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DEPARTMENT OF INDUSTRIAL AND SYSTEMS ENGINEERING

**COVER PAGE FOR FINAL PROJECT DOCUMENT (BPJ 420) - 2012**

**Information with regards to the mini-dissertation**

<b>Title</b> (e.g. A Contingency framework for the after-sales inventory at Xxxxx Part Distribution Centre)	A critical analysis of the throughput rate at Steinmüller Alrode Works
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<b>Abstract</b> (Provide an abstract of the mini-dissertation. An abstract is a short summary of the contents covered in the item.)	The project is a critical analysis and improvement of the throughput rate at Steinmüller Alrode Works. This project aims to increase the turnover in sales for Steinmüller and as a direct result increasing their profits, by focusing on the following critical areas:  Flow and stock levels of materials

A critical analysis of the throughput rate at Steinmüller Alrode Works

	<p>Standardising materials.</p> <p>Workforce motivation and empowerment.</p> <p>Workforce performance management.</p> <p>Communication between management and workers and between shifts.</p> <p>Improve throughput by optimizing the level of quality in relation to the standard time</p> <p>The optimal number of workers per bellow.</p>
<p><b>Category</b> (Enter the category in which the project was done. E.g. Operations Research, Simulation, Logistics...)</p>	<p>Quality Management, Productivity</p>
<p><b>Declaration</b></p>	
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A critical analysis of the throughput rate at Steinmüller Alrode Works

A critical analysis of the throughput rate at Steinmüller Alrode Works

by

Graham Vermeulen

283015888

Submitted in partial fulfillment of the requirements for the degree of

BACHELORS OF INDUSTRIAL ENGINEERING

in the

FACULTY OF ENGINEERING, BUILT ENVIRONMENT AND INFORMATION TECHNOLOGY

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A critical analysis of the throughput rate at Steinmüller Alrode Works



**Steinmüller Africa (Pty) Ltd.**

**A critical analysis of the throughput rate at Steinmüller Alrode Works**



## ACKNOWLEDGEMENTS

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Thank you to Mr. Hannes Mussel, CEO of Hitachi Power Africa Ltd., for creating this opportunity for me.

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## EXECUTIVE SUMMARY

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Based on a previous project and subsequent discussion with Mr. Gary van den Berg, works manager of Steinmüller Alrode Works, an opportunity has been identified at Steinmüller to conduct a final year's project for the partial completion of the requirements for the degree. The improvement opportunities relates to workforce motivation and empowerment, workforce performance management, communication between management and workers and between shifts, and improving throughput by optimizing the level of quality in relation to the standard time

This document provides an overview of the aim, scope and deliverables of a project that will be conducted in four phases.

Phase 1: Identifying opportunities, literature reviews, finalizing the project definition to be conducted in phase 2, and writing an interim report.

Phase 2: Literature review.

Phase 3: Conducting a detailed analysis of existing literature, selecting the most appropriate method/s, tool(s) and/or technique/s for design/problem solving and indicating how one employs them, analyzing the project environment and gathering information, and testing and validating all the results.

Phase 4: Completion of final report

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## INTRODUCTION AND BACKGROUND

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Steinmüller Alrode Works is a part of the parent company Steinmüller Africa (Pty) Ltd, owned by Bilfinger Berger Holdings. They manufacture steel bellows- a component used in the boiler of a power plant to help absorb the forces created by the expansion of material from the enormous amount of heat generated. Many different sizes (or dimensions) are manufactured, each referred to by its own position/item number. Steinmüller has good standing contracts with a couple of big companies, and the most important one is a contract with Hitachi Power Africa to manufacture the bellows for the power plants currently built on location at Witbank (Kusile) and Lephalale (Medupi). Steinmüller has the potential to be a very profitable company. It manufactures a relatively expensive product from inexpensive materials and equipment, and has a very competent workforce who can handle the simple manufacturing process with ease. Despite all of this, Steinmüller Alrode has an abysmal turnover every month and they are on their way to bankruptcy if something is not done. Steinmüller is guaranteed work for the next five years, and they do not even need to spend money on advertising or selling because they have a guaranteed sale. The work is almost done for them! Steinmüller Alrode should be one of the most profitable companies of the Bilfinger Berger group with the least amount of complications. A bright future should lie ahead.

PROCESS DESCRIPTION

PROCESS FLOW: ITEM 26

1.<sup>1</sup>



Pipe End to Flange Assembly

2.



- Vacuum Ring Assembly
- Welding of Vacuum Ring

3.



Tower assembly

4.



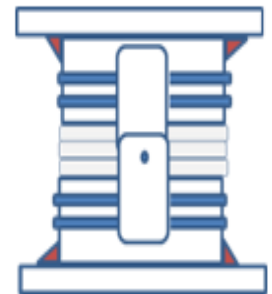
Welding of S/S convolution To Pipe End

5.



- Hinge Preparation
- Hinge Assembly

6.



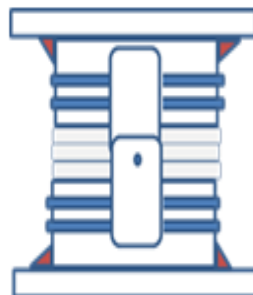
Weld Hinge

7.



Clean up and grind

8.



- Tack inner sleeve and flat bar
- Fit up for S/S sleeve

9.

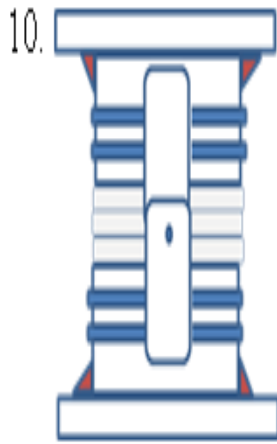


Weld S/S Sleeve

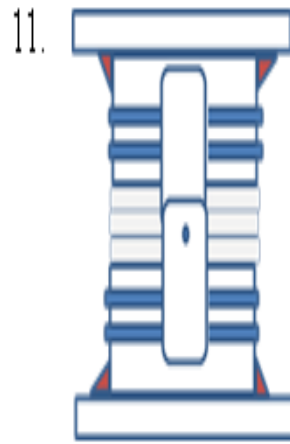
FIGURE 1 PROCESS MAP OF ITEM 26

<sup>1</sup> (van den Berg, 2002)

2



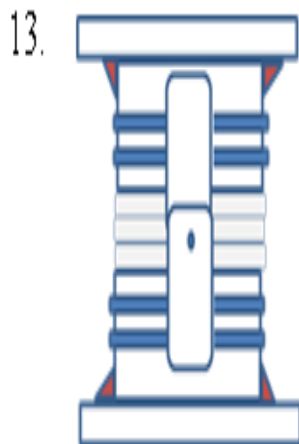
Internal Pressure Test



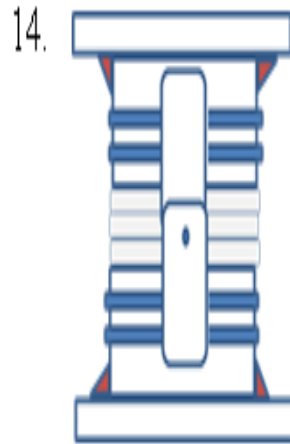
External Pressure Test



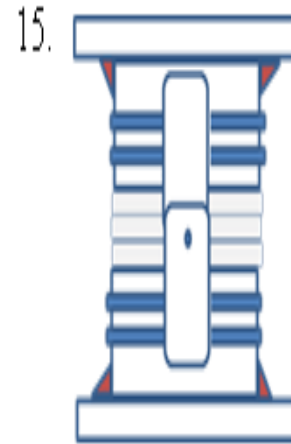
- Mark Inner Sleeve for section Cut-out
- Paint between Vacuum Rings.



Fit-up Outer Sleeve



Weld Outer Sleeve



- Clean and Grind
- Final Inspection

FIGURE 2 PROCESS MAP ITEM 26 (CONT)

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<sup>2</sup> (van den Berg, 2002)

PROCESS FLOW: ITEM 27

3

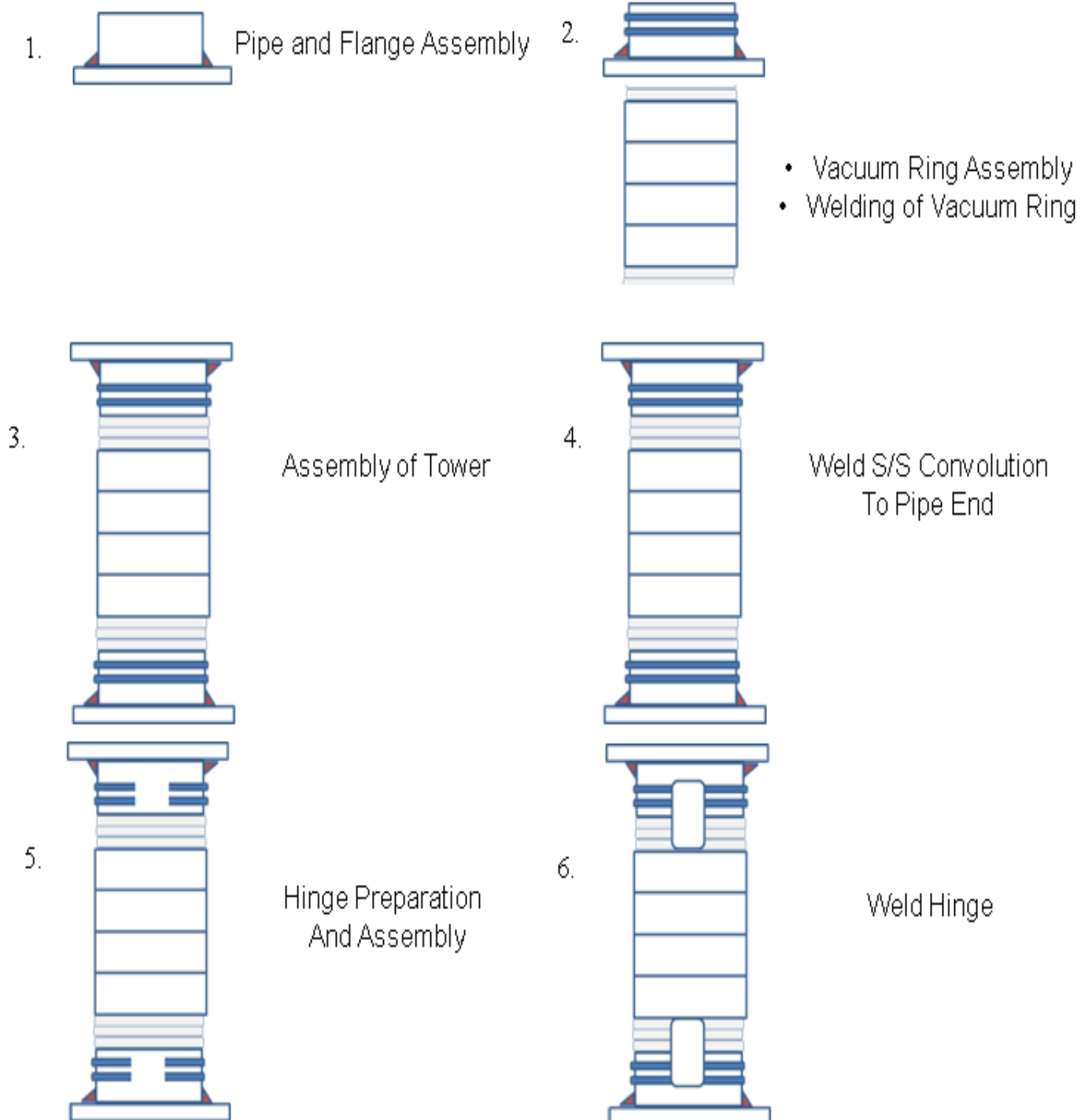


FIGURE 3 PROCESS MAP OF ITEM 27

<sup>3</sup> (van den Berg, 2002)

4

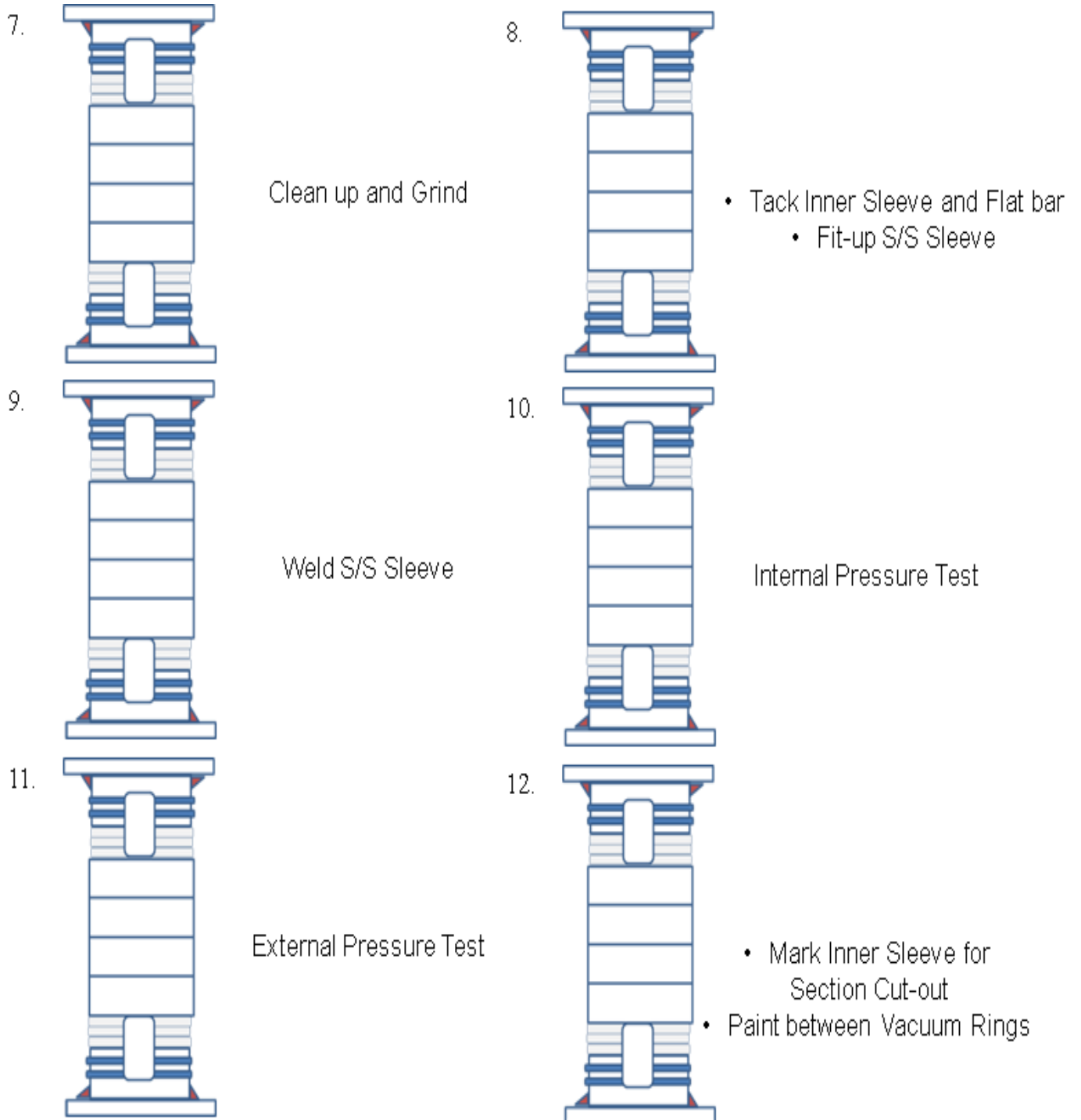
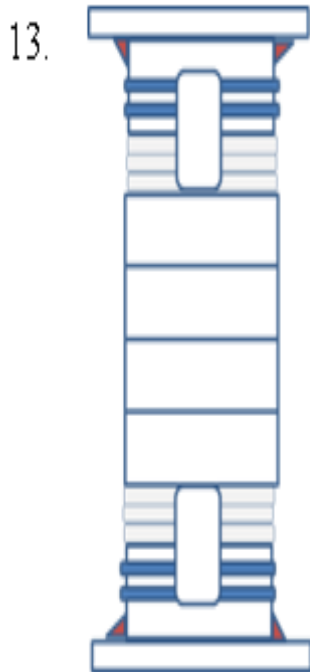


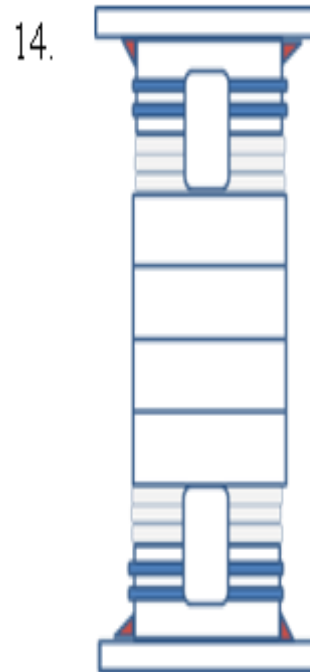
FIGURE 4 PROCESS MAP OF ITEM 27 (CONT)

<sup>4</sup> (van den Berg, 2002)

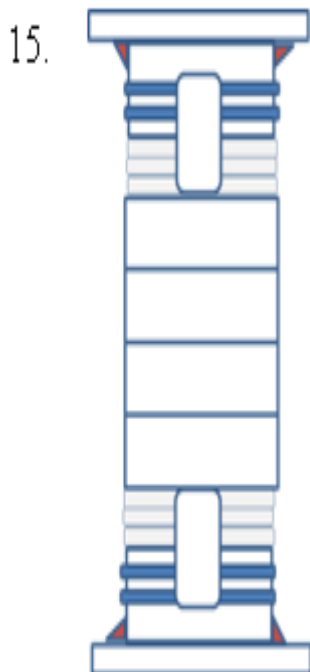
5



Fit-up Outer Sleeve



Weld Outer Sleeve



- Clean and Grind
- Final Inspection

FIGURE 5 PROCESS MAP OF ITEM 27 (CONT)

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<sup>5</sup> (van den Berg, 2002)

## PROBLEM INVESTIGATION

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The way things are currently going unfortunately paints a bleak future. Steinmüller displays a non-productive picture tainted by inefficiency and a complete lack of communication and management ability. Every day its workers do meaningless, repetitive work and have no job satisfaction other than having lunch and going home when the time has passed. Instead of working as one efficient and highly capable unit, they work as individuals honing their skill at passing the time while looking as busy as possible. I reiterate- these are very skilled and competent workers, with the ability to 'raise the roof' so to speak.

