Quality product and labelling assurance systems at Bakkavor Spring Valley Foods

by
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1. INTRODUCTION

1.1. Company Background

Bakkavor Group is a leading international food manufacturing company specialising in fresh prepared foods and produce, with 57 factories and 20 000 employees in ten countries. Spring Valley Foods (SVF) is part of this leading organization situated in Bapsfontein, South Africa. The company specializes in the production and packing of fresh fruits for various grocery retailers. The primary customers are Woolworths (WW) a well known South African retailer and Marks & Spencer (M&S) a Leading British retailer in the United Kingdom.

1.2. Project Background

Thousands of goods are produced daily and distributed worldwide. The process of producing a fresh prepared product is divided into sections internally known as Medium Risk, Prepping, Packing and Collation. This distinction is made due to the different processes and the hygiene area it is allocated to. Where fruits are open and prone to human contact the area is a high risk area and procedures are very specific in ensuring a clean safe product.

The production processes at Spring Valley Foods include the labelling and packing of goods. The Collation area receives sealed goods from the packing area which makes this a low risk area. This is the area where Product labelling is done and it is the final step in producing a finished good, as indicated in Appendix A. Customers have specific labels assigned to different products and these labels are ordered by the company with the predefined design already printed. It is the company’s responsibility to print the product details onto the label and ensure the label is ready when requested for production. The printed details include the product expiry date, mass etc.

1.3. Problem Statement

The Collation labelling system responsibilities refers to the printing, applying and verification of company labels. This Labelling system has proven to be insufficient not only because of customer complaints but also due to a number of Marks and Spencer Code of Practise specifications that are not met.
In addition, it is a company goal to implement systems for continuous improvement. The company is however not accustomed to change and it was recommended to approach every area individually to ensure successful results. This project seemed to be the appropriate starting point to implement measurable processes within the collation area.

1.3.1. **Label Printing System**

The product label details are printed in the print room, situated within the collation area. When label details are printed it is the employees’ responsibility to provide all the necessary details of the products. This method of printing labels has proven to be unsuccessful as numerous customer complaints were received due to incorrect printed details. In situations like this, if there isn’t time for relabeling, the goods are dumped and results in a great loss of profit for the company.

1.3.2. **Label Verification System**

Throughout the past year it became apparent that not all Marks and Spencer supplier specifications were met. The M&S Code of Practise is updated regularly with required changes constantly appearing. The next M&S audit will be during October 2011 and the main specifications stipulated that a product verification system is required. M&S requires a system that will ensure them food products are packed using the correct packaging and date coding as well as removing allergenic risks to the customer.

1.3.3. **Continuous Improvement**

One concern within the company’s operations is that there are no methods in place to measure the production efficiency. The purpose of this project is not only to design and implement Labelling systems that would ensure a quality product but also a way of creating measurable processes. As soon as a measurable process is created the opportunity for continuous improvement and cost reduction arises. Future projects will work backwards from the collation area in creating systems which will later be integrated in performing one common goal of improving production efficiency and reducing operational costs.

2. **PROJECT AIM**

The aim is to design labelling systems, which will guarantee Bakkavor Spring Valley Foods’ of a Quality Product with Quality labelling systems, at the least possible cost. This includes removing ‘allergenic’ risks to the customer by eliminating the possibility of using incorrect packaging on any food products. This will also be used as the first step for the company to create a system for the purpose of future continuous improvement.
3. PROJECT SCOPE

This project was phase one of a series of projects that will follow in the future, which is why it was extremely important to design systems that will support future continuous improvement projects.

3.1. Label Printing System

This branch of the project existed from customer complaints on the printing of label details. Through this however an opportunity existed for the improvement of other areas within the print room. The Label printing system includes all the processes and procedures from when a preliminary order is received up to where the left over labels are dumped. The following areas were investigated; method of printing labels, the print room location and layout, server information technology, mass balance systems. System implementation and staff training was a vital process in ensuring a successful system.

3.2. Label Verification System

The Label verification system includes all the processes associated with assuring a quality product with the correct label and date coding. The Marks and Spencer specification stated that every produced product will need to be checked, as soon as a label is applied, to ensure the correct label was used. This system includes all the processes from when a label is applied to a product up to where it is boxed and sent to dispatch. Processes were designed, conveyor specifications were identified and the information technology required in performing the task was carefully planned.

3.3. Continuous Improvement

All the processes and procedures developed in the Label printing system and Label Verification System were developed with special consideration for measurable processes. This will provide the basis for continuous improvement.

The Project Scope included the project Implementation, employee training and the development of Procedure Manuals. A system design or change, of this stature, need to concern the employee training as one of the fundamental areas to ensure a successful system. A perfect system can be designed and implemented but without a well trained staff errors are a certainty.
4. LITERATURE REVIEW

4.1. Label Printing System

To reduce the employees’ responsibilities in the print room a semi automated information technology system is required. A modern automated printing system relies heavily on Information Technology to ensure correct information is supplied and sufficient data is recorded.

When designing a printing system it is extremely important to take a company’s constraints and specifications into account. Information Technology has a wide variety of functions to offer which is why organizations will have unique printing systems designed to perform according to their specific requirements.

