CHAPTER 1

INTRODUCTION AND PROBLEM STATEMENT

1.1 INTRODUCTION

To remain competitive, companies are developing strategies to exceed their customers’ expectations as they strive to become World-class companies. This is imperative if a company wants to stay in business, as the customers are now much wiser about their needs and the type of service they need. Companies therefore cannot do business the way they’ve been doing it all the years - they need to constantly come up with innovative ways of improving and gaining a competitive edge over their competitors.

Until about a decade ago, it was not necessary for South African organisations to be world-class. This situation has changed drastically since it has become almost imperative for any business operating internationally to be regarded as world-class. Without this status, it is virtually impossible to service and do business in the global markets.

According to the Economist World, as cited in the Tranwerk magazine, Traverser (issue 2, 2006), South Africa’s rail network has been ranked the tenth longest in the world and ranks eighth in the freight carried. This poses a major challenge for
Transwerk to strive to be world-class as they are at the heart of ensuring that wagons are always available to carry that freight.

In this research Transwerk Uitenhage will be briefly discussed, the supply line barriers to implementation of lean manufacturing identified and recommendations to overcome them will be outlined.

1.2 MAIN PROBLEM

South African manufacturing companies are faced with the challenges of global competition and for them to stay in business they need to adapt to the global processes. In their quest to do this some of them introduce world-class manufacturing processes.

Transwerk is one of the seven well-equipped ISO-certified factories of Transnet based in South Africa’s major cities, servicing the spectrum of railway rolling stock. Its core function is the engineering excellence in refurbishing, upgrading and manufacturing of South Africa’s rolling stock.

Transwerk’s wealth of experience and depth of skill in railway engineering began almost a century ago as the Mechanical Engineering Department of the former South African Railways and Harbours. In partnership with the industry, Transwerk played a major role in supplying customised rolling stock for the coal, ores,
general goods, containers, agricultural products, cement and fuel. This contributed a lot in growing the South African economy.

Business development, product development and skills development are at the heart of Transwerk’s strategy. Internal efficiencies and core competencies complemented by joint ventures with leading Original equipment Manufacturers (OEM’s) and international specialist design companies ensure technology and skills transfer for continuous improvement. This results in market share growth and product range expansion.

The Uitenhage plant is a Rail Refurbishing (RFR) business, which refurbishes mainly coal, flat, and drop-side wagons and car carriers. The customer-centered culture in Transwerk results in additional dedicated services such as fleet management, prototype development for production runs and small quantities for special purpose wagons. Modifications can also be made to accommodate different couplers, draw-gears and braking systems.

Centres of excellence have been created for pantographs, airbrakes and traction motor repairs incorporating testing facilities. Wheel sets are also assembled and profiled at this plant as well as at others around the country.

Rolling stock equipment comprises various product lines, namely braking system components, turbo chargers couplers and draw gear components, pantographs and bogies.
As a fully-fledged corporate and commercialised business entity, Transwerk is focused on proper financial controls, governance structures and risk management procedures that are managed by the SAP enterprise resource planning system. The success of these measures is indicated by Transwerk’s cash flow return on investment, which is ahead of the engineering industry average.

Transwerk has recently acquired some of the Spoornet maintenance depots due to the integration resulting from Transnet restructuring of its businesses and disposal of non-core businesses.

The complexity of optimising the processes at such an extensive organisation leads to the following problem, which will be addressed by this research:

**Overcoming the Supply Line barriers to the implementation of Lean manufacturing in Transwerk Uitenhage plant.**
1.3 SUB – PROBLEMS

In order to develop a research strategy to deal with and solve the main problem, the following sub-problems have been identified:

1.3.1 What does the literature reveal about the adoption of the world-class manufacturing practices?

1.3.2 What does the literature reveal about issues concerning the adoption of the lean manufacturing practices?

1.3.3 What implementation barriers to lean manufacturing are experienced by the Supply line in Transwerk Uitenhage?

1.3.4 What can be learned from the study, to make the adoption of lean manufacturing at Transwerk Uitenhage more successful?
1.4 OBJECTIVES

The objective of this study is to assess the adoption of the Lean manufacturing practices by Transwerk Uitenhage and to reveal the barriers to the implementation of lean manufacturing strategies experienced by their Supply line. This will be compared to what the literature says and suggestions to overcome these barriers will be developed.

1.4.1 GEOGRAPHICAL DELIMITATION

In order to make the research manageable, the research will be limited to the adoption of the Lean Manufacturing strategies by the supply line, in Transwerk Uitenhage plant.

The assessment will be limited to the Rail refurbishing business of the Transwerk plant in Uitenhage. The research focuses specifically on supply line processes adopted at Transwerk Uitenhage.
1.4.2 SUBJECT OF EVALUATION

The implementation barriers will be investigated and analysed and solutions recommended.

1.4.3 THEORETICAL DELIMITATION

The study will focus on the assessment of the adoption of lean manufacturing strategies by the supply line at Transwerk, their implementation barriers and how they can be overcome.

1.4.4 DEFINITION OF CONCEPTS

For the purpose of this study the following meanings are associated with the concepts in the title and the problem statement of the study.

1.4.4.1 Supply line

All internal functions plus external suppliers involved in the identification and fulfilment of needs for materials, equipment, and services in an optimised fashion. The objective of this is to improve the organisation’s profitability and to ensure its survival, as well as the survival of its customers and suppliers.
1.4.4.2 World-class manufacturing practices

World-class manufacturing practices are a different set of concepts, principles, policies and techniques for managing and operating a manufacturing company. It is driven by the results achieved by the Japanese resurgence following World War II, and adapts many of the ideas used by the Japanese in automotive, electronics and steel companies to gain a competitive edge. It primarily focuses on continual improvement in quality, cost, lead-time, flexibility and customer service.

1.4.4.3 Lean manufacturing

Womack & Jones, (1996:46) define Lean Manufacturing as providing a way to do more and more with less and less-less human effort, less equipment, less inventories, less time and less space-while coming closer and closer to providing customers with exactly what they want when they want it.

It may be seen as the coherent, composite management concept geared to avoiding waste in the inputs and outputs of production (http://en.wikipedia.org/wiki/Lean_manufacturing, 1993:3)
1.5 THE RESEARCH METHODOLOGY

In this section the methodology that was followed in the study is described.

• The researcher has initially conducted a study of the literature. This has helped the researcher in understanding the concepts of the world-class manufacturing processes.

• An analysis has then been done on the supply line barriers to implementation of lean manufacturing in Transwerk Uitenhage.

• The current state of the identified barriers to implementation of Lean manufacturing was compared to what the literature reveals on the implementation of Lean manufacturing processes. This has highlighted the causes of the barriers, upon which corrective action can be taken to overcome them.

• Recommendations will then be made to the management of Transwerk to improve the situation.
1.6 KEY ASSUMPTIONS

a) Assumption one

Assuming that Transwerk Uitenhage needs to implement Lean Manufacturing in its supply line in order to achieve Lean status.

b) Assumption Two

It is assumed that Transwerk Uitenhage wants to improve its efficiencies by reducing line stoppages due to waiting for material and poor quality of raw material and thus produce products without defects.

c) Assumption Three

Transwerk needs the commitment of all employees in the achievement of both individual and organisational goals in order for both to reap the benefits of implementing the Lean manufacturing processes.
1.7 CHAPTER HEADINGS

The research consists of the following chapters:

Chapter 1 Introduction to Transwerk-Uitenhage, the problem definition and definition of concepts

Chapter 2 Literature survey of world-class manufacturing processes

Chapter 3. A current state map focusing on supply line barriers to implementation of lean manufacturing in Transwerk Uitenhage.

Chapter 4. Research Design

Chapter 5. An empirical study and interpretation of the causes of these supply line barriers to implementation of Lean manufacturing in Transwerk Uitenhage.

Chapter 6. Suggestions for eliminating or reducing supply line barriers to the implementation of the Lean Manufacturing in Transwerk Uitenhage will be done to management of this plant.
1.8 CONCLUSION

In this research report a literature survey was conducted on the philosophies and principles of world-class manufacturing processes with emphasis on lean manufacturing strategies. This provided the researcher with a better understanding of the concepts of world-class manufacturing. This is then compared to the existing situation at Transwerk, thereby highlighting the deficiencies on the supply line processes so that corrective action can be taken. Recommendations will then be made to the management of Transwerk Uitenhage.
CHAPTER 2

WORLD CLASS MANUFACTURING

2.1. Introduction

According to J.Todd (1994:1) "Put simply, world-class means being best in your field in the world". He further states that ‘best’ can be in terms of:

- Product design and performance
- Quality and reliability
- Least manufacturing cost (so that you can undercut your competitors on price or spend more than they can afford on research and development, or on advertising)
- The ability to keep introducing innovative designs more quickly than your competitors
- Shorter lead times and more reliable delivery performance
- ‘Customer service’ performance that makes your customers bend over backwards to buy from you rather than from your competitors

He further states that it would be nice if you could be better than your competitors in all these aspects, but it’s simply unlikely. According to him whatever techniques you use to assess and improve your competitive edge, the ultimate objective is to ensure that your sales force never needs to be afraid of any of your major competitors, so that they can always say in confidence, 'If they can sell there, so can I'.
In this chapter, the principles and philosophies of world-class manufacturing will be discussed with the emphasis on the supply line lean manufacturing philosophies and principles.

2.2. JUST-IN-TIME

JIT aims to involve the whole workforce in attacking ‘waste’. Where it differs is that JIT places particular emphasis on ‘wastes’ that affect stock levels and lead times. The JIT process involves the progressive reduction and elimination of relevant wastes by exposing fundamental problems and then putting them right once and for all, so that they don’t keep recurring, in contrast to the traditional solution of holding plenty of stocks to provide cover just in case things go wrong. The aim is to make production processes as simple as possible, with short throughput times, usually involving the introduction of cell manufacture and fast changeover techniques to maximise flexibility. In many cases this removes the need for complex Manufacturing Resource Planning (MRP11) and scheduling systems

Hugo, Badenhorst-Weis and Van Biljon (2004:158) state the following as the critical elements of JIT:

- A commitment by top management to JIT and continuous improvement and elimination of waste
- A participatory management approach
- An increased emphasis on total quality management (TQM)
- Reduced purchasing quantities
- Regular deliveries and highly reliable delivery schedules
• A reduction of suppliers to a few good ones and close partnering relationships with key suppliers

• Shortened and highly reliable internal and external lead times

• Respect for people and a strong focus on external and internal customers

• A willingness to reduce the scale of the business by reducing batch sizes and the size of factories

According to Hugo et al (2004:158), the following are the advantages of JIT purchasing:

• **Lower inventory levels** are achieved as a result of the large number of small deliveries demanded by JIT. The speed of inventory levels is increased considerably, resulting in lower working capital needs and higher cash flow.