Steinmüller have not incorporated any sort of system that regulates and monitors the flow of the everyday workings of the company. When asked why, they are quick to point fingers but last at taking charge and achieving results. The lack of any sort of system and real communication is crippling them, and therefore the company. They are in desperate need of proper guidance.

The process regarding the logistics of materials leaves much to be desired. After it takes a couple of weeks for management to realize that materials have run out, it takes another two- to three months where no work can take place, for the materials to arrive (and sometimes defective). How can any company move forward without the basic building blocks in place?

## PERSONAL INTERVIEWS

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Please refer to the appendix for a copy of each interview. The following is a summary of the critical points each interview, where important points pertaining to possible areas of focus or improvement related to the scope of the project are highlighted in bold:

### FOREMAN- MIKE SCHUTTE

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From Mike's personal observations he estimates that the company manufactures **six bellows in three months currently at the Bobcat factory**. When asked what he thinks the company could make given some changes he said the company **could manufacture more than five bellows every month**. The problems he experiences are that materials show up defective, and some are not standardized. He mentions that **workers are not working efficiently**. Mike admits that by his own fault the company might be **too focused on quality**, especially talking about getting the straights on the bellow perfectly level. He does not know why this is so, but he has tried to find out if this level of quality is really that necessary but no one is able to tell him. He explains this is possibly due to the fact that he does not believe in re-work. Mike noted that he works very well with his factory workers

despite the fact that all of them are from a foreign nationality and speak a different first language. His biggest concern that needs addressing is the procurement of materials, and he **believes they are understaffed.**

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QUALITY CONTROL INSPECTOR- SIBUSISO

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With regards to the bellows manufactured at Steinmüller the **quality is completely satisfactory.** He expresses his frustration at the fact that there is no materials handling- or procurement system in place. Sibusiso comments that it often happens that the company runs out of materials and therefore production will be halted for that particular bellow. He comments on the **complete lack of communication between management** and that it is definitely having a negative effect on the company. He comments that some members in the management team do not have even the most basic skills for them to be able to do their jobs. He observes that there is no night shift inspector.

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WORKS MANAGER- GARY VAN DEN BERG

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Gary would rate the **quality at Steinmüller 9/10** and would buy the finished product himself. He does however agree that **Steinmüller focuses too much on quality and therefore is losing out on production time.** Gary believes that if they run **at 100% efficiency, the company can manufacture about 28 bellows a month.** The company is **currently manufacturing 20 Bellows per month.** Some possible reasons for the indiscretion is that by speeding things up recently, people are struggling to cope. People are **not used to working at a high efficiency,** especially compared to that of **the previous year where Steinmüller was only making 6 bellows every 3 months. There is a problem with worker morale.** Gary thinks there is definitely an **opportunity to implement a performance management system as currently there isn't a system in place.** Gary thinks that the lack of standardizing is a problem, especially when you take into account that their tooling is inferior. He reveals that earlier on in this year Steinmüller went to their opposition and tried to buy some of their corner pieces, but it turned out to be too expensive. Gary says that up until very recently there was no system in place for material handling or material flow. A change he implemented is that materials are numbered now, and they are combined into little kits for each item. Gary agrees that there is a **lack of communication between management and the factory floor, but says that he has tried to address this issue by handing out a communication form to the workers to complete every day.** Steinmüller is experiencing **problems with worker morale** and there is definite room for improvement. He attributes this **lack of morale to poor attitude of the workers.** Gary has made plenty of successful changes to the company recently, which has increased the monthly turnover from R890 000 to almost R12 million. He has re-engineered the process whereby items are manufactured at Jurie Street, and then Bobcat only does the assembly. There has also been an unsuccessful attempt to improve the process with a consultant. Gary has noticed that the lead time for ordering the materials is longer than originally thought (not 4 weeks but 12 weeks). Gary has recently fired the materials planner, and hasn't hired a new one yet. Gary took over procurement and materials planning in the meantime. Gary noted that the company is performing **poor at welding, and more training is required.** Gary has not changed the night shift.

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## FACTORY WORKERS

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Numerous attempts were made to try to get the perspective of the workers themselves. They refused to be interviewed on the basis that they might get into trouble for saying their views and then management might not like it. Workers are assured that all information would remain anonymous but they are scared that they could get into trouble as a group for doing interviews and stating their feelings. It is clear that Steinmüller does not have a constructive culture based on mutual respect and understanding.

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## CRITICAL POINTS FROM INTERVIEWS

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The following problems have been identified from the interviews as possible areas of improvement:

- Workers are not working efficiently.
- The level of quality with regards to manufacturing is too high and therefore time is wasted.
- The factory is understaffed.
- Lack of communication between management divisions, and between management and factory workers.
- There is a problem with the attitude and morale of workers.
- There is no performance management system in place.
- Steinmüller does not have a constructive culture based on mutual respect, understanding and personal growth.

Conclusion: It is estimated that Steinmüller has the capacity to manufacture 5 bellows every month at Bobcat where they are currently manufacturing 2 bellows every month. The company as a whole is currently manufacturing 20 bellows per month where they can make an estimated 28 bellows per month. Steinmüller has a lot of room for improvement and is therefore a good place to do a final year project. From the list of possible improvements three critical areas are chosen as the focus of the project- those with the largest estimated effect on the company and the least amount of cost involved.

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## PROJECT AIM

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This project aims to increase the throughput rate of a bellow by increasing the efficiency of the workers. The project aims to decrease the production time and as a result decrease the manufacturing cost. The areas of focus are clearly defined in the project scope.

## PROJECT SCOPE

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1. Workforce performance management, motivation and empowerment.
2. Communication between management and workers and between shifts.
3. Find the optimal strategy to deploy workers.

## LITERATURE REVIEW

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### INTERNET

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The internet contains a wealth of information on almost every subject imaginable. The problem encountered with using internet sources is that the sources are often unreliable and unreferenced. Therefore much care is taken in selecting sources and information from the internet to assist in the development of the project.

The internet also provided a tool with which to conduct investigations into the usage of the system and provided a platform to conduct further research into areas of improvement or expansion in the system.

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### WAGES OF FACTORY WORKERS

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Payscale.com is used to find the estimated industry related salaries of workers. Payscale.com has a filter where one can show salaries in a specific area, in a specific industry, at a company making a specific product, number of years of experience, and the qualifications required. According to the industry standard salaries (Payscale, 2012) following is the salary rate for workers in Alrode, South Africa working in the metal manufacturing industry:

Boilermaker (With TCC Level 2 Qualification)

Median Salary: R202 000

Median Hourly Rate: R60

Bonus: R240 to R20 673

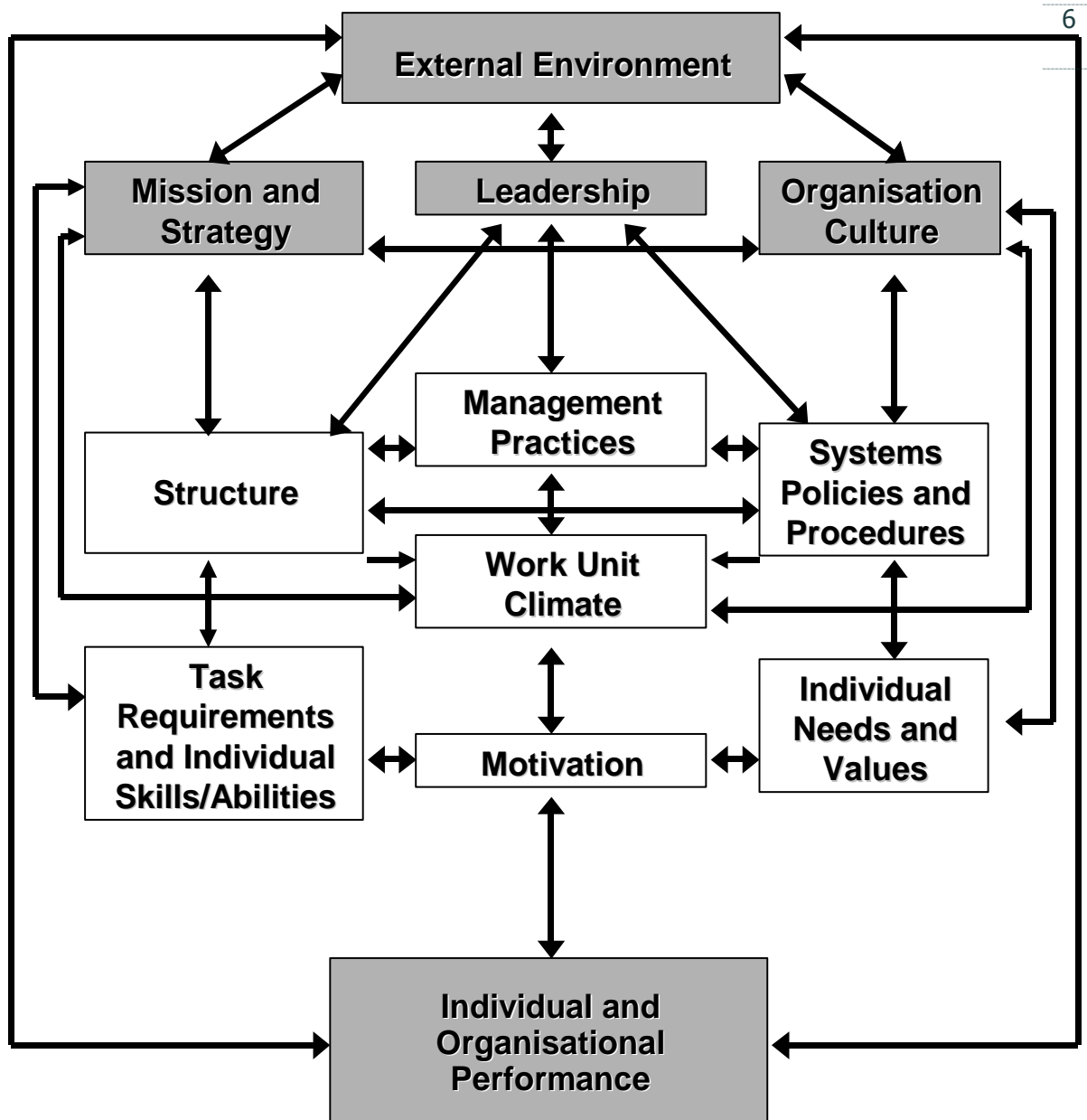
Welder (With any Argon Welding Qualification)

Median Salary: R101 921

Median Hourly Rate: R42

Bonus: R850 to R18 343

BURKE-LITWIN MODEL



- Transformational Dynamics
- Transactional Dynamics

FIGURE 6 BURKE LITWIN MODEL

<sup>6</sup> [http://www.12manage.com/methods\\_burke\\_litwin\\_model.html](http://www.12manage.com/methods_burke_litwin_model.html)

The Burke-Litwin model is a cause-and-effect model that is widely used by senior staff to better their understanding of the workplace. It explains the relationships and interactions of the management practices of a company and how each practice will influence other practices. Transactional dynamics are the day-to-day happenings (think of daily transactions at an ATM machine) where transformational dynamics transform the company as a whole. The idea is to change the transactional dynamics in order to influence the transformational dynamics. The ultimate goal is to affect the individual and organizational performance in a positive manner. It is clear that motivation should be the primary concern as it is the only transactional dynamic that is directly linked to organizational performance. The key aspects that affect motivation is the work unit climate (culture), the individual needs and values of employees, and workers understanding on a daily basis the tasks they are required to perform. The leaders of the company must ensure a team-based approach. This will empower the supervisors to manage their team in a constructive manner. The model is used extensively in the design and development of the performance management scheme.

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#### EXTERNAL LECTURES

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- **Gail Vermeulen, Head of Human Resources at Hitachi Power Africa (Pty)Ltd**

Gail has more than 30 years' experience in the workplace and is an expert in the field of human resources, labour law, labour disputes, dealing with trade unions, training of artisans and project management, to highlight only a few. Gail is very well educated, having obtained a masters degree in labour law at the University of Johannesburg. Steinmüller is subcontracted by Hitachi Power Africa and therefore Gail is able to give an educated, involved and objective opinion based on decades of experience. Gail is consulted on every important decision of this project and has made valuable inputs thus far.

- **Dave Vermeulen, Retired, Lecturer at Varsity College**

Dave has more than 40 years of experience in the field of Human Resources and Project management. Before retiring Dave was the Senior Manager of Human Resources for Sanlam Properties. Dave is consulted every step of the way and provides valuable input to the project.

- **Joint Lecture by Gail Vermeulen and Dave Vermeulen**

The following are the key points pertaining to the lecture:

Workforce Empowerment and Motivation

Empowerment has three legs:

- Knowledge and skills
- Allow you to implement them
- You take responsibility for the decisions you've been empowered with.

Difference between being efficient and being effective: Efficient is doing things right, effective is doing the right things right.

## A critical analysis of the throughput rate at Steinmüller Alrode Works

Empowerment in practical terms:

Make sure supervisors are top notch.

-Must see the bigger picture and understand where the bellows fit in for the successful completion of the power station

-Management must present an orientation program to allow this. They will then convey this to their workers.

Supervisor is the important link to management in terms of communication.

-Call team meetings every morning. Talk about four things:

Yesterday, today, tomorrow and health and safety. Always try and use visual aids for unskilled and semi-skilled workers e.g. putting their photo up on the wall when they achieve something good.

Supervisor must break up monthly targets into weekly targets into daily targets.

Supervisor must be taught how to give constructive feedback to their workers.

Yesterday: What did we achieve? Identify the stumbling blocks? Why didn't we achieve our target? How can we rectify it? Must be an open discussion where everyone can give their input. Focus lies on recognition of achievement.

Today: Targets for the day. Every worker must know what is expected of him today. Any possible hindrance we can foresee that can keep us from achieving our targets?

Tomorrow: Anything special happening tomorrow to take cognizance of.

Health and safety: Talk about anything bad that happened the previous day and avoid that.

Basics:

Communicate effectively.

Recognize and reward.

Plan and see the bigger picture.

From below average to applying world class standards can increase profit by 50%.

Have to couple production targets to a monetary incentive. Pay him to meet his target, however if he surpasses his target there must be a reward.

E.g. for every extra 10% the target is surpassed, will give the worker an extra 5% on his salary.

Team incentive: Special incentive to the team. Concept- WIIFM- What's in it for me? Joke: It's not a radio station, it's an important concept.

It is a fallacy to think that workers only come to work for recognition or to be part of a team. The bottom line is that monetary rewards are very important.

For each team, recognize by: worker of the month, which takes all criteria set by supervisor into consideration. Absolute world class practice is giving workers shares in the company.

E.g. PPC Cement was busy making a loss. They turned it around by going back to the basics:

Effective communication

Feedback

Recognition and Reward

Giving workers a share in the company.

Work smarter.

Even though mixing cement is very mundane, came up with ways to work smarter

Getting inputs from workers. Their feedback is very important because they are the ones on

## A critical analysis of the throughput rate at Steinmüller Alrode Works

the front line who knows the process the best. A common and easy mistake to make is for management dictating to workers what is best but not listening to their workers. Often the input from the workers is the most insightful.

Allow workers to ask questions and give meaningful answers.

Let workers vote on the best workers and therefore make that worker eligible to become the supervisor, if they have the intellectual capacity.

In South Africa we need to go back to the basics. We throw people at a problem instead of sorting out the real problem. E.g. If we can't manufacture our 30 bellows per month, we employ more people to do it. In essence all that you have done is to increase your manpower cost and to decrease your efficiency.

World class practice is to employ the optimal amount of people and ensuring that each person in the team is productive.

### Managing absenteeism

Manage non-performance.

People that have bad attitudes affect the rest of the team. These people need to be identified and managed out of the organization following due process.

It is very important to manage unions. Even the best process will fail when the unions decide to strike. One of your Key stakeholders is the unions and it's very important to have a good relationship with them. Always inform unions of changes to your systems

### Performance management

Set targets.

Set standards in terms of quality, time, etc. Allow feedback from workers to see if targets are reachable.

The supervisor must rate workers at the end of the month.

Zero defect, zero harm.

Must couple your PMS to an incentive scheme. Normally these are salary increases. Cash bonuses every quarter. E.g. Employee of the month doubles his salary.

Especially in this industry, use a simple scheme.

If standards are not met, make sure that the workers have the required training to do their job properly.

Identify your high flyers with potential as candidates for supervisor. A good way to do this is by letting the team vote for them.

### Communication between management and workers

Set up monthly meetings and a newsletter.

Let the workers nominate representatives to talk to management. Management and reps have quarterly meetings to talk about any agenda items either party feels is important.

Good example: Religion in the workplace. Can we reach some consensus? Workers are not allowed to talk about religion at work.

