objectives**

When it comes to layout planning, the main objectives of warehousing should first be determined (Coyle, 2003). In general, the objectives of a warehouse layout are:

- Use space efficiently
- Allow for the most efficient material handling
- Provide the most economical storage in relation to cost of equipment, use of space, damage to material, handling labour and safety
- Provide maximum flexibility regarding change in storing and handling requirements
- Make warehouse a model of good housekeeping
2.3.4.2. Principles

Outlined by Coyle (2003) the following layout design principles could be considered:

1. **Use a one story facility wherever possible**  
   - Usually, less expensive to construct and provides more usable space per investment dollar.

2. **Use straight-line or direct flow of goods**  
   - This will avoid any backtracking and inefficiency.

3. **Use efficient material handling equipment and operations**  
   - Among other benefits, proper material handling equipment improves efficiency in operations.

4. **Use an effective storage plan**  
   - Utilize existing space as completely and efficient as possible while providing both protection and adequate accessibility for the stored goods.

5. **Minimize aisle spaces**  
   - Considering both goods that are stored and material handling equipment size, type and turning cycles, and minimizing the aisles within those constraints.

6. **Make maximum use of building height**  
   - Usually requiring integration with material handling equipment to utilize the building's cubic capacity effectively. Although equipment capable of maneuvering in small aisles and spaces can be quite expensive, it still offers potentially large overall system savings because using height costs only one-fifth of the cost of building the same cubic footage horizontally.

![Figure 8: Utilization of warehouse cubic capacity](image-url)
2.3.5. Storage Planning

According to Tompkins (2003), the objectives discussed in 2.3.4.1 are similar to the objectives of storage and warehouse planning. This might seem obvious as layout planning involves the coordination of labour, equipment and space. The following principles regarding storage can be integrated to achieve the desired objectives:

- **Popularity**
  The materials should be stored in such a way that the travel distance is inversely related to the popularity of each material in storage so that travel distances are minimized and accessibility and productivity are improved. If material enters and exits the warehouse through one point, the most popular materials should be positioned as close as possible to this point.

- **Similarity**
  Materials that are usually shipped or used together should be stored together. Items that are received from the same vendor usually require the same material handling and storage space, and the consolidation of those items in the same area can result in more efficient use of space and material handling.

- **Size**
  The size of the storage location should fit the size of the material to be stored. Also, the total quantity of the material being stored should be considered because different storage methods and layouts will be used for storing two pallet loads vs. 200 pallet loads of the same material.

- **Characteristics**
  Characteristics and storing policies of materials often requires being stored in contrary of the method indicated by their popularity, similarity and size.

- **Space utilization**
  While considering popularity, similarity, size and characteristics of material, a layout should be developed that maximizes the utilization of space and level of service. This also includes the determination of space requirements for materials to be stored. Some factors to consider are:
    - Space conservation
    - Space limitations
    - Accessibility
    - Orderliness
2.3.6. Recommended Green Coffee storage practices

The following practices and standards regarding green coffee storage should be highly considered in the designing phase of the warehouse. (Green Coffee Association, 2011)

2.3.6.1. Location and physical structure

Any location which is used for the storage of green coffee should be continuously maintained according to the following standards:

1. All areas of the warehouse should be weather tight and rodent proof.
2. The warehouse should comply with all local, federal and state laws, including fire regulations and sufficient floor loading limits.
3. Sufficient lightning to execute warehouse operations, cleaning and identification of storage deficiencies without the need of supplemental lightning.
4. The warehouse should have proper ventilation to the outside.
5. The warehouse should not be artificially heated except for preventing pipes to freeze at a minimum level.
6. The warehouse should have and maintain sufficient material handling equipment.
7. The warehouse should be free of leaking pipes.
8. The warehouse should have clearly visible signs to direct nearby toilet facilities, prohibit smoking, eating or drinking as well as requiring employees to wash their hands upon entering.
9. The warehouse should also have clearly visible signs or postings making storage locations inside the warehouse.
10. The warehouse should be segregated from any non-coffee storage areas to prevent access by rodents, insects, or odors.
11. A fire and theft alarm system should be connected to a central monitoring service.
12. The warehouse should store coffee separate from other products that may affect the quality of the coffee such as chemicals, high fire risk materials and odorous products.

2.3.6.2. Housekeeping practices

1. Floors should be kept clean at all times and active storage areas swept clean after each workday.
2. The warehouse should be inspected on a weekly basis for leakages on the walls, ceilings, overhead pipes and the beams seasonably free of cobwebs, dirt, dust, excrete, loose foreign matter, peeling paint or damaged insulation.
3. Store or dispose rubbish in a manner which will prevent the development of odor and becoming an attraction to pests.
4. The surroundings of the facility should be kept clean to prevent conditions which may result in any pest control problems.
2.3.6.3. **Basic storage practices**

The following practices should be applied to ensure adequate space for sampling, inspection and effective fire protection, ventilation, and provide sufficient space for pest control programs:

1. Coffee should be stored on pallets that provide a minimum of 4 inches above the floor.
2. The pallets used should be kept clean and in good repair at all times.
3. Coffee should be stored at least 24 inches below a ceiling and 18 inches below any sprinkler head.
4. Coffee should be stored at least 24 inches away from walls.
5. The space between different piles of coffee should be at least 20 inches and not exceed the height of five pallets or 100 bags, whichever is less.
6. Slack bags must be placed on a separate pallet in front of the piles.
7. All space requirements should be measured from the bag or pallet closest to the sprinkler, ceiling or wall.

2.3.6.4. **Requirements**

All inventory records should be kept neat, tidy, orderly and up to date so auditors can verify warehouse and inventory records against physical stock.

1. Before the received coffee can be stored inside the warehouse, the warehouse must be in possession of a copy of the delivery order as well as the following information regarding the received stock which should also be reflected in the warehouse records:
   a) Growth
   b) Number of bags
   c) Shipper’s brand (Coffee)
   d) Crop year
   e) Bag marking
   f)Carrier (vessel or truck transport), location, date of arrival.
2. When the coffee is moved into the warehouse for storage, the information above should be recorded into the warehouse system or receiving report. The report should also record all exceptions and deficiencies.
3. The Information on the order receipt or bill of lading should be compared to the bag markings and amount of bags received checked. If a difference exists, the shipper should be informed immediately.
4. The warehouse should record the identifying information as set forth on the coffee bags onto warehouse tags or marks stenciled that is attached to the bags at all times. These tags should be clearly visible and preferably placed on both sides of the coffee bags or pile.
5. The warehouse should maintain all inventory records necessary to execute efficient warehouse operations and responsibilities, including all movements of coffee, change in ownership and when the coffee has been weighed.
6. The warehouse should also keep a copy of each sampling order.

The above practices are an excellent guideline to follow for successfully maintaining storage operations of green coffee.
2.3.7. Space utilization and Requirements

To determine proper space requirements in a facility or warehouse, lots of factors such as annual demand (Inventory levels), annual growth, safety stock, product size, storage methods and strategies, material handling equipment requirements, personnel requirements, aisle spaces, building constraints and storing policies etc. needs to be considered.

2.3.7.1. Aisles

According to Tompkins (2003), aisles should be located in a facility to promote effective flow of materials and is much influenced by the type of material handling equipment being used. Planning aisles that are too narrow may result in congestion issues and having high levels of damage and safety risks. Conversely, planning aisles too wide results in wasted space and poor housekeeping practices.