• **Smaller buffer stocks** are achieved by JIT’s demand for short and reliable lead times. Theoretically the system operates without buffer stocks but in South Africa manufacturers who use JIT system are obliged to keep some stock, owing to the nature of the supply market

• **Improved adaptability of the production schedules** is achieved due to short and reliable lead times.

• **Quality improvement.** The higher quality of products purchased translates into an improved quality of products produced. IT purchasing has a side effect of increased quality awareness among workers.

• **Cost savings.** Apart from the savings already mentioned, the long-term relationships between purchasing firms and suppliers resulting from JIT greatly
encourage suppliers to reduce costs. Examples include improved designs and less expensive alternative materials, as well research and development that could lead to higher technological breakthroughs and excellent cost advantages for purchasing firms.

2.3. TOTAL QUALITY MANAGEMENT

Logothetis (1992:3) states that in the TQM culture, the top managers are themselves the advocates of change. He further states that they must be, because no improvement can ever materialise without a change in the old management attitudes.

Wong and Fung (1999:199) place TQM in a broader perspective:

TQM aims at the continual increase in customer satisfaction at continually lower real cost. Total quality is a total system approach (not a separate area or programme), and an integral part of high-level strategy. It works horizontally across functions and departments, involving all employees, top to bottom, and extends backwards and forwards to include the supply chain and customer chain.

According to Logothetis (1992:26) Management can make use of the tool provided by Doctor Deming which is a fourteen points framework that can lead to permanent change should it be properly appreciated and accepted. He further states that this could lead to permanent change (for better) in the thinking of top management, and to a beneficial transformation of the whole company culture.
The following are Doctor Deming’s fourteen points as will be discussed:

1) Create constancy of purpose for continual improvement of product and service.

2) Adopt a new philosophy for economic stability.

3) Cease dependence on inspection to achieve quality.

4) End the practice of awarding business on the basis of price tag alone.

5) Improve constantly and forever the system of production and service.

6) Institute training on the job

7) Adopt and institute leadership.

8) Drive out fear

9) Break down barriers between departments and individuals.

10) Eliminate slogans, exhortations, and targets for the workforce.

11) Eliminate quotas.

12) Remove barriers that rob the hourly worker of the right pride in workmanship

13) Encourage education and self-improvement for everyone.

14) Take action to accomplish the transformation.
These points will each be discussed briefly

1) **Create constancy of purpose for continual improvement of product and service**

Deming (1986:26) state that “Your customers, your suppliers, your employees need your statement of constancy of purpose-your intention to stay in business by providing products and services that will help man live better, and that will have a market.”

This is in line with Logothetis’ statement that in a TQM culture, the top managers are themselves the advocates of change (Logothetis 1992:3). The platform and resources should therefore be provided to ensure that employees have enablers to implement incremental changes on a daily basis.

2) **Adopt the new philosophy for economic stability**

A change is necessary in the old management methods, which are no longer effective for today’s environment. Without innovation you can never lead. If you try to meet the competition, you will not survive in the new economic age. We can no longer live in the days when quantity was more important than quality; but what has to be realised is higher quality costs less (Logothesis, 1992:31)
Management needs to embrace change, unlearn old methods of doing business and take advantage of the innovative ways of doing business that may be brought about by change.

3) Cease dependence on inspection to achieve quality.

According to Deming (1986:26) routine 100% inspection to improve quality is equivalent to planning for defects, acknowledgement that the process has not the capability required for the specifications. Inspection to improve quality is too late, ineffective and costly.

Quality should be built in each and every employee’s work as to eliminate the need for inspection at the end of the line or process. This should start with the customer and involve each and every individual through the whole supply chain including internal as well as external suppliers. Process and product improvement needs to be a culture within the organisation.

4) End the practice of awarding business on price tag alone

We can no longer leave quality, service and price to the forces of competition for price alone—not on today’s requirements for uniformity and reliability.
Logothesis (1992:33) states “Price has no meaning without measure of the quality being purchased. Without adequate measures of quality, business drifts to the lowest bidder, low quality and high cost being the inevitable result. The aim in the purchase of tools and other equipment should be to minimise the net cost per hour of life. This requires long-term thinking, not just cheapest price tag for purchase today.

Business can no longer be awarded solely on price. A lot of variables have to be taken in consideration before making decision. The overall impact on the whole business has to be taken into account before a decision is made. This implies the importance of working with suppliers and vendors to give them the information they need to deliver materials of quality that the organization requires. The organization should insist that suppliers adopt a TQM culture.

5) **Improve constantly and forever the system of production and service.**

Search continually for problems in order to constantly improve quality and productivity and decrease costs. Always try to reduce the variability of products and services, in order to achieve the highest quality at the lowest cost. Never be satisfied with simply meeting standards or specifications.

In order to continually search for whether and how well the product meets the customer’s needs, an organisation can make use of surveys, focus group sessions
with customers, and open-ended customer interviews. The aim here should be to continually improve the product or service in order to not only meet but to exceed the customer expectations while lowering the cost of doing business.

6) **Institute training on the job**

According to Deming (1986:52) “Training must be totally reconstructed. Management needs training to learn about the company, all the way from incoming material to the end customer”.

Managers need to be resourceful as they are expected to make decisions about opportunities to pursue and deploy resources, build and deploy organisational capabilities and review, develop and support initiatives. Without training these opportunities will pass

7) **Adopt and institute leadership**

The job of management is not supervision, but leadership. Management must work on sources of improvement, the intent of quality of product and of service, and on the translation of the intent into design and actual product. The required transformation of Western style of management requires that managers be leaders. (Deming, 1986:54).
Good leadership is the ability to inspire others to move enthusiastically toward the organisation’s goals. Good leaders know where they are going and can get others excited about going there with them.

8) **Drive out fear**

Deming (1986:59) states: “No one can put in his best performance unless he feels secure. Secure means without fear - not afraid to express ideas and not afraid to ask questions. Fear takes on many faces. A common denominator of fear of any form, anywhere, is loss from impaired performance and padded figures”.

Fear is a constructive motivator only in rare circumstances, and then you pay the price of people resenting you forever. Fear cannot be changed into trust unless organisational leaders consciously decide to behave in ways that will turn around the negative patterns. A platform should therefore be created for employees to ask questions and give input on production matters. They might have brilliant ideas on how the processes could be improved since they are the ones performing the duties. Top down as well bottom up communication channels should be built within the processes.
9) **Break down barriers between departments and individuals**

Specialisation of work and effort allows a unit to develop greater expertise, focus, and efficiency. So it is that some organisations adopt functional, or similar structures. Their strategy depends on the dividing different activities within the firm into logical, common grouping-sales, operations, administration, or geography-so that each set of activity can be done most efficiently. Control of sets of activities is at a premium. Dividing activities in this manner, sometimes called “differentiation,” is an important structural decision. At the same time, these separate activities, however they are differentiated, need to be coordinated and integrated back together as a whole so the business functions effectively. Demands for control and coordination needs differ across different types of businesses and strategic situations (Business week, 2000:August 28).

Adequate horizontal communication between different functional departments and within each functional department is vital in any organisation. An organisation must develop a process for communicating essential information of the plan so that people at all levels of the organisation know how best to structure their work to contribute to the organisation’s strategy and objectives.

10) **Eliminate slogans, exhortations, and targets for the workplace**

What is wrong with the slogans and exhortations? They are directed at the wrong people. They arise from the management’s supposition that the production workers could, by putting their backs into the job, accomplish zero defects,
improve quality, improve productivity, and all else that is desirable. The charts and posters take no account of the fact that most of the trouble comes from the system (Deming, 1986:65).

People are doing the job and not the slogans. It rather works well if the people know what is expected of them, why must they do things the way it must be done and what is in it for them. Slogans and exhortations therefore have to be eliminated, as they are not motivating anyone to perform better.

11) **Eliminate work standards and numerical quotas**

Logotheresis (1992:41) states “Eliminate management by objectives (MBO), by numbers and by numerical goals. Focus on quality not quantity. The attainment of a target must not be viewed as the ultimate success, because there is always room for further improvement. MBO neglects the variation in the process and is an invitation to a short-term thinking. The only way to increase quality and productivity (and joy in work) is to replace work standards with competent leadership”.

MBO must be replaced by MBIO: management by improvement objectives. If there is an objective to be set, it should be that of constancy of purpose for continuous quality improvement of products, processes and services, an objective that is not specific in detail in the form of numerical target in isolation.

This objective should always be a real consensus rather than a top-down mandate, and should be supported by continuous training and sustained
cooperation involving everybody from the top management down. (Logothesis, 1992:42)

Unachievable work standards and numerical quotas do not add any value in ensuring increased productivity, as they are often not met. To have them is rather a fruitless exercise, as they do not have any bearing to productivity.

12) Remove barriers that rob hourly worker of the right to pride in workmanship

An organisation will do well if the employees work under the driving power of their own desire to do well. Employees get personal satisfaction when their abilities and energy are used efficiently. They take pride in doing well, in serving their outfit, in building the name and reputation of their organisation as efficient employees. Management should therefore take a conscious effort in making sure that all barriers that rob them of the right to pride in workmanship are removed.

Tom Peters, a human capital guru and a motivational speaker once said," There’s a need for individuals to explore their own ability and innovate, and for the organisation to recognise that ability in all of their workers". Transformation, Change and Leadership Turbulence workshop (May 26; 2004.Pretoria via satellite)

Logothesis (1992:42) states that one cannot expect workers to be proud of their output when it consistently turns to be defective because of faulty purchased
materials, faulty equipment or poor working environment, the provision of which is management responsibility.

13) **Encourage education and self-improvement for everyone**

One of the elements of world-class manufacturing is high a degree of investment in education, training, development, and coaching of all. Education should be a continuous tool used to make employees understand why the organisation has to do the things the way they do them whilst training helps them understand how the organisation does its business. Coaching on the other hand help them understand why things are done, how best to do them and to internalise the processes.

According to Deming (1986:86) “what an organisation needs is not just good people; it needs people that are improving with education. People require in their careers, more than money, ever-broadening opportunities to add something to society, materially and otherwise.”

14) **Take action to accomplish transformation**

Management should immediately take action to accomplish the transformation by implementing all the preceding thirteen points. All employees must understand and be committed to the new philosophy. Senior managers must lead the way by
fully committing themselves to continuous quality improvement and innovation, and by practicing whatever they preach (Logothesis, 1992: 45).

Transformation should be accomplished in management styles, way business is conducted, processes and in human capital matters. This is important so that employees do not get conflicting messages due to actions that are contrary to what management is preaching. How management is doing the little stuff will determine the response.