Have an annual year function with a fun theme. It is very important to establish a bit of fun

in the workplace.

The MD and HR should walk around on the shop floor. They should greet every welder personally and inspire them. Concept is MBWA- Management by Wondering Around. Do something social for e.g. a soccer team, or a choir, or something like this. Organize to watch a soccer match or rugby match at work.

Cost wise, you will probably utilize an external consultant and agree to a fee of approximately R50000 to set up the scheme. All three of these areas can be done by the same consultant. You will recover this cost very quickly in terms of your increased throughput rate.

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#### PUBLISHED BOOKS

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- **Facilities Planning, 4<sup>th</sup> Edition**

(Thompkins, 2010)

The project takes place in a factory with plenty of materials handling and layout problems. This textbook provided insight into the process of defining facilities planning, background information on product-, process-, schedule- and facilities design. A good knowledge on materials handling principles and techniques were required to understand the process flow. Safety considerations and laws were of vital importance to make the connection to the current safety measures in place at the facility.

- **Operations and Supply Management, 12<sup>th</sup> Edition**

(Jacobs, Chase, & Aquilano, 2009)

This textbook has provided valuable insights into project management which has greatly increased the efficiency of all activities and time management techniques used in the project and its development.

- **Project Management: A Multi-Disciplinary Approach, 2<sup>nd</sup> Revised Edition**

(Steyn, 2008)

This textbook has provided comprehensive knowledge on the workings of management and in undertaking a project. It provides good background information about project lifecycles and phases, organizational structures, identifying work, responsibilities and roles, project time management, and other factors which influence costs during a project. A major theme of this project is improving the management skills and current management style of Steinmüller. This book has provided valuable information on human resource management, labour law, and very importantly project communication management.

- **Quality Management, 3<sup>rd</sup> Edition**

(Gitlow, 2005)

This textbook provides information on defining and documenting the process flow and process description.

- **Introduction to Labour Relations in South Africa**

(Finnemore, 2009)

This textbook explains the important elements of the performance contract. The functions, steps and legal implications of the grievance procedure and the disciplinary procedure are explained in detail. It is important to know on what grounds constitute fair discrimination and what grounds constitute unfair discrimination. It is important to note that the disciplinary procedure as described in the Employment Equity Act (EEA) of 1999 is. The act plays a crucial role in the transformation of a workplace. The textbook provides information on the Occupational Health and Safety Act (OHSA) of 1993 which is used to ensure workers conduct their daily activities in a safe and secure environment. The working environment has changed tremendously from the old days and this textbook provides the required insights to comply with the labour laws in the modern workplace.

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#### WORK IN PROGRESS SCHEDULE

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The work in progress schedule (WIP schedule) shows the planned throughput rate of bellow number 27, a large unit with a vacuum ring assembly, and unit number 26, a relatively large unit without a vacuum ring assembly. The addition of a vacuum ring assembly is used for items bigger than item 26 as a support. The production time for item number 27 is approximately 50 days and for item number 26 the production time is approximately 35 days.

WIP SCHEDULE

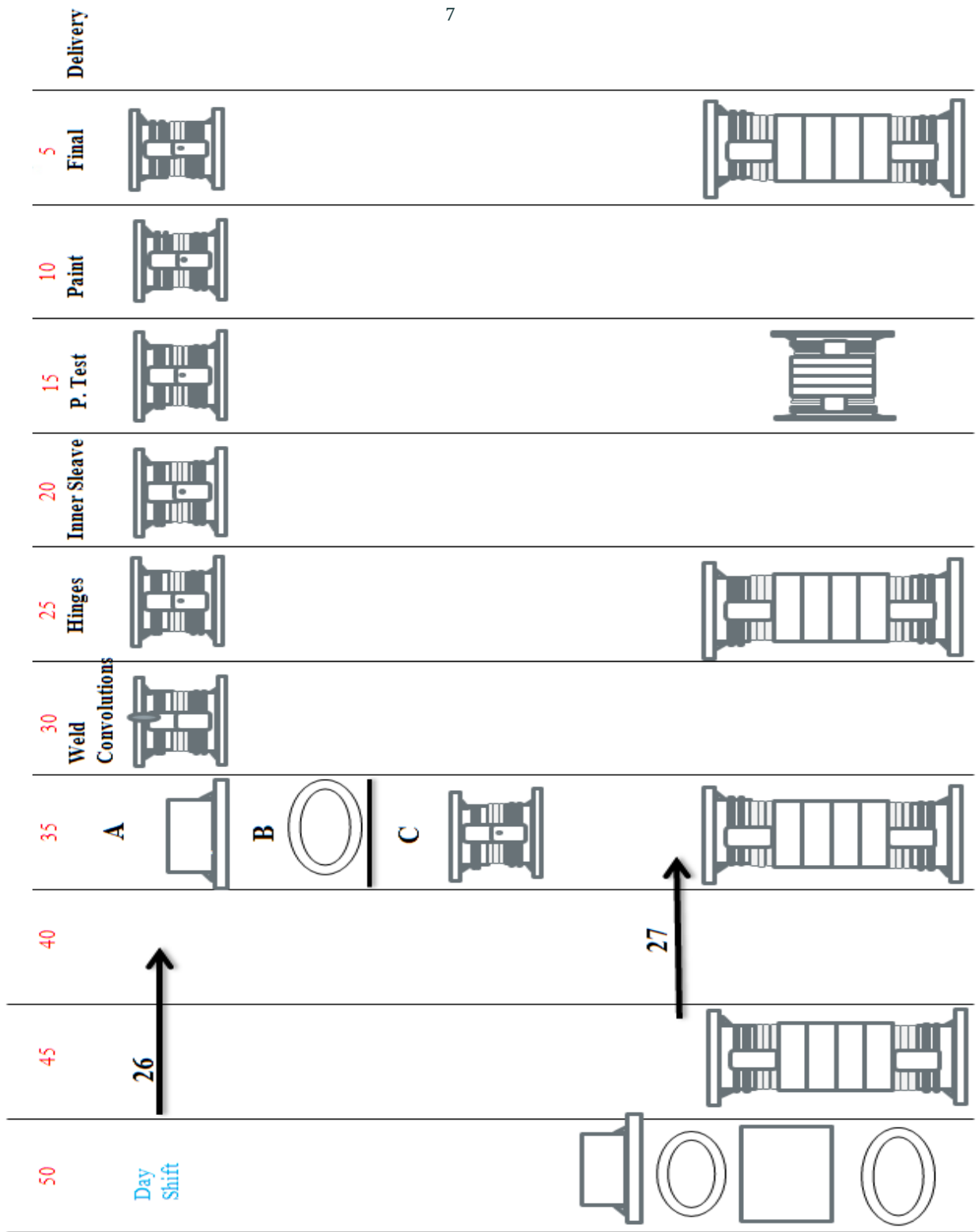


FIGURE 7 WIP SCHEDULE

<sup>7</sup> (van den Berg, 2002)

## DATA ANALYSIS

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A report is compiled documenting the efficiency of the workers of Steinmüller. This report is used to base decisions at an executive level. All time studies are done at Bobcat, a second factory rented by Steinmüller. Unfortunately due to the short duration of time available combined with the lengthy duration required to manufacture a bellow, the time studies are limited. The efficiency times are a true reflection of the operations of the company.

To obtain the efficiency level of the workers a detailed time study is done down to the second. The progress time is the time where the project physically advanced. Efficient time is defined as the time where the worker is busy working and inefficient time is defined as the time where the worker is either idle or taking a break, not including time allocated for lunch or prayer. An efficiency factor (out of 10) is assigned to correct the efficient- and progress time of each worker to the amount of 'perfect work' achieved. The amount of perfect work achieved is shown as the 'actual' time. Please refer to the appendix for the full time studies done. The following is a summary of the results obtained:

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### DAY ONE AND TWO

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#### **Process: Full Weld all top parts of the corners of convolutions before flip**

- **Summary**

Worker 1 is one of the most efficient welders in the factory and has a very good attitude. If all workers had the same work ethic and attitude as worker 1 the production rate would more than triple.

Worker 1 Actual Efficiency: **69% (Excellent)**

In contrast, worker 2 stands around all day looking busy trying to pass the time. Even when working, worker 2 works very slowly and without purpose.

Worker 2 Actual Efficiency: **16% (Terrible)**

#### **Welding time:**

2 Workers

+8.5 Workable hours

Total Efficient time: 7.02 hrs

Total Inefficient time: 5.75 hrs

Total Actual Weld time: 1.67 hrs

Total Actual Set-up time: 1.38 hrs

Total Actual File & Brush time: 1.33 hrs

Total Actual Efficient time: **4.95 hrs (Paying for 19 hrs)**

Weld corners at an average of 1.4m per hour

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DAY THREE

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**Process: Full weld 3 straights on top convolutions that joins the L-bar and the convolution sheet**

- **Summary**

Worker 1 is the most efficient welder in the factory with the best attitude (same worker from corner weld). Worker 1 achieved an **Actual Efficiency of 53% (Good)**, which is a lot less when compared to the 69% achieved on the corner weld. Note how productivity goes down even with the best of workers when:

1) Monday

2) No supervisor the entire day

A representative wearing a brown suit came to visit the factory. About 6 workers at a time are standing around talking to him. I could not determine whether it is authorized or not, and by whom.

Worker 2 worked at the station until lunch. He spent almost half the morning socializing at other stations, and is not very efficient even when he is at the station. It took him 15 minutes just to fetch some weld sticks. **Worker 2 Actual Efficiency: 28.62% (Poor)**

Why worker 3&4 are even at the station is a complete mystery, yet they spend the entire day there. **They 'achieved' actual efficiencies of 1.95% and 9.19% (Terrible) respectively.** This problem will be addressed in detail later in the report.

Note: At 14:38 I counted only 9 employees on the factory floor, of which 5 are working.

**Welding time:**

4 Workers

+7 Workable hours

Total Efficient time: 3.23 hrs

Total Inefficient time: 8.7 hrs

Total Actual Weld time: 1.65 hrs

Total Actual Set-up time: 0.09 hrs

Total Actual Efficient time: **2.69 hrs (Paying for 32.5 hrs)**

Weld straights at an average of **1.4m per hour**

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DAY THREE

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**Process: Full weld piece that joins the convolutions to the L-bar on the outside. Weld only edges +-30cm.**

- **Summary**

Worker 1 is a very effective welder and the fact that he achieved an **Actual Efficiency of 60.16% (Excellent)** despite every other worker taking full advantage of the lack of supervision is to be commended. Even worker 1 from Pos 44 (one of the best) only measured an efficiency of 53% on this day.

## A critical analysis of the throughput rate at Steinmüller Alrode Works

This is a good demonstration of how things are going at the moment in the factory. The current trend is that if there are more than one workers working together at a bellow, one worker will work diligently and another will do nothing more than look busy. Worker 2 'achieved' an **Actual Efficiency of 9% (Terrible)**.

### **Welding time:**

1 Worker  
+-3,22 Workable hours  
Total Efficient time: 2.45 hrs  
Total Inefficient time: 3.9 hrs  
Total Actual Weld time: 1.98 hrs  
Total Actual Set-up time: 0.17 hrs  
Total Actual File & Brush time: 0 hrs  
Total Actual Efficient time: 2.195 hrs (Paying for 6.84 hrs)  
Weld edges of corners & straights at an average of **0.75m per hour**

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### DAY FOUR

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**Process: Weld straights that join the two units 1/3 on, 2/3 off. Not full weld.**

- **Summary**

When worker 1 is idle, at least he sees where he can help out elsewhere at jig. However, all worker 2 is doing is hammering clamps ever so often when worker 1 is finished welding. Worker 1 scored an **Actual Efficiency of 64% (Excellent)** while worker 2 scored an **Actual Efficiency of 8.57% (Terrible)**.

### **Welding time:**

2 Workers  
+-0.9 Workable hours  
Total Efficient time: 0.71 hrs  
Total Inefficient time: 1.09 hrs  
Total Actual Weld time: 0.46 hrs  
Total Actual Set-up time: 0.01 hrs  
Total Actual File & Brush time: 0 hrs  
Total Actual Efficient time: 0.54 hrs (Paying for 1.8 hrs)  
Weld straights at an average of **4.32m per hour**

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### DAY FIVE:

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**Process: Fit and Weld Corner sheet onto unit (top and bottom, two corners)**

- **Summary**

Most of the time spent fitting the corner to a frame is spent on molding the corner sheet to make it fit properly. Materials could be standardized to fit the corners and save four workers a full day of labour per bellow.

A critical analysis of the throughput rate at Steinmüller Alrode Works

One worker fitting and grinding is very busy, while the welder stands idle for most of the time. Welding only takes about 10 seconds for every 2-3 minutes of molding. The rest of the time the welder is idle.

Idea: Worker that welds could carry on straight welding some other section close by, and continue with the corner weld on request. The problem is that there is no multi-tasking. Workers are idle yet could be doing another mold on their own. Pos 13-E standing next door in jig has many opportunities for welding while corners are molded.

**Welding time:**

- 4 Workers
- +3 Workable hours
- Total Efficient time: 6.95 hrs
- Total Inefficient time: 5.05 hrs
- Total Actual Weld time: 1.93 hrs
- Total Actual Set-up time: 0.11 hrs
- Total Actual Shaping time: 2.91 hrs
- Total Actual Efficient time: 5.55 hrs (Paying for 12 hrs)
- Weld corners at an average of 1m per hour

CHAPTER SUMMARY

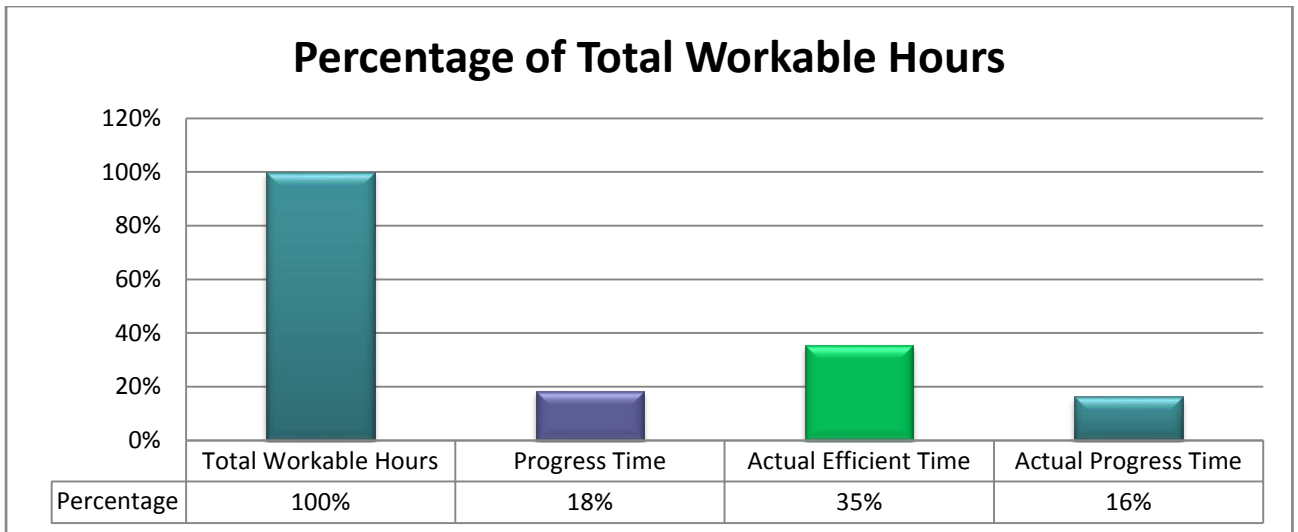


FIGURE 8 SUMMARY OF TIME AS A PERCENTAGE OF TOTAL TIME

As shown in figure 7 the actual efficient time achieved is very poor compared to the total amount of paid hours. Also we see that actual progress time achieved is less than half of the actual efficiency. This clearly illustrates that the current way of working wastes a lot of time, a big part due to the need to work materials into a desired form. This waste of time can be avoided by increasing the supply of standardized material.

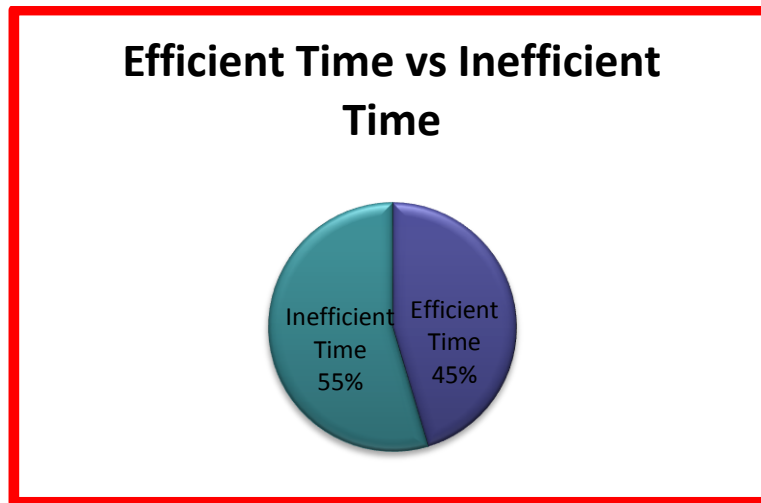


FIGURE 9 EFFICIENT TIME VS INEFFICIENT TIME

Figure 8 shows how inefficient the workers are due to laziness and a lack of proper motivation.

## OPTIMAL NUMBER OF WORKERS PER BELLOW

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According to the time study analysis, workers work very inefficiently (45% efficiency). It is prudent to investigate this phenomenon by analyzing the worker strategies and scenarios to see if they are possibly contributing to the problems experienced with efficiency as well as worker morale. The experience and discretion of the author is used to determine the parameters of the proposed scenarios. Item 27 is the chosen unit of study. All of the scenarios were implemented in the factory and the results are represented in the figures below. According to the WIP schedule the estimated production time per unit is 50 days.