Evident in Table 1 below are recommended aisle widths for various types of flow (Tompkins, 2003).

<table>
<thead>
<tr>
<th>Type of Flow</th>
<th>Aisle Width (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tractors</td>
<td>12</td>
</tr>
<tr>
<td>3-ton Forklift</td>
<td>11</td>
</tr>
<tr>
<td>2-ton Forklift</td>
<td>10</td>
</tr>
<tr>
<td>1-ton Forklift</td>
<td>9</td>
</tr>
<tr>
<td>Narrow aisle truck</td>
<td>6</td>
</tr>
<tr>
<td>Manual platform truck</td>
<td>5</td>
</tr>
<tr>
<td>Personnel</td>
<td>3</td>
</tr>
<tr>
<td>Personnel with doors opening into the aisle from one side</td>
<td>6</td>
</tr>
<tr>
<td>Personnel with doors opening into the aisle from two sides</td>
<td>8</td>
</tr>
</tbody>
</table>

*Figure 9: Recommended aisle widths for various types of flow*
2.3.8. Warehouse Management Systems

Having the correct amount of stock at hand and accurate inventory records eliminates costly write-offs as well as unhappy customers. According to Coyle (2003), many companies implement Warehouse Management Systems (WMS) that assist the warehouse manager in accurate management activities and establishes optimum inventory levels and control. These computer software systems typically begin at the receiving area where the received goods are scanned into the system and inventory records are automatically updated. Fully integrated software also ensures essential flow of up-to-the minute information between different departments and can be configured to follow rules that match a company’s operations.

2.3.8.1. Benefits

By implementing an integrated WMS, the following benefits have proven its success:

- Better utilization of warehouse space
- Increased productivity of employees
- Automate receiving and put-away processes
- Improvement of warehouse control, inventory management, visibility and accuracy
- Minimizing overstocked warehouses and costly stock-outs
- Control of inventory levels in real time
- Access up to the minute inventory data
- Eliminates manual data entry and administration
- Centralize the control of inventory data across facilities
- Reduce labour intensive and time consuming physical inventory stock counts.

2.3.8.2. Integration

Another function of a MWS is the integration of the purchasing and inventory control processes. Any company’s purchasing decisions have a huge influence on the control and management of accurate inventory levels. Such a system streamlines the purchasing and inventory control process for better control in order to reduce unwanted carrying costs and replenish inventory levels when expected. It is designed to enhance inventory visibility and control, so that your organization has real time inventory information available at any time to purchase new stock with confidence, goods be replenished when expected and orders be managed without errors. More benefits regarding the integration function includes:

- Centralize purchasing and budget management
- Enhance information sharing and supply management
- Automate procurement order generation
- Reduce duplication, administration and overhead costs.
2.3.8.3. Implementation

According to Carsten Howitz (2010), successfully implementing WMS planning is absolutely crucial. He also states that the top three roadblocks companies face when implementing new WMS are:

- 61% Employee training/learning curve
- 45% Alterations or upgrades needed
- 38% Functional integration problems.

Howitz (2010) explains the essence for a company to have a detailed training plan in place and how this influences the success of the implementation phase. A company should also allow sufficient time for unexpected issues that will come up at some stage. For Howits, another key to success is to follow industry best practices and not customize the baseline of a system too much. Only a small percentage of the package should need modification towards your specifications, otherwise you probably selected the wrong package.

2.3.9. Material Handling

Material handling relates to the movement, protection and control of materials within a facility. Defining material handling would be best described as providing the right amount of the right material, in the right condition, at the right place, in the right position, in the right sequence, and for the right cost, by the right methods(s). (Tompkins, 2003) Furthermore, material handling is an important aspect of facilities design and space requirements as well as ergonomic standards related to man labour.

2.3.9.1. Objectives

General objectives by Coyle (2003) of material handling further include:

- Increase effective capacity of warehouse
- Minimize aisle space
- Reduce number of times product is handled
- Develop effective working conditions
- Reduce movements involving manual labour
- Improve logistics service
- Reduce cost
2.3.9.2. **Principles**

According to Tompkins (2003), material handling principles are important in practice. They provide guidance and fresh perspective to material handling system designers as well as concise statements of the fundamentals of material handling practice.

The following principles and their definitions were adopted by the Industry Council on Material Handling Education (CIC-MHE):

1. **Planning Principle**
   - Material handling plan which defines the method to use, taking into consideration the limitations and functional requirements to meet objectives.

2. **Standardization Principle**
   - Standardization means less variety and customization in the methods and equipment implemented.

3. **Work Principle**
   - Manual labour should be minimized and productivity maximized without quality of service being influenced.

4. **Ergonomic Principle**
   - Refers to the working conditions to suit the abilities and promote the well-being of employees.

5. **Unit Load Principle**
   - A unit load is one entity that can be moved or stored as a single entity at one time, such as a pallet, container, reel, coffee bag, regardless of the amount of individual items that make up the load.

6. **Space Utilization**
   - Space in material handling is three-dimensional and therefore counted as cubic space.

7. **System Principle**
   - A collection of interacting entities that form a system as a whole.

8. **Automation Principle**
   - Technology concerned with the application of electronic systems to operate and control production and service activities.

9. **Environmental Principle**
   - Environmental impacts need to be considered and eliminated when implementing material handling equipment.

10. **Life Cycle Cost Principle**
    - This includes the total cash flows from the time the equipment is implemented to the time the equipment or method is replaced.
The following questions set up by Selders (2002) can be used to determine if the current material handling system is efficient. If the majority of the answers are “yes”, the current system can likely be improved. The questions are:

1. Can the number of times the material is handled be reduced?
2. Can the system be more continuous for a smoother flow of materials?
3. Can the speed of handling be increased?
4. Can the materials be handled in larger containers or in greater volumes?
5. Can distances the material is handled be reduced?
6. Are workers kept waiting for material to be moved?
7. Are there times when the equipment is not used to full capacity?
8. Can gravity be used more to move material?
9. Do workers have to make unnecessary movements?
10. Can hand operations be mechanized?
11. Can layout and flow patterns be improved?
12. Can the system be made more flexible?
13. Does the system damage or waste some of the product?

The above principles and questions can be used as a guideline during the material handling phase of this project and to determine what equipment best suits the requirements and objectives for Tribeca.

2.4. Seven Oaks Trading Best Practices

Seven Oaks Trading is a reputable coffee wholesaler based in Randburg, Gauteng. They are international traders in coffee and receive their green beans from various vendors around the world. Seven Oaks have been in the coffee business for years and has tremendous experience in warehouse operations. In an interview with Hennie Smith, Seven Oaks’s warehouse manager, he explains their successful operations in warehousing based on their focus on the critical success factors being cleanliness, tidiness, good security and taking pride in what they do. The following best practice concepts implemented by Seven Oaks were also identified during the industrial visit and could be possible considerations in Tribeca’s green coffee warehouse environment.

2.4.1.1. Receiving Operations

During the receiving process, Seven Oaks Trading makes sure the received coffee is on standard before they sign any agreement. All received coffee is checked and weighed to obtain an average weight per bag to compare with bill of materials and order receipts. Moisture tests are also performed on samples in the lab and the coffee is excepted after all criteria are met.