4.2. Label Verification System

Modern society has opened up a new world for verification systems. A vast amount of research has been done on this subject and solutions such as bar coding and RFID tags have been developed and used successfully in organizations across the world. Verification devices can be integrated in-line, attached to the printer to monitor the quality of every printed label or they can be used in a standalone configuration to audit batches and labels. Depending on the company specifications and constraints an automated or manual system can be developed.

When designing a verification system the main concern is the construction, implementation and maintenance costs involved. These costs can be very high and the return on investment along with a payback period will give an indication of the project’s success, if applicable. The need for this verification system existed from a Marks and Spencer supplier specification and is therefore not an investment for increase in profit but for customer satisfaction. Nevertheless great opportunities for improvement can rise from verification systems.

4.3. Continuous Improvement

Continuous Improvement on processes will only be possible if the processes are measured. If nothing is measured no data is available to support management in making decisions. Organizations have different methods of measuring, as can be seen in the table. The measurements will depend on the types of processes within the operations.

<table>
<thead>
<tr>
<th>GOAL</th>
<th>MEASURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Effectiveness</td>
<td>Productivity (or Production coefficient)</td>
</tr>
<tr>
<td>Efficiency</td>
<td>Rework as a fraction of total effort</td>
</tr>
</tbody>
</table>
5. SUPPLEMENTARY TOOLS AND METHODS

5.1. Process Design

Quality plays an essential role in any organisation, and more critically in a company where products are produced and need to conform to various safety standards and internal specifications.

Company procedures were created and used to identify and design processes which will form the base of continual improvement within the company. These processes will provide a foundation for employees uncertain of any procedure and assist in ensuring processes are completed as required. The processes and procedures will assist in improving the quality management system through acting as a reference point for any uncertainty within the company.

Processes were designed for all the responsibilities assigned to the collation area and new responsibilities with processes were created where necessary. These processes are simple and easy to understand, as can be seen in Appendix B.

5.2. Layout Design

Label Printing

There are thousands of processes that are performed in a company of this stature. To create process flow patterns and accommodate for new processes the layout of areas were redesigned.

Label Verification

The new verification system required new equipment that would be added to the existing equipment. Every piece of equipment and information technology involved in this process will be vital in performing the goal successfully. This is why the design of the system was developed in-depth with every detail considered in full.

The design of the equipment also needed to consider the collation layout and available space. The final construction will be done by a contractor and will be received on the day of implementation. There is no room for error on this day and every detail of size and space involved need to be designed according to the available resources.
6. CONCEPTUAL DESIGN AND SOLUTION

6.1. Label Printing System

6.1.1. Development of Solutions

All the problems were identified with the possible solutions developed. The solutions were reviewed and compared to one another with consideration for the constraints and the most appropriate solution was then selected.

<table>
<thead>
<tr>
<th>CATEGORY OF CONCERN</th>
<th>PROBLEMS AND SOLUTIONS</th>
<th>SOLUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Space</td>
<td>The upstairs location of the print room created problems for the line leaders to retrieve labels. They are up and down the stairs numerous times a day and the stairs only allow movement of one person at a time.</td>
<td>A bigger space was available downstairs. The print room’s flow of processes will be improved by this move, including the process of retrieving labels. This area is closer to the collation area which will save time. The available space is bigger than the old print room which will create opportunities for other improvements.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>CONSTRAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Store labels for the days productions on line</td>
<td>• M&amp;S Supplier Code of practice stipulates that only one label is allowed on a production line.</td>
</tr>
<tr>
<td>• Design a process to transport the labels by alternative methods</td>
<td>• Complication of a simple process</td>
</tr>
<tr>
<td>• Move the print room to a location down stairs, closer to production lines</td>
<td>• Need to find the available space</td>
</tr>
</tbody>
</table>
During peak seasons the issue window is too crowded and line leaders waste too much time on requesting labels.

The best solution, when considering all the specifications from customers, is to increase the size of the issue window. With the development of the new print room this will be a simple task. The Issue window will have to accommodate up to four line leaders at a time. (There are eight production lines and it almost never occurs that more than three lines start new production runs at the same time)

The storage of printed labels are inconvenient and impossible to work with, all the labels are stored on the same shelves (+- 80 different labels). Marks and Spencer specified within the code of practise that every label needs to be stored separately with a method to indicate the labels details and planned production day

This was a difficult task to approach because of a space constraint, even with the new print room in development. A shelf will be designed to store at least 95% (peak season) of the labels with specific indication of a label’s location. During peak seasons there might have to be one or two labels stored on the same location but if this is indicated clearly it shouldn’t create any problems

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>CONSTRAINT</th>
</tr>
</thead>
</table>
| • A shelf will be constructed which will allow for individual storage of labels. The self will separate the labels from one another and an area to indicate the label details will be available | • There are +-80 different labels during a peak season  
• Cost of construction |
<p>| • Only print a label | • During peak |</p>
<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>CONSTRAINT</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Construct a shelf that will store the unprinted labels individually</td>
<td>• High cost involved and limited space available</td>
</tr>
<tr>
<td>• Only request necessary labels in the mornings from packaging and return left over labels at the end of the day</td>
<td>• Resistance</td>
</tr>
<tr>
<td></td>
<td>• If employees do not follow the correct procedure the customer code of practice will be broken</td>
</tr>
</tbody>
</table>

Unprinted Labels are difficult to collect from the storage area. It is a requirement for printed and unprinted labels to be stored separately and be locked away. Print Room staff retrieves the labels from outside the print room where the labels are piled onto one another with no indication of where to find specific labels.