2.3.1 Quality management and the supply chain

According to Hugo et al (2004:165), managing quality in the supply chain is a shared responsibility of all participants. Coordination of quality efforts of supply chain participants is undoubtedly a responsibility of the vantage point firm, but the quality philosophy must be part and parcel of the management of each link in the chain. In this regard Romano (2002:982) stresses the importance of the mindset change required for efficient quality management in the supply chain.

The quality level delivered to the final customer is the result of quality management practices of each link in the supply chain; thus, each actor is responsible for the final result. This has meant a shift in the managerial approach to quality, from a perspective focused on a single firm and its internal quality system, to a broader view that also considers customers and suppliers or, in other words the supply chain in which the firm operates.

Clearly then, managing quality in the supply chain is the integration of the quality philosophy of three major components: the supplier quality system, the internal
quality system of the vantage firm and the quality system of the customer (intermediate customers in the chain and also the ultimate customer)

2.4. TOTAL PRODUCTIVE MAINTENANCE

Get everyone, particularly operators, involved in the task of improving the performance and reliability of production equipment. People who operate machines must be able to recognise that something is going wrong and take corrective action. They must react to any potential failure condition and take corrective action before the related functional failure actually occurs.

Some of the ways in which operators can be involved in reducing equipment failures are:

- Keeping work surfaces clean to minimise contamination and wear
- Report oil leakage and make sure something is done about them
- Use their senses to recognise unusual noise, temperature vibration, smell etc.
- Check bolts for tightness
- Report any deterioration in quality before it becomes serious
- Keep an eye on condition – monitoring instruments
• Maintain process control charts and take corrective action before a control level is breached

Operators must be trained in what to look for and the cooperation of the maintenance specialists will be needed

2.4.1. Implementing Total Productive Maintenance

According to Pieterse (2006:82) TPM represents a drastic, but necessary change in how an organisation does business. He further states that the implementation must therefore be planned and executed carefully and the commitment of top management must be guaranteed. It is not a quick process and top management must support and sustain the process throughout the time. In his book he also mentions two types of maintenance, which will discussed.

a) Preventative maintenance

Implementing TPM changes the role of maintenance technicians radically from fire-fighting mentality to an approach where the emphasis is on preventative maintenance and support to the operators (Pieterse, 2006:85)

He further states that operators must receive training to understand how equipment works. This training includes aspects of hydraulics/pneumatics; electrical and mechanical drive systems, lubrication and safety. This knowledge
can be useful to the operator to assess problems and to determine the appropriate response to be followed.

\textit{b) Predictive maintenance}

The aim of predictive maintenance techniques is to try to predict machine component failures by looking for and measuring changes in the machine or component operating conditions or by looking for changes in the quality of the product produced by the machine (Pieterse, 2006:86).

He further states that some of the tools that can assist the operator to diagnose impending failure are oil analysis, temperature measurement, vibration analysis, ultrasound, and resistance measurement and motor current signature analysis.

\textbf{2.5. LEAN MANUFACTURING}

Womack et al (1990:14) states that a lean organisation’s main goals, within a manufacturing process, are elimination of waste and continued effort to:

- Provide world-class customer service
- Reduce manufacturing lead-times
- Increase labour efficiencies
• Improve product quality

• Increase market flexibility

• Reduce inventories

• Lower the cost of overheads

The broad philosophies of Lean manufacturing are opposite to those of traditional systems of mass production. These philosophies aim to address all aspects of business starting from strategic planning, to maintenance, engineering, work culture, information management and production systems.

Lean manufacturing focuses on only producing what the customer wants, when they want it and only in the quantities wanted by the customer. On the other hand mass production is focusing on maximising production efficiencies by extending run lengths, increasing levels of inventory, making to stock, having low product flexibility and dictating to the customer what and when they can have the product.

### 2.5.1 Philosophies of Lean Manufacturing

In striving to achieve the lean status, organizations can use many different strategies and approaches. To implement these philosophies, organization has to operate in the frame of mind that is lean thinking.
After their success with “The Machine that Changed the World”, the authors Womack et al as cited in Pieterse (2006; 11) decided to summarise the principles of “lean thinking” to act as a kind of guide for action to managers. This was an attempt to create such an implementation strategy that puts first things first and to establish a philosophical basis for the change process.

2.5.1.1 Lean Thinking

They identified five basic stages associated with lean thinking, which are as follows:

i. Specify value by specific product

ii. Identify the value stream for each product

iii. Make value flow without interruption

iv. Let the customer pull value from the producer

v. Pursue perfection

Lean thinking has to start with value. It is a specific concept and it’s meaning is determined by the ultimate customer. Value is expressed in terms of the product, which meets the needs of the customer at a specific time and at a specific price.
Although the producer creates it, it is always determined by the customer (Pieterse, 2006:12).

Burt, Dobler and Straling (2003:217) state that companies need to incorporate the customer into product design. That means getting more and more members of an organisation in contact with the customer-manufacturing and design people, as well as sales and marketing staff. You can, for example, have customers sitting in your internal committee meetings.

Pieterse (2006:12) is in agreement with this as he states “Lean thinking should therefore start with a discussion with the customers, to determine their exact needs so that the value can be specified in terms of a specific product with specific capabilities, at a specific price”.

He further states that seeing through the eyes of the customer will determine the appropriate definition of the product and not a view distorted by manufacturing, design or marketing needs. This will also imply a whole new way of talking to the customer and to the firms along the value stream.

ii. Identify the value stream for each product

This principle starts with the premise that every manufacturing business is concerned with three critical management tasks:
• a **problem-solving** task, which is attempted during the product creating process. It runs from the concept phase through to detailed design and engineering to production launch;

• the **information management** task, which runs from taking of the order through the scheduling process and ends with delivery;

• the **physical transformation** task. This begins with the raw materials and ends with the finished product in the hands of the customer.

The value stream consists of all the activities required to take a specific product (good or service) through these three critical management tasks of any business. The second step in lean thinking is then to identify the entire value stream for each product.

The aim of the value stream is to analyse and identify all activities within the value stream as to be able to see which activities add value, which activities are necessary but do not add value and which activities are pure waste by not adding value at all. Activities that are pure waste must be eliminated immediately and those that add value should be perfected through the use of proper methods.

iii. Make value flow without interruption

The creation of value and the elimination of waste within the value stream should pave way for the production or processes to flow. This flow is necessary to increase productivity and reliability. To do this, focus on the actual object-design order, or product and do not let the object out of sight from beginning to completion. The second step is then to ignore the traditional boundaries of jobs, careers, functions and firms, which forms barriers to flow of the specific product. Thirdly, the work practices and tools should be reconsidered to eliminate all
backflows, scrap and stoppages, so that the flow of the design, order and production of the product can continue smoothly (Pieterse, 2006:13).

iv. Let the customer pull value from the producer

The previous steps can cause a dramatic decrease in the amount of time required to get a product through production, into the hands of the customer. This enables the organisation to change from the system of manufacturing according to the sales forecasts, to one where a product is made only when customer requests manufacture. The customer pulls the product as needed, rather than letting the factory push its products, which might not be required, onto the market. It also means varied demand can be accommodated continuously (Pieterse, 2006:14)

If products are made when ordered, the need for big inventory stores to store material and products will be eliminated. Thus money locked in material will be released to improve the products and processes and to invest in technologies that will enhance productivity.

v. Pursue perfection

Now that the value has been defined, the value stream has been identified and a pull flow has been achieved, further improvements can always be made in effort, time, space, cost and mistakes in the effort to achieve perfection. In this way the customer can be served better and better by providing what is asked, without producing waste (Pieterse, 2006:14).
For an organisation to be able to produce products or service without producing waste, it must be able to identify waste in its processes. Being able to identify and remove waste is going to help an organisation in its improvement efforts. To do this an organisation can make use of the tool called “seven mudas” as identified by Taichi Ohno who pioneered the Toyota production system. (Wikipedia: September:2006,Toyota system)

2.5.1.2 The Seven Mudas

“Muda” is the Japanese word for waste. Waste is anything other than the minimum amount of equipment, materials, parts, space, and workers time, which are absolutely essential to add value to the product (Suzaki, 1987:8).

According to Imai (1986:89), Taichi Ohno identified the seven mudas as:

i. Waste from over-production

ii. Inventory waste

iii. Waste of waiting time

iv. Transportation waste
v. Waste from defect making
vi. Waste of motion

i. **Waste from over-production**

Imai (1986; 89) states that Taichi Ohno felt that over-production was central evil that led to waste in other areas. To eliminate the problem of waste, Ohno devised a production system based on a “just-in-time and automation concept.

According to Suzaki (1987:12) producing goods over and above the amount required by the market creates this waste.

Symptoms of over-production are:

- Smooth flow of goods is difficult
- Piles of Work In Progress
- Target and achievement unclear and
- Excessive lead-time and storage times

ii. **Inventory waste**

Excess inventory increases the cost of a product. It requires extra handling, extra space, extra interest charges, extra people and extra paper work. We should consciously try to reduce inventory levels at all times. As we begin to reduce
inventory levels, we may find more problems that need to be addressed before the inventory level can be reduced further (Suzaki, 1987:17).

Symptoms of inventory waste are:

- Prescribed storage volume exceeded
- Deteriorating material
- Old dates on material
- Stocks of containers for WIP and
- Sophisticated stores system (Pieterse, 2006:16)

iii. Waste of waiting time

Whilst waste from overproduction is not always easy to identify because the operations appear to be busy, waste of waiting time is usually easy to identify. Waste in the form of waiting should be exposed, so that corrective action should be taken. Supervisors can thus better assess the capacity and control the situation more readily (Suzaki, 1987:14).

Other symptoms of waiting waste as stated by Pieterse (2006:15) are:

- Operators waiting
- Operators slower than line and
- Operators watching equipment and operation (Pieterse, 2006:15).
iv. Transportation waste

Transportation waste and double or triple handling is also commonly observed wastes in most factories. Ill-planned layouts may make long-distance transportation necessary. In order to eliminate this waste, improvement in layout, coordination of processes, methods of transportation, housekeeping, and workplace organisation need to be considered (Suzaki, 1987:18).