2.4.1.2. Storage Methods

Seven Oaks make use of box-stacking storing methods throughout their warehouse. This, being the most practical solution for them, works well in their environment where they have sufficient space to store one type of coffee on a high, neatly stacked pile. This is possible because coffee beans at the bottom of the batch can handle the weight of bags on top of them. Another advantage of this storing method is
the optimization of three dimensional spaces and if it’s strictly organized; the management of inventory is not a too complicated situation. By maintaining a neat and organized standard in terms of stacking for each pile of coffee, stock takes also becomes a very simple and efficient effort, knowing the exact and constant amount of coffee per row. An example of box-Stacking is evident in figure 10 below.

- Alternatively, another storing method very similar and in some environments a bit more practical than box-stacking is a method where 4 - 6 piles of coffee is placed on pallets and stacked on top of each other to optimize space. Although the whole batch consists of the same type of coffee, it makes it easier to place or remove a few bags from the pile by only using a forklift instead of manual labour in the case of box-stacking. Additional cost will be added by using more pallets but this method might increase productivity and efficiency during warehouse operations dramatically and FIFO policies also be better maintained if space is limited. This method is illustrated in figure 11 below.

- Finally, another best practice method includes heavy duty shelving. Coffee bags can still be placed on pallets, but this time instead of on top of each other, it’s placed on heavy duty shelves. Although this might be the most expensive alternative, it will most probably optimize
control and three dimensional spaces best of all as well as the ability of controlling FIFO policies (especially when dealing with a smaller inventory then wholesalers). Different shelf levels could be used for different batches and dates received and rotated as older stock is used first before the newer stock. The moment the first batch is finished, the newer batch becomes the current (older) batch and new received stock can fill the space of the finished batch and the shelves and levels rotate this way according to dates received. An example of heavy duty storage shelves is illustrated in figure 12 below.

![Heavy Duty shelves used for storing green coffee](image)

**Figure 12: Heavy Duty shelves used for storing green coffee**

### 2.4.1.3. Inventory Management

Seven Oaks Trading make use of both a manual as well as an automated warehouse management system. After new stock has been received, checked and approved, the appropriate data is captured on the computer based system where after a printout control sheet of the specific batch is printed and attached via a clipboard onto the specific batch in the warehouse. This control sheet states the necessary information regarding the specific batch of coffee, including:

- Coffee Type and Bag marking
- Origin details
- Date Received
- Total Quantity (Nr of bags)
- Coffee bags stacked per row and column
- Dispatched by, date and amount
- Updated balance after picking

This is a simple, affordable and practical way of organizing and managing your inventory to be up to date with stock levels consistently. After each day, stock balances are updated on the computer system and a complete stock take is done at the end of each week to verify balances. In case of a power interruption or failure, the updated details are always available on the sheet.
Chapter 3: Current Operations Analysis

Due to the nature of this project, a combination of various methods, tools and techniques discussed in Chapter 2 will be combined to successfully analyze and improve the operations of Tribeca.

3.1. Process Flow Analysis

3.1.1. Process Diagram

The following sequence of activities is followed throughout the inbound, manufacturing and outbound operations of Tribeca. Because the main focus of this project centers on the Inbound (Receiving and storing) operations, these activities will be documented and discussed in more detail than the rest of the operations. According to Anthony Catts (2009), documenting current business processes creates a baseline for comparison to future defined process capabilities. He also states that assessing the current processes against desired future process capabilities identifies gaps and enables you to create detailed requirements to fill those gaps.

Figure 13: Tribeca Process Flow Diagram
3.1.2. Receiving & Put-away operations

Process steps

A coffee sample (350g) is tested and analyzed according to moisture, bean size, defects, visual color and fragrance before the order is placed by the QA manager.

1. Container arrives with ordered coffee after +/- 7 weeks either from private vendor or Seven Oaks Trading around 10-11am
2. Port Health should be present when container arrives and inspect the imported goods for any illegal products on board before the freight is offloaded
3. Amount of bags are counted and compared to bill of materials and order receipt
4. Coffee bags (70-80kg each) are offloaded into a smaller truck (when available) by employees that can access the warehouse where the coffee should be stored
5. In front of the warehouse, the coffee is offloaded from the truck and stacked onto pallets
6. Available space inside the warehouse is then used to stack the pallets onto one pile similar to a box-stack method, depending on the amount of bags
7. Received coffee and quantities are updated in an excel spreadsheet by the QA manager

Resources

- 4-7 workers + the warehouse manager depending on container size

Time

- Once the employees start to offload the container it can take up to 5-6 hours before the process is completed and the coffee is stacked onto pallets and stored inside the warehouse.

Documentation used (Illustrated in Appendix A)

- Green Coffee Inspection sheet (Used for sample testing)
- Order Receipt
- Bill of Materials
- Vehicle and inspection sheet
- Driver collection log

Material handling used

- Truck, forklift and pallet jack
- Manual labour

Favourable and unfavourable outcomes

- Moisture should be between 10 and 12%
- Fragrance should by grassy an hay like with no odors
- Bean size should be according to specification and sample should contain no defects.
3.1.3. Storage Operations

Documentation for inventory control

- One clipboard is used inside the warehouse containing all coffee present with usually up to date quantities. This clipboard is also used for dispatch operations and employees write down the amount of bags taken next to the specific coffee.

Computer based system

- No Warehouse Management System is currently being used and the excel spreadsheet containing balances is updated once every 2\textsuperscript{nd} week.

Stock counts

- Stock take occurs at least once a month where all bags are counted and the spreadsheets are then updated. The outcome is not very accurate because of the chaos and current storage methods and can take up to 2 hours.

Steps when dispatching

1. Employees get orders from production or the QA manager to fetch specific bags needed for production
2. Employees go down to the warehouse by truck and load the needed bags by hand
3. The amount of bags taken from the warehouse are noted on the clipboard
4. Bags are offloaded at the factory warehouse by the same employees

Resources

- Usually 2-3 employees

Time

- On average +/- 50 bags this process can take up to 2 hours without a forklift and 1.5 hours with a forklift.

Material handling used

- Truck
- Forklift is not always available and employees would just load the truck by hand

Constraints

- Space and access
- Material handling equipment
3.2. Warehouse Operations Assessment

As discussed in Chapter 2, the importance of defining current operations and processes before making any changes is absolutely necessary. In 2.3.2.1, the warehouse operations assessment is illustrated on how to assess and evaluate current warehouse performance in a company. The ten categories within Tribeca’s warehouse operations, also illustrated below, were rated according to a personal analysis of current operations as well as inputs from warehouse personnel at Tribeca. Through this warehouse assessment, not only present status is assigned to different areas but also priority for the greatest opportunity for improvement. Evident below are the results of the warehouse assessment of Tribeca’s main green coffee warehouse, illustrating the current performance index and warehouse classification.