A method that would allow only for the daily unprinted labels to be stored within the print room is required. This creates more control and easy accessible labels.

Storage of promotional stickers as well as box coding and colour coding is unorganized with no clear indication of where labels should be stored or collected.

A storage shelf will be constructed by the Engineering department which will have clearly indicated spaces for every type of label to be stored in.
**System Design**

The Print room employees are making a number of mistakes when printing label details. Not only because of the stress of constantly being behind demand but also because of an uneducated work force. This was where the customer complaints came from. Spring Valley Foods works with an Uneducated work force and excessive errors will be a given if too much responsibilities are assigned to workers. During this investigation it became clear that a system that would reduce employee responsibilities was necessary. Methods have been investigated and a semi-automated system with a server connected to the printers was identified as the best solution.

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>CONSTRAINT</th>
</tr>
</thead>
</table>
| ● Create an automated information system and remove the input from staff members | ● Highly complex information system
● High Cost
● Not a necessity |
| ● Create a Semi automated information system to partially remove the staff input | ● Input from staff members could still create problems |

<table>
<thead>
<tr>
<th>JOB DESCRIPTIONS, ROLES AND PROCEDURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Job Descriptions, Roles and Procedures weren’t clear and available to employees which made it impossible to improve in their work areas and complete responsibilities sufficiently.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROCEDURES WITH ROLES AND JOB DESCRIPTIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Procedures with Roles and Job Descriptions will be developed to give exact instructions on what needs to be done by whom. This will be openly available in the print room and job descriptions will be signed off by employees.</td>
</tr>
<tr>
<td>Time</td>
</tr>
<tr>
<td>---</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Change Resistance</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
<tr>
<td></td>
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<tr>
<td></td>
</tr>
</tbody>
</table>
6.1.2. Conceptual Design

The problems were identified and solutions were created which finally lead to the commencement of the conceptual design. This design will be the basis for the project development and construction. Changes during development are possible but this will be the reference point throughout the project.

Job Descriptions and Procedure Manual

A template was designed for the job descriptions necessary, this will be used for all the roles identified within the print room. Meetings will be arranged with managers and all the relevant employees to discuss the responsibilities in full. These meetings will provide information to create sufficient and clear job descriptions. The procedure manual will be created according to standard and the main topics to discuss were identified to ensure a sufficient document.
The following topics will be discussed in the procedure manual with complete steps to follow. This will ensure the correct procedure and standards are followed at all times.

— Purpose/Background
— Applicability
— Scope
— Roles and Responsibilities
— Procedure
— Ordering and returning labels
— Calculating Required Labels
— Preliminary Print
— Final Print
— Recording Processes
— Manual Forms
— Server Device
— Day end Responsibilities
— Mass Balance
— Cleaning
— Forms
— Appendices

**Woolworths and Marks and Spencer Label Storage**

Separate shelves were designed for Woolworths and M&S. This design allows for the storage of individual labels and a space where label details will be displayed to ensure labels are not mixed. Spring Valley Foods’ production systems operate according to a colour coding scheme to ensure products are produced and dispatched on the correct date. Every production batch will have a release form attached to it with a colour code to indicate the dispatch date, as can be seen in the picture.

![Figure 5: Photo of label detail display](image1)

![Figure 6: Photo of batch with colour coding release form](image2)
The shelves are designed to store up to 45 labels for Woolworths and 30 labels for Marks and Spencer. Every label will be separated by a thin piece of steel. The separation steel used will be as thin as possible to ensure space isn’t wasted. Various options have been investigated to ensure the separation can be completed at the least possible cost and labour. The investigations proved that a steel rod will be the best option. The old shelves will be used in which holes, same diameter as the rod, will be made. The rod will be welded to the shelf and this will finally create a storage shelf for a great number of labels.

![Figure 7: Label storage design](image)

**Storage of Promotional Stickers**

The storage of the promotional stickers is a simple task to improve on. An engineering construction to allow for the storage of 15 different types of stickers is required. This storage device was designed and will be attached to the wall next to the issue window for easy issue access and a quick issue method.

**Storage of unprinted labels**

Unprinted labels will not be stored in the print room anymore. The labels, necessary for the daily prints, will be ordered from packaging in the mornings and issued back to packaging at the end of every day. This will remove the responsibility of recording extra data for the print room staff.
Print Room re-location

There is an available space downstairs for the re-location of the print room. The space has an improved location with more space available for sufficient processes.

Proposed Ground Floor Layout

![Proposed Ground Floor Layout](image)

Figure 8: Illustration of proposed Print Room design and layout (Ground Floor)

Semi-automated label data storage

A simple design of what is required was created. This design will be used to improve on with adjustments to develop a successful semi-automated recording device.

![Semi-automated label data storage](image)

Figure 9: Illustration of data recording device
Printing errors

Information technology will be the main concern in this area of the project. The IT equipment and programming will be completed by Julian Powers from Cab Technology. This will be done according to the following system specifications.

