



**MÄLARDALEN UNIVERSITY**  
**SWEDEN**

School of Innovation, Design, and Engineering

# **SANDVIK MINING FACILITY LAYOUT PROJECT**

*Hemin Adam, Michael Afrem, Gulce Karsli, Cansu Onen*

School of Innovation, Design and Engineering - IDT  
Mälardalen University, Eskilstuna, Sweden



## Contents

<b>1</b>	<b>BACKGROUND.....</b>	<b>1</b>
1.1	PROJECT SPECIFICATION.....	1
	<i>Problem description and project objectives.....</i>	<i>1</i>
	<i>Purpose.....</i>	<i>1</i>
	<i>Project organisation.....</i>	<i>1</i>
	<i>Delimitations.....</i>	<i>2</i>
1.2.	COMPANY DESCRIPTION.....	3
<b>2.</b>	<b>CURRENT STATE OF PROCESSES.....</b>	<b>4</b>
	PROCESS DESCRIPTION.....	4
	PRODUCTS.....	4
	MANNING AND CAPACITY.....	4
	ROOT CAUSE ANALYSIS.....	4
<b>3.</b>	<b>SUGGESTED IMPROVEMENTS.....</b>	<b>5</b>
3.1	FUTURE STATE.....	5
3.2.	IDEAL STATE.....	7
<b>4.</b>	<b>INVESTMENT/COST CALCULATION.....</b>	<b>9</b>
<b>5.</b>	<b>ADDITIONAL PROJECTS: INVENTORY MANAGEMENT.....</b>	<b>9</b>
<b>6.</b>	<b>CONCLUSIONS &amp; RECOMMENDATIONS.....</b>	<b>10</b>

# 1 Background

## 1.1 Project specification

### Problem description and project objectives

In the course KPP206, Production, maintenance, and quality development, we are assigned to make a project for a company to apply methods and tools for improvements in a “real” industrial project. The task is to suggest some improvements to the company to obtain a more effective workflow and we work on this project with the company Sandvik which is located in Köping, Sweden. We visited their facility to understand their current situation and asked questions to get answers which we can use in our project. Their main problem is disorganization of shelves in a specific area at facility, in blasting area which will be called as section A in the following parts. This project's aim is to improve their industrial process, make operation more efficient.

### Purpose

The purpose of the task is to use our knowledge gained from the Production, maintenance, and quality development to understand the current situation of Sandvik and enhance operation of the facility by working on their value stream analysis. So regulating shelves, reducing time and effort to reach materials and products which they use in section A is the main focus of the project.

### Goals

- Understanding how the facility layout works
- Analyzing the importance of facility layout
- Show current situation of Sandvik and discuss on possible improvements
- Provide some suggestions to Sandvik
- Suggesting a realistic alternative to the current shelf order and system
- See improvements that we made in facility and analyze last situation

### Project organisation

There were no direct roles in the group. Instead we divided the assignment between two smaller groups. Each group got a part of the project to write about and to meet the deadline that was set up by the group. The contact person between the group and the customer was Hemin Adam.

Week 1	Arrangement of groups and project start-up
Week 2	First group meeting to talk about what we will do on this project and first visit to Sandvik
Week 3	Group meeting to share parts of project report template and second visit to Sandvik
Week 4	Group discussion on what we would suggest to company and how we will write in report
Week 5	Writing individual parts and group meeting to write conclusion together
Week 6	Group meeting to combine parts which are written individually by group members
Week 7	Group Discussion on the inventory management part given as an additional project part.
Week 8	Final changes on the paper.
Week 9	Final project presentation

### **Delimitations**

Since there are so many products that go through the blistering machine we decided to limit us to the products that are most often used.

The products are: Rulle 1-2-3 7/8 tum, Rulle 9 tum, Rulle 9 7/8 tum, Rulle 10 and 10 5/8 tum, Rulle 12 1/4 tum, Rulle 13 3/4 tum, Rulle 15 tum and Rulle 16 tum.

## 1.2. Company description

Sandvik is a world-wide engineering company which has various industrial products and operates in more than 130 companies with more than 49,000 employees. Along with the technological developments and change of the needs in industrial areas, Sandvik advanced researches and operations all over the world. This company is expert in use of materials and industrial processes with the focus on high profitability and safety. In facilities they manufacture industrial tools, equipment for mining and construction. They have progressive logistic network and services.