Symptoms of transportation waste are:

• Stacking and unstacking of components

• Conveyors

• Many busy forklifts and

• Widely placed equipment (Pieterse, 2006:15).

v. Waste from defect making

When defects occur at one station, operators at subsequent stations waste time waiting, thereby adding cost to the product and adding to production lead-time. Further more, rework may be required or the defective products are scrapped. If a defect has occurred in the assembly, operation, additional labour is required for reassembly. Schedules must then be adjusted to accommodate these changes (Suzaki, 1987:18)
Symptoms of defect waste are:

- Poor material yield
- Work in scrap bin
- High inspection levels
- Difficult assembly
- Large rework area
- High customer complaints and

vi. **Waste of motion**

An operator may look busy but sometimes no value is being added by the work. Therefore simplification of work is a rich source of reduction in waste of motion. Symptoms of motion waste are:

- Components and controls outside easy reach
- Double handling
- Layout not standardised
- Widely spaced equipment and
- Operators bending
vii. Processing waste

Pieterse (2006:15) states that the process itself may be a source of waste. Some operations may only exist because of poor component design, the present state of the technology or poor maintenance and so can be eliminated. Symptoms of process waste are:

- Variation between operator methods
- Variation between standard and actual operation and
- Processes that are not statistically capable.

2.5.2 Lean Supply

Hugo et al (2004:160) when defining Lean supply as a related concept in inventory management emphasizes that fundamental to the development of lean supply, is the drive to identify duplication and waste-any activity that does not add value, adds cost and should therefore be eliminated. They further state the following as the features of lean supply as having impact on supply management in general as well as in inventory management:

- The relationship as a quasi firm.

Lean supply means that the purchasing has the task of holding together a complex organisation that consists of a central core, which is the own firm, and an elaborate external organisation consisting of all the role players in the supply chain. It is a collaborative network of customers and suppliers all working together to achieve the central aim of eliminating all unnecessary costs.
From an inventory management perspective the JIT approach, as implemented in South Africa, often means the burden of inventory holding is merely shifted from the buying organisation to the supplier. Lean supply implies managing the collaborative effort between the supplier and customer (and all intermediaries) to fundamentally address the problem of costs associated with inventories and to minimise this cost in the supply channel as a whole.

• Cost transparency

In the lean supply the customer is willing to share data on internal processes (the value chain) with the supplier. Similarly, the supplier shares with the customer detailed data of process cost structures. The two-way exchange of data is aimed at pursuing the essential logic of lean supply-removal of duplications.

From an inventory perspective genuine sharing of date implies a mutual search for ways to reduce not only inventory in the supplier’s and buyer’s organisations but also all the other inventories in the pipeline. This can only be achieved through joint planning and cost trade-offs in the supply channel.

• Research and technology

Lean supply requires the exploitation of new technologies, and the collaborative roles within lean supply the need for shared research environment aimed at
discovering new technology. This implies, for example, that the supplier is effectively an intrinsic part of the intelligence-gathering network of the customer.

From an inventory perspective new technology in fields such as Electronic Data Interchange (EDI), coding and transportation is easier to discover and implement, resulting in cost reductions in the supply pipeline in general.

**Relationship assessment**

Since the relationship is jointly managed, it obviates the need from the customer’s perspective to evaluate vendors. In fact the supplier evaluation becomes inappropriate and should be eliminated since it is costly and does not add value. Within the principles of lean supply both partners, customer and supplier, should develop joint approaches to assessing the relationship itself.

If inventory management is again taken as the example, relationship assessment implies that the management of inventories in the relationship should be evaluated, and not the inventory performance of any of the partners.

Lean supply is a management philosophy that is being implemented increasingly in addressing the complicated supply management environment of the global market place.
Phelps, Hoenes and Smith (2003:5), state that the supply chain cost and lead time begin with initiating the purchasing process at the prime contractor and end with the incorporation of the assembly into the end product. They further state that anything that classifies as waste within a company will also be waste from the supply chain point of view. A classic example used is work in progress (WIP), which is partially completed work sitting around waiting for its next processing step. WIP is a waste whether you are looking at a single company or a supply chain. This forced the supply chain companies to work together to improve their scheduling, shipping, and processes, allowing them to hold only the amount of strategically located inventory necessary to guard against flow interruptions. This may seem obvious, but, because it requires coordinated efforts across multiple companies, is often difficult to accomplish. It therefore becomes imperative that a process to remove waste should be introduced through the whole supply chain in order for the supply chain to become lean. This can be achieved by introducing a continuous improvement process known as kaizen.

2.6 KAIZEN - CONTINUOUS IMPROVEMENT

“Continuous improvement” means improving performance with many small, incremental improvement steps. The emphasis is not on the improvements being small, but rather that these improvements have the advantage that they can be followed relatively painlessly by other small improvements. In Japan this process is called kaizen. The word means continuing improvement, involving everyone. It implies a never-ending cycle of repeatedly questioning and requestioning the basic working of an operation. This process is best summarized by the so-called Plan Do Check Act (PDCA) cycle, as illustrated below, which is a sequence of activities that need to be undertaken on a cyclical basis to improve the process (Pieterse, 2006:38).
According to Pieterse (2006:38) the first step in this cycle is the PLAN stage, in which the current method or problem is studied when a plan of action is decided upon, the next step is the DO stage-the implementation stage where the plan is tried out. This is followed by a check stage, where the newly implemented solution is evaluated to determine if it had the required results.

In the final ACT stage, the implemented solution is standardised or consolidated if it has been successful, or the cycle starts again if the solution is unsuccessful. The process is repeated without stop.

2.6.1 Continuous improvement tools

There are several tools that can be utilised to get to the root cause of the problem as to ensure that not only the symptom is treated, but also the root cause is rooted out for good.
The Five Why’s

In this process, the question “why” is asked after each successive answer, to find the reason why that answer is given. The end result is then the root cause that must be addressed to ensure that the symptom does not occur again (Pieterse, 2006:39).

<table>
<thead>
<tr>
<th>Problem: Material cannot supplies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why → Late order received</td>
</tr>
<tr>
<td>Why → unscheduled demand</td>
</tr>
<tr>
<td>Why → Customer using pull demand</td>
</tr>
<tr>
<td>Why → Customer needs changed</td>
</tr>
<tr>
<td>Why → Firm using push demand</td>
</tr>
<tr>
<td>Solution: Implement JIT process-involve customers in your plans</td>
</tr>
</tbody>
</table>

Fig.2.2 The Five Why’s

Source: Adapted from Suzuki, (1987:116)

The five why’s as illustrated in figure 2.2, is the example of how one can get to the root cause of the problem by asking the question five times.
Brainstorming

Brainstorming sessions are frequently held by small-group activities. The small group activities should be deployed throughout organisations that want to become lean or world-class (Imai, 1986:96).

According to Pieterse (2006:39), team members are required to come up with ideas on a rotating basis, without interference from the other team members or from the group leader. Only when these ideas have been harvested, can they be categorised and analysed to determine the best options. The best ideas may be picked through the system of multi-voting, where every team member is allowed a certain number of votes, that he or she must divide among the options that he or she prefers. The options with the most votes are then chosen.

Process flowcharting

Pieterse (2006:39) defines a process flowchart as a picture of what happens first, second, third etcetera in a process. All the steps in the process are listed. The chart is used to determine which processes add value and which not, so that as many non-value adding as possible can be eliminated.

All the activities and steps that take place in the flow of a product or service are shown in the chart by means of symbols. This ensures a more detailed evaluation of a process from the very first step or activity, to the last step, when the product leaves the organisation. These steps should follow the sequence in which they are
happening in a logical order. All steps including moving, inspection and waiting for parts should be included.

![Flow Process Chart]

**Fig. 2.3 Section of a Flow Process Chart.**

**Source:** (Pieterse, 2006:40)

**Pareto charts**

Pareto charts are used to organise errors, problems or defects to help provide focus to the problem-solving efforts. Pareto analysis indicates which problems may yield the greatest payoff when solved. A Pareto chart is simply a bar chart, which lists the frequency of occurrence of incidents, arranged from the most frequent to the least. It is a visual reminder of where the activities should be focused (Pieterse, 2006:41).
Cause and effect diagram

This diagram is also called the Ishikawa diagram after its inventor, or the fishbone diagram after its appearance. On the diagram the data is arranged into six categories: material, assessment, people, method, equipment or environment. Each of these categories is then explored to determine if there are factors in the category that contributed to the problem (Pieterse, 2006:42)

Run Charts and Checklists

Run charts are simply plots on the graph of a variable that is of importance, against time. It may, for instance, show the variation of the number of occurrences of a specific event over time. Armed with this information, it is possible to analyse if there are certain trends, such as more absenteeism on Mondays, or whatever the case may be (Pieterse, 2006:43)

Check lists are also used to record the frequency of occurrences by simply making a mark in the corresponding column when a certain event happens.

Scatter diagrams

Scatter diagrams reveal the relationship between two measurements. An example is the relationship between humidity and the cure time of a polymer. If the results are spread in a tight band, then a relationship exists, but if a random pattern appears, the items are unrelated (Pieterse, 2006:44).
**Histograms**

These are useful when one wants to compare the frequency with which each measurement occurs and how much do the measurements vary. It is often not necessary to analyse histograms by means of statistical methods, as they are easier to draw meaningful conclusions from.

**Statistical process control charts (SPC)**

Statistical process control charts plot the status of a variable, such as temperature, over time. They have a central, target value and upper and lower control limits to show when the process is running out of control (Pieterse, 2006:45).

**Benchmarking**

Benchmarking is a performance measurement tool used in conjunction with improvement initiatives. It measures comparative operating performance of companies and identifies “best practices”. It is based on the premise that it makes no sense to reinvent something that someone else is already using.

**Benchmarking approach**

i. Identify area or process to be examined

ii. Find output measures of area or process and obtain measurements

iii. Select an accessible set of competitors and best-in-class companies against which to benchmark.

iv. Calculate differences in company’s performance measurements and those of the best in class and determine why the differences exist.

v. Develop tactical programs for closing performance gaps
vi. Implement the programs and compare the resulting new measurements with those of best-in-class companies

Types of benchmarking

Internal

• Look at different departments; units or processes within the same company.

• Look at similar departments in the same company in other geographic areas or countries.

Competitive benchmarking

• Look at competitors

• Compare measurements and processes

• Tasks i.e picks/picker, tons/picker, etc.

• Functions i.e. time line of order

• Procedures

• Systems

• Costs
**Fig. 2.4. The benchmarking process: common steps**

*Source (Cane, 1996:42)*

<table>
<thead>
<tr>
<th>Getting started</th>
<th>Preparing to benchmark</th>
<th>Conducting research</th>
<th>Selecting whom to benchmark</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning, Organising and managing for benchmarking</td>
<td>Identify key process</td>
<td>Collect information: “Who’s best?” “What to ask?”</td>
<td>establish relationship</td>
</tr>
<tr>
<td></td>
<td>Form team</td>
<td></td>
<td>plan to collect and share info</td>
</tr>
<tr>
<td></td>
<td>Understand your own processes</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Collecting and sharing info</th>
<th>Analysing, adapting and improving</th>
</tr>
</thead>
<tbody>
<tr>
<td>surveys</td>
<td>compare data</td>
</tr>
<tr>
<td>site visits</td>
<td>plan to surpass</td>
</tr>
<tr>
<td>determine any third parties</td>
<td>implement and monitor</td>
</tr>
</tbody>
</table>
2.6.2 Communication

Managers in most organisations spend a lot of time planning in meetings without involving the people who are going to do the actual work. This result in brilliant ideas that are only stored either in computer databases or written in white boards in the boardrooms that are never implemented due to the fact that they are not filtered down to the people doing the work.