- Semi-automated system
- Record printer name, date printed, product details and expiry date
- Provide all relevant information. Expiry date, product (staff only need to scan the bar code), product mass etc
- Restricted access to change the information on system
- All employees are required to login with a personal ID and password
- Minimum information provided by print room employees

Prepared production labels

There are eight production lines and every line has a daily production plan. The print room employees also receive the daily production plan and this will be used to prepare labels in advance. Eight boxes will be available at the issue window with the next production runs’ label prepared in advance. The box will be big enough to hold any size label and the process will be simple. As soon as a label is issued from a box the line’s next label is prepared.

![Figure 10: Prepared line boxes](Figure 10: Prepared line boxes)

6.2. Label Verification System

6.2.1. Physical Design

The verification system design will be completed in two phases. Phase 1 will be the design without a label applicator, when labels are still applied manually. Trial and error is always a factor associated with change and will be a method of obtaining success in phase 1. Phase 2 will then be to add the label applicator to the line which will help increase the efficiency of production.

During the design of both phases there will be factors to consider with constraints allocated. It is a vital point in the design to ensure all factors are considered with appropriate solutions developed.
### Design Factors to Consider

<table>
<thead>
<tr>
<th>Phase</th>
<th>Issue</th>
<th>Possible Solutions</th>
<th>Constraint</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Enough space needs to be available for walking and movement of batches at line ends (See Appendix A)</td>
<td>Consider reduction of length provided for employees to apply labels</td>
<td>Might not be enough space left for 4-6 employees to apply the labels</td>
</tr>
<tr>
<td></td>
<td>The design will have to consider the implementation of the label applicators in the next phase</td>
<td>The manual process of applying labels will need to consist of a roller bed stand that can lock to the ground and be removed at a later stage</td>
<td>High cost involved</td>
</tr>
<tr>
<td></td>
<td>Labels need to be scanned from the bottom</td>
<td>The conveyor will be designed with two separate belts and an opening in the centre</td>
<td>Conveyor stability uncertain</td>
</tr>
<tr>
<td>If labels are not applied correctly the label scanner might find false errors</td>
<td>Employee Training will have to include the retraining of applying labels</td>
<td>Change resistance</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>Labels shouldn’t be able to be shifted on the conveyor. This might complicate the scanning process</td>
<td>At the start of the feed a mould will be required which will ensure that the punnet is in the correct position on the conveyor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employees might feed the products in intervals faster than accepted (False errors)</td>
<td>A stopper will be required before the scanning conveyor feed starts to ensure correct time elapsed for next product</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Procedure if there is a malfunction with the barcode scanner</td>
<td>A procedure will need to be developed for machine malfunction which in a peak season will need to be done manually</td>
<td>During Peak seasons every line is in use and critical for production</td>
<td></td>
</tr>
<tr>
<td>The design to manually apply labels might affect the employees’ efficiency and the possibility of not physically fitting into the line will be considered</td>
<td>The design will need to include ergonomics to ensure employees are comfortable and can perform responsibilities efficiently</td>
<td>Change resistance</td>
<td></td>
</tr>
</tbody>
</table>

Most factors related to phase 2 have been considered in phase 1 and special consideration for the label dispenser is required now.

**Phase 2**

<table>
<thead>
<tr>
<th>If there is a malfunction with the label dispenser preparations are necessary to eliminate unnecessary production down times</th>
<th>Allow employees to apply labels manually</th>
<th>Is there enough space available for the label scanner before the next label is scanned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continue the production run on another line</td>
<td>With the massive demand in a peak season all production lines will be in use</td>
<td></td>
</tr>
</tbody>
</table>
6.2.2. **Functional Design**

The functions to consider when the system is designed are:

- System stops and alarms are triggered when labels are unreadable
- A setup procedure is required that will test the Scanner
- Accurate scanning of bar codes
- A Product is rejected when the label is incorrect or unreadable
- Rejected product is recorded
- Accepted Product is recorded
- Future Projects will include the calculation of estimated starting and finishing time
- Display screen to show amount left to produce during production run
- Interface with scanner to allow sufficient insertion of production run details
- Coloured lights to indicate the completion of the setup and the production run

The physical design will be completed by Theunis Taljaard (*Ingenior*), Automation and Machine Specialists. Ingenior specializes in customized automation systems to provide functions designed for a company’s unique specifications. There are standardized systems available from European countries but the associated maintenance costs are unnecessary and will exceed the company’s budget. Ingenior is located in Centurion, Pretoria only 40 min from Bakkavor’s premises.
6.3. Continuous Improvement

In the system design the Information Technology involved will need to record certain data that will be used to create reports for analysis of production efficiency.

The following data will be recorded:

- Starting time of a production run
- Finishing time of a production run
7. PROBLEM SOLVING AND RESULTS

The printing system will take care of numerous errors that were identified and the verifications system will do checks to ensure a quality product. This will include collecting data, providing reports and creating measurable processes which will present an opportunity of improvement for the company.

7.1. Label Printing System

Adjustments have been made to various areas of the Label Printing System. The print room was moved down stairs to create more space for additional storing and different methods of storing. The methods of printing labels and issuing have been changed into a semi-automated system with less responsibility assigned to employees. The changes will now be discussed as either a physical or information technology system change.