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
<th>Target Rating</th>
<th>Weight</th>
<th>Category Score</th>
<th>Target Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer Service</td>
<td>3</td>
<td>4</td>
<td>20</td>
<td>60</td>
<td>80</td>
</tr>
<tr>
<td>Control Systems</td>
<td>2.5</td>
<td>4</td>
<td>20</td>
<td>50</td>
<td>80</td>
</tr>
<tr>
<td>Inventory Accuracy</td>
<td>3</td>
<td>5</td>
<td>30</td>
<td>90</td>
<td>150</td>
</tr>
<tr>
<td>Space Utilization</td>
<td>2.5</td>
<td>4</td>
<td>30</td>
<td>75</td>
<td>120</td>
</tr>
<tr>
<td>Labour Productivity</td>
<td>2.5</td>
<td>5</td>
<td>20</td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Layout</td>
<td>2.5</td>
<td>5</td>
<td>25</td>
<td>62.5</td>
<td>125</td>
</tr>
<tr>
<td>Equipment Methods</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>Equipment Utilization</td>
<td>3</td>
<td>5</td>
<td>15</td>
<td>45</td>
<td>75</td>
</tr>
<tr>
<td>Building Facilities</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>30</td>
<td>40</td>
</tr>
<tr>
<td>Housekeeping/Safety</td>
<td>2.5</td>
<td>5</td>
<td>15</td>
<td>37.5</td>
<td>75</td>
</tr>
<tr>
<td>Total Performance Index</td>
<td></td>
<td></td>
<td></td>
<td>545</td>
<td>920</td>
</tr>
</tbody>
</table>

AVG 59.24%

Figure 14: Tribeca Main Coffee Warehouse performance index

<table>
<thead>
<tr>
<th>Warehouse Class</th>
<th>Performance Index</th>
<th>Ratings &lt; 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>A+ Excellent</td>
<td>95-100%</td>
<td>0</td>
</tr>
<tr>
<td>A+ Very Good</td>
<td>90-94%</td>
<td>1</td>
</tr>
<tr>
<td>B Good</td>
<td>85-89%</td>
<td>2</td>
</tr>
<tr>
<td>C Average</td>
<td>80-84%</td>
<td>3</td>
</tr>
<tr>
<td>C- Below Average</td>
<td>70-79%</td>
<td>4</td>
</tr>
<tr>
<td>D Poor</td>
<td>&lt;70%</td>
<td>&lt;4</td>
</tr>
</tbody>
</table>

Figure 15: Tribeca Warehouse classification
Customer Service:

Although the main coffee warehouse of Tribeca does not influence customer service directly, there is still a time constrain connected to deliveries for production. If deliveries are delayed and production has to wait until all coffee is received, it could ultimately have an impact on customer service and on time deliveries. Because of the poor labour productivity, efficiency and layout within the warehouse, deliveries to production do take much longer than it's supposed to.

Control Systems

As discussed in 3.1., the documentation and paperwork currently used is not the most practical and organized method of managing and controlling inventory. Confusion due to the lack of proper control sheets and management can easily result in chaos and incorrect judgment. Paperwork can be drastically improved to ensure better management and control.

Inventory accuracy

Due to poor facility layout, sloppy palletizing, lack of control systems, poor management and stock counts, inventory balances is not a very accurate estimation at this stage. Accurate stock counts and control sheets form the basis of good inventory management and because of the above problems accurate stock counts is basically impossible at this stage.

Space utilization

Three dimensional space is not currently being optimized within the warehouse as it could be due to the absence of proper shelving or storage methods. With a ceiling height of almost 6 meters, there can be a major improvement in terms of space utilization.

Labour Productivity

Labour productivity is currently a major setback due to the warehouse conditions in terms of space utilization, management and improper material handling. A lot of manual labour is needed to unload containers and stack pallets and employees are exhausted because of the physical labour they need to endure.

Facility Layout

The current facility layout of the main warehouse (discussed in more detail in 3.3.) is not ideal for an environment dealing with high inventory capacities. With only one entrance and exit, the flow of materials in and out of the warehouse can’t be practically optimized. The lack of isles between pallets results in poor labour productivity, as well as material handling efficiency.

Equipment methods and utilization

Only one pallet jack and forklift (when available) is used to operate and assist with warehouse operations. Because of the lack of space and proper isles, the forklift cannot always access the needed materials and manual labour should be used.
Building facilities

The building and surroundings are not ideal in terms of delivery docks and convenient access for big delivery trucks with containers to the entrance of the building. Although the building is in a good state and condition, it only has one entrance resulting in a lack of labour efficiency and prevents direct flow of material in a straight line. The question also exists whether only one warehouse of this capacity is sufficient for the inventory and demand of Tribeca and if the possibility of a new and larger warehouse should be considered.

Housekeeping and safety

The lack of housekeeping, cleanliness and tidiness is a major concern and contribution to the current warehouse issues. Around 46m² of the warehouse is occupied by storage of non-coffee waste materials that could rather be efficiently used for more pallets of coffee and improve the space for isles in the main area next to it. This also results in an untidy and dirty environment and complicates cleaning attempts by staff. Figure 16 below illustrates the area in discussion.

![Figure 16: Wasted space inside the main coffee warehouse occupied by waste materials](image)

Summary

From the assessment above can be clearly seen that the main warehouse currently classifies under Poor with an average performance index of about 60% and various categories that need attention. Probably the greatest opportunity for improvement lies in control system, space utilization, labour productivity, layout as well as housekeeping. This might seem quite a lot but fortunately resolving one or 2 issues might influence the others in a positive way. If space is better optimized the layout of the whole facility would automatically improve because of more available floor space together with labour productivity as staff could maneuver around the warehouse more easily and by means better utilize material handling equipment that would improve productivity and efficiency. Control systems is a basic tool for inventory control and having an organized warehouse, knowing where what is and the exact updated quantity of each. This assessment also created a platform for developing alternative designs and to compare the present with future requirements and To-Be states for the main warehouse operations of Tribeca.
3.3. Facility layout and storage analysis

3.3.1. Green Coffee Warehouse 1

3.3.1.1. Overview and purpose

The purpose of the main coffee warehouse is to facilitate and store all green coffee ordered by Tribeca from various vendors to use in production. This facility is not on-site of the factory itself and available floor area of the warehouse adds up to +/- 200m². Maximum storage height for the 160m² area is 5m and 2m for the 46m² area. After a container arrived with orders and approved by the quality assurance manager, the bags are stored here until it’s fetched again for production by employees.

3.3.1.2. Main issues

- 3D Space is not utilized
- Layout influences productivity, efficiency and material handling
- No proper isles for forklift to maneuver and access pallets
- Too much manual labour results in bad ergonomics
- No proper control system to manage inventory
- Waste material occupies valuable space
- Storage methods complicate stock counts, control and FIFO policy
- Pallets are unstable and fall over if stacked too high
- Poor housekeeping practices
- Only one 3m entrance is present for accessing the facility
- Distance from factory

3.3.1.3. Operating policies and constraints

- A FIFO policy should be maintained at all times
- Conventional coffee may not be stored within 3m of organic coffee
- No sprinkler system is installed which constrains storage height
- Coffee beans are sensitive to moisture and odors and should preferably be stored in an environment where these factors can be controlled
- Storing height is limited by the health and safety act if sprinkler systems are not installed

3.3.1.4. Current Layout

Below is an illustration of the current layout of the main warehouse. Evident in the figure is the lack of isles between pallets and the arrangement of piles throughout the facility. Each block (Pallet) consists of a different type of coffee and varies in height stacked.
Figure 17: Current Layout of Green Coffee Warehouse 1
3.3.2. Green Coffee Warehouse 2

3.3.2.1. Overview and purpose

The purpose of the 2nd and smaller coffee warehouse on-site is to facilitate and temporarily store coffee used for production. When coffee is obtained from the main warehouse by employees, the bags are stored here until needed for production. This is also where the coffee beans are debagged for their original packaging and filtered through a pneumatic cleaning process by Tribeca’s LILLA system where after it is ready for roasting. This warehouse is only illustrated and will not be analyzed in detail for any major improvements.