If a company wants to operate Kaizen successfully, it needs to review its communications systematically. Within the organisation itself, as much importance needs to be attached to the smooth functioning of upwards and cross-functional communication as to traditional downwards communication (Cane, 1996:43).

2.6.2.1 Communication within the company

Downward communication

Cross-functional

Communication

Upward communication

Source: (Cane, 1996:43)
The organisations communications with related parties outside (suppliers, shareholders, customers, etc.) also need to be subject to scrutiny and improvement.

2.6.2.2 Communication outside the company

Source: (Cane, 1996:44)
2.6.2.3 In-company communication

When a company goes through a major change, a clear consistent integral communications strategy is vital to explain the positive benefits of the change. Internal communication is one of the most important elements of the communications mix. Staff briefings, information packs, magazines and publications all have a part to play in building understanding (Cane, 1996:45).

If an organisation wants its workforce to be “enabled”, it will not help simply to tell them that they are! People need to feel for themselves that they are becoming powerful and that takes action from management to create the conditions where it can be realised by the staff themselves. It is also too easy for the “lip service” empowerment syndrome to become a source of amusement for staff if:

- Decision making remains with management
- Employees are only allowed to recommend and not to implement
- Employees are not given freedom to decide what to do, (only how to do it)
- Managers still see the problem as how to motivate staff
- Jobs are allowed to remain repetitive and unsatisfying (Cane, 1996:51)

A platform should be created for ideas to flow from the shop floor upwards as to contribute to the overall performance improvement of the organisation. This can be done through suggestion systems as done in Matsushita.
Cane (1996:53) states that at best these suggestion systems have enormous benefits to a company, including greater participation by staff, a greater sense of involvement, increased motivation, interest, responsibility, recognition, and reward. In addition they can help both to tap and release further aspects of people’s potential. She further states that the system (of which there are many variations) can apply individually or as part of small group activities, often in Quality Circles (QC) and Total Quality Control (TQC) programmes.

2.6.2.4 Cross-functional communication

This simply means there should be readiness to work with other teams or departments in the area of the transfer of skills, ideas and information. In this way quality implementation is facilitated into the whole process of product delivery or service. Most of the time there is no communication between groups or departments, which have equally important role in the company’s activities.

According to Cane (1996:57) one of the quickest and most effective ways of improving performance within most organisations is the introduction of the inter-departmental communications. Internal barriers protecting mini-empires are common even in relatively small companies. Not only do these barriers friction, in many cases they cause inefficiency—a typical example is duplication of work—and worse still, customer dissatisfaction, when, for example, the sales department promises delivery of a product which the production department knows it cannot manufacture in time.
2.7 CONCLUSION

In this chapter the philosophies and principles of world-class manufacturing were discussed with the emphasis on the principles of lean manufacturing. This was necessary in order to gain enough understanding which might be useful in analysing the barriers to the implementation of lean manufacturing in Transwerk Uitenhage plant.

One thing has become evident in this study, achieving a lean status requires a certain frame of mind, lean thinking and a lot of effort. This frame of mind will pave the way to a long process of continuous improvement, which eventually through joint efforts with all stakeholders will lead the organisation to achieving a lean status.
CHAPTER 3

THE SITUATION AT TRANSWERK

3.1 INTRODUCTION

In this chapter a current state map of the supply line of the Transwerk Uitenhage plant will be outlined, focusing on the supply line barriers to the implementation of lean manufacturing. This will provide the researcher with the framework for the research methodology to be applied.

3.2 THE TRANSWERK UITENHAGE PLANT

The Uitenhage plant is a Rail Freight Refurbishing (RFR) business which refurbishes mainly coal, flat and drop-side wagons and car carriers. The RFR business consists of the Wagon business which is a profit centre, the Fabrication, the Components, the Wheels businesses and the Bogies sections that all act as internal suppliers to the Wagon business. The human capital, the finance, the maintenance, the risk, the customer services, the engineering, the Logistics and the ICT departments, all are support services to the wagon business and in some cases to each other.
3.3 THE WAGON BUSINESS AND PROCESSES

3.3.1 The manufacturing and the Refurbishing process

The Wagon business produces various types of wagons depending on the demand at that particular moment. At the time of the research the following products were either being manufactured or refurbished:

<table>
<thead>
<tr>
<th>Product</th>
<th>use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orex wagons</td>
<td>to transport iron ore</td>
</tr>
<tr>
<td>CFR wagons</td>
<td>to transport various commodities</td>
</tr>
<tr>
<td>SCL wagons</td>
<td>to transport various commodities</td>
</tr>
<tr>
<td>OLJ wagons</td>
<td>to transport coal</td>
</tr>
<tr>
<td>AR5 wagons</td>
<td>to transport coal</td>
</tr>
<tr>
<td>Botswana wagons</td>
<td>to transport various commodities</td>
</tr>
<tr>
<td>SMLJ wagons</td>
<td>to transport various commodities</td>
</tr>
</tbody>
</table>

As the main business in the plant this business has the most number of employees in the plant. Its staff compliment has increased from 550 to 856 in the last two years. Additional to this, is 175 employees whose services are rented from employment brokers in order to beef up for the double shift.
i. **Labour; critical skills and machinery**

The wagon business is highly labour intensive with employees involved in heavy manual labour. It is a high-risk environment as employees in this area are exposed to high levels of dust; welding fumes and sparks. Employees are also exposed to a lot of bending and standing in awkward positions.

The critical skills in this section are the welding skills and the wagon fitting skills performed by artisans and lately by trained semi-skilled workers. It has been recently been discovered that the business does not really need artisans for all welding processes as in some processes only one type of welding is being used. A decision was therefore taken that semi-skilled workers could be trained to do these single type of welding duties. Using qualified welders who are trained for three years was seen as a waste of time as well as pushing up the price of the product. This was also necessitated by the fact that the welding skill for the type of welding done in Transwerk, was a scarce skills as even the welders rented from employment brokers needed to be retrained before they could weld the thick steel plates used in the welding processes.

Most of the equipment used in this section is welding guns; welding machines; cutting torches and grinding machines. All other processes are manual, but the plant is making strides in trying to improve this situation. For instance, with the gas supply, a ten-minute preparation time is allocated for each welding station to set up the gas containers. To improve this bulk supply of gas has been installed.
Source: Photographs taken from the Transwerk plant

See annexure on page 82 for more improvements.

The skills and machinery mentioned above is therefore used too either build or refurbish wagons. The process engineers prepare the layout of each line before a new product enters the line and the supervisor man the line with the necessary skills required for the type of wagon to be built or refurbished. Each wagon enters the line marked and with the menu of what has to be done attached to it. The planners have to draw up a pick list of material, attach a drawing and see to it that, the material is available on the line before the process of refurbishing or building is started.
ii. **Working hours and production targets**

The wagon business is divided into 11 long different product lines each manned by a supervisor with subordinates ranging from 15 to 40. All other lines work straight shift, which runs from 07:00 till 15:30, except for the two main lines that run double shifts.

The two main lines run for Twenty-four hours since the 01 June 2006, one shift starts at 07:00 to 19:00 and the next one from 19:00 to 07:00. This need for a double shift was due to an increase from the order book and it is the first time in the history of Transwerk Uitenhage that production is working double shifts. Each shift is inclusive of a three-hour overtime daily during both day and night shift.

The 24/7 shift as it is called in Transwerk, is a negotiated agreement between labour and management in the Transwerk bargaining chamber and was cascaded down to all centres. Working the 24/7 shifts is at this stage on a voluntary basis though it is envisaged that it would be built into the contracts of prospective employees. Though it is voluntary, there are sweeteners built into it as to entice the employees to work it. The sweeteners are in the form of notch increases besides the normal shift allowance.

For the double shift, a big capacity drive was taken to train semi-skilled workers in welding; wagon fitting; flame cutting; crane driving and drilling duties. This was so that these employees could act in these higher grades during the double shift
period until the said order book is finished, and the contracted employees could fill the lower level jobs.

3.4. The supply line

The supply line consists of all internal functions plus external suppliers involved in the identification and fulfillment of needs for materials, equipment, and services in an optimised fashion. The objective of this is to improve the organisation’s profitability and to ensure its survival, as well as the survival of its customers and suppliers. The current state map will prove whether this is true for the supply of Transwerk Uitenhage.

3.4.1 Transwerk internal suppliers

3.4.1.1 The Fabrication business

The Fabrication business is situated in the plant and consists of the fabrication section, the Machining section as well as the tool room. The total staff compliment for the Fabrication business is 382 employees, divided amongst 11 supervisors, who in turn reports to the Operations manager. They supply the wagon business with the following products:

Fabrication: This section supplies the three main lines of the Wagon business, which are responsible for the manufacturing, and refurbishing of the CFR wagons. All the lines in this section are working straight shift, which runs from 07H00 till 15H30, except for one line that runs double shift in line with the lines they are supplying with material. The double shift is in two twelve-hour shifts, which starts
from 07 H00 till 19H00 and continues from 19H00 till 07H00. The night shift was meant to start from Monday night and end on Saturday morning but the employees requested that it should start on Sunday night and ends on Friday morning and their request was granted.

The following are the products supplied:

- Various types of plates for making floors; sides and ends; and sole bars.

- Volumes: Floor plates-16 sets daily
  
  : Sides –24 sides daily and during night shift
  
  : Ends -24 ends daily and during night shift
  
  :Sole bars-8 daily

**Machining**: This section is a second tier supplier to the wagon business as it performs the cutting and turning duties of bolster fenders, refurbish bolsters and supply the Bogies section with the bolsters, which in turn, refurbish the bogies and send them to the wagon business. The machining section where bolsters are made also work double shift as they are supplying the bogies section that works double shifts.

- Volumes: 24 bolsters daily and during night shift

**3.4.1.2 The Bogies sections**

The Bogies section is situated right next to the wagon business and it makes use of the bolsters supplied by the Machining business to build bogies on which the wagons are lowered before fitting the wheels

Volumes: They deliver as per need (JIT system followed)
3.4.1.3 The Wheels business

The wheels business supplies the wagon business with wheels for the wagons. These wheels are either refurbished wheels fitted with new centres purchased from an external supplier, Scorr or new wheels.