The process can be summarized into five important stages. In reference to the process description, the stages consist of steps:

1. Fabricate Frame
  - a. Pipe end to flange assembly
  - b. Vacuum ring assembly
  - c. Tower assembly
2. Assembly of convolutions/corners, weld middle section
  - a. Welding of S/S convolution to pipe end
  - b. Hinge preparation and assembly
  - c. Weld hinge
  - d. Clean up and grind
3. Weld complete unit
  - a. Tack inner sleeve and flat bar. Fit up for S/S sleeve.
  - b. Weld S/S sleeve
4. Inside fabrication
  - a. Internal pressure test
  - b. External pressure test
  - c. Mark inner sleeve for section cut-out. Paint between vacuum rings.
5. Weld inside and Inspect
  - a. Fit-up outer sleeve
  - b. Weld outer sleeve
  - c. Clean and grind. Final inspection

### CURRENT SCENARIO

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The current scenario portrays that workers decide how many want to work on a bellow on any given day. There are no scheduled breaks other than lunch (12:00-13:00) and two prayer times (10:00-10:15 and 15:30-15:45). Bathroom breaks are taken at random.

- There are 6 spots for the unit to be placed out of the jig.
- There are only two jigs and about 60%-70% of the time the bellow will be worked on in the jig.
- Inspection is done by the welders themselves before the foreman will inspect it.

A critical analysis of the throughput rate at Steinmüller Alrode Works

- After the foreman signs off on the quality the bellow is moved by overhead crane to the delivery position. There is no constraint for the number of delivery positions.

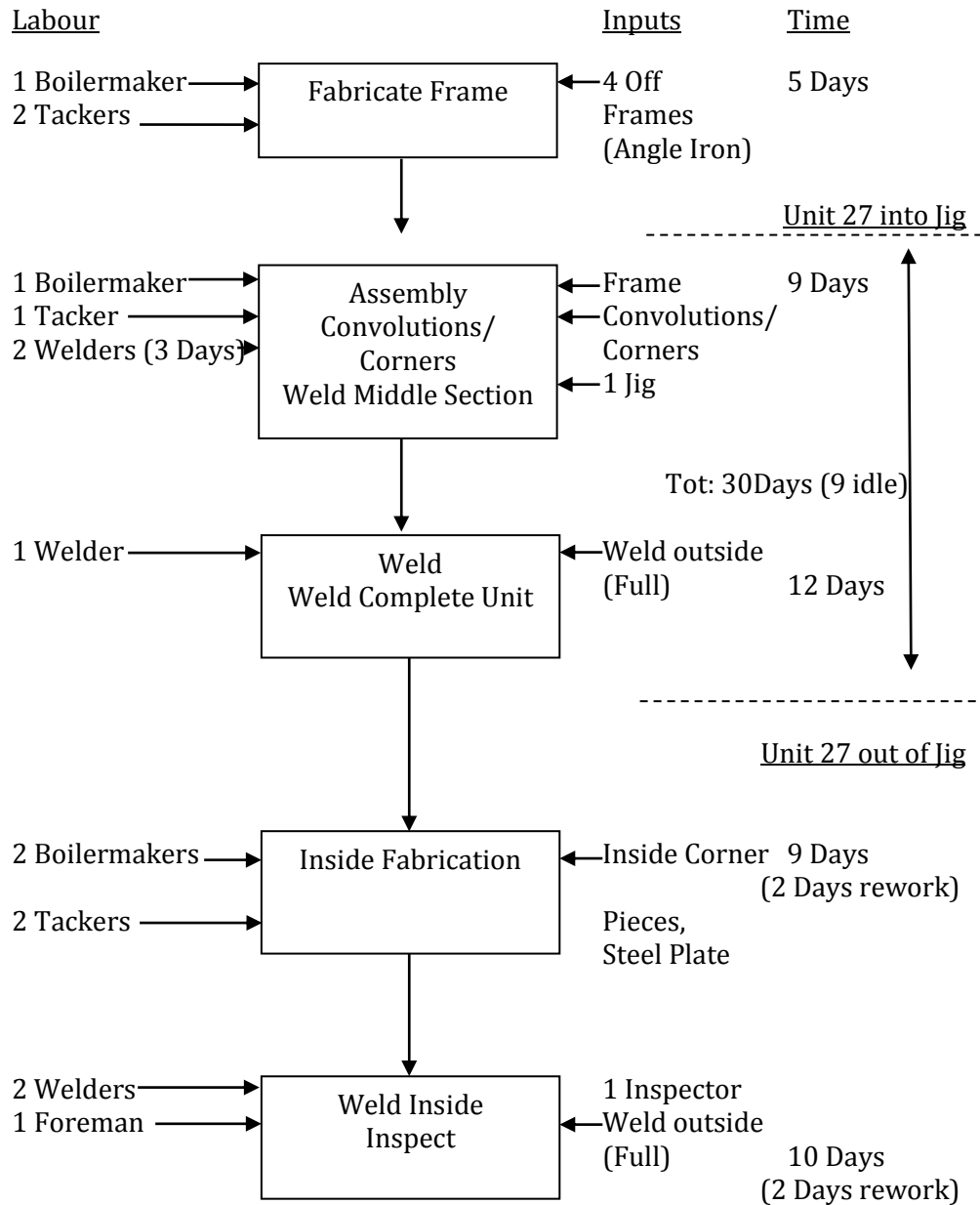


FIGURE 10 CURRENT SCENARIO

The jig is identified as the bottleneck.

- Given that there is a 30 day bottleneck.  
Therefore 1 unit manufactured every 30 days = 1 unit / month per jig.
- 1 Unit per month x 2 jigs = 2 Units/month is manufactured.
- Total time taken on a bellow is 54 days.
- One can see they get very tired after about 2 hours of work and this is on top of all the unscheduled breaks they take at will.
- The foreman inspected the unit and is not happy with it. It is sent back to be reworked.

A critical analysis of the throughput rate at Steinmüller Alrode Works

- There are no safety concerns.
- Worker hours spent:
  - Boilermakers: 18 Days
  - Tackers: 37 Days
  - Welders: 38 Days

OPTIMAL COST/TIME SCENARIO

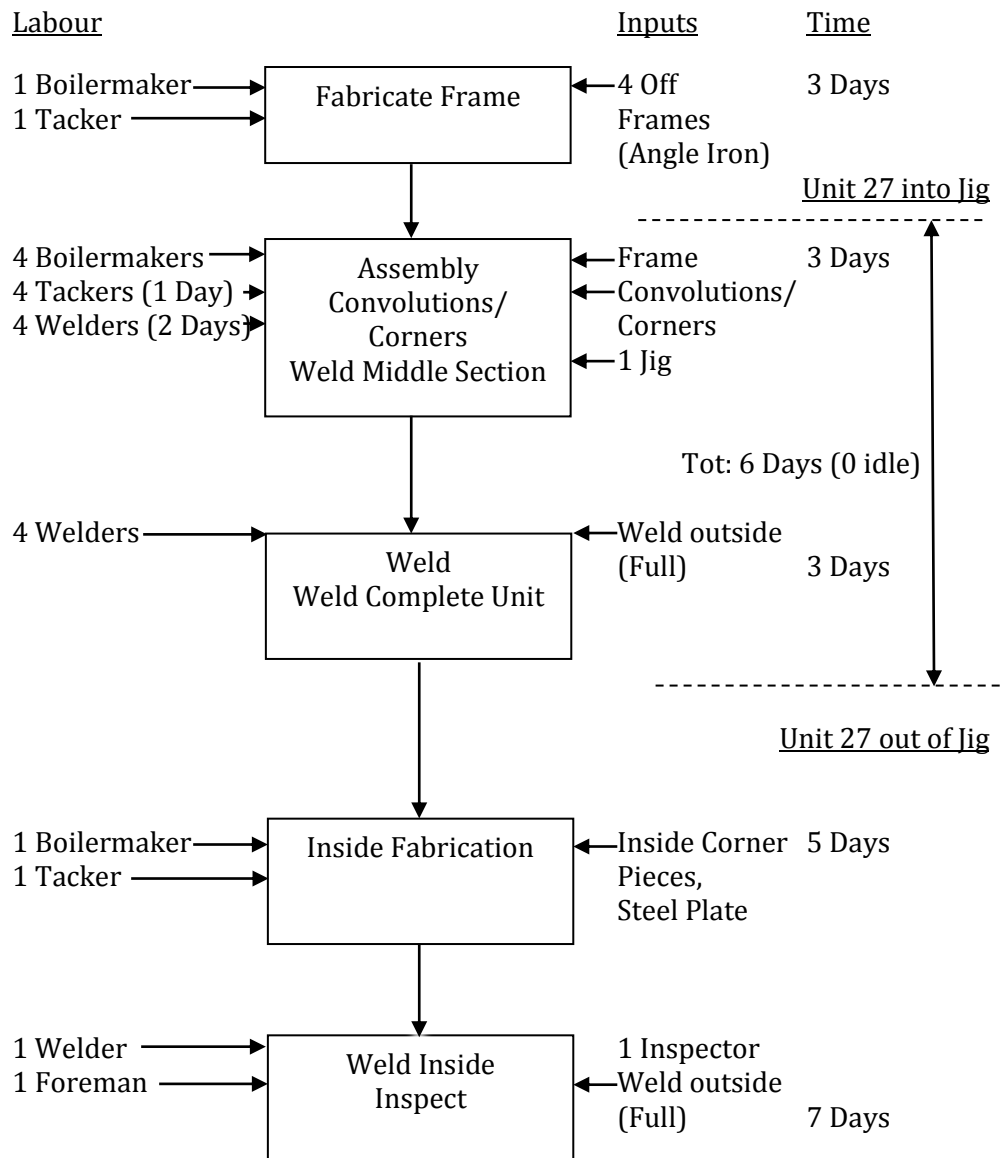


FIGURE 11 OPTIMAL SCENARIO

This scenario provides the best tradeoff between cost and time. The optimized scenario has the following logical inferences:

## A critical analysis of the throughput rate at Steinmüller Alrode Works

- Fabricate Frame: Two frames need to be made every 6 days (or one every 3 days). This could be accomplished with the minimum possible number of workers.
- Work in jig: There are 4 corners in the bellow as well as 4 straights. Each corner/straight can be worked on independently from the others, but only one worker can work on a corner/straight at any given time.
- Work done after jig: For optimal cost the workers are kept to a minimum, but still make good time regardless.
- This scenario is recommended to be the norm. It is the best scenario that suits the everyday needs of Steinmüller as it provides the best trade-off between cost and time.
- Workers are told when to work and what needs to be accomplished during that time frame.
- Workers have normal allowed breaks which consist of lunch (12:00-13:00) and two times for prayer (10:00-10:15 and 15:30-15:45). Prayer times are fixed and therefore can't be changed or optimized.
- For every hour of hard labor workers work for 45 minutes and rest for 15 minutes. They are allowed to talk and eat and completely shut off from their work, but they are only allowed to take bathroom breaks during these rest periods.
- Even though it is not deemed necessary to do time studies for the new scenario, it is clear to the person monitoring and controlling the experiment that workers are much more efficient and work more effectively.
- There are no safety concerns.
- The jig is clearly the bottleneck, and therefore all efforts are spent to complete the tasks of the jig as quickly as possible.
- All tasks outside of the jig are optimized to find the least number of workers needed to complete them just in time to be ready for the bottleneck.
- If time is a constraint, the bellow can be completed faster as the next scenario bellow will show.
- Given that there is a 6 day bottleneck:  
Therefore 1 unit manufactured every 6 days = 5 units/month per jig.
- 5 Units per month x 2 jigs = 10 Units/month
- Workers are encouraged to inspect their quality of work after every step of the process.
- There is no time lost on rework.
- Worker morale is much higher
- Workers commented that they could not believe how quickly they finish the bellow, as well as how effortless it feels for them. They say that they are very happy to implement the new scenario.
- Worker hours spent:
  - Boilermakers: 20 Days
  - Tackers: 20 Days
  - Welders: 31 Days

FASTEST TIME SCENARIO

All inferences are the same as the Optimal Strategy, except for the following:

- There will be 4 tackers working on the inside fabrication.
- There will be 4 welders working to weld on the inside.
- As explained before there is no need to speed up the frame fabrication process as the resulting product will have to wait for the bottleneck (jig) once completed.

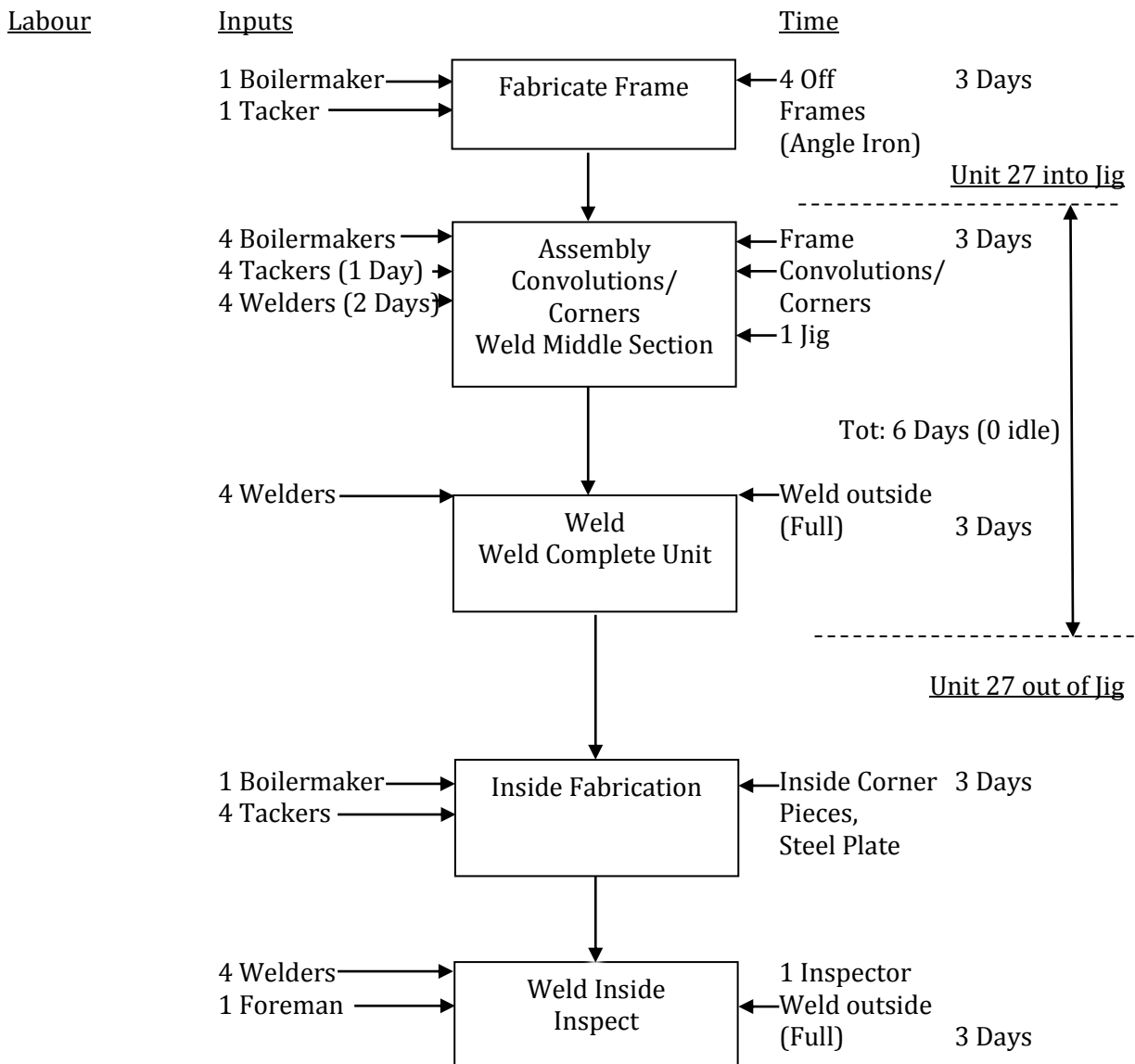


FIGURE 12 COST/TIME SCENARIO

SUMMARY

The key points of the three scenarios are tabulated below. Notice that the material cost is independent from the worker strategy deployed and therefore not included in the table. The profit per bellow will increase the exact amount that the cost will decrease. The fixed expenses of the company remain unchanged but the number of bellows manufactured per month will drastically increase the total profit of the company. The exact cost and profit per bellow is not allowed to be disclosed. Time is given in days. Labour cost is calculated with the average salary given by Payscale.com (refer to the literature study).

Scenario	Bottleneck Time	Total Time	Percentage Favorable	Rework (Y/N)	Worker hours spent			Labour Cost	Percentage Favorable
					BM's	Tackers	Welders		
Current	30	54	N/A	Y	18	37	38	R38k	N/A
Cost	6	19	184%	N	20	20	31	R30k	27%
Time	6	13	216%	N	17	27	36	R33k	15%

The difference is amazing! The total time of production decreased by 35 days (184%) for the cost scenario and 41 days (216%) for the time/cost scenario. 10 Bellows can be manufactured per month vs. 2 bellows manufactured currently. This will definitely have a drastic effect on profit. Unfortunately the profit increase cannot be calculated because the information is too sensitive. Even though boiler makers take slightly longer compared to the previous scenario (20 days vs. 18 days), tackers and welders are much more efficient (20 days vs. 37 days and 31 days vs. 37 days respectively). Labour cost decreased by R8k (27%) for the optimal cost scenario and R5k (15%) for the time/cost scenario. These results have been shown to the Works Manager of Steinmüller who plans to implement the prospective scenarios as soon as possible.