7.1.1. Physical Changes

The initial Print room didn’t utilize the available space and didn’t have enough space available for storage of labels. It was located upstairs in the collation area with little space available for line leaders to request labels at the issue window.

The following changes have been made:

- Prepared line labels are provided at the Issue window (according to the production plan)
- The new layout of the print room is situated on the ground floor where access for line leaders to request labels are convenient, easy and quick.
• The planning manager is now situated within the print room to ensure more control and to assist where necessary

• Shelves were designed to store 95% of Woolworths and 100% of M&S Labels (peak season)

• Every label is now stored individually with the specific label identified and the day it is required for indicated (company colour coding used to indicate production day). There are seven shelves for every day of the week and a row for every product in production.

• Job descriptions, roles and procedures were created and staff members trained (See Appendix)

• With the development of the new print room the size of the issue window was increased
• Labels are prepared three days in advance (possible with new storage method)

• Storage shelf constructed by engineering department for storage of promotional stickers

• Unprinted labels are now ordered in the morning (according to demand) and returned at the end of the day. This method ensures enough space for storage and easy access to specific labels.

7.1.2. IT System Changes

Printing Control

The changes increased the printing control in the print room; this was where the customer complaints existed from. Employees were making mistakes when label details were printed and the employee responsibility of providing details needed to be reduced.
A server connected to the printers was identified as the best solution with special consideration for the constraints. A server with a database was created, containing product details provided by authorised personnel. This data is updated regularly by assigned staff members and when this is done the date, changes made and person who made the changes are recorded for traceability purposes.

The printing employees have fewer responsibilities and all the processes performed by the print room employees are recorded via a connection between the server and printers. When a preliminary order is received the employee’s responsibilities only consists of the following steps.

1. Scan the label
2. Enter the customer
3. Enter Label Version
4. Enter Product Depot date
5. Enter Number to be printed

This method of printing labels reduces the possible number of errors and provides traceability for all processes associated with printing labels.

![Figure 22: Photo of a printer connected to a scanning device](image)

**Issuing System**

Changes in this area were made to remove the massive amount of paper work (necessary for traceability and calculation of mass balance) as well as to reduce the time associated with labels issued and returned.
To reduce the paperwork, but still ensure that all the necessary data is recorded, a label issue device was designed. This device is connected to the server and records the weight and time as well as staff involved with a photo of the label’s printed area. The print room employee places the printed labels on the scale and follows the instructions as indicated by the interface. This process is necessary when a label is printed, issued, returned or dumped. This data is then available to create reports (including mass balance) and investigations on any errors are possible. This saves paper, costs are reduced, the time to completing processes is less and the labour required in the print room is less.

The print room employees are now instructed to keep track of the daily production plan. With this knowledge the labels required for the next run are prepared and temporarily stored at the issuing window. This method reduces the time it takes to issue a label.

7.2. Label Verification System

The Marks and Spencer specifications only require a system that verifies the label details but this project will be divided into phases using the verification system as the basis for improvement.

7.2.1. Physical Design and Layout

Verification System

The design was completed by Theunis Taljaard (Ingenior), Automation and Machine Specialists along with Julian Powers (Cab Technology), Technology equipment and programming.

The physical design allows the process to first conduct the existing metal test (if labels are applied before this process it will be a waste of labels) then applying the labels and finally the product is scanned. As soon as the scanning process is completed the products are boxed and sent to dispatch.

The manual labelling area consists of a roller bed at an angle; this leads the product to the scanning process. As soon as the product descends to the scanning area it follows the conveyor through an adjustable mould to ensure it is in the correct position. The scanner has a stopping device (functioning on a timer) which ensures enough time has elapsed before the next product is received by the scanner.

Each product is transported through the scanning system by two conveyor belts that are both adjustable. The adjustment was a requirement for products that are labeled differently.
A product is moved forward by the belts with the barcode displayed at the bottom through the gap. The barcode moves over the scanning head which reads the barcode details and compares it to the product setup details. If any errors occur the system will trigger the next feed to be lifted on a timed interval, allowing the rejection of a faulty label. Accepted labels are transferred to the boxing process.
Label applicator

The next phase of the project is the label applicator which will only be completed in December of 2011. The application is a C-strap method and the length of the label could cause problems which is why numerous tests are being conducted by Ingenior.

7.2.2. System Setup

A key element in the success of the verification system is the procedures and functions associated with the setup of the system. The system will need to undergo a test to check that all functions are working before a production run commences.

The setup process will occur every time a new production run is required.