- Volumes: 100 wheels daily

This business normally struggles to deliver as expected due to problems experienced from their supplier Scorr resulting in wagons being staged, thus increasing WIP.

![Graph 3.1 Source (Transwerk Uitenhage Financial Report:2005/2006)]
3.4.2 Transwerk external suppliers

3.4.2.1 Knorr-Bremse

This is also an overseas supplier that makes use of Dorbyl in Johannesburg for its RSD. It supplies Transwerk with the following material:

- Various types of valves - used in the breaking system of the wagons
- Volumes: DB 60-1 batch of 60 valves
  - DB 20-1 batch of 50 valves
  - DB 10-1 batch of 50 valves

- Huck Bolts-To fasten the sole bars and under frame of the wagon together.
  Volumes: 1 batch of 6000 huck bolts
- Rubber gaskets-For air brakes
  - Volumes:1 batch of 6000
- Frequency of delivery: the valves are delivered thrice a week.
3.4.2.2 RSD Dorbyl

This supplier supplies Transwerk us with the following material:

- SL 76 Draw gears – This is a gear with a spring to stop the jerking when pulling or breaking the wagon.
- Volumes: 1752 Draw gears
- Frequency of deliveries: Monthly

3.4.2.3 Scorr-metal

- Wheel centers-672 weekly
- Axles-384 trice a week
- Gibson rings-These rings provide lockering for the wheel
- Volumes: 192
- Frequency of deliveries: weekly
3.4.2.4 Conbrako

Conbrako is an American overseas company that makes use of Dorbyl in Johannesburg for its RSD and it supplies Transwerk with:

- Reservoir air tanks – these reservoir tanks work in conjunction with the DBs and form part of the air brake system.
- Volumes: 3 912
- Frequency of deliveries: Thrice a month, sometimes weekly depending on demand. They are sometimes unpredictable, for instance in July the following wagons were staged and could not be sold due to waiting for draw gears:

<table>
<thead>
<tr>
<th>Wagon type</th>
<th>number staged</th>
</tr>
</thead>
<tbody>
<tr>
<td>DZ</td>
<td>119</td>
</tr>
<tr>
<td>BAD</td>
<td>75</td>
</tr>
<tr>
<td>CR</td>
<td>46</td>
</tr>
<tr>
<td>OLJ</td>
<td>25</td>
</tr>
</tbody>
</table>

This is a problem encountered due to making use of sole suppliers.

3.4.2.5 Future Africa Trading

This supplier is situated in Johannesburg and delivers to Transwerk three times a month delivering the following products:

Steel plates-to be fabricated to make sides and floor plates of a wagon
- Round and Flat bars-truck components
- Volumes: 600 plates; 500 round bars
• Frequency of deliveries: 4-5 trucks per month

3.5 The logistics department

The logistics manager is the head of this department and reports directly to the centre manager who is responsible for managing the whole plant. Falling under the logistics manager’s jurisdiction are the following functions:

3.5.1 The inventory stores

An inventory stores manager who has five supervisors reporting to him manages this department. The total number of staff in the inventory stores is thirty-three with varying duties such as picking material, driving trucks, cranes and forklifts, stacking material, receiving material, and dispatching material.

3.5.2 Sales and distribution

This department is managed by a sales and distribution manager who has four people reporting to him and who are responsible to ensure that the fully completed wagons are sold. They are also responsible that transactions on inter-departmental sales are captured.

3.5.3 Planning

There are nine planners whose responsibilities is ensure that material is being planned for all the activities that are to take place for each wagon. They formulate a pick list of all material to be picked based on the menu stating what has to be done on each wagon. They are also responsible to make sure that a pick list
together with the drawing is forwarded to the internal customers should there be parts to be manufactured. This ensures that the artisan knows exactly how the part should be manufactured by using the drawing. They further need to work through the procurement should there be a need to procure material.

3.5.4 Purchasing

A procurement manager who reports to an engineering manager manages this department. There are six employees responsible to cure different raw material and components from the various external suppliers. Most contracts are negotiated by Transwerk head office in Kilnerpark, for all Transwerk plants.

This results in businesses at plant level having no choice but having to use sole suppliers to procure material from. The result of this is that the suppliers are not managed resulting in long lead-time problems, not keeping up with delivery schedules and sometimes even resulting in quality problems. At this stage the people who negotiated the contract are not even involved as to be able to see and experience the problems encountered by those plants who are at the receiving end. For instance, the wheels business could not deliver to the Wagon business for the last five months due to problems with Scorr who supplies them with wheel centres and axles.

The following were problems experienced due to this problem:

- Wagons had to be staged, as they could not be sold without wheels.

- This is in itself resulted in the yard being full of wagons, blocking entry to the wagons that need to be refurbished.
• The increase in WIP to unacceptable levels

• Line stoppages due to wheels not available

• Re-works when centres were received.

• The wagon business being unable to deliver to their clients

• Employees sitting and waiting for work.

• Demotivated employees due to lack of work to do

• All Wheel businesses and RFR businesses nationally suffered the same problems due to the fact that Scorr is the sole supplier.

The reasons for them not being able meet their delivery schedules were that they were moving to new premises. They informed Transwerk in due time but had promised that this would not affect their delivery schedules and the results were opposite to what was promised. Besides the moving the company has and is still experiencing problems with them not being to deliver on time. If they deliver on centres, they would be behind on axles and the problem is just recurring.

There are other small components that they are allowed to purchase.
CHAPTER 4

RESEARCH DESIGN

4.1. INTRODUCTION

The management of Transwerk Uitenhage in their daily production meetings is always faced with supply line problems, which sometimes result in line stoppages. These line stoppages are either due to material shortages as a result of supplier cannot supplies, late deliveries or unplanned product change due to instructions from top management who resides in head office and not in the Uitenhage plant.

It has also became evident that the different functional departments within the supply line plan as individual functions and as such some of the crucial information is not communicated to all the functions within the supply line. This results in the blaming syndrome amongst the functional departments within the supply line. Often the material for product A is received when the production schedule has changed to product B already and as such has to be kept in inventory, resulting in high inventory costs. It further means that the material needed for product B is not even available due to lead times resulting in late ordering as the material for product B was not planned for the changed production schedule.

The factor is that the inventory and the planning functions are reporting to the logistics manager whilst the procurement function reports to the engineering manager. This factor on its own is resulting in conflicting interests. Often the
customer services department which is doing the marketing function meets with the customer and commits the company to a delivery date without involving the whole supply line in order to take an informed decision. This result in the planning and the procurement departments, only getting the crucial information to plan and to procure the material when the line is running already.

The inventory stores in Transwerk Uitenhage are also running short of capacity as the inventory levels are increasing daily. To improve the efficiencies in the supply line, Transwerk Uitenhage needs to implement the Lean processes in their supply line.

4.2. RESEARCH METHODOLOGY

4.2.1 Interviews

According to Coldwell and Herbst (2004: 54) interviews are particularly useful for getting the story behind a particular participant’s experiences. The interviewer can pursue in-depth information around a topic. Interviews may be useful as a follow-up to structured questionnaires with certain respondents, e.g. to further investigate their feelings/perceptions about a particular topic. Usually open-ended questions are asked during interviews. They further state that the general rule for interviewing is to record responses verbatim. This usually means that you should use a recording device, or write down word-for-word what the respondent says.
The interviewer has a list of issues to be covered but the purpose of the interview is to let the respondents express their thoughts without restraint. These interviews need to be face to face (mail and telephone interviews do not work)

There are two types of interviews viz.: Qualitative and Quantitative:

**4.2.1.1 Qualitative**

It allows an in-depth analysis of problems, opportunities and situations in the business environment. The results of this in-depth analysis cannot be subjected to a formal or quantitative analysis.

**Advantages:** It is less costly than quantitative

**4.2.1.2 Quantitative**

The quantitative approach describes, infers, and resolves problems using numbers. Emphasis is placed on the collection of numerical data, the summary of those data and the drawing of inferences from the data. Measurement is seen to be utmost critical, and factors that cannot be easily measured using numbers, such as feelings, values, and beliefs are generally difficult to include in such analysis (unless specially designed scales are constructed for this purpose) (Coldwell et al, 2004:15).
4.2.1.3 Validity

Validity is usually discussed in terms of internal and external validity.

Internal validity

Internal validity refers to the validity of the findings of a particular study per se, or, in other words, the extent to which the hypothesis are supported by the available evidence.

External validity

External validity refers to the capacity of the generalise findings to other similar situations and context.

Coldwell et al (2004:17) further states that in order to show the validity of a particular research study, a number of validity issues need to be investigated:

Face validity

This is a weak form of validity which refers to whether the items in the measuring instrument appear to measure what they purport to measure. In other words, do the items appear logically and conceptually accurate?
Content validity

The aim here is to show the extent to which the items for a particular measuring instrument fully represent the area under study, with no omissions.

Construct validity

The construct validity refers to how well the factors that are included in a particular construct are supported by the available data.

Criterion-related validity

This is in two forms, namely concurrent and predictive:

Concurrent validity: refers to the extent to which the measures taken by one instrument correlate with measures taken at the same time by another instrument or measure of a given construct.

Predictive validity: refers to an extent to which a particular measure, e.g. one designed to measure employee propensity to leave a particular job, is effective in predicting actual labour turnover in a specific company.

This research is considered a qualitative in-depth study that analysed the supply line processes of Transwerk Uitenhage plant, in order to identify and analyse the barriers to the implementation of lean manufacturing processes. It was also experimental in nature as the researcher participated in the production planning meetings and asked questions as to try and understand where the gaps in the supply line were in order to compare with the responses received from the interviews.
The study is also considered reliable and valid since the findings of this study is supported by available data and that the findings can be generalised in similar situations since the tools used in the form of Dr Deming’s fourteen points and the lean principles of continuous improvement were tried and tested and they give the same results every time. Cognisance of the fact that these tools needs to be appreciated and accepted in order to lead to permanent improvement, and that not all processes could be improved at the same time, was taken. Hence the supply line was the focus of this study.

4.3. The research process

The research addresses two issues:

i. People

ii. Processes

Interviews were held with the inventory manager, the logistics manager, the planners, the quality personnel, the procurement manager and the procurement personnel on the following questions:

- Who are Transwerk’s suppliers?
- What volumes are ordered from these suppliers?
- What are the batch sizes ordered from them?
- How frequent are their deliveries?
- How far are the suppliers situated from the plant?
What is the quality issues that the quality department is often faced with?

The researcher also sat in a number of daily operations meeting where some of the material problems experienced by production are discussed. The whole internal supply line processes were analysed according to the lean manufacturing philosophy, as discussed in chapter 2. A current state map is developed to collect data and to better understand the existing supply line processes in Transwerk Uitenhage.