Sandvik operates in five different areas which are (Figure 1):

- Sandvik Mining
- Sandvik Machining Solutions
- Sandvik-Materials Technology
- Sandvik Construction
- Sandvik Venture

In our facility they produce equipments which are used in mining and construction.

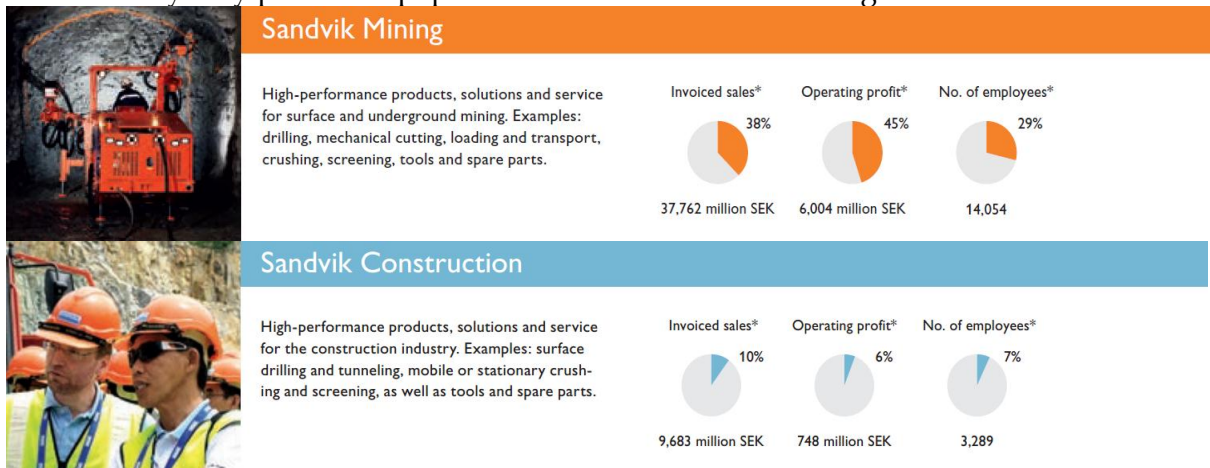
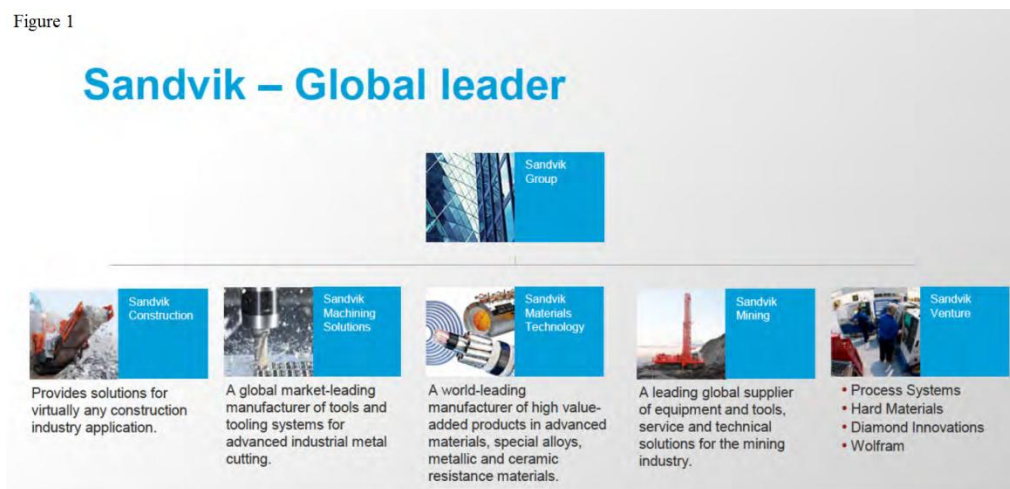


Figure 1



## 2. Current state of processes

### Process description

The current situation of the blistering department of the company is not very good, there is no actual system and the products are just stored where there is space. There are a lot of pallets that shouldn't be there which just take unnecessary space.