<table>
<thead>
<tr>
<th>STEP</th>
<th>SYSTEM</th>
<th>LINE LEADER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Request an Authorization card to be swiped</td>
<td>Swipe the card</td>
</tr>
<tr>
<td></td>
<td>Line leaders are responsible for production runs. When a production run occurs the system will record the line leader information which will be used for traceability. Only line leaders will be allowed to initiate a production run.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Approve Card</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The system will read the card and authorise the production run as well as record the information for the production run</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Request to Scan a label</td>
<td>Scan Label</td>
</tr>
<tr>
<td></td>
<td>To ensure the correct label is scanned and checked the required label will need to be scanned for the system to recall the label details to be scanned and approved</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Read and display label</td>
<td></td>
</tr>
<tr>
<td></td>
<td>To ensure the correct label is about to be used and system functions are correct the system will display the information and request input from the line leader</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td>Request approval input</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Approve”</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Start Conveyor Movement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The IT system and conveyor is connected and soon as the initial information is approved the IT system will trigger the conveyor to start moving</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>Request Correct Labelled Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insert Correct Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The first step in testing the scanner functionality is to request the product with the correct label</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td>Approve and Trigger Light</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If this process was accepted the system will trigger the light that will indicate to the line leader that the test was successful and the next test is required</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td>Request Incorrect Labelled Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insert Incorrect Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The next test will require a product with an incorrect label to test the functionality</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Approve and Trigger Next Light</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the product was rejected and the test approved the next light will be triggered</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Request Product without a label</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Insert Unlabelled Product</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The final step in the test will be to check a product without a label</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Approve and Trigger Next Light</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If this test was successful the next light will be triggered and it will be clear to a line leader that the setup was successful and the system is ready for the production run</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Request number to be Scanned Successfully</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Input Total Production Run</td>
<td></td>
</tr>
<tr>
<td></td>
<td>The final step before the production run commences is to indicate the production number (batch size). During Production the system will display the number to be produced and ensure products are not over produced</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Trigger final light indicating Running session</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Start Production Run</td>
<td></td>
</tr>
</tbody>
</table>

Below is a figure of what will appear during a production run to confirm a successful setup. The green light will indicate that the setup was successful and a production run is in session.

![Figure 28: Illustration of the production setup indicators](image-url)
7.2.3. Scanning Process and IT Functions

The actual scanning process will ensure that the correct label is applied and that the label is readable to scanners. The design includes the processes and procedures when a label is rejected (Appendix F illustrates exactly what processes occur, the sequences of processes and who are responsible for them).

When a product is unreadable or unrecognizable the IT system triggers the opening of the rejection box to ensure the product is not distributed to customers. The line leader removes the product from the rejection box, removes the label and places the product back on the roller bed to be relabelled. The IT system records the information regarding label rejections and this data is available in different types of reports.

The Marks and Spencer specifications indicated that when a Label is rejected the Line will have to stop. The IT system immediately triggers the conveyor to stop when a label is rejected and request an authorised card to continue production. This authorised person is the collation manager; he/she will investigate the reason for the rejection and swipe the authorization card to proceed with production when it is safe to do so.

During a production run the number to be produced will be displayed, this information is used by the line leader and communicated to the packing area to ensure products are not over produced or short. As soon as the production number (entered by the line leaders) is reached the production run is completed and the IT system will trigger the conveyor to stop and reset itself to its initial state.

7.3. Continuous Improvement

The following data is now recorded and can be used to create reports, review production efficiency and identify areas on which can be improved.

- Starting time of a production run
- Finishing time of a production run
- Number rejected products due to metal rejection
- Number rejected products due to unreadable label
- Number quality Products produced during a production run
- Number Setup failures
- Number labels printed incorrectly
- Label wastage (Mass Balance)
• Calculate number goods to be produced during production run
• Records the Line leader’s information running the production line

8. RECOMMENDATIONS AND CONCLUSIONS

8.1. Label Printing System

8.1.1. Conclusion

The implemented systems have created an improved flow of processes while simplifying and removing the massive amount of paper work required. The processes are now semi-automated to assist in removing human errors. The changes in this area of the project are straightforward and uncomplicated which should be easy to adapt to and could only benefit the employees in completing tasks.

• Reduced the cost of tasks (paper removed and less labour time required)
• Assist in making decisions through easy accessible process reports
• Reduced the number of labour required in the print room
• Decreased the number of printed errors by reducing employee responsibilities
• Reduced the time it takes to print, issue and return labels as well as calculating the mass balance

8.1.2. Recommendation

Printing the Labels on line will remove a number of responsibilities and increase the speed at which production is occurring. However, there are always other factors to consider and it would be suggested to compare the current methods to an on-line printing method. On line printing methods will have disadvantages that need to be investigated and compared to the advantages and cost reduction, if any.

8.2. Label Verification System

8.2.1. Conclusion

The label verifications system complies with all Marks and Spencer Code of Practise specifications and is used for so much more. Every product produced is now checked by the
scanner to ensure the correct label was used and that the label is readable to customers. While a production run is in session information that can be used in making decisions and reviewing collation efficiency is recorded. Data is a vital aspect in a production process and the method of recording the data will make a huge impact on the utilization of the data. This method allows for the data to be recorded automatically and create easy accessible reports for management to use.

- Marks and Spencer supplier specifications are met
- Data is recorded on systems for easy use and to assist in making production changes
- Every label is scanned ensuring a quality product with the correct label and readable bar code
- Display for line leaders to be notified of number to be produced in production run. This removes the processes of over producing products and shorts in production

8.2.2. Recommendation

The information technology designed in this system allows for continuous improvement on processes and methods used. It was developed with the idea of adding tools to it to improve on methods, increase productivity and be completely assured of a quality product.

This system needs to be utilized and improvements should constantly be made where appropriate to the system. As mentioned previously this is the first step in creating measurable processes and other production areas will be next in line to create these processes.

Future project should consider the scanning device to include the checking of the printed area. This would assure management 100% of quality labels with every label checked and boxed according to standard.