## PERFORMANCE MANAGEMENT, MOTIVATION AND EMPOWERMENT

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The performance management, motivation and empowerment plan was developed in collaboration with Gail Vermeulen from a broad perspective. All pictures were developed from scratch. Steinmüller has no idea about the aspects of a performance management scheme (PMS) and therefore theoretical background as well as an explanation of major concepts is included for their benefit.

### INTRODUCTION TO PERFORMANCE OPTIMISATION

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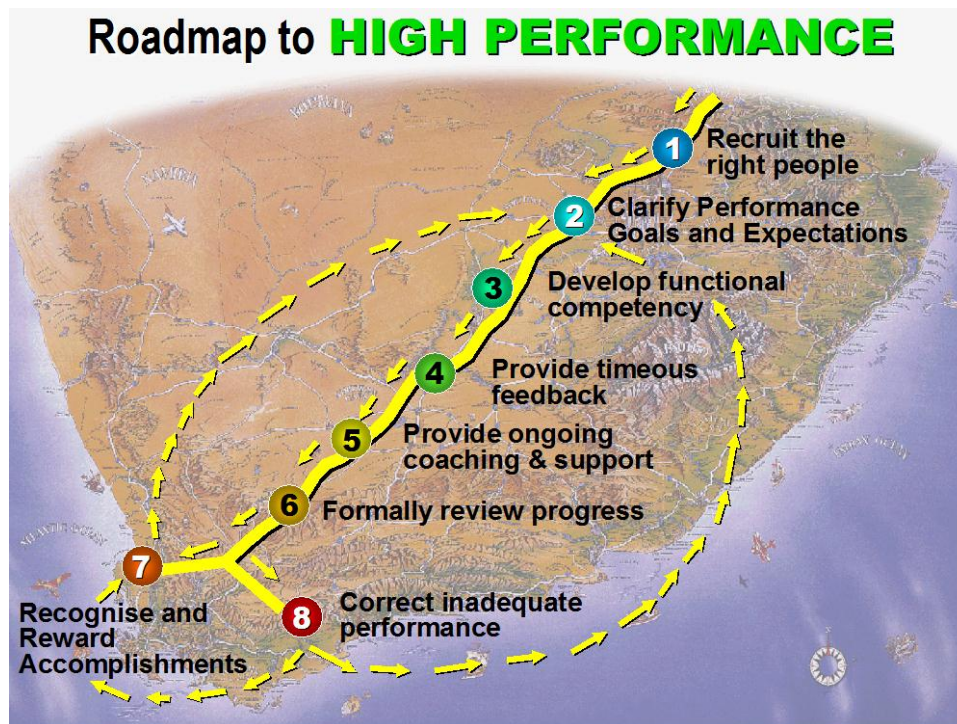


FIGURE 13: BASIC ROADMAP TO PERFORMANCE

“You can dream, create, design and build the most wonderful place in the world... but it requires people to make the dream a reality.”- Walt Disney

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## PERFORMANCE OPTIMISATION SYSTEM

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### INTRODUCTION

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The Performance Optimization Approach will only be effective and deliver the required results for Steinmüller if it is aligned to and supports the mission and overall strategic objectives of the organization. Furthermore, it must be an integrated approach and not a stand-alone system. The main overall purpose of the Performance Optimization System is to create a high performance culture within Steinmüller by unleashing the potential of people to perform and rewarding and recognizing expected and outstanding performance

“It is the purpose of an organization to make ordinary people do extraordinary things.”- Dr Peter Drucker

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### DEFINITION OF PERFORMANCE OPTIMISATION

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It is an integrated approach of different processes that have to do with the measurement of how people perform and the supporting process, which puts focus on the development of people to perform at a higher level to enable Steinmüller to reach its mission and strategic objectives.

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### ADVANTAGES

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A sound system, applied correctly, will ensure:

- Responsibilities are shared.
- Communication is open.
- The system is applied as a process and not only events that take place from time to time. This ensures that the formalized part of the process is handled with ease and misunderstandings are minimized. No unnecessary time is wasted to justify viewpoints as these are made and addressed continuously.
- Results and expectations are clear.
- Performance is reviewed objectively.
- The system is clearly explained to each individual and there are no misunderstandings as performance contracts are entered into annually.
- The overall performance of the organization increases.
- Training and development is driven by needs.
- The review process is viewed as fair as results, standards, measurements and competencies are agreed upfront.
- The total organization is focused on the overall mission and strategic objectives.
- Focuses all activities on the importance of service delivery.
- Career development does not only focus vertically but also horizontally.

## A critical analysis of the throughput rate at Steinmüller Alrode Works

- The extremely important principle to have the right people at the right place at the right time is served.
- It changes the perception that people have of performance management because it rewards the right things.
- It supports the creation of an organizational culture of performance.
- People are better utilized in terms of their potential.
- Those who perform are given recognition and reward.
- It changes mindsets regarding what is important for Steinmüller and creates a clear focus.
- The high flyers are retained and utilized to positively influence others.
- It supports the creation of a culture which does not only focus on the organization inside but also on the important role that the organization has to play to influence the outside.
- It supports the focus of a culture where people see the bigger picture beyond the scope of their own position and Region/Division.
- It creates a culture of innovation and creativity where people challenge the status quo constantly and make meaningful recommendations to change the way things are done.
- The empowerment of people makes them grow as they learn through the mistakes they make.
- The cost of mistakes is seen as an investment in the development of people.
- People who do not perform in terms of expectations are supported to improve but not carried indefinitely.

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### PERFORMANCE OPTIMISATION APPROACH

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<b>WHAT PERFORMANCE OPTIMISATION IS</b>	<b>WHAT PERFORMANCE OPTIMISATION IS NOT</b>
Systematic approach to develop the competencies of employees to enable Steinmüller to reach its mission and strategic objectives.	Purely rewarding long years of service.
The alignment of individual goals to the overall mission/strategic objectives of Steinmüller.	Rewarding employees for working punctually in terms of regulated hours.
Creating a climate that is conducive to support improvement of performance.	Focused on the performance of individuals only but also to the alignment of results to Steinmüller as a whole.
The monitoring of the progress of the individual and Steinmüller as a whole via a continuous, pro-active process.	Events, but a continuous process which includes performance appraisal.
Giving constructive feedback and taking corrective action timeously.	Not to focus on the taking of punitive measures, but to catch people doing the right things and where they are to support and uplift them.
Creating a climate conducive to the	To reward employees for past performance

## A critical analysis of the throughput rate at Steinmüller Alrode Works

unleashing of the potential of people.	which became irrelevant and out of context.
About identifying and retaining high flyers/ those who stand out, for the future.	A system of rewarding people that is favoured.
Rewarding results through recognition both in monetary and non- monetary terms.	Measuring qualifications but results.
A process to encourage performance that adds value to the overall performance of Steinmüller enabling Steinmüller to be efficient and effective.	Only to focus on results because that leads to a short term outlook only.
A process that empowers people to accept accountability for own personal development.	Is not always a formal process or formal events once or twice a year, but should be supplemented by an informal, continuous process.

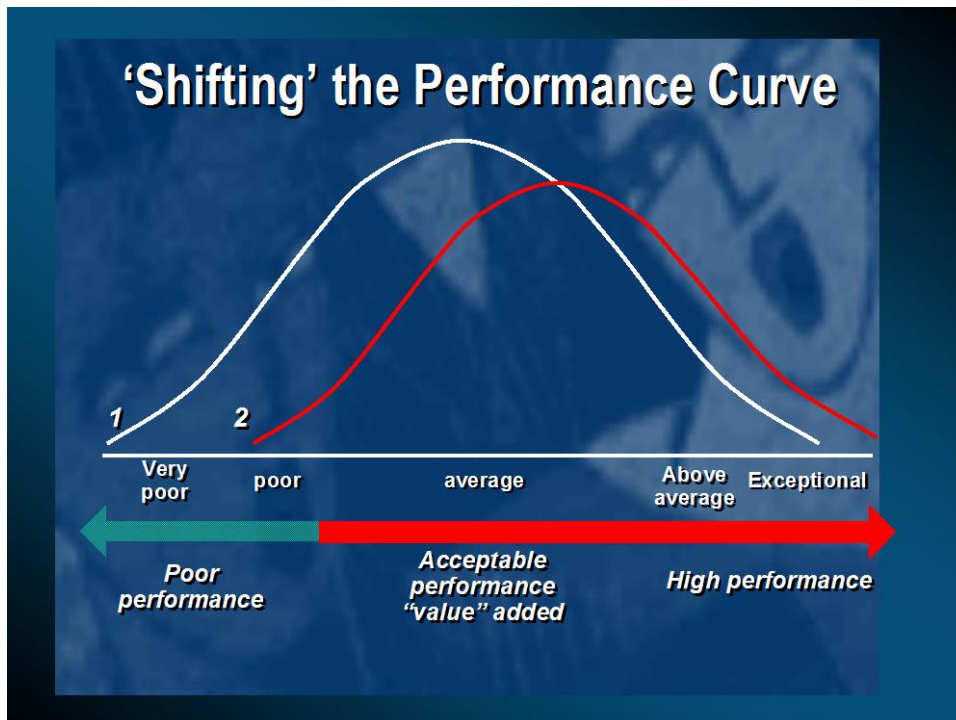
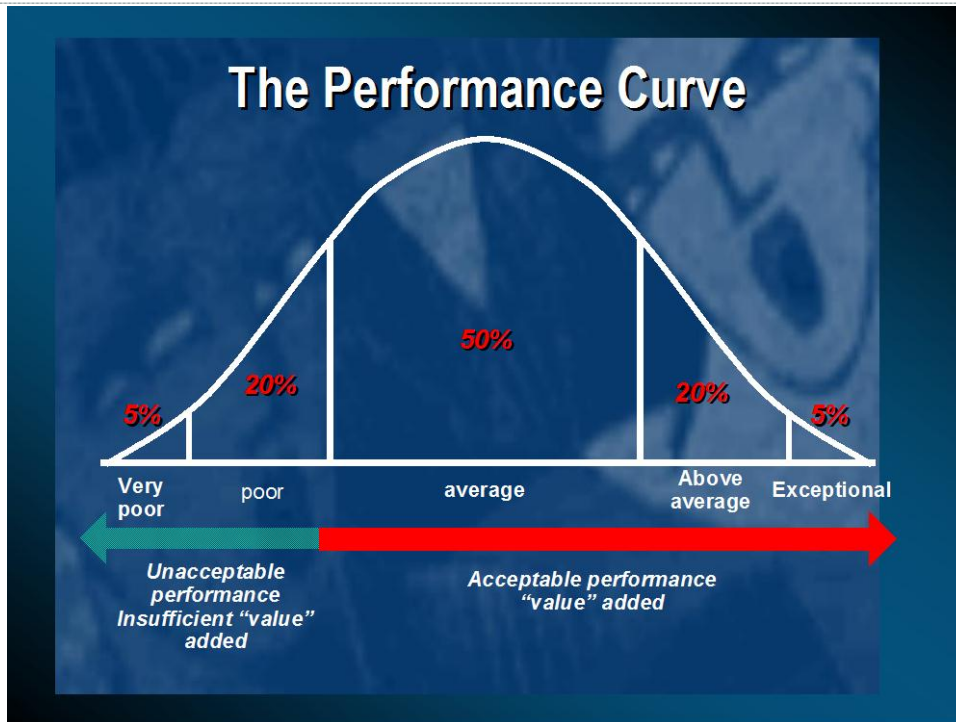
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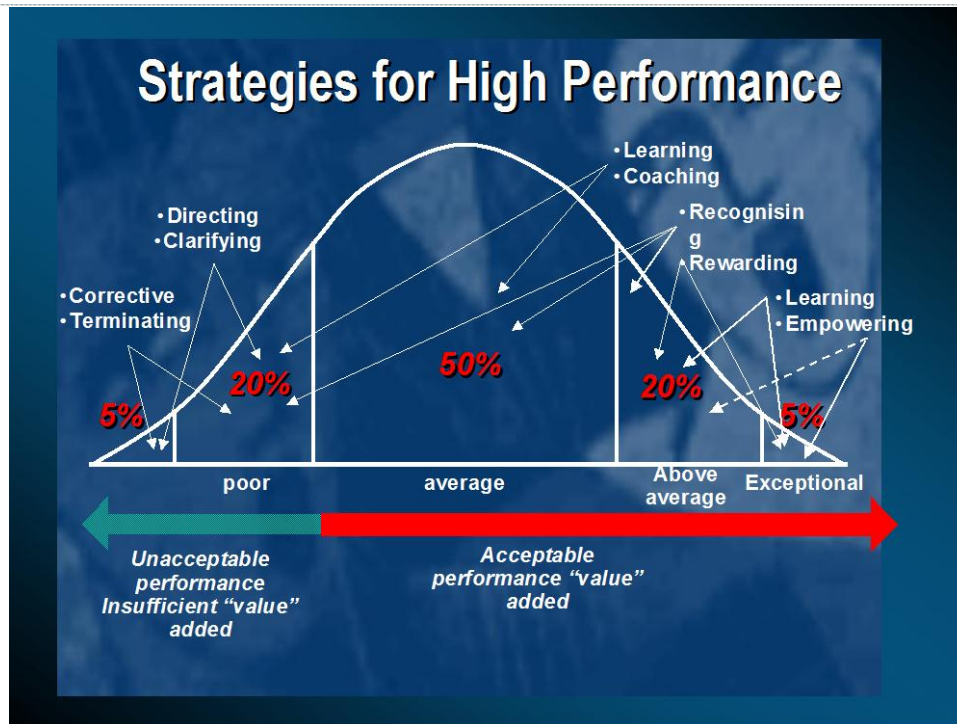
### PHILOSOPHY

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The performance and survival of an organization is determined by the level of functioning and adaptability of its human capital. We live in times of constant change and the ability of Steinmüller to survive, grow and prosper lies in the hands of its people. It is a firm belief that the performance of the organization is rooted in the development of human capital. This especially rings true in the constantly changing business environment of today. One can only prosper as an organization if one creates a climate of learning where people are resilient to cope with the ever growing challenges of change and take accountability for their own development, amply supported by the management team of Steinmüller.

The continued, successful shifting of the overall performance curve of Steinmüller to the right, therefore lies in the wake of the application of sound performance optimization principles. One of the crucial underlying principles of an effective Performance Optimization System, is effective leadership, management and commitment.





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## POLICY

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## OBJECTIVE

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To provide Management with a clearly delineated, constructive approach to the management of performance to ensure that everyone in the organization is focused on and that the strategic objectives are met.

To incorporate a culture change that will ensure that all individuals employed, will take accountability for and develop the knowledge and skills required to enable them to support Steinmüller to reach its mission and strategic objectives.

The main purpose is to measure the performance of people and in so doing to determine how they can be supported to develop their competencies to add the required value to the organization.

This policy applies to everyone employed by Steinmüller irrespective of the type of employment contract or level of functioning.

The measurement should not focus on performance of individuals only, but also on the performance of Teams, Regions, Divisions and the Organization as a whole.

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IN BROADER TERMS

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It is the policy of Steinmüller that the performance of all individuals employed, be measured on an ongoing basis, both formally and informally. Performance Optimization should, therefore, be a process and not only a formal event that take place from time to time.

A formal Performance Contract must be entered into between all the relevant parties on an annual basis before the beginning of each financial year.

Performance Optimization is a dynamic process and we live in an ever changing environment, therefore this contract can and should be amended when necessary, provided it is not done unilaterally.

It is the prerogative of management to lay down the standards of performance required. This will, however, always be done within reasonable limits in terms of the inherent requirements of the position and the requirements should be reasonable and fair.

Those that are prepared to deliver beyond expectations will be recognized and rewarded accordingly.

The organization cannot afford to carry passengers for unlimited periods of time and therefore individuals, who do not perform according to the standards required, should be identified as soon as possible to receive the necessary attention and support. If this support does, however, not lead to improved performance, then continued employment would have to be seriously reviewed.

Performance of individuals should be measured as objectively as possible to ensure that everyone is treated in a fair and consistent manner.

Sound application of the Performance Optimization System will be a Key Performance Area for each Director/ Manager/Supervisor.

Recognition and rewards will be given to encourage effective performance. Formation of partnerships between the Director/ Manager/Supervisor and the Reportee, which is an important building block of the System, can only be successfully achieved if both parties approach Performance Optimization in a positive, constructive way and understand the benefits of sound performance.

A Personal Development Plan will be developed for each individual and revised continuously to ensure that the individual's performance improves via needs driven training and development.

We do not work in isolation and Performance Optimization should be utilized as an effective tool to upgrade knowledge and skills required for continuous improvement and learning in a changing environment.

Rewards will be tangible as well as intangible and be complementary to the annual remuneration review.

The Performance Optimization System should ensure that the organization retains its' top performers in line with its staff retention strategy.

## A critical analysis of the throughput rate at Steinmüller Alrode Works

To encourage integration of all Regions/Divisions, the Performance Optimization System will break down silos and ensure an integrated approach by focusing on the overall strategy of Steinmüller and internal as well as external customers/stakeholders.

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### ASSESSMENT

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All individuals will have a formal performance review, twice a year.

All relevant measuring instruments will be used in the process of assessment.

The Performance Optimization Process must form part of the induction programme of newcomers so that they are aware of the premium that is placed on performance in the organization and how it will affect them. It is essential that a Performance Contract be entered into as soon as possible after commencement of employment.

Exit interviews should be utilized as a means to determine how fair performance assessment is perceived.