3.3.2.2. Current Layout

![Figure 18: Current Layout of Green Coffee Warehouse 2](image)
3.3.3. Packaging Warehouse

3.3.3.1. Overview and purpose

The on-site packaging warehouse is located directly next to the factory where the coffee is being roasted and packed by automated packaging machines. This warehouse is mainly used for the boxing and palletizing of orders and also for storage purposes of the main packaging reels and other materials used. There is a station where quality control is performed on items rejected by the x-ray scanner and also a station where orders are managed and packed into larger boxes for distribution purposes. The approximate floor area available for operations and storage equals +/- 290m² with an available storage height of 6m.

3.3.3.2. Main issues

4. There is not efficient storing space to facilitate packed orders as well as all the packaging reels and other packaging materials. Because of this, nothing is organized and stored on specific locations. The expensive packaging reels also get damaged by forklifts and pallet jacks passing by and need to be stored in a more secure location where this can be prevented.

5. A lot of unused material occupies valuable storage space that could rather be used for reels standing around the warehouse on pallets.

6. Due to the unorganized chaos, inventory control is a major challenge. Materials disappear when employees don’t know where to store specific materials and stock counts is not accurate at all.

7. Reels are not used efficiently due to employees not finishing the current reels when larger batches are to be packed. This is another contribution to the stock control issue as none of the remaining reels are the same size and the heavy reels has to be weighed first to determine the stock levels.

8. An increase in lead time of the packaging reels now results in larger batches to be ordered in an environment of already constrained storing space and inefficient inventory control.

3.3.3.3. Constraints

- Storing height is limited by the health and safety act if sprinkler systems are not installed.
- All outbound operations are performed from this warehouse and available space can get filled with packed orders and pallets waiting to be shipped.

3.3.3.4. Current Layout

Below is an illustration of the current layout of the packaging warehouse. Evident in the figure is the lack of sufficient storage shelves, racks and space to accommodate all packaging reels and also the amount of space occupied by packed boxes and orders.
Figure 19: Current Layout of Packaging Warehouse
3.4. Material Handling Analysis

3.4.1. Overview

As discussed in Chapter 2, material handling relates to the movement, protection and control of materials within a facility. It is an important aspect of facilities design and space requirements as well as ergonomic standards related to man labour. Applying the correct material handling equipment to a facility can dramatically increase the productivity and efficiency within the warehouse and simultaneously increase effective capacity and working conditions. The 13 questions discussed in 2.3.10.2. were used to determine whether Tribeca’s current material handling equipment is efficient enough for the operations of the company and to identify opportunities to improve the current system.

3.4.2. Current Material Handling Equipment

Currently Tribeca owns 1 forklift which is used for all operations throughout the company. Furthermore, pallet jacks are used to move pallets and less heavy materials around the warehouse. Presently the forklift is occupied by production operations until the new conveyor system is fully installed. This causes major problems for warehousing operations and containers that should be offloaded, moved and stacked by using only pallet jacks and manual labour. If the forklift is used, production is interrupted and coffee can’t be packed on the new packaging machine. This issue has a negative influence on employee morale, ergonomics, productivity as well as space utilization.

With the current material handling system in place:

- The number of times material is handled can be reduced
- Receiving operations can be more continuous for smoother flow of materials
- The speed of handling can be drastically improved
- Workers have to do unnecessary manual labour that can be mechanized
- Space could be better utilized by optimizing maximum storage heights
- Overall system and operations could be more flexible

The current material handling equipment definitely contributes to the operational and warehouse efficiency issues Tribeca faces and can surely be improved by alternative and/or additional material handling equipment.
Chapter 4: Proposed Improvements and Evaluation of Alternatives

4.1. Receiving and Put-away Process

4.1.1. Flow Diagram

The main issues regarding the receiving process is considered to be the utilization of labour, equipment and productivity of the put-away process. All though this process would always be labour-intensive, better resource planning, equipment and layout planning would improve the overall process and cycle time significantly.

Once containers arrive, the required checkups should be done according to proposed receiving policies to ensure maximum control and management of received goods. The necessary samples and stock counts should be executed at arrival and if necessary some bags be weighed to obtain an average weight to compare with the receipt. A revised receiving control sheet as shown below was designed according to best practices of the necessary checks to be done during the process indicating all relevant information for filing purposes. After the goods are signed off and accepted by the supervisor, an inventory control sheet (Discussed in 4.2.) should be generated by management stating all relevant information and stock figures to be attached to the pallet in the warehouse where the specific coffee will be stored.

While an improved facility layout and better material handling equipment will result in fewer employees needed to complete the task in less time, the management and control of materials and inventory will be much improved by the revised control sheets as shown in Figure 22 (next page).
Received

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<th>Origin:</th>
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</table>

<table>
<thead>
<tr>
<th>Carrier:</th>
<th>Reg:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Coffee Type:</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Bag Marking:</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nr. of Bags:</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Moisture:</th>
<th>Sample:</th>
</tr>
</thead>
</table>

### Damages

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<tr>
<th>Pallets</th>
<th>Nr. of Bags</th>
<th>Weight</th>
<th>Damage Description</th>
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<td></td>
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<td></td>
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<td>3</td>
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<td>15</td>
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</tbody>
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### Weight per Bag

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</tr>
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<table>
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<table>
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<th>Weather:</th>
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<th>Cloudy</th>
<th>Raining</th>
</tr>
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</table>

### Comments

_________________________________________________________________

_________________________________________________________________

_________________________________________________________________

Driver Signature:  |  Supervisor:     | Date:    |
4.2. Storage and Picking Process

4.2.1. Proposed Improvements

As discussed in Chapter 3, various issues contribute to the overall storage problem within the main coffee warehouse. Better layout and resource planning combined with the correct material handling equipment would improve labour productivity and efficiency while inventory management and control sheets would improve control over available stock and tidiness around the warehouse.

When a coffee container arrives, management should use the data captured in the Receiving Control Sheet (4.1.1.) to generate an Inventory Control Sheet. This control sheet would be attached to a clipboard onto the specific pallet of coffee stating all necessary information regarding coffee type, origin, bag marking, date received and amount in stock. This is a very basic but practical method to increase the orderliness and control of inventory on hand. By having a clipboard on each different pallet of coffee (instead of only one universal clipboard), it would be clearly visible for any employee entering the warehouse what coffee is stored where, the date it has been received as well as the updated amount present. These sheets should also be used to control the FIFO policy throughout the warehouse, especially where two different pallets of the same coffee are available.

When employees are instructed to fetch bags for production, it’s very simple to identify the correct pallet to be picked according to type, bag marking and date received and for the employee to note the amount of bags taken onto the clipboard and update the inventory balance. The stock quantity available will thus be constantly updated and if the computer systems are offline, the updated figures will always be visible in the warehouse itself.