8.3. Continuous Improvement

8.3.1. Conclusion

The collation area now has numerous methods installed to capture data and create measurable processes. It is the first step within the company that will make continuous improvement a possibility. These tools need to be utilized to ensure the company benefits from these new systems.
The processes can now be analyzed and used as reference in making production decisions. It can also be used to create future improvement products and assist in cost reduction calculations. The system records the number of products produced during a production line as well as the time it took to complete a production run. This information will give the company a solid indication of its efficiency.

8.3.2. Recommendations

As mentioned previously future project will now be to create measurable processes within all areas of production.

The next area will be the packing area which is in the high risk production area. Working backwards assures the company of removing bottlenecks and creating a continuous flow within the production area. All project should later be considered as a whole.
9. APPENDICES

9.1. Appendix A: Ground Floor Production Layout

Not to scale
9.2. Appendix B: Collation Process

### PROCESS TITLE:
Collation Procedure

### PROCESS OWNER:
Johannes Mtsweni

### STAFF:
Line Leaders, Shop Floor

### OBJECTIVE(S):
Correct procedures are followed when labels are printed, issued and applied. Ensuring a quality product.

#### INPUTS
- Product Order
- Punnet from Packing

#### PROCESS MONITORING
- Automatic Barcode system
- Quality Assurance Checks
- Traceable Paper work

#### Chart:
- **Input**
  - Print Labels
  - Request Engineering Assistance
  - Receive Order Details
  - Daily Metal Detector Test
- **Setup/Test** Metal Detector
  - Setup system Scanner/Test
  - Perform label Scanning Test
  - Pack Product in Box/Punnet/Bag
  - Record Batch Completion
- **Receive Punnet on Conveyor from high risk**
  - Punnet Passes Metal Detector
  - Apply labels/stickers
  - Collect Boxes/Lugs until batch size is reached
- **Request Product Label**
  - Reject Defective
  - Complete/Attach Batch Release form
  - Retrieve Defective
  - Investigate Problem
  - System Records Information
  - Dump Rejected Product
- **Signal Transport Employee**
  - Move Batch to Dispatch Checking Point
  - Collect Left Over Labels
  - Investigate Problem
  - Clean Line Area (Day end Procedure)
- **Line Leader**
  - Clean Line (New product procedure)
  - Check/Scan Line to ensure all labels are removed
  - Collect Left Over Labels
  - Return labels to Print Room
  - Signal Transport Employee
  - Move Batch to Dispatch Checking Point
  - Collect Left Over Labels
  - Investigate Problem
  - System Records Information
  - Dump Rejected Product
  - Daily Line Production Finished

---

Bakkavor Spring Valley Foods  Page 1 of 5
Prepared By: Murray van der Hoff Date: August 2011
Approved By: Nigel Brown Date: August 2011
9.3. Appendix C: Collation Metal Detector Setup

<table>
<thead>
<tr>
<th>PROCESS TITLE:</th>
<th>COLLATION PROCEDURE – METAL DETECTOR SETUP</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROCESS OWNER:</td>
<td>JOHANNES MTSWENI</td>
</tr>
<tr>
<td>STAFF:</td>
<td>COLLATION MANAGER, LINE LEADERS, SHOP FLOOR</td>
</tr>
<tr>
<td>OBJECTIVE(S):</td>
<td>Correct procedures are followed when labels are printed, issued and applied. Ensuring a quality product</td>
</tr>
</tbody>
</table>

![Diagram of Collation Metal Detector Setup Process]

- Collect Test objects from Print Room
- Collect four Sealed products from High Risk
- Insert different objects in punnets
- Insert Product information into system
- Place Punnets with objects on conveyor to pass metal detector
  - All four rejected? (YES)
  - Place quality Punnets on conveyor to pass metal detector
  - Place Punnets on conveyor to pass metal detector
  - Report Problem to Engineering Department (YES)
  - Complete Paperwork (Test was passed) (NO)
  - Inform Collation Manager (NO)
- Return Test objects to Print Room
- Continue Production Run

Bakkavor Spring Valley Foods Page 2 of 5
Prepared By: Marnay van der Hoff Date: August 2011
Approved By: Nigel Brown Date: August 2011
9.4. Appendix D: Collation Barcode Scanner Setup

**PROCESS TITLE:**  
COLLATION PROCEDURE—BARCODE SCANNER SETUP

**PROCESS OWNER:**  
JOHANNES MTSWENI

**STAFF:**  
COLLATION MANAGER, LINE LEADERS, SHOP FLOOR

**OBJECTIVE(S):**  
Correct procedures are followed when labels are printed, issued and applied. Ensuring a quality product

---

**Diagram Description:**

- **Process Flow:**
  - **Collect incorrect label punnet from Collation Table**
  - **Apply Correct Label to punnet from High Risk**
    - **NO** Approve Card
      - **YES** Scan Authorized Card
  - **Request Authorized Card Scan**
  - **Record Card Detail**
    - **YES** Scan Successful
      - **NO** Scan Correct Label
  - **Request Authorization**
    - **YES** Input Approval
      - **NO** Input Approval
        - **NO** Request Approval Input
          - **YES** Request Version Number & Amount to be scanned successfully
    - **NO** Request Version Number and Amount to produce
  - **Record Version Number and Product detail**
  - **Start Production Run**
    - **IT SYSTEM** Adjust conveyor with Punnnet size & press Enter
  - **Place Correct Label Pack on conveyor**
    - **LINE LEADER** Request Authorized assistance
  - **IT SYSTEM** Scan Authorization Card to over ride system
    - **NO** Punnett Approved!
      - **YES** Punnett Rejected
  - **Place incorrect label on conveyor**
    - **NO** Punnett Approved!
      - **YES** Punnett Rejected
  - **Scan Authorization Card to over ride system**
    - **Document Approved Scanning Test**
      - **Proceed with Production Run**