The emphasis is on continuous improvement and the existing supply line processes are analysed to identify the barriers to the implementation of lean manufacturing in the supply line.

4.4 CONCLUSION

In this chapter, the research design and process has been outlined, the research methodology described and the validity of the study declared.
CHAPTER 5

THE EMPIRICAL STUDY AND INTERPRETATION

5.1 INTRODUCTION

In this chapter the results of the study of the situation on the Transwerk supply line will be interpreted. The people and processes aspects will be discussed and compared to that of a lean supplier. The focus will be on the identification of waste on the supply line so that recommendations can be made to the Transwerk Uitenhage plant management, to bring it in line with that of a lean manufacturer.

5.2 The people aspect

5.2.1 The reporting structure

The Transwerk Uitenhage plant is under the jurisdiction of a centre manager who used to report directly to the National manager (RFR) at the time the research was started and who is now reporting to the regional manager. The change in organisational structure was effected as a result of the restructuring in Transnet, resulting in Spoorneet maintenance depots being integrated into Transwerk. This integration is part of the four-point turn-around strategy of Transnet Chief Group Executive, Maria Ramos.
This resulted in the appointment of regional managers and the centre having to be responsible for all the Spoornet maintenance depots of the Port Elizabeth area, the East London area, the Queenstown area up to and including Noupourt.

5.2.2 Interviews with the Supply line managers

In this section the interaction between the supply line managers, how they function and their planning process is discussed.

5.2.2.1 Interview responses

All managers interviewed participated willingly and responded openly to the interview though at times some of them became too emotional due to problems they are encountering preventing them from delivering to their customers as promised. When asked why they are so emotional about these issues the response was that they could not deliver because of things beyond their control.

5.2.2.1.1 Inter-departmental relationships

Each one of the managers concerned believed that he did everything in his power to play his part, further than that it’s somebody else’s responsibility. Customer services was blaming production as a reason why they could not make sales; production was blaming logistics for not having material, logistics was blaming
procurement for not purchasing the material on time and procurement blamed the planners for not planning in advance. So it carried on, nobody wanted to take responsibility and accountability for the problems encountered that led to wagons being staged. Each one of them was also protective of their employees and always shifted the blame from their employees to the other section’s employees.

This is a barrier that needs to be dealt with if they want the supply line to be lean.

Comment:

To remove the blaming syndrome and sort out the existing problems, it has to start with these managers, they need to stop seeing themselves as managers of their individual functions and see themselves as all members of one unit, the supply line. They need to plan together and try to find unified solutions to root out the cause of these problems and start viewing the Wagon business as their customer. They need to ensure that they combine their efforts to deliver in time and cascade this down to their subordinates as well. The company has tried this by forming management production teams but they all failed as management used those as platforms to blame each other. A proper training for management in lean thinking and lean processes is necessary to address this problem. Managers are not developed and equipped to deal with the challenges of lean manufacturing.

5.2.2.1.2 The External Suppliers

Communication between the suppliers and the plant is very minimal and it is through the procurement staff and it is mainly transactional. Further than that there is nothing else, as they don’t have much influence over them. They do try to persuade them to bring the orders forward - these sometimes works, but not very
often as the suppliers are adamant about sticking to their lead-times. The suppliers do not understand our business and often do not meet the delivery dates. This is a result of contracts being negotiated centrally for all Transwerk businesses. This results in waste of waiting time.

The literature reveals that having few sole suppliers is a barrier to lean manufacturing as it restricts the firm’s lead time, cost and quality and therefore a firm should encourage its suppliers to adopt the lean supply principles in order to improve their processes. For the firm to be able to encourage their suppliers to do this, it has to have adopted the lean processes first so that it would be able to contribute to the assessment and improvement processes of its suppliers.

One other form of waste experienced from these sole suppliers is delivering material that is not according to specification. This results in the work having to be redone by the Transwerk Fabrication business, which results in processing waste. An example is that some of the steel received for the sides is sometimes not cut to specifications as a result of that and internal processes have to be utilised to cut these plates, which is waste of time and process.

5.2.2.1.3 Increase in WIP (staged wagons)

The cost of WIP in the first week of October was reported to be at R15,5 million. These are potential sales locked into stock, due to some material shortages. In this case it was due to unavailability of wheel centres from Scorr, resulting in the wheel department having no output. This had the following repercussions:
i. The wheel business employees had no work to do in some of their operations.

ii. As an internal supplier it could not deliver to the wagon business

iii. The wagons had to be staged thus, increase in WIP

iv. The employees wasted time doing nothing, waiting for material

v. Average efficiency rate in the last three months starting from July dropping to 77.4 percent.

vi. The wagon business could not deliver to their customer, Spoornet.

vii. Ageing of WIP – almost three million of WIP older than six months

viii. An increase in inventory levels on the lines due to material stacked waiting for wheels to be available before it could be utilised. The example of this is the bogies on which the wagon has to be lowered before the wheels are fitted. This is also contributing to the high inventory costs.

These staged wagons further result in blockages, as a result it becomes difficult to shunt in wagons that must still be built or refurbished. Nothing or very little is done to educate the supplier about the wagon business and how the material shortages impact on it. Though some responsibility has been cascaded down to the centre procurement department to procure the material from these sole suppliers, they have no authority over them. No attempt from the supplier’s side is made to reduce their lead-times as to improve this situation, as they know that there are no performance measures in place to measure their performance. Lead-times need to be reduced as to reduce WIP as it is waste that will have to be removed, for wagon business to be lean.
5.2.2.1.4 Processes

i. Make-to order

Though the Wagon business is using the make-to-deliver process, the supply line processes are not in place to support them to make their process efficient. The stock value is currently at R95 million rand, but wagons are being staged. This shows a mismatch of what is needed by the wagon business and what is ordered, resulting in waste.

This mismatch is seen in the volumes and batch sizes received. Batch sizes are not reduced even if the program is coming to an end and only few components are needed, resulting in the material lying all over the plant, deteriorating, resulting in it being scrapped. This calls for a need for, firstly, the internal suppliers to work together to improve their supply line processes and then work with the external suppliers and help each other where necessary to make sure that they also strive to be lean. The volumes and batches need to be reduced to only the volumes and batches needed. The suppliers need to adopt the pull supply process, instead of the push supply process. They need to do frequent deliveries of what is needed when it is needed, in the quantities needed.

ii. Quality inspections

The receiving section of the inventory stores still has to check incoming material for quality defects. This would not be necessary if Transwerk and their suppliers had a common understanding of what quality is, in the eyes of Transwerk. The wagon business still makes use of quality controllers and quality assurance
personnel to inspect quality of their products before they leave the production lines and issue non-conformance reports where necessary. Additional to that an employee from the customer side still inspects quality of our products and either accepts or rejects them. Often at this stage it is already too late to repair the quality defect and as a result rework stations have been created, as it is difficult to return the wagon to the beginning of the line for rework. This process has to be eliminated as it does not add value and instead employees should be trained to improve the quality of their own work.

The inspection by the customer shows a lack of trust in Transwerk’s quality standards, as the products sometimes rejected by the customer are products that have been approved by the company’s quality controllers. In this regard, Transwerk’s supply line needs to have a mental change and a common goal of improving quality by making sure that quality is built into the product.

### iii. Housekeeping

Efforts by the Risk department of educating, training and involving employees in housekeeping have been nullified by these stacks of material lying all over. Though the floors were clean and free of oil and water spills, and the machines were cleaned, the work areas were blocked by material stacked all over the place. In one line material of 50 wagons, of a process that has been cancelled was stacked, meanwhile the material for the running program was not yet available.
Though the trolley system was introduced, it is not properly used as it is used for dumping material that is not used. The literature reveals that introducing kanban cards in storage areas can control inventory levels. In this case, before even the kanban system is introduced, there has to be a system to return unused material that was booked against the wagon back to the inventory stores. This is necessary to reduce the cost of the wagon.

Both managers and employees interviewed were concerned about so many people giving orders to the employees directly without sometimes involving even the centre manager or the operations manager. This is caused by the National and Regional office being accommodated in the same yard as the Uitenhage plant.

It is said that the problem with the former reporting structure was that, due to the fact that the National manager (RFR) resides in the Transwerk Uitenhage plant, it is too easy for him to go directly to the lines and ask the operations manager to effect some changes to production, or sometimes even speak directly to the supervisors without the knowledge of the centre manager. The centre manager or sometimes the operations manager would go to the production lines and find employees doing something else and not what was planned for that day. This caused confusion on the production lines, as employees did not know whom to listen to anymore. This problem has now doubled due to the formation of the regional office, with the regional manager also residing in the same plant.

Management need to be seen as having common goals as this often results in employees undermining authority of those they directly report to due to following top management instructions. As management always encourage employees to
follow the protocol when solving problems, they need to walk the talk otherwise this can be interpreted as being divided by employees.

Measurable Performance goals should be identified for each level of the supply line and for each participant in the supply line as a framework to develop a lean supply line for Transwerk Uitenhage plant.

iv. Equipment and enablers

The double shift has resulted in the shortage of working equipment as there was no proper planning in this regard. The planning was done for increased capacity as far as employees are concerned and there was an oversight concerning planning for equipment for doing the work. This has resulted in misleading theft figures as equipment will be reported as stolen, to be found being used in another line. This implies that employees have to “steal” each other’s equipment, in order to perform their duties.

The company made strides in improving the working conditions by purchasing enablers to make some operations easier to perform; a mention was made by employees in line 9.2 of converters that turn the wagon around so that an employee could be able to weld in what used to be awkward positions. A robotic welder was also made mention of, by employees in the fabrication section, though a feeling is that a lot can still be done in this area.
Among the management and the employees in the planning, the inventory, the procurement and the quality departments, a lack of an integrated information system that can be used by all as a tool that enables them to work together and have access to was mentioned as one of the causes of some of the material problems. Their departments are about 1, 5 km apart and sometimes you are stopped along the way by a supervisor who has an urgent need while going to check whether the material has been purchased or received, etc.

Though the company has invested a lot of money in the SAP R3 system, it is seen not to be reaping the full benefit of this system as it is used in pockets without any integration. Employees from different functions using SAP are only given access to their functional module only. They cannot access information on other modules nor use them even though the SAP is able to do that. The Information Communication and Technology (ITC) department is seen to be dictating what the employees need instead of giving support, though the need is a business need. Other businesses within the plant are not seen as customers whose needs to improve their systems should be met. Even an external email is seen as a privilege and not an enabler that enables the employees to enhance communication amongst themselves, their clients and their suppliers. Most things are still done manually though there are computers. This is seen as a waste of company resources and results in unnecessary cost of overheads that could be saved.
Employee responses to the interview

i. Labour, critical skills and machinery

The employees interviewed were first sceptical about an interview as they were viewing it as another management fad that is not going to bear any fruits. They alluded to having answered a lot of surveys done by OD and nothing came of them. The researcher had to give them a background about the research and why it is necessary for them to participate in answering the interview questions. After some persuasion they agreed to participate.