Stock counts will be simplified and outcomes and figures much more accurate due to the constant updated inventory figures. Better stacking methods (discussed in 4.3.) will also contribute to better control of stock takes as well as the amount of bags stacked in each row and column noted in the top corner of the Inventory Control Sheets. An example of the Inventory Control Sheet to be attached to each pallet within the warehouse is shown in Figure 23 below.
## Inventory

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<thead>
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<th>Type:</th>
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<tbody>
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<td>Bag Marking:</td>
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<tr>
<td>Origin:</td>
</tr>
<tr>
<td>Date Received:</td>
</tr>
<tr>
<td>Amount Received:</td>
</tr>
</tbody>
</table>

<table>
<thead>
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<th>Dispatched By:</th>
<th>Date:</th>
<th>Amount of Bags:</th>
<th>Balance:</th>
</tr>
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</tbody>
</table>

*Figure 23: Revised Inventory Control Sheet*
4.3. Main Green Coffee Warehouse

4.3.1. Alternative 1

4.3.1.1. Proposed Layout

Figure 24: Main Coffee Warehouse Alternative Layout 1
4.3.1.2. Proposed Improvements

Probably the best improvement proposal for the current green coffee warehouse would be the installation of heavy duty storage racks for optimum space utilization and the optimization of maximum building height. The addition of such storage racks would result in a much better layout and aisle spaces because vertical space is used throughout the warehouse instead of only horizontal space. Although the installation of these racks would be quite pricy with a high initial cost, vertical space still remains more cost effective than vertical space at the end of the day. The different zones evident in the Proposed Layout are used to classify and sort inventory according to popularity, similarity and characteristics. All of the above would contribute to a better utilization of space and service. The cost advantages due to productivity improvements and efficiency throughout the warehouse should not be underestimated and would be a major advantage for Tribeca into the future.

4.3.1.3. Advantages

- Improved utilization and optimization of vertical space by installing 3-level heavy duty racks throughout the warehouse and making use of maximum building height (See Appendix B)
- Improved labour productivity due to better material flow and open aisles between racks
- Sufficient space for material handling equipment to maneuver around pallets and access needed bags
- Storage racks allow goods to be swiftly located
- Improved Ergonomics and less manual labour necessary due to improved access and utilization of material handling equipment
- Less employees needed to complete tasks in a shorter period
- Improved accuracy, stock counts and management of inventory due to improved layout
- Better control of FIFO policy by assigning different rack levels to different dates received
- Achievable separation of organic coffee from conventional coffee by assigning a specific zone and rack to organic coffee
- Better housekeeping, tidiness, cleanliness and safety throughout the warehouse

4.3.1.4. Disadvantages

- High initial installation costs of racks
- Improvements made to a building not owned by Tribeca
- Warehouse size and space might still be insufficient for future inventory demands
- Distance from the factory still effects productivity
- Layout of the warehouse building is not ideal for flow of materials and equipment

4.3.1.5. Estimated Cost

Estimated costs for the proposed improvements to the main coffee warehouse are **R60 335**. A quote was given by *Universal Storage Systems* and a full description is evident in Appendix B.
4.3.2. Alternative 2

4.3.2.1. Proposed Layout

Figure 25: Main Coffee Warehouse Alternative Layout 2
4.3.2.2. Proposed Improvements

The second proposal for the current green coffee warehouse is the use of a pallet stacking method evident in Figure 25 and also discussed in 2.4.1.2. This storage method of using wooden pallets between piles of coffee also results in improved vertical space utilization, although not as efficiently as storage racks. The different zones evident in the Proposed Layout are used to classify and sort inventory according to popularity, similarity and characteristics. All of the above would contribute to a better utilization of space and service. Considering budget constraints, this alternative would definitely be more affordable than heavy duty storage racks and will still free up some aisle space resulting in a better layout, productivity and efficiency throughout the warehouse.

4.3.2.3. Advantages

- Lower initial cost than installing storage racks
- Still improved utilization and optimization of vertical space by stacking 4 pallets on top of each other, although not as stable as storage racks at maximum heights
- Improved labour productivity due to better material flow and open aisles between pallets
- Sufficient space for material handling equipment to maneuver around pallets and access needed bags
- Improved Ergonomics and less manual labour necessary due to improved access and utilization of material handling equipment
- Less employees needed to complete tasks in a shorter period
- Improved accuracy, stock counts and management of inventory due to improved layout
- Achievable separation of organic coffee from conventional coffee by assigning a specific zone to organic coffee
- Better housekeeping, tidiness and cleanliness throughout the warehouse

4.3.2.4. Disadvantages

- Stacking pallets to maximum heights is less stable than storage racks
- FIFO policy is difficult to maintain due to all bags stacked on top of each other
- Productivity is influenced because all pallets have to be removed first to reach bags underneath
- Warehouse size and space might still be insufficient for future inventory demands
- Distance from the factory still affects productivity
- Layout of the warehouse building is not ideal for flow of materials and equipment

4.3.2.5. Estimated Cost

Because only wooden pallets will be used in this recommended proposal, no installation costs for any structures and racks need to be implemented. The only expense there might be is for additional pallets at R1050 per pallet where Tribeca do not have sufficient amount available for all storage requirements.
4.3.3. Alternative 3

4.3.3.1. Proposed Layout

Figure 26: Main Coffee Warehouse Alternative Layout 3
4.3.3.2. Proposed Improvements

The 3rd proposal for the current Green Coffee Warehouse is to integrate with the Café Warehouse attached to the factory itself and divide the warehouse into 2 sections namely Green Coffee, as well as a Café section. This of course is done after aisle spaces are minimized according to material handling equipment specifications discussed in 4.5. and also more storage racks are added in the spaces saved by aisle modifications. Also visible in Figure 26 above, is the installation of a staircase and new storage racks on top of the current café offices where the lighter and smaller café inventory can be stored and be easily accessed by employees. This will make room for heavier inventory that can be stored on the ground level and be accessed by a forklift. Although this proposition requires a lot of change, the advantages of improved productivity and efficiency due to reduced travelling distance between the warehouse and factory would be tremendous. The size and layout of this facility is also much more eligible for warehouse operations and the necessary space is available if future demand requires a bigger area. Lastly, the current warehouse used for green coffee can be used to store materials currently occupying storage space in the café warehouse and not being used frequently. Additional Storage racks to be installed in the Packaging Warehouse could also facilitate all packaging materials currently stored in the Café Warehouse and if future space requirements exceed the available area for green coffee, an alternative nearby facility for the Café department should be considered.

4.3.3.3. Advantages

- Improved utilization and optimization of vertical space by using 3-level heavy duty racks throughout the warehouse and making use of maximum building height (See Appendix B)
- These racks are mostly already installed within this warehouse (currently used for Woolworths Café storage), thus eliminating big initial installation costs for new racks
- This facility is attached to the factory and small coffee warehouse, thus illuminating travelling time between the current warehouse and factory while improving overall productivity and efficiency dramatically
- Layout of facility is more ideal for warehouse operations with straight line flow of material with a separate entrance and exit to the building
- Improved labour productivity due to better material flow and open aisles between racks
- Sufficient space for material handling equipment to maneuver around racks and access needed bags
- Access for deliveries and collections much better than current warehouse
- Storage racks allow goods to be swiftly located
- Improved Ergonomics and less manual labour necessary due to improved access and utilization of material handling equipment
- Less employees needed to complete tasks in a shorter period
- Improved accuracy, stock counts and management of inventory due to improved layout
- Better control of FIFO policy by assigning different rack levels to different dates received
- Achievable separation of organic coffee from conventional coffee by assigning a specific zone and rack to organic coffee
- Better housekeeping, supervising, tidiness, cleanliness and safety throughout the warehouse
- Sufficient storage space for possible future growth and demands
4.3.3.4. **Disadvantages**

- The facility needs to be shared with the Café department
- If the remaining storage space is not sufficient for café inventory, some of the café stock needs to be stored in a separate facility
- Materials other than coffee will be stored within the same facility

4.3.3.5. **Estimated Cost**

Since most of the storage racks are already installed in this warehouse, only a few rows will be added as aisle spaces are minimized to increase storage space for additional racks. The estimated costs for the installation of additional storage racks by *Universal Storage Systems* will equal **R17500**, excluding the staircase evident in the proposed layout.
4.4. Packaging Warehouse

4.4.1. Alternative 1

4.4.1.1. Proposed Layout

Figure 27: Alternative Layout for Packaging Warehouse
4.4.1.2. Proposed Improvements

The proposal of installing additional storage racks in the Packaging warehouse (evident in Figure 27 above) would improve storage space utilization within the warehouse and create space to facilitate the expensive printing reels currently being stored all over the facility. This improvement would create better flow of materials and operations throughout the warehouse, creating open aisles and a better layout for packing operations and storage of packed orders. The utilization and protection of the expensive printing reels can now be controlled by management, ensuring better inventory accuracy and management throughout the warehouse.