---

**Additional Information:**

- **Prepared By:**  
  Monay van der Hoff  
  Date: August 2011

- **Approved By:**  
  Nigel Brown  
  Date: August 2011
9.5. Appendix E: Printing Labels
9.6. Appendix F: Label Scanning Process

<table>
<thead>
<tr>
<th>PROCESS TITLE:</th>
<th>COLLATION PROCEDURE–LABEL SCANNING PROCESS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PROCESS OWNER:</td>
<td>JOHANNES MTSWENI</td>
</tr>
<tr>
<td>STAFF:</td>
<td>INFORMATION TECHNOLOGY SYSTEM</td>
</tr>
<tr>
<td>OBJECTIVE(S):</td>
<td>Correct procedures are followed when labels are printed, issued and applied. Ensuring a quality product</td>
</tr>
</tbody>
</table>

PAGE 1

Wait for Conveyor to Pass Punnet over scanner

Scan Barcode Detail

NO

YES

Barcode Matches Production Run

Count ++ & Record Product acceptance

Calculate number to be scanned

Display number to be scanned

NO

YES

Barcode Matches Production Run

Trigger Rejection system to Reject Product in specified seconds

Trigger Alarm System

Stop System

IT SYSTEM

IT SYSTEM

Record Count ++ Rejected product

Request Authorized Assistance

Remove Rejected Pack from Rejection Bin

Remove Label and apply new Label

PLACE PUNNET back on Conveyor

Request Authorized Card to continue

NO

YES

Approve Card

Input "YES" if production run should continue

Input "YES" if production run to continue

Bakkavor Spring Valley Foods

Page 5 of 5

Prepared by:
Murray van der Hoff
Date: August 2011

Process

Production Procedure

Approved by: Nigel Brown
Date: August 2011
### 9.7. Appendix G: Print Room Job Descriptions

**It is important that we provide our people with the opportunity to fulfill their potential – it’s a fundamental part of our Can-do approach.**

**Job Title:** Print Room Line Leaders  
**Date:** 29/08/2011

**Job Description:**

A trained employee who has experience in the Print Room area to the extent of knowing exactly how the processes work and what procedures are necessary. The Print Room Line Leader needs to be competent and trusting.

**Responsibilities:**

<table>
<thead>
<tr>
<th>Labour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure all staff members in the Print Room are trained on their roles and responsibilities</td>
</tr>
<tr>
<td>If any disciplinary issues should occur it is the Line Leaders responsibility as well as duty to report the issue to Print Room Management</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Need to Manage the Total Stock Control of the Print Room</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Technical/Other Support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure that all Customer Technical procedures are followed at all times.</td>
</tr>
<tr>
<td>Ensure that a Clean as you go Policy is followed</td>
</tr>
<tr>
<td>Responsible for the upkeep of all Print Room Equipment. If any problems occur it is the Line Leaders responsibility to report the problem to Engineering or other authorized personnel</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Health and Safety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ensure that all staff members are wearing the required safety PPE</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>If any team members or support staff prevents you from meeting the above targets or standards then you must discuss the issues immediately with your senior. This should include all operational issues and may include poor timekeeping, attendance or break disciplines</td>
</tr>
<tr>
<td>If any equipment, machinery or services prevent you from meeting any of the above targets or standards then you must discuss with your senior immediately</td>
</tr>
<tr>
<td>You must ensure that you report/replace any missing procedure/technical paperwork/standards/procedures that prevent you from achieving the above standards</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Employee Name:</th>
<th>Clock Number:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Joining Date:</td>
<td></td>
</tr>
<tr>
<td>Employment Status:</td>
<td>Full-time</td>
</tr>
<tr>
<td>Employment Type:</td>
<td>Production</td>
</tr>
<tr>
<td>Manages Others:</td>
<td></td>
</tr>
<tr>
<td>Number of Vacancies:</td>
<td>1</td>
</tr>
<tr>
<td>Contact Number:</td>
<td></td>
</tr>
</tbody>
</table>

**Job Description Agreement**

______________________________  ___________________________
PRODUCTION MANAGER SIGNATURE  POSITION HOLDER SIGNATURE
10. BIBLIOGRAPHY


3. Bakkavor Spring Valley Foods’ Operations Manager – Nigel Brown
   +27 11 571 7800

4. Ingenior, Automation and Machine Specialist - Theunis Taljaard

5. Information Technology, Equipment and Programming - Julian Power
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6. Marks and Spencer Code of Conduct (Confidential Document)


8. Due to confidentiality of internal company documents and procedures certain documents were not included in this document. For verification of these documents please contact the Operations Manager at Bakkavor Spring Valley Foods.