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### THE PERFORMANCE CONTRACT

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The Contract must be entered into before the beginning of the financial year.

The Contract must be based on the inherent requirements of the position.

The Contract will focus on both results to be achieved as well as the required knowledge, skills and attributes (competence).

The weighting between the results on the one hand and the competencies on the other hand, will be reviewed annually to ensure that the competencies required eventually outweigh the results. As a point of departure, the results will account for 80% of the overall performance score and competencies 20%. This percentage will change over time as the essence of performance lies in the wake of competence.

Even if an individual refuses to sign a contract, the contract will still be valid provided that it is based on the inherent requirements of the job and is fair. It is Management's prerogative to set the acceptable standards for performance within Steinmüller, subject to fairness.

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### DISPUTES

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Where individuals feel that performance contracts or reviews have been done unfairly, the normal grievance procedure can be followed.

The organization will ensure, as far as is practically possible, that such an individual will not be victimized or prejudiced in any way.

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### RETENTION OF HIGH FLYERS

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There should be a special focus and effort to retain the services of people who excel and add exceptional value as well as those who show exceptional potential.

This may include, amongst other approaches, special recognition and rewards, fast track development, secondment to other regions/divisions to improve skill and give special, individualized attention to their training and development needs. This will afford the organization the opportunity to fully utilize their potential.

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### NON-PERFORMERS

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The main purpose is to support individuals to ensure that they perform in terms of the required standards.

Should an individual, after the necessary corrective action had been taken, still not perform or show good progress towards the required standards, the disciplinary process will have to be implemented.

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### BUILDING COMPETENCE

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Focused training and development will take place to ensure that people learn the right things at the right time. A learning culture will be instilled in the organization. People will be encouraged to take accountability for their own development and opportunities for development will be created by Steinmüller. This could include secondments, transfers, attending workshops and other applicable options.

This will ensure that what is accepted as average performance within the organization will continuously improve, thus shifting the performance curve in total towards that of a high performing, world class organization.

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### PERSONAL DEVELOPMENT

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The Performance Optimization System should ensure that individuals develop to such an extent that their own job security lies within themselves via the learning of new knowledge and skills, which can also be utilized outside Steinmüller. Staff members should be encouraged to learn beyond the expectations of a specific position, thus enabling them to see a much broader picture of the organization and encourage a strategic approach to their work. Staff should be

encouraged to adopt an approach to question and make meaningful recommendations in the interests of the organization.

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## PROCESS

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### PRINCIPLES SUPPORTING THE PROCESS

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- **Continually revisit priorities**

Priorities will change and should be adapted to the work environment

- **Ensure roles and responsibilities are clear**

All employees should know exactly what their focus should be at all times.

Directors/Managers/Supervisors and Reportees should work together as partners and ensure that there are no misunderstandings in terms of expectations.

The deliverables in terms of performance i.e. results, standards and competence must be clear. Help each employee identify what the critical performance areas are for the position.

An annual performance contract should be entered into between partners in writing, with copies maintained.

The expectations in terms of the contract should be continuously monitored as a process and remedial action taken immediately. Remedial action can both be formal and informal.

Clarification of expectations and support to meet them is essential.

- **Manage change**

We know from human nature and our experiences that certain employees will not readily embrace changes in the organization positively.

Engage employees in change to afford them the opportunity to ask questions and understand the reasons for change. This will make sure that they buy in to the change.

Let employees know that independent thinking, decisive and action oriented approaches are desired. Nobody can do the work perfectly and that is not what is expected.

- **Empower people**

It is a self-protective measure not to try to police all activities.

Good delegation gives employees a feeling of being trusted and this will lead to their commitment and feeling of self-worth and ownership.

Empowerment of employees is about building capacity first, then to ensure people want to be empowered. This means they have the right attitude and want to take on more responsibility and decision making power. Empowering people then means to let go, to allow them to take ownership and to learn from their mistakes. Empowerment does not take away the accountability of the manager and some control measures should still be in place. Managers should however, be careful not to jeopardize the trust which forms the corner stone of empowerment.

- **Climate of support and understanding**

A supportive work environment creates an atmosphere that makes employees more willing to take risks and experiment with new ways of doing things.

Concentrate on rather shaping employees' behaviour than grading it.

Be a coach, not a judge or a referee.

Give positive feedback where it is deserved and this doesn't mean there must be perfection first. Celebrate small, meaningful wins or instances where positive attitude is shown.

Create a climate conducive to new ideas and compliment people for initiative even though the new idea may not be implemented. Be sure to explain why it cannot be implemented and encourage further initiative.

Focus on catching employees doing something right rather than catching them out.

Employees in a supportive environment deliver better results, flourish and react positively to changes because they are encouraged to put changes on the table themselves.

- **Make work meaningful**

Quality of work life suffers as employees succumb to 'organization battle fatigue', i.e. being bogged down by side - tracking issues.

Organization politics and culture have a direct impact on work results.

Boost morale by focusing on building partnerships.

Make people feel valued and give them a "cause" that lends meaning to their work routine.

Keep everyone focused on the mission, strategic objectives and values.

Find opportunities to celebrate achievements.

Build the fire in your part of the woods, i.e. a special focus on your own environment.

Nobody likes to fail, make sure they don't.

Employees need to understand and know what changes are taking place and how it will affect them. They will more often than not make meaningful inputs if requested to do so.

Encourage people to take accountability for their own development but support them in the process.

- **Realize the importance of intangible rewards**

Little effort is required to give positive feedback.

Intangible rewards are a good way to compensate employees for doing more than expected.

Don't underestimate the value people place on simple forms of recognition like compliments and words of encouragement. A complimentary note will sometimes be carried around for quite some time.

Be a good listener, show empathy and listen to other opinions.

Be honest when giving recognition but be careful not to do it too easily. People must feel it is well deserved.

Stay in touch with your people. Know what makes each one tick.

- **Effective communication**

Good communication is a two-way flow of information.

Be approachable and available.

Be more visible and manage by wandering around.

Keep everyone posted on all critical issues. Remember they all support the mission and strategic objectives.

Clear up negative rumors and misinformation that clutters the communication channels.

Give constructive feedback and share information to ensure that everyone knows how the organization is performing against the overall objectives.

- **Stay in touch and in tune**

If you are not aware of any problems, that is a problem in itself.

Invite people to share bad news. You cannot lead if you are the last one to know about problems.

Make it easy for people to tell you those things you don't always want to hear.

Make it clear that openness is always welcome no matter what the circumstances.

Value employee's viewpoints. Everyone sees things from a different angle. Each angle will put the situation in a different perspective. No-one has all the answers. We have to learn from one another.

At the very least, their viewpoint is important to them, thus it should be to you.

- **Service delivery**

Be clear about upholding standards for quality and client service delivery.

You have a real influence on the organization's image and reputation in the market place.

Make client satisfaction the top priority.

- **Retention of star performers**

It's the high flyers that have other options that are likely to leave the Organization and therefore need as much support and attention as those not performing.

Focus internally with the same intensity that would be invested in recruiting externally.

It's high-risk management to assume that your key players are going to remain just because they have not announced their plan to leave.

Make your winners feel important. They deserve this.

Address issues that detract from performance.

Personal issues may influence effective performance.

Get these issues addressed so that the focus is on the right things.

- **Be a Leader-Manager**

Understand how to combine both roles.

It's up to you to be a leader.

Your position doesn't make you a leader- how you lead does.

Seize the opportunity to coach, mentor, inspire, challenge and influence others to achieve success.

Manage the results you want effectively.

What gets measured gets done.

- **Take accountability for your own achievements**

Only blame yourself if you are unsuccessful.

Apply your competencies to benefit the organization.

## A critical analysis of the throughput rate at Steinmüller Alrode Works

Your success will be recognized both by yourself and the organization and rewarded accordingly.

Focus on continuous improvement.

Be pro-active in your own development. This will show your drive.

View constructive feedback in the correct light and face the challenge positively.

Critical competencies and strategies which the organization needs must be embraced with the right attitude.

- **Make them 'stretch'**

Ask more of your employees and make them stretch.

Push them to try harder and work smarter.

A clear-cut focus on results will boost morale, as people will not have time to worry about unnecessary issues.

The performance standards and results must be challenging but not unrealistic.

Generate experiences that lead to success.

Create a climate for motivation to galvanize people to excel.

Encourage risk taking and initiative.

Be tolerant of mistakes, but intolerant of lack of ownership and accountability.

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### GENERAL OVERVIEW

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In order to give effect to a fair process, directors/managers/supervisors together with the person that reports to the specific director/manager/supervisor must together clarify certain critical issues at the beginning of the performance optimization review process. These critical issues are:

Results expected from the individual in a specific position as well as what standards/measurements will apply. (These results can be changed and revised throughout the year due to circumstances that can change e.g. contents of position, organizational strategy etc. but must not be done unilaterally.)

The inherent job competencies needed to be able to achieve the required results:

At the end of the Performance Review term, the performance of the individual will be determined based on results, standards/measurements and priorities or weighting as well as competencies inherent to the specific position, which encourages desired behaviour.

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## EXPLANATION OF TERMINOLOGY

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### RESULTS

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The specific job/position determines the results required. These can be derived from the job profiles. It is important to determine the results required that would add value through the specific position. The context within which a position functions will also determine the results. Results are achieved through a collection of activities and inputs. The specific inputs and activities required in the job/position will lead to specific results. Results must always be defined as “**smart**” i.e. specific, measurable, attainable, and realistic, within a specific time frame. Results should stretch and challenge an individual to perform beyond expectations.

**Specific:** Don't generalize but focus on specific results that can be measured.

**Measurable:** This entails that the result is measured in terms of definable measures.

**Acceptable:** Allow enough stretch, but still stick to what is achievable.

**Realistic:** Within the specific context and time frame set realistic results to be achieved.

**Timeframe:** Results must be achieved within a specific, realistic time frame. This applies to different projects and interventions as well.

A guideline is a maximum of not more than 5 core result areas per position.

Each result will be specifically defined in terms of deliverables, measured against specifically defined standards of performance, utilizing measurement instruments indicated.

The measurement instrument can be viewed as the barometer and the reading on the barometer will indicate whether the individual met the required performance standard. In order to ensure objectivity, standards for each core result area must be determined beforehand.

The standard indicates the level of performance required and must be formulated in measurable terms such as quality, quantity, time frames, percentages etc.

**Measurement:** This defines the instrument, which will be used to determine the actual level of performance (the barometer)

**Prioritize/Weighting:** An individual normally has more than one critical results area. It is therefore essential to determine which of these result areas are more important than the others and to weight them accordingly. These weights should collectively add up to 100%. The main aim of weighting is to ensure that there is no misunderstanding in terms of which result area is the most important in terms of results. This also allows the individual to focus energy on the right issues.

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## COMPETENCIES

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These are the critical competencies identified by the organization that will allow the organization as a whole to meet its strategic objectives and mission. Therefore it is imperative that they be internalized for each specific position in the organization.

A competency is a combination of knowledge, skills and attributes.

The following positions should have generic core competencies in order to be effective. These core competencies are the following:

- **Directors/Managers/Supervisors**

Leadership/Management:

The ability to align employees to the strategic objectives of the organization and to ensure that sound people and operational practices are applied to achieve the desired results.

Always act with integrity and consistency.

Learning and Continuous Improvement:

To stay abreast with the latest developments and trends in the applicable field.

To use initiative to create improvement.

Judgment:

To make systematic and rational judgments based on relevant information.

Act with insight and foresight and realize the implications of decisions on cost, time, resources and stakeholders.

Interpersonal relationships:

To build constructive working relationships with all relevant stakeholders to ensure a climate conducive to effective co-operation and delivery of desired results.

To be able to handle conflict in a constructive way.

Communication:

To effectively articulate thoughts orally and in writing to ensure clear understanding.

To listen in an unbiased way and create a two way stream of information sharing.

**Commitment:**

To actively promote the image and strategic objectives of Steinmüller internally and externally.

To act in good faith and in the best interests of Steinmüller.

- **Foreperson and Inspectors**

**Task Management:**

The ability to effectively plan, organize and implement the workflow.

Always act with integrity and consistency.

Support and utilize the resources allocated.

**Learning and Continuous Improvement:**

To stay abreast of the latest developments and trends in the applicable field.

To use initiative to create improvement.

**Judgment:**

To make systematic and rational judgments based on relevant information.

Act with insight and foresight and realize the implications of decisions on cost, time, resources and stakeholders.

**Interpersonal relationships:**

To build constructive working relationships with all relevant stakeholders to ensure a climate conducive to effective co-operation and delivery of desired results.

To be able to handle conflict in a constructive way.

**Communication:**

To effectively articulate thoughts orally and in writing to ensure clear understanding.

To listen in an unbiased way and create a two way stream of information sharing.

**Commitment:**

To actively promote the image and strategic objectives of Steinmüller internally and externally.

To act in good faith and in the best interests of Steinmüller.

- **Administrative staff**

Task Management:

The ability to effectively plan, organize and implement the workflow to ensure effective support.

Always act with integrity and consistency.

Proactively support the objectives of the bigger team.

Technical knowledge and skills Improvement:

To continually improve knowledge and skills to be able to render effective support service.

To use initiative to create improvement.

Judgment:

To make systematic and rational judgments based on relevant information to ensure effective support.

Interpersonal relationships:

To build constructive working relationships with all relevant stakeholders to ensure a climate conducive to effective co-operation and delivery of desired results.

To be able to handle conflict in a constructive way.

To effectively support the team to achieve the desired results.

Communication:

To effectively articulate thoughts orally and in writing to ensure clear understanding.

To listen in an unbiased way and create a two way stream of information sharing.

Commitment:

To actively promote the image and strategic objectives of Steinmüller internally and externally.

To act in good faith and in the best interests of Steinmüller.

## A critical analysis of the throughput rate at Steinmüller Alrode Works

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### TIME FRAMES

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Formal Performance Reviews will take place twice a year, with the first formal review 6 months after the commencement of the financial year:

1 April – 30 September (6 months)

1 October – 31 March (6 months)

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### MEASURING OUTPUTS

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A four-point scale will be used to indicate the level of success in terms of achieving results and performing at the level of competence in terms of standards required.

% LEVEL OF PERFORMANCE			
1	2	3	4
Poor	Average	Above average	Excellent
0% - 40%	50% - 64%	65% - 79%	80% - 100%
Continuously performing below required standards.	Meeting the required standards most of the time.	Exceeding the required standards most of the time.	Exceeding the required standards all the time.

Weighted distribution. Each separate results area will be individually weighted and should all add up collectively to 100%. Competencies will be weighted in the same way. After determining the weighted distribution of both results areas and competencies, a final weighted overall score will indicate the final overall percentage score.

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### PERSONAL DEVELOPMENT PLAN

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The main focus is to enable individuals to grow in terms of competencies.

The shortfall in the required standard of performance in terms of competencies and results for the specific position should be identified and addressed by means of an action plan.

This action plan should have a specific time frame with specific responsibilities assigned. The accountability for development lies in the hands of the individual supported by the director/manager/supervisor, who must ensure opportunities for development are identified and the employee motivated to seize the opportunities to develop.

The organization must ensure a supportive environment conducive to motivating the individual to develop and perform.

In cases where the relevant support has had no effect on increased performance, stricter corrective measures may have to be taken.

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### COLLECTION OF DATA

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Data must be documented in all instances of either excellent/good or poor performance so that the formal assessment that takes place every six months is a fair assessment that can be substantiated by examples. All directors/ managers/supervisors will both assess and be assessed. What you expect from your manager in terms of assessment is what your reportee expects from you i.e. a fair, objective assessment, substantiated by specific examples both of good and poor performance. This concept obviously applies to any assessment made in the process whether feedback is given formally or informally. The least that a reportee can expect from a manager in terms of assessment is "GIVE ME ONLY YOUR BEST". Data collection is the collective responsibility of all parties concerned. This diminishes subjectivity of performance appraisal, as facts are put on the table.

**No assessment may be changed unilaterally and without due consultation, should this be required.**

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### PUTTING THE PROCESS INTO PRACTICE

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#### **Individual Performance Contract**

The Contract should be duly completed by the director/manager/supervisor and the person reporting to the former and ideally the parties should agree to the issues in the performance contract. Both parties who have now entered into a partnership regarding the performance of the relevant individual should sign this contract.

#### **Performance Management is a process**

Once the Performance Contract has been signed, it is the explicit duty of management to enter into a continual informal process of dialogue giving constructive feedback, both positive and negative. This enables the individual to take corrective action as soon as possible. The role of the director/manager/supervisor as a coach of high performance cannot be over emphasized.

#### **Review**

The process is now formalized where the individual gets a chance to assess his/her own performance by completing the relevant assessment form in pencil.

The manager enters into a one-on-one discussion regarding the individual's performance and both parties put relevant facts/examples on the table.

Although an elaborate discussion can take place, the manager still makes the final decision based on substantive fairness.

### **Individual takes ownership and action**

Emanating from the review is an individual development plan. This plan is discussed between the two parties and agreed upon. The main focus is the development of the individual.

The manager/organization provides the necessary support but the final accountability lies with the individual.

### **Performance Management is a dynamic process**

Due to changing circumstances, the content of the performance contract can be changed, but not unilaterally.

### **Semi-annual reviews**

Formal reviews are held every 6 months where the process is repeated.

The manager cannot change any assessment made in the first 6 months, thereby promoting objectivity.

The performance of the individual for the first 6 months of the review period can now be compared to the performance of the last six months.

An overall picture can then be formalized of the individual's performance over the full performance year (12 month period).

The cycle starts all over with the contracting of performance for the new performance review year.

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## MONETARY REWARDS

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Salary review considered with effect from 1 April annually.