4.4.1.3. Advantages

- Installation of additional storage racks provide sufficient storage space for packed orders, packaging materials and expensive printing reels currently occupying limited floor space on pallets
- Better material flow due to wider aisles and vertical space utilization by storage racks
- All reels can be stored onto one common rack near the factory floor, not only protecting it, but also improving the usage, control and management of the reels
- An increase in storage space allows Tribeca to facilitate larger batch orders due to an increase in lead time on packaging reels
- Better housekeeping, tidiness and management of inventory throughout the whole warehouse

4.4.1.4. Estimated Cost

Estimated costs for the proposed improvements to the packaging warehouse equals R29 535. A quote was given by Universal Storage Systems and a full description is evident in Appendix B.
4.5. Material Handling

4.5.1. Proposed Improvements

Appropriate material handling equipment could contribute to space utilization, productivity and efficiency throughout a company.

Tribeca’s main problems are a result of insufficient space and utilization thereof and it is quite obvious that material handling equipment suitable to operate in narrow aisles and spaces could drastically improve Tribeca’s situation at the end of the day.

Translift Bendi Ldt is a privately owned UK manufacturing business and has been designing and manufacturing ground braking space saving forklift trucks since 1964. These award winning forklifts such as the electric Bendi B318 is designed to give optimal aisle performance whilst retaining many of the features which resulted in the success of these equipment. Such a forklift can articulate and operate in aisles as small as 1.6m offering great space savings over counterbalance and reach trucks. According to the South African Bendi distributors, Goscor, SPAR Eastern Cape has recently implemented 2 Bendi B318 articulated forklifts at its off-site warehouse in PE and through innovative design and the new forklifts they managed to gain an extra 40% of storage space. Goscor also states that the Bendi’s ability to pick indoors and load outdoors with equal dexterity, prevents the requirement for two machines and all this significantly enhances efficiency.

If such a forklift is implemented at Tribeca, space could be optimized and utilized to the extreme and still gain better productivity and efficiency throughout their operations. A massive advantage is also that the Bendi can assist in the receiving operations to offload trucks as well and prevent employees to exhaust themselves and waste precious time. More info regarding the Bendi B318 can be seen in Appendix B.

Figure 28: Bendi Forklift narrow aisle illustration
4.5.1.1. **Advantages**

- Maximum space utilization due to operation in as small as 1.6m aisles
- Up to 9m lift heights maximizes building storage heights
- 1800kg capacity exceeds the maximum pallet weights of green coffee as well as printing reels
- Dual inside and outside capabilities
- Improves productivity and efficiency throughout the company by allowing the operator to work faster, safer and more accurately
- Improves ergonomics and employee morale
- Improves safety
- Lifetime warranty on the articulation unit

5.5.1.2. **Estimated Cost**

Estimated cost for a new Bendi B318 by Goscor is **R480 000**, depending on the exchange rate at time of purchase. All through this seems as quite a high initial cost, the future advantages and savings that will be gained will far exceed the expense of this equipment.

*Figure 29: Bendi Forklifts implemented by SPAR*
Chapter 5: Final Recommendations and Conclusion

5.1. Introduction

As previously stated by Tomkins (2003), the facilities we design and improve should help an organization achieve supply chain excellence at the end of the day. By constantly considering the core issues Tribeca is currently experiencing together with Tomkins and all other resources and information gathered throughout this project, a practical set of recommendations can now be given to get one step closer to the ideal environment every manufacturing company is striving for, supply chain excellence. Below is a summary of the final recommendations from the primary Receiving and Storage operations to the different recommended warehouse layouts and material handling equipment based on the Chapter 4 proposed improvements and evaluation of alternatives.

5.2. Final Recommendations

5.2.1. Receiving and Storage Operations

With both operations and their proposed recommendations discussed in 4.1 and 4.2, it is strongly recommended that Tribeca implement both these revised control sheets evident in Figure 22 and 23 to improve inventory control and overall management throughout the Green Coffee Warehouse. This basic control system creates the basis for inventory accuracy and management of stock together with tidiness and good housekeeping practices. A more in depth description of these control sheets are summarized in 4.1 and 4.2.

5.2.2. Green Coffee Warehouse

For the Main Coffee Warehouse, the highest recommendation would be Alternative 3 evident in 4.3.3. As discussed in the Evaluation Phase, this alternative creates the most advantages regarding improved productivity, space utilization, efficiency and available space for future growth and demand. The fact that this is an on-site warehouse also eliminates all issues regarding wasted travelling time between facilities and would furthermore increase management and overall supervision over this warehouse and its operations.

If Tribeca prefers to keep the main warehouse in the current facility but is willing to implement the budgeted costs for improvements, Alternative 1 is recommended evident in 4.3.1. All though this facility will not be able to satisfy Tribeca’s demand and inventory in the future, this option would still address the current issues with its advantages discussed in 4.3.1. better than Alternative 2 which is only recommended if Tribeca is in no position at the moment to implement any of the needed costs.
5.2.3. Packaging Warehouse

For the Packaging warehouse, the proposed improvements and layout evident in 4.4.1 are recommended to address the issues discussed in 3.3.3. This basic addition of storage racks would increase available storage and floor space while increasing material flow and inventory control. The protection of expensive printing reels are of utmost importance and through these improvements printing reels can be stored in one specific area where the utilization can be controlled and managed. The remaining space could be used to get packed orders on pallets out of the way and to store other packaging materials in one place where they will be needed and easily accessed.

5.2.4. Material Handling Equipment

Considering the current material handling issues discussed in 3.4. and the amount of manual labour needed throughout day-to-day operations at Tribeca, additional equipment would drastically improve ergonomics, employee morale and labour productivity together with savings on temporary staff expenses that would no longer be needed. As discussed in 4.5, the implementation of the recommended Bendi B318 forklift would allow Tribeca to optimize space to an extent impossibly obtained with a standard counterbalance truck. With the advantages such a forklift delivers, it is highly recommended that Tribeca invests in a new Bendi forklift to enjoy the award winning features and benefit from what it has to give.

5.3. Conclusion

Implementing and dealing with change in a company is probably one of the biggest universal challenges you would find in any workplace. It is important to focus on what you would like to achieve and aim high with the thought in mind that outcomes never will change unless you are willing to adjust your every day actions and do it different, and better.