Employees saw the lack of goal setting as de-motivating for them. This was a common concern to all lower level employees as they complain that they are not involved in the planning of production. They come to work in the morning not knowing what they are going to do only to be shuffled around by the supervisor in the morning. Knowing what is expected of them when they go to sleep will motivate them to wake up and go to work the next morning, knowing what challenges lie ahead.

It has been cited that the team concept was introduced in August but proper research on how to implement this was not done. Employees were promised compensation that could not be effected due remuneration policies that are not flexible. Teams are an essential ingredient in continuous improvement initiatives. Supervisors need to involve their employees more in setting goals for their sections. They need to know why they have to do the things the way it is expected of them and be allowed to have an input. This is the way to go to ensure continuous improvement in the supply line.
The lack of equipment to perform their duties and the shortage of material that prevents them from working is seen as a deliberate effort by management to prevent them from earning gain sharing. They also feel they should not be punished by not being paid gain share for problems beyond their control.

As long as employees are not part of the processes from the beginning, they will always have a ‘them and us’ perception. When they are empowered enough to be able to understand the correlation between production sales and how to calculate the gain sharing themselves, they won’t blame anybody as they would understand the process.

**ii. Working hours and production targets**

While overtime and night shift is seen as putting more money in their pockets, they feel they end up suffering from fatigue because of this. This is also made worse by the fact that it is difficult to get leave during the year to relieve the fatigue due to production demands. The firms from which the double shift processes were benchmarked are not working 12 hours as implemented in Transwerk. This is also contravening section 10 (b) (ii) of the Basic Conditions of Employment Act, which states that an employer may not require or permit an employee to work more than 10 hours overtime per week.
Management needs to re-look at this agreement as the rate of absenteeism in the plant has risen from 0,2 percent before the double shift was introduced in June, to an average of 2,7 percent from July to October. This has also contributed to the efficiency levels having dropped, since when the material is finally available there are not enough people to do the work.

Production targets are set for each line. The daily target set for each line in the wagon business is four wagons except for the two main lines that are expected to produce five wagons. This limits the employees for producing more, since when the employees finished their target before the end of the day, they stop working as they take it; they have finished their work for the day. Empowering the employees in business principles and involving them in the day-to-day production improvement will eliminate this perception. If the company wants to become lean and increase efficiencies, it needs to do away with setting of targets and replace it with continuous improvement principles.

5. 3. CONCLUSION

The supply line processes are not managed according to the lean manufacturing principles. The following features of lean manufacturing are non-existent:

- Improvement of product and service quality
- Reduction of all costs of manufacturing and logistics
- Improvement of flexibility to meet customer needs
- Reduction of lead times in all facets of the business value chain
Other problems encountered were:

• Inventory and WIP levels are very high and there is no data integrity.

• Management does not make use of the management information system to manage the business processes nor are the workers empowered with equipment and technology to perform their duties efficiently and collaborate with other co-workers. Available technology is not used optimally.

• Management is quick to copy and implement certain concepts from other companies without investigating and planning properly before implementing the concept. The result, are processes working against each other.

• Employees are not empowered to take decisions on production issues and their inputs are not valued. Important information is not shared with employees and the grapevine is the source of information.

• Quality is dependent on inspections and is not built into the product. The aim of the inspections is not to educate or change behaviour, but to give non-conformance reports and trends are not analysed.

• Identifying the value stream and focusing on the removal of waste in the supply line processes of the Transwerk Uitenhage plant and focusing on the improvements of the value stream would be the first steps towards achieving a lean status. The tool called the seven Mudas, is the first checkpoint that can be utilised to identify all form of waste in the supply line.

• In identifying the value stream, management should employ the following as their main critical tasks:

   i. a problem-solving task

   ii. information management task
iii. physical information task

The seven Mudas to be eliminated are:

i. Waste from overproduction

ii. Inventory waste

iii. Waste of waiting time

iv. Transportation waste

v. Waste from defect making

vi. Waste of motion

vii. Processing waste

Examples of muda that were identified:

i. Waste from overproduction

• The increase in WIP to unacceptable levels

• Excessive lead times

ii. Inventory waste

• Unused material not returned to inventory stores resulting in material being damaged.

• A big inventory department full of stored material with 95 million rand locked into stock.
iii. Waste of waiting time

- Wagons had to be staged, as they could not be sold without wheels. This resulted in the employees from the wheels business having nothing to do as they were waiting for material and employees in the wagon business also having nothing to do due to line stoppages.

- This further resulted in customers having to wait for their orders, as delivery schedule could not be met.

iv. Transportation waste

The transporting of wagons from the line to the stage area due to shortage of material and the transportation of wagons back to the line once the material is received constitutes transportation waste.

v. Waste from defect making

- Re-works when centres and other material were received due to damage while wagons were staged.

vi. Waste of motion

- The yard being full of wagons, blocking entry to the wagons that need to be refurbished. This results in unnecessary of shunting of wagons around the plant and even to return some of the wagons back to New Brighton in order to create space.

- The moving up and down of planners from the line to the procurement department and the inventory stores in order to deliver pick lists instead of utilising the SAP system to do this just at the click of a button.

vii. Processing waste
The capturing of the data from the menus and pick lists by the data capturers of the different functional departments due to receiving this data manually instead of electronically.
CHAPTER 6

Conclusions and recommendations

6.1 SUMMARY

The intention of this study was firstly; to introduce Transwerk (Uitenhage plant) Rail Freight Refurbishing business current state; secondly to investigate the literature on world-class manufacturing processes concentrating on the philosophies and principles of lean manufacturing; thirdly to map the current state of the supply line at Transwerk Uitenhage plant; and fourthly to compare the current state based on the research methodology to that of the lean manufacturing philosophies and principles. This has helped to identify the barriers to the implementation of lean manufacturing in the supply line upon which Transwerk Uitenhage, management can react.

6.2 CONCLUSIONS

On completion of the study of related literature the following conclusions could be drawn:

- South African companies are faced by a lot of challenges due to globalisation and some are fighting fires just to be able to survive. Often they are too quick to use the lean concepts without proper investigation and groundwork. This becomes
a short term solution as problems keep recurring until the right processes are investigated and implemented the correct way and are thereafter continuously improved. Fortunately for them, they don't have to re-invent the wheel, as there are tools that are readily available to be adapted and implemented.

• The supply line is not managed as the lean manufacturer would. Decision remains with management and there is lack of cross-functional and upward communication. Problem solving and setting of targets' responsibility lies with management and teamwork is non-existent between management as well as among the employees. Problems are not traced back to their source and are not captured as reference for future purposes. Role conflict among workers and well as management is evident.

• Suppliers are not managed and their lead times are too long and non-flexible. Use of sole suppliers is virtually killing the business and needs to be re-examined.

• Management are not using management information system as to enable them to manage the businesses. No market research is done at the plant level everything is done by the National Office. The SAP system is not utilised optimally and activities of different functions are not integrated into the SAP system. Use of technology by employees is very minimal, poor and often transactional and trends are not analysed. A lot could be achieved by integrating the different functions into the SAP system and costs of buying printing paper and unnecessary delays could be minimised.
• There is inadequate management commitment to product quality and absence of goal setting. This is resulting in a mismatch between what the customer expects and what the business perceive as quality.

• Trolleys are used inadequately; stacks of material lying all over the lines spoil housekeeping, though the floors and machines are kept clean.

• Unused material is not returned to the inventory stores resulting in inadequate costing of the product and lack of data integrity. Prices of products are generally very high due to high labour costs and reworks that could have been avoided.

• There is an urgent need to purchasing production equipment, as employees have to steal from each other or wait for each other to be able to perform their duties.

• Too much is expected from management without properly developing and equipping them in the latest business trends and without resources to learn on the job. Most managers were promoted through the ranks, as they were excellent artisans; they never worked for any other company and have never studied except having a wealth of experience about how things have been done in this company. These constant changes are causing uncertainties; therefore proper change management interventions are necessary as well as beefing up their experience with the latest theoretical background on the lean manufacturing philosophies and principles.
6.3 RECOMMENDATIONS

The above-mentioned conclusions clearly show that there are some fundamental principles regarding lean manufacturing that can be learnt by the supply line of Transwerk Uitenhage to make the implementation of lean manufacturing more successful. These are the recommendations:

- Management should make use of the available lean tools. As a starting point the use of the seven mudas as was outlined in chapter three is recommended. Thereafter all forms of muda should be totally eliminated and the system regularly audited.

- Secondly the value stream needs to be analysed for each product line and continuous improvement implemented. The mentality of “this will not work” if a company is serious about achieving a lean status, should not be acceptable.

- Manufacturing and supply line strategies must be aligned.

- All businesses within the plant need to improve on upwards communication within the department and cross-functional communication amongst the departments.

- All employees must be involved and given a platform to have an input in decision making on production matters. All employees should take part in goal setting and possibilities should be created.

- There should be high degree of and investment in education, training and coaching of all managers. Investment in MIS is critical as an empowering tool.
• The ICT department should work towards improving employee and job fit. Technology needs to be seen as a strategic tool to enhance and improve efficiencies and not as a privilege.

• All departments within the supply line and the whole Transwerk plant should introduce and build teamwork. Teams should be empowered to stop the line anytime there is a problem and brainstorm on how to solve it.

• A database where all production problems and their solutions are captured should be created.

• Quality controllers and quality assures should be retrained and deployed in other sections of the business and only few should be trained to be quality coordinators.

• Quality goals must be set with employees and quality must be built into the product.

• The proper use of Kanban should be properly investigated and implemented, as the trolley system needs to be improved.

• A process to return unused material back to the inventory stores should be introduced and proper costing of wagons to reduce prices should be done. Data integrity must be improved.

Enablers and working equipment should be purchased as a matter of urgency to improve efficiencies
6.4 Suggested implementation plan

• It is recommended that the plant engineer champion this process as he is always determined to motivate and educate others to join in his initiatives.

• The services of an expert in lean manufacturing processes should be sought to educate and act as a sounding board.

• A map of the value stream should be drawn

• An integrated team from different functions should be formed to learn from the expert and thereafter be responsible to teach the value stream to everyone in the plant.

• Instil continuous improvement as a habit

• The suppliers and customers should also be encouraged to follow the same implementation plan
LIST OF REFERENCES


Businessweek (August 2000)


Traverser Issue 2:2006

Annexure A

Showing welding activity before the welding crawler was purchased.
Annexure B

Showing the improvement after the welding crawler has been installed.

Welding Crawler