Salary reviews will be performance based.

This is a process that will be phased in so that high performers are retained, developed and remunerated at a different level to the other performers. They need to be rewarded for their excellence.

PERFORMANCE CONTRACT

**ENTERED INTO BETWEEN TWO PARTNERS**

NAME OF EMPLOYEE EMPLOYEE NO:	
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AND

NAME OF DIRECTOR/MANAGER/SUPERVISOR EMPLOYEE NO:	
--------------------------------------------------------	--

POSITION OF EMPLOYEE:	
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PERIOD:	
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DATE:	
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SIGNATURES:	
Employee:	
Director/Manager/Supervisor:	

## A critical analysis of the throughput rate at Steinmüller Alrode Works

### A. Results

LIST PERFORMANCE (KPA)	KEY AREA	KEY PERFORMANCE INDICATOR(KPI) (STANDARD)	MEASUREMENT	PRIORITISED WEIGHTING %
1.				
2.				
3.				

A critical analysis of the throughput rate at Steinmüller Alrode Works

4.			
5.			
Total of weights must be equal to 100%			

\_\_\_\_\_

**Signature of Employee**

\_\_\_\_\_

**Signature of Director/Manager/Supervisor**

\_\_\_\_\_

Date

THE PERFORMANCE REVIEW PROCESS

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PERFORMANCE REVIEW

**PERIOD:**

<b>Name:</b>		<b>Initials:</b>	<b>Surname:</b>
<b>Employee No:</b>			

**Job Title:**

**Region/Division:**

In partnership with your Director/ Manager/Supervisor evaluate critically how successful your performance has been for this evaluation period.

**FOCUS ON:**

- ⇒ The results and overall competencies
- ⇒ Your development needs
- ⇒ "Partnership" between you and your Director/ Manager/Supervisor

## 1. RESULTS

Results are: outputs as specified in your performance contract measured against the standards set out.

<i>RESULTS</i>	WEIGHT %	%LEVEL OF PERFORMANCE				WEIGHT ED SCORE
		1	2	3	4	
No.1						
No.2						
No.3						
No.4						
No.5						
TOTAL	%					
<i>TOTAL OF WEIGHTS MUST BE EQUAL TO 100%</i>						

% THE LEVEL OF PERFORMANCE MEASURED			
1	2	3	4
Poor	Average	Above average	Excellent
0% - 49%	50% - 64%	65% - 79%	80% - 100%
Continuously performing <b>below</b> required standards.	<b>Meeting</b> the required standards most of the time.	<b>Exceeding</b> the required standards <b>most of the time.</b>	<b>Exceeding</b> the required standards <b>all the time.</b>

## 2. PERFORMANCE SUCCESS

	<b>Weighted contribution</b>	<b>% Scored</b>	<b>Total Performance Measurement</b>			
Results	80%					
Competencies	20%					
Total weighted performance	100%		1	2	3	4

## 3. GENERAL COMMENTS

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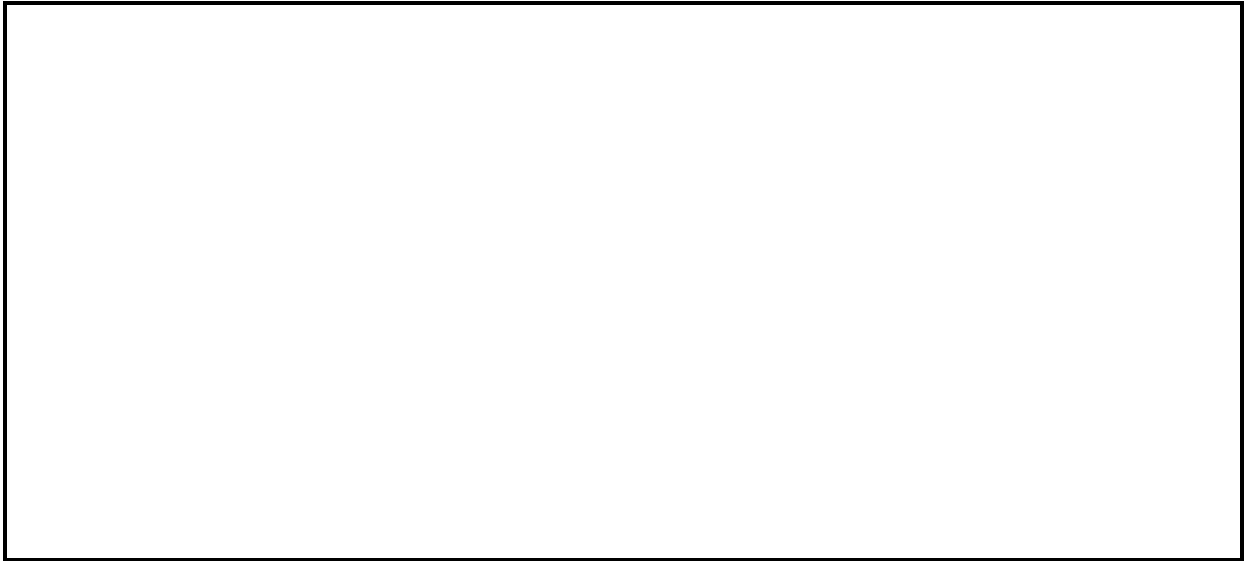
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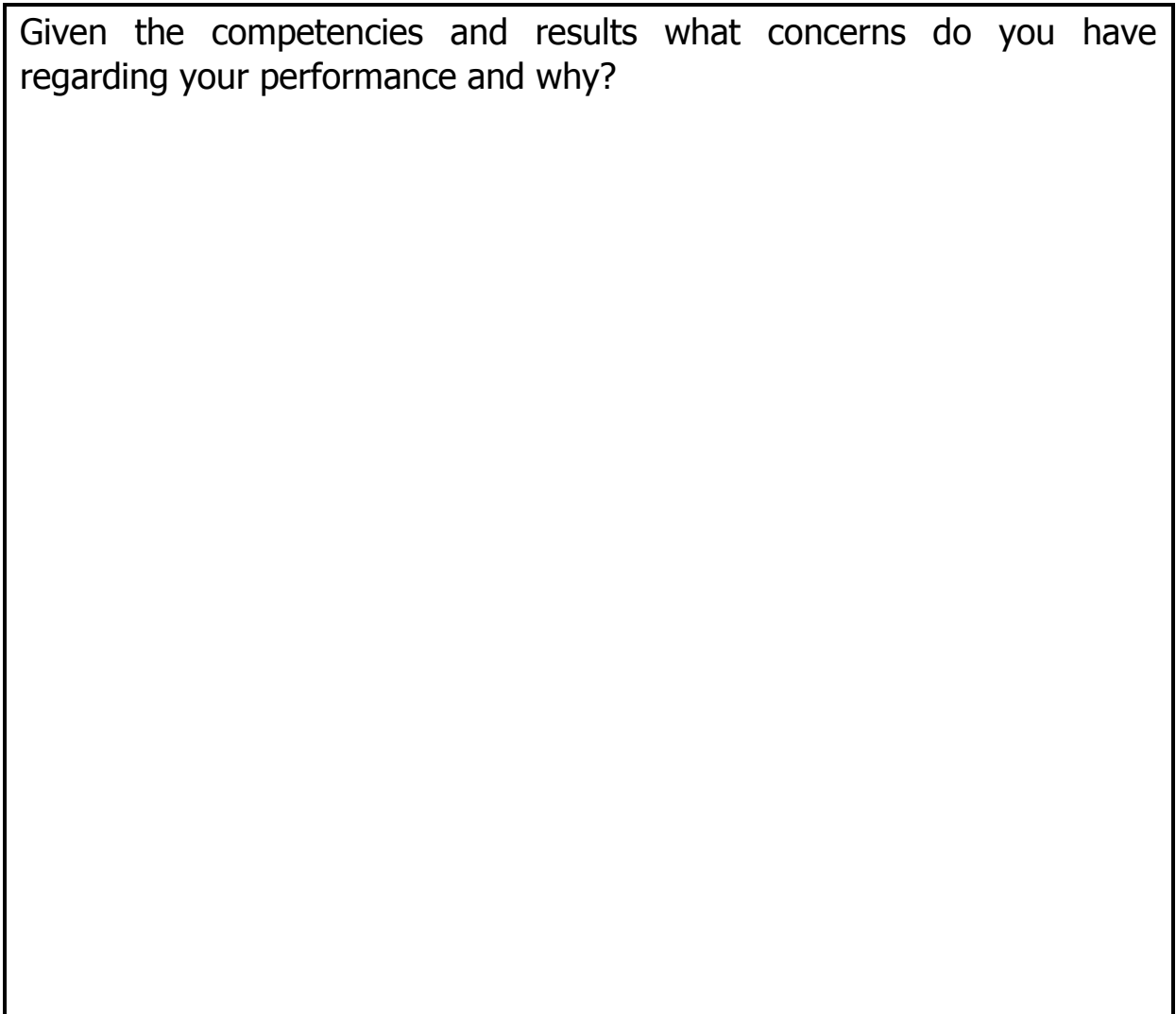
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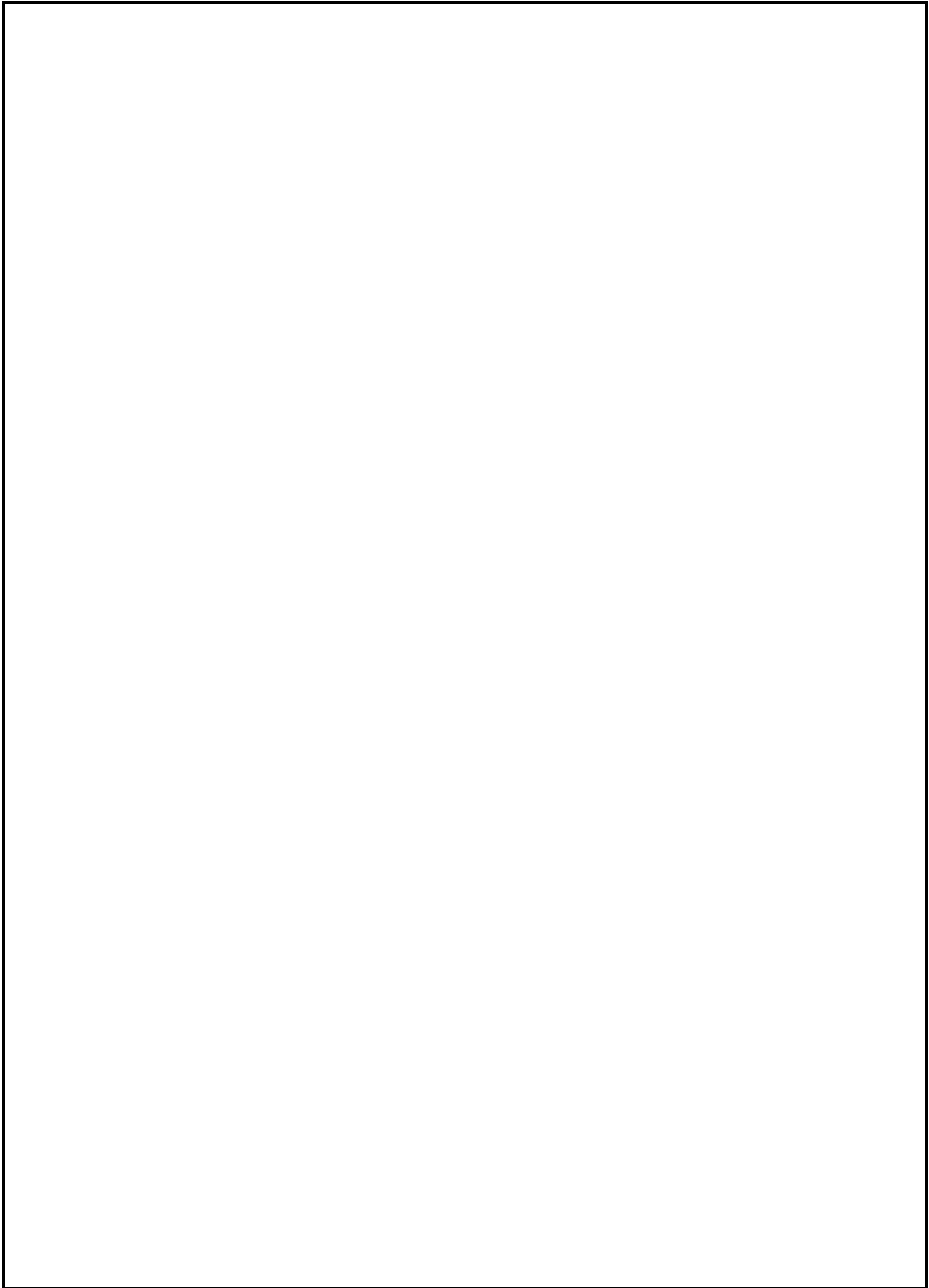
## 4. PERSONAL DEVELOPMENT PLAN

Given the competencies and results what did you do well and why?



Given the competencies and results what concerns do you have regarding your performance and why?





**ACTION PLANNER**

Action Steps to Be Taken	Time Frame	Person Responsible

**Comments:**

\_\_\_\_\_

**Signature of Employee**

\_\_\_\_\_

**Signature of Director/ Manager/Supervisor**

\_\_\_\_\_

**Date of Review**

Should there be any areas of concern regarding this Review, the matter can be addressed via the grievance procedure.

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## APPENDICES

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### INTERVIEW: FOREMAN

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1. Have you made bellows overseas or at another company?  
**No**
2. If yes, how long (on average) did it take you to manufacture a bellow of average size?  
**N/A**
3. What was the repair rate?  
**N/A**
4. How long do you think it should take to manufacture one unit of item 13 from start to finish? Or how many in a selected time frame?  
**If we have the materials at all times and the process is flowing, approximately five per month.**
5. How long is it currently taking?  
**More or less 6 in three months**
6. Why is it taking so long to manufacture a bellow at Steinmüller Alrode?
  - **The materials show up defective**
  - **Materials are not standardized. Especially corners take very long. There are companies who have the corners standardized and they do a much faster job.**
  - **Workers are not working as efficiently as possible**
  - **Maybe too focused on quality. Especially talking about getting the straights on the bellow perfectly level.**
  - **Materials are my biggest concern**
7. You say that you focus a lot on quality and getting the bellows perfectly straight. Is it necessary to focus so much time on getting everything perfect? Is it possible that we lose too much time focusing on unnecessary perfection?  
**I do not know the answer. I have tried to find out if this quality is necessary but no one is able to tell me. I believe in doing something right the first time. I do not believe in re-work. It is possible that I am too focused on quality, but I take pride in my work and every single bellow should be perfect.**
8. You work with workers from a foreign nationality. What are the challenges that you face as a result?  
**No challenges. I am working very well with them.**
9. Any recommendations?

**Need more people. We could do a lot more at a given time.**

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INTERVIEW: QUALITY CONTROL INSPECTOR (INTERNAL)

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1. From a quality control perspective, how do you rate the work from Steinmüller Alrode?  
**In general, quite good**
2. Any issues with the current work that we could improve?
  - **Cannot get material certificates. Files are completely disorganized and there is no system in place.**
  - **Do not really see a problem with the quality**
3. Any Recommendations?
  - **Not for the quality side**
  - **Only problem is material certificates. They are taking up so much of my time that some of my duties are being neglected.**
  - **Materials are a big problem. Often do not have materials therefore cannot finish the job**
  - **Some planners cannot even read the technical drawing**
  - **No progress meetings. No real communication between offices and factory workers.**
  - **No night shift inspector. Not an issue at the moment (quality is very good) but might become a problem later.**

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INTERVIEW: WORKS MANAGER

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1. Have you made bellows at another company or overseas?  
**No**
2. How would you compare the work of the other company to that of Steinmüller?  
**N/A**
3. From a quality perspective, how do you rate the work at Steinmüller?  
**9/10. Very good quality. I would buy the finished product myself.**
4. Is it possible that Steinmüller focuses too much on quality and therefore is losing out on production time?  
**Yes I agree.**
5. How many bellows do you think can be produced in a given time frame if the company is running at 100% efficiency?