By implementing the recommended improvements throughout the operations of Tribeca, the key aim for this project will be reached in order to:

- Improve the inventory accuracy, control and management of stock throughout the warehouses
- Utilize space to accommodate all inventory and material handling movement
- Improve layouts of the warehouses to progress labour productivity, efficiency and tidiness
- Perform FIFO storage policies throughout the main warehouse
- Improve safety of employees
- Reduce manual labour and improve employee morale and efficiency
- Reduce distance from the main coffee warehouse to factory to improve productivity
- Prevent overstocked warehouses
- Improve storage space within the Packaging Warehouse to facilitate and protect expensive printing reels and improve the utilization and control thereof
- Establish good housekeeping practices throughout the facilities
Total estimated costs for proposed improvements equal **R527 035** and at the end of the day all these improvements to the current facilities of Tribeca are justified to achieve supply chain excellence and to maintain a competitive advantage within the ever growing coffee industry.
Resources


Appendix A

The following sheets are currently used in the receiving process of Tribeca Coffee Company as well as sample testing procedures.
Appendix B

The following sheets summarize specifications regarding heavy duty storage racks, quotes for the alternative layouts by Universal Storage Systems as well as the Bendi B318 forklift that is recommended for Tribeca in the future.
UNI-RACK

ADJUSTABLE PALLET RACKING

APPLICATIONS:
Ambient and coldroom pallet racking — consumer goods, paper, timber, chemicals, heavy components and parts, stillages etc.

Universal Storage Systems, Africa’s leading manufacturer of racking and shelving, markets a range of warehousing and storage products and systems.

The company, through the use of its own research, technology and highly trained engineers, plus access through international relationships, has a reputation of being able to develop solutions for most storage challenges.

Serving the Republic, through a network of company branches and distribution centres, Universal Storage Systems has developed a reputation for excellence in South Africa. The company has also established an expanding base of export countries such as the Middle East, Australia, Africa and the UK.

Visit our Web Site: www.universal-storage.co.za
High rise racking with 100% selectivity.
For all warehouses and distribution centres.
P.O. BOX 35062  
NORTHCLIFF  
2115

COMPANY NAME:  GREEN COFFEE WAREHOUSE  
E-MAIL:  
CONTACT PERSON:  THEU N VAN RENSBURG  
DATE:  6-06-11  
DESCRIPTION:  UNI-RACK  
REF No.:  NS 11/352

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ALL ABOVE PRICES EXCLUDES VAT!

VALIDITY: 20 DAYS ONLY
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<tr>
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<th>QTY</th>
<th>PRICE EACH</th>
<th>TOTAL PRICE</th>
<th>UNIT KG</th>
<th>TOTAL KG</th>
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<tbody>
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<td>1.50</td>
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<td>158.06</td>
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**MATERIAL TOTAL** 43,206.48 1,627.26

**DISCOUNT %** 42

**MATERIAL NETT TOTAL** 25,058.73 TONNE 1.03

<table>
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<tr>
<th>RATE</th>
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<th>INSTALLATION</th>
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<td>3,825.00</td>
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**NETT TOTAL** 28,884.76 **TOTAL** R 26,534.76

**TRANSPORT** 650.00 **TRANSPORT** R 650.00

**NETT TOTAL** 26,534.76 **NETT TOTAL** R 26,534.76

ALL ABOVE PRICES EXCLUDES VAT!

**VALIDITY : 20 DAYS ONLY**
B318 FWD
Battery Electric Multi-Purpose Articulated Forklift Truck

Designed to give optimal aisle performance whilst retaining many of the features which have made the award winning Bendi the first choice in articulated forklift trucks, the B318 is capable of storing pallets in aisles as small as 1.6m offering great space savings over counterbalance and reach trucks. Bendi can achieve a storage density that exceeds that of a very narrow aisle (VNA) installation.

Features
- Battery electric
- 1800kg capacity
- 9m lift
- 1.6m aisle
- Dual inside / outside capability

Ergonomics & Safety
- Comfortable seating position with all truck functions to hand
- No ‘deadman switch’ required as rotation fully visible from drivers cab
- Four post overhead guard
- Full hydraulic power steering

Drivetrain
- Large soft tyres
- Regenerative braking
- Powerful 8kW drive motor
- 220° over rotating steering

Electrical System
- 48 volt high capacity battery
- Maintenance free AC control
- Battery and status monitoring display
- Provision for radio data terminals / RFID reader

Engineering
- Full backwards and forwards tilt
- Accepts all standard attachments
- Lifetime warranty on articulation unit
- Award winning chassis design
- Patented front wheel drive
# B318 FWD
Battery Electric Multi-Purpose Articulated Forklift

## Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
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<tbody>
<tr>
<td>Model</td>
<td>B318</td>
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<tr>
<td>Capacity</td>
<td>3180</td>
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<tr>
<td>Load Handwidth</td>
<td>500</td>
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<tr>
<td>Power source</td>
<td>Traction Battery</td>
</tr>
<tr>
<td>Unladen mass without battery</td>
<td>5800</td>
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<tr>
<td>Drive system</td>
<td>Integral</td>
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<tr>
<td>Lift Speed</td>
<td>Last / Unladen m/s</td>
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<tr>
<td>Lower speed</td>
<td>Last / Unladen m/s</td>
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<tr>
<td>Tilt range</td>
<td>Fore/Rea</td>
</tr>
<tr>
<td>Overhead guard height</td>
<td>g</td>
</tr>
<tr>
<td>Seat height</td>
<td>f</td>
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<tr>
<td>Cast floor height</td>
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<tr>
<td>Minimum ground clearance</td>
<td>d</td>
</tr>
<tr>
<td>Last band centres</td>
<td>a</td>
</tr>
<tr>
<td>Overall length to rear of forks</td>
<td>c</td>
</tr>
<tr>
<td>Wheelbase</td>
<td>b</td>
</tr>
<tr>
<td>Chassis width</td>
<td>h</td>
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<tr>
<td>Maximum gradient</td>
<td>%</td>
</tr>
<tr>
<td>Rotation angle</td>
<td>a</td>
</tr>
<tr>
<td>Combined Lift and power down motor rating</td>
<td>kW</td>
</tr>
<tr>
<td>Drive motor rating</td>
<td>kW</td>
</tr>
<tr>
<td>Wheel size</td>
<td>Front / Rear</td>
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<td>Battery type, standard</td>
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<tr>
<td>Minimum battery weight</td>
<td>kg</td>
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<td>Carrier type</td>
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## Most Dimensions

<table>
<thead>
<tr>
<th>Lift Height</th>
<th>Free Lift</th>
<th>Closed Height</th>
<th>Extended Height</th>
<th>Lift Height</th>
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<td>3000 mm</td>
<td>4166 mm</td>
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</table>

All heights are stated without load attachment, if fitted.

## Axle Dimensions

<table>
<thead>
<tr>
<th>Load Depth x Width (L x W)</th>
<th>Minimum Clear-Access (A)</th>
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</thead>
<tbody>
<tr>
<td>1000mm 0 x 1500mm</td>
<td>1620 mm</td>
</tr>
<tr>
<td>1300mm 0 x 1900mm</td>
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<td>1200mm 0 x 1400mm</td>
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<tr>
<td>Minimum clear transfer side</td>
<td>2200 mm</td>
</tr>
</tbody>
</table>

---

*See the Bendi B318 in Action*

download the FREE QR code reader from your app store

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Translift Bendi Ltd
Sales/General Enquiries: 01527 527411 Fax: 01527 510177 Email: info@bendi.co.uk
22 Padgets Lane • South Moons Moat Industrial Estate • Redditch • Worcestershire • B98 0FB
www.bendi.co.uk

Anything else is a waste of space.