**We can make about 28 bellows a month.**

6. How many bellows are you currently manufacturing in a given time frame?  
**20 Bellows per month.**
7. Why are you currently not manufacturing that maximum amount?
  - **By speeding things up like we have recently, people are struggling to cope. People are not used to working at a high efficiency, especially compared to that of last year where we were only making 6 bellows every 3 months.**
  - **There is a definite problem with worker morale. People do not believe they can achieve the targets set out for them.**
8. What performance management system are you currently using? Are you happy with it?  
**There is definitely an opportunity here. We do not have any sort of proper system in place.**
9. Is there an opportunity to increase efficiency and throughput by standardising some of the materials?
  - **Yes, the lack of standardising is a problem. Especially when you take into account that our tooling is inferior as well. There is a problem with die set. Instead of having a proper die set, we pretty much use any objects lying around to do the job instead. We need to invest in a proper die set.**
  - **We currently do not have a press, so why bother to have the correct tooling. We need to be doing this in-house.**
  - **Earlier this year we went to opposition and tried to buy some of their corner pieces, but turned to be too expensive and it cuts into our profits too much.**
10. Is there any system in place at Steinmüller to govern the level- and flow of materials?  
**Up until very recently there was no system in place. Materials are numbered now. They are combined into little kits for each item- we are not just leaving the materials separately.**
11. Do you think that there is a lack of communication between management and the factory floor?  
**Yes I agree.**
12. Any suggestions on how to improve the communication?  
**So far I have set up a bar chart for communication so far. The form basically says what has to be done on a given day, what everybody should be doing, it has got milestones, etc.**
13. Are you experiencing any problems with worker morale? If yes, please elaborate.
  - **There is a definite problem with morale. People do not believe they can achieve.**
  - **Workers are Muslim. They have different holidays. Workers work for a couple of months for money and then go back home for a couple of months. This is very disruptive. The workers pray throughout the day which takes time.**

14. What changes have you made to the company recently?

- **Have re-engineered the process already. We manufacture the items at Jurie Street, and then Bobcat only does the assembly.**
- **Last year we brought in a consultant to improve the process- Mr. Nick Bothma, manager at BHR Piping. He worked for two months and did nothing, so I asked him to leave.**
- **From the time of your last holiday work up to now, we went from a monthly turnover of R890 000 to billing almost R12 million.**

15. Any other thoughts or recommendations?

- **Have noticed that the lead time for ordering the materials is longer. Not 4 weeks as thought but 12 weeks. Buy from Trident Steel. Have recently fired the materials planner. Haven't hired a new one yet. Gary took over procurement.**
- **Last year invoiced over R12 million a month.**
- **Company is poor at welding. Need to train them better.**
- **Still have a night shift. Work from 4pm to 1am.**

TIME STUDIES

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DAY ONE

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**Process: Full Weld all top parts of the corners of convolutions before flip**

Description: Position 44  
 Worker 1  
 Outside  
 Weld, File & Brush welded piece, and grinding  
 Efficiency Factor: 9

<b>Efficient Time</b>	14015	3.89	hrs	<b>Inefficient Time</b>	6986	1.9	hrs
<b>Percentage</b>	66.73%			<b>Percentage</b>	33.27%		
<b>Progress Time</b>	5710	1.59	hrs	<b>Actual Efficient Time</b>	12613.5	3.50	hrs
<b>Percentage</b>	27.19%			<b>Percentage</b>	60.06%		
				<b>Actual Progress Time</b>	5139	1.43	hrs
				<b>Percentage</b>	24.47%		

Description: Position 44  
 Worker 2  
 Inside

A critical analysis of the throughput rate at Steinmüller Alrode Works

Sets up foam inside convolution for welding  
Efficiency Factor: 4

<b>Efficient Time</b>	8341	2.32 hrs	<b>Inefficient Time</b>	12660	3.52 hrs
<b>Percentage</b>	39.72%		<b>Percentage</b>	60.28%	
<b>Progress Time</b>	0	0 hrs	<b>Actual Efficient Time</b>	3336.4	0.93 hrs
<b>Percentage</b>	0.00%		<b>Percentage</b>	15.89%	
			<b>Actual Progress Time</b>	0	0.00 hrs
			<b>Percentage</b>	0.00%	

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DAY TWO

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**Process: Full Weld all top parts of the corners of convolutions before flip**

Description: Position 44  
Worker 1  
Outside  
Weld, File & Brush welded piece, and grinding  
Efficiency Factor: 9

<b>Efficient Time</b>	1496	0.42 hrs	<b>Inefficient Time</b>	462	0.13 hrs
<b>Percentage</b>	76.40%		<b>Percentage</b>	23.60%	
<b>Progress Time</b>	273	0.08 hrs	<b>Actual Efficient Time</b>	1346.4	0.37 hrs
<b>Percentage</b>	13.94%		<b>Percentage</b>	68.76%	
			<b>Actual Progress Time</b>	245.7	0.07 hrs
			<b>Percentage</b>	12.55%	

Description: Position 44  
Worker 2  
Inside  
Sets up foam inside convolution for welding  
Efficiency Factor: 4

<b>Efficient Time</b>	1394	0.39 hrs	<b>Inefficient Time</b>	564	0.16 hrs
<b>Percentage</b>	71.20%		<b>Percentage</b>	28.80%	

A critical analysis of the throughput rate at Steinmüller Alrode Works

<b>Progress Time</b>	0	0 hrs	<b>Actual Efficient Time</b>	557.6	0.15 hrs
<b>Percentage</b>	0		<b>Percentage</b>	28.48%	
			<b>Actual Progress Time</b>	0	0.00 hrs
			<b>Percentage</b>	0	

- **Summary**

Worker 1 is one of the most efficient welders in the factory and has a very good attitude. If all workers had the same work ethic and attitude as worker 1 the production rate would more than triple.

Worker 1 Actual Efficiency: **69% (Excellent)**

In contrast, worker 2 stands around all day looking busy trying to pass the time. Even when working, worker 2 works very slowly and without purpose.

Worker 2 Actual Efficiency: **16% (Terrible)**

**Welding time:**

2 Workers

+8.5 Workable hours

Total Efficient time: 7.02 hrs

Total Inefficient time: 5.75 hrs

Total Actual Weld time: 1.67 hrs

Total Actual Set-up time: 1.38 hrs

Total Actual File & Brush time: 1.33 hrs

Total Actual Efficient time: **4.95 hrs (Paying for 19 hrs)**

Weld corners at an average of 1.4m per hour

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DAY THREE

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**Process: Full weld 3 straights on top convolutions that joins the L-bar and the convolution sheet**

Description: Position 44

Worker 1

Outside

Weld, File & Brush

Efficiency Factor: 9

<b>Efficient Time</b>	7098	1.97 hrs	<b>Inefficient Time</b>	4952	1.38 hrs
<b>Percentage</b>	58.90%		<b>Percentage</b>	41.10%	

A critical analysis of the throughput rate at Steinmüller Alrode Works

<b>Progress Time</b>	5378	1.49	hrs	<b>Actual Efficient Time</b>	6388.2	1.77	hrs
<b>Percentage</b>	44.63%			<b>Percentage</b>	53.01%		

<b>Actual Progress Time</b>	4840.2	1.34	hrs
<b>Percentage</b>	40.17%		

Description: Position 44  
 Worker 2  
 Outside  
 Help worker 1, take out wooden blocks and hammer plate on top of corner  
 Efficiency Factor: 9

<b>Efficient Time</b>	2153	0.60	hrs	<b>Inefficient Time</b>	4618	1.28	hrs
<b>Percentage</b>	31.80%			<b>Percentage</b>	68.20%		

<b>Progress Time</b>	1240	0.34	hrs	<b>Actual Efficient Time</b>	1937.7	0.54	hrs
<b>Percentage</b>	18.31%			<b>Percentage</b>	28.62%		

<b>Actual Progress Time</b>	1116	0.31	hrs
<b>Percentage</b>	16.48%		

Description: Position 44  
 Worker 3  
 Outside  
 File & Brush  
 Efficiency Factor: 3

<b>Efficient Time</b>	783	0.22	hrs	<b>Inefficient Time</b>	11267	3.13	hrs
<b>Percentage</b>	6.50%			<b>Percentage</b>	93.50%		

<b>Progress Time</b>	0	0.00	hrs	<b>Actual Efficient Time</b>	234.9	0.07	hrs
<b>Percentage</b>	0.00%			<b>Percentage</b>	1.95%		

<b>Actual Progress Time</b>	0	0.00	hrs
<b>Percentage</b>	0.00%		

Description: Position 44  
 Worker 4  
 Outside  
 File & Brush, Replace Cylinder  
 Efficiency Factor: 7

A critical analysis of the throughput rate at Steinmüller Alrode Works

<b>Efficient Time</b>	1582	0.44	hrs	<b>Inefficient Time</b>	10468	2.91	hrs
<b>Percentage</b>	13.13%			<b>Percentage</b>	86.87%		
<b>Progress Time</b>	0	0.00	hrs	<b>Actual Efficient Time</b>	1107.4	0.31	hrs
<b>Percentage</b>	0.00%			<b>Percentage</b>	9.19%		
<b>Actual Progress Time</b>	0						
<b>Percentage</b>	0.00%						

- **Summary**

Worker 1 is the most efficient welder in the factory with the best attitude (same worker from corner weld). Worker 1 achieved an **Actual Efficiency of 53% (Good)**, which is a lot less when compared to the 69% achieved on the corner weld. Note how productivity goes down even with the best of workers when:

1) Monday

2) No supervisor the entire day

A Pakistani worker wearing a brown suit came to visit the factory. About 6 workers at a time were standing around talking to him. I could not determine whether it was authorised or not, and by whom.

Worker 2 worked at the station until lunch. He spent almost half the morning socialising at other stations, and was not very efficient even when he was at the station. It took him 15 minutes just to fetch some weld sticks. **Worker 2 Actual Efficiency: 28.62% (Poor)**

Why worker 3&4 were even at the station is a complete mystery, yet they spent the entire day there. **They 'achieved' actual efficiencies of 1.95% and 9.19% (Terrible) respectively.** This problem will be addressed in detail later in the report.

Note: At 14:38 I counted only 9 employees on the factory floor, of which 5 were working.

**Welding time:**

4 Workers

+7 Workable hours

Total Efficient time: 3.23 hrs

Total Inefficient time: 8.7 hrs

Total Actual Weld time: 1.65 hrs

Total Actual Set-up time: 0.09 hrs

Total Actual Efficient time: **2.69 hrs (Paying for 32.5 hrs)**

Weld straights at an average of **1.4m per hour**

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DAY THREE

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**Process: Full weld piece that joins the convolutions to the L-bar on the outside. Weld only edges +-30cm.**

A critical analysis of the throughput rate at Steinmüller Alrode Works

Description: Position 13-D  
 Worker 1  
 Outside  
 Weld, grind, file & brush  
 Efficiency Factor: 9

<b>Efficient Time</b>	127	2.12	hrs	<b>Inefficient Time</b>	63	1.05	hrs
<b>Percentage</b>	66.84%			<b>Percentage</b>	33.16%		
<b>Progress Time</b>	114	1.9	hrs	<b>Actual Efficient Time</b>	114.3	1.905	hrs
<b>Percentage</b>	60.00%			<b>Percentage</b>	60.16%		
<b>Actual Progress Time</b>	102.6	1.71	hrs				
<b>Percentage</b>	54.00%						

Description: Position 13-D  
 Worker 2  
 Outside  
 Weld  
 Efficiency Factor: 9

<b>Efficient Time</b>	19	0.32	hr	<b>Inefficient Time</b>	171	2.85	hr
<b>Percentage</b>	10.00	%		<b>Percentage</b>	90.00	%	
<b>Progress Time</b>	5	0.08	hr	<b>Actual Efficient Time</b>	17.1	0.28	hr
<b>Percentage</b>	2.63%			<b>Percentage</b>	9.00%		
<b>Actual Progress Time</b>	4.5	0.07	hr				
<b>Percentage</b>	2.37%						

- **Summary**

Worker 1 is a very effective welder and the fact that he achieved an **Actual Efficiency of 60.16% (Excellent)** despite every other worker taking full advantage of the lack of supervision is to be commended. Even worker 1 from Pos 44 (one of the best) only measured an efficiency of 53% on this day.

This is a good demonstration of how things are going at the moment in the factory. The current trend is that if there are more than one workers working together at a bellow, one

A critical analysis of the throughput rate at Steinmüller Alrode Works

worker will work diligently and another will do nothing more than to look busy. Worker 2 'achieved' an **Actual Efficiency of 9% (Terrible)**.

**Welding time:**

1 Worker  
 +-3,22 Workable hours  
 Total Efficient time: 2.45 hrs  
 Total Inefficient time: 3.9 hrs  
 Total Actual Weld time: 1.98 hrs  
 Total Actual Set-up time: 0.17 hrs  
 Total Actual File & Brush time: 0 hrs  
 Total Actual Efficient time: 2.195 hrs (Paying for 6.84 hrs)  
 Weld edges of corners & straights at an average of **0.75m per hour**

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DAY FOUR

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**Process: Weld straights that join the two units 1/3 on, 2/3 off. Not full weld.**

Description: Position 13-E  
 Worker 1  
 Outside  
 Weld  
 Efficiency Factor: 8

<b>Efficient Time</b>	2088	0.58	hrs	<b>Inefficient Time</b>	1152	0.32	hrs
<b>Percentage</b>	64.44%			<b>Percentage</b>	35.56%		
<b>Progress Time</b>	2036	0.57	hrs	<b>Actual Efficient Time</b>	1670.4	0.46	hrs
<b>Percentage</b>	62.84%			<b>Percentage</b>	52%		
				<b>Actual Progress Time</b>	1628.8	0.45	hrs
				<b>Percentage</b>	50%		

Description: Position 13-E  
 Worker 2  
 Outside  
 Work with worker 1 at straights, hammer clamps. Loosen Screws on jig  
 Efficiency Factor: 6

<b>Efficient Time</b>	463	0.13	hrs	<b>Inefficient Time</b>	2777	0.77	hrs
<b>Percentage</b>	14.29%			<b>Percentage</b>	85.71%		

A critical analysis of the throughput rate at Steinmüller Alrode Works

<b>Progress Time</b>	0	0 hrs	<b>Actual Efficient Time</b>	277.8	0.08 hrs
<b>Percentage</b>	0		<b>Percentage</b>	8.57%	
			<b>Actual Progress Time</b>	0	0.00 hrs
			<b>Percentage</b>	0.00%	

- Summary**

When worker 1 is idle, at least he sees where he can help out elsewhere at jig. However, all worker 2 is doing is hammering clamps ever so often when worker 1 is finished welding. Worker 1 scored an **Actual Efficiency of 64% (Excellent)** while worker 2 scored an **Actual Efficiency of 8.57% (Terrible)**.

**Welding time:**

2 Workers  
 +-0.9 Workable hours  
 Total Efficient time: 0.71 hrs  
 Total Inefficient time: 1.09 hrs  
 Total Actual Weld time: 0.46 hrs  
 Total Actual Set-up time: 0.01 hrs  
 Total Actual File & Brush time: 0 hrs  
 Total Actual Efficient time: 0.54 hrs (Paying for 1.8 hrs)  
 Weld straights at an average of **4.32m per hour**

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DAY FIVE:

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**Process: Fit and Weld Corner sheet onto unit (top and bottom, two corners)**

Description: Position 13-F (inside jig)

Worker 1

Outside

Mould corner plate with hammer and grinder to fit. Make sure convolutions are at water level. Grind side of convolution for a smooth edge. After fitting is done, weld corner plate to unit.

Efficiency Factor: 8

<b>Efficient Time</b>	8055	2.24 hrs	<b>Inefficient Time</b>	506	0.14 hrs
<b>Percentage</b>	94.09%		<b>Percentage</b>	5.91%	
<b>Progress Time</b>	0	0.00 hrs	<b>Actual Efficient Time</b>	6444	1.79 hrs
<b>Percentage</b>	0.00%		<b>Percentage</b>	75.27%	
<b>Actual Progress Time</b>	0	0.00 hrs			
<b>Percentage</b>	0.00%				

A critical analysis of the throughput rate at Steinmüller Alrode Works

Description: Position 13-F (inside jig)

Worker 2

Outside

Mould corner plate with hammer and grinder to fit. Make sure convolutions are at water level. Grind side of convolution for a smooth edge. After fitting is done, weld corner plate to unit.

Efficiency Factor: 7

<b>Efficient Time</b>	6058	1.68	hrs	<b>Inefficient Time</b>	2503	0.70	hrs
<b>Percentage</b>	70.76%			<b>Percentage</b>	29.24%		
<b>Progress Time</b>	0	0.00	hrs	<b>Actual Efficient Time</b>	4241	1.18	hrs
<b>Percentage</b>	0.00%			<b>Percentage</b>	49.53%		
<b>Actual Progress Time</b>	0	0.00	hrs				
<b>Percentage</b>	0.00%						

Description: Position 13-F (inside jig)

Worker 3

Outside

Weld corner sheet onto unit

Efficiency Factor: 9

<b>Efficient Time</b>	1791	0.50	hrs	<b>Inefficient Time</b>	6770	1.88	hrs
<b>Percentage</b>	20.92%			<b>Percentage</b>	79.08%		
<b>Progress Time</b>	1701	0.47	hrs	<b>Actual Efficient Time</b>	1612	0.45	hrs
<b>Percentage</b>	19.87%			<b>Percentage</b>	18.83%		
<b>Actual Progress Time</b>	1531	0.43	hrs				
<b>Percentage</b>	17.88%						

Description: Position 13-F (inside jig)

Worker 4

Outside

Weld corner sheet onto unit

Efficiency Factor: 9

<b>Efficient Time</b>	3930	1.09	hrs	<b>Inefficient Time</b>	4631	1.29	hrs
<b>Percentage</b>	45.91%			<b>Percentage</b>	54.09%		
<b>Progress Time</b>	3801	1.06	hrs	<b>Actual Efficient Time</b>	3537	0.98	hrs
<b>Percentage</b>	44.40%			<b>Percentage</b>	41.32%		

**Actual Progress Time**            3421   0.95   hrs  
**Percentage**                        39.96%

- **Summary**

Most of the time spent fitting the corner to a frame is spent on moulding the corner sheet to make it fit properly. Materials could be standardised to fit the corners and save four workers a full day of labour per bellow.

One worker fitting and grinding is very busy, while the welder stands idle for most of the time. Welding only takes about 10 seconds for every 2-3 minutes of moulding. The rest of the time the welder is idle.

Idea: Worker that welds could carry on straight welding some other section close by, and continue with the corner weld on request. The problem is that there is no multi-tasking. Workers are idle yet could be doing another mould on their own. Pos 13-E standing next door in jig has many opportunities for welding while corners are moulded.

**Welding time:**

4 Workers

+3 Workable hours

Total Efficient time: 6.95 hrs

Total Inefficient time: 5.05 hrs

Total Actual Weld time: 1.93 hrs

Total Actual Set-up time: 0.11 hrs

Total Actual Shaping time: 2.91 hrs

Total Actual Efficient time: 5.55 hrs (Paying for 12 hrs)

Weld corners at an average of 1m per hour