As a result of that there is no actual system, the worker has to look for the products he needs. Since the pallets are just put where there is free place leads to unnecessary work because the pallet you need could end up in the bottom. Also there is no own fork lift for this department which could be disturbing if someone else is using it when it is needed.

### Products

The current product that are mainly used are (Rulle 1-2-3 7 7/8 tum, Rulle 9 tum, Rulle 9 7/8 tum, Rulle 10 and 10 5/8 tum, Rulle 12 1/4 tum, Rulle 13 3/4 tum, Rulle 15 tum and Rulle 16 tum) products, while the other product which are not needed gets stored for a long time of period.

### Manning and capacity

There are two shifts at the company, during one of the shifts there is one employee who works full time at the machine. During the other shift there is no one who actually works there but when the other employees are not needed in their own departments they usually go to the blistering machine and work.

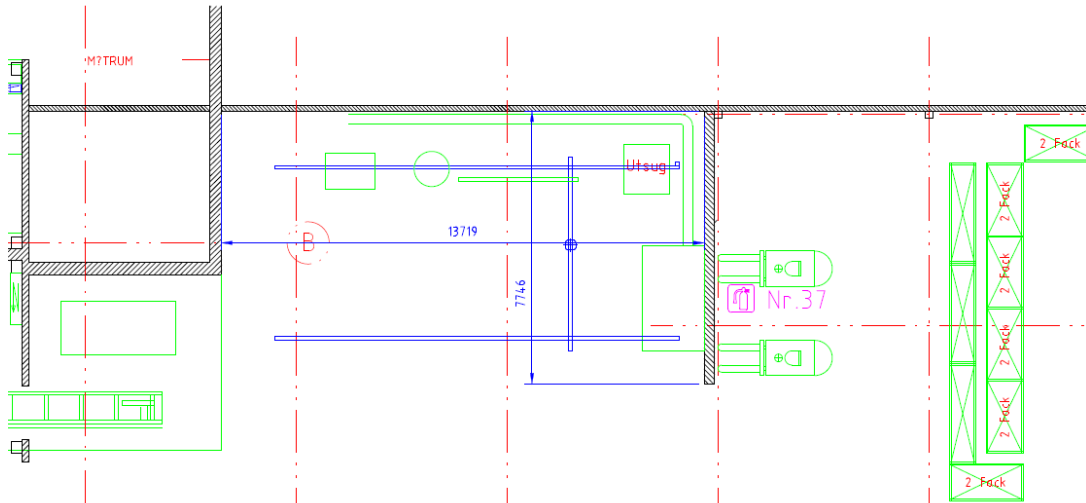
There was no definite number of how many pallets are being done per day because there is only one full time worker at the machine. According to the employee he is always two full pallets ahead of schedule.

### Root Cause Analysis

The material that should be stored in section B is stored in the blistering facility which is a disturbance for the employee because of the lack of space and mess. There is no direct system for where the material should be stored if there is no space in section B. Half of the shelves are packed with unnecessary pallets which are not used in this department is an example that there is no actual system. This is an example that shows how the 5S are not implemented in this department. "5S" is an abbreviation of first letters of these five words: sort, straighten, sweep, standardize and self-discipline.

### 3. Suggested improvements

The aim is to provide a better and more efficient operation for section A by suggesting a realistic alternative to the current shelf order and system. All group members together, we went to the facility of Sandvik and investigated the main operation in section A. We asked questions to employees to understand the exact problems that they are experiencing in daily operations about these shelves. We discussed together and came up with two sets of improvements; Future state and Ideal state. Below you can see the layout schema of the blasting section A:



#### 3.1 Future State

One of our suggestions to company is arranging a specific place for forklift machine which is a truck for carrying and transporting materials in industrial areas. Both sections are using the same forklift so we found a place for the forklift between two sections and it prevents employees looking for where the forklift is before using.





Our second suggestion is to replace orange, blue and some of the white boxes which belong to the other section. We offered them to separate these products to other storage shelves in section B so every section has only their own boxes in room and they use the space in a more effective way. New shelves should be built in section B if needed.



Also the stairs in section A, on the left of the shelves, should be removed and merged into inventory section, so it will give them one more available shelf to use for storage.





Finally the boxes should be put in order according to their type and sizes. Suggested order would be vertical shelves have the same product, going from biggest to smallest size, down to up.

The list and the sizes of products used in section A is as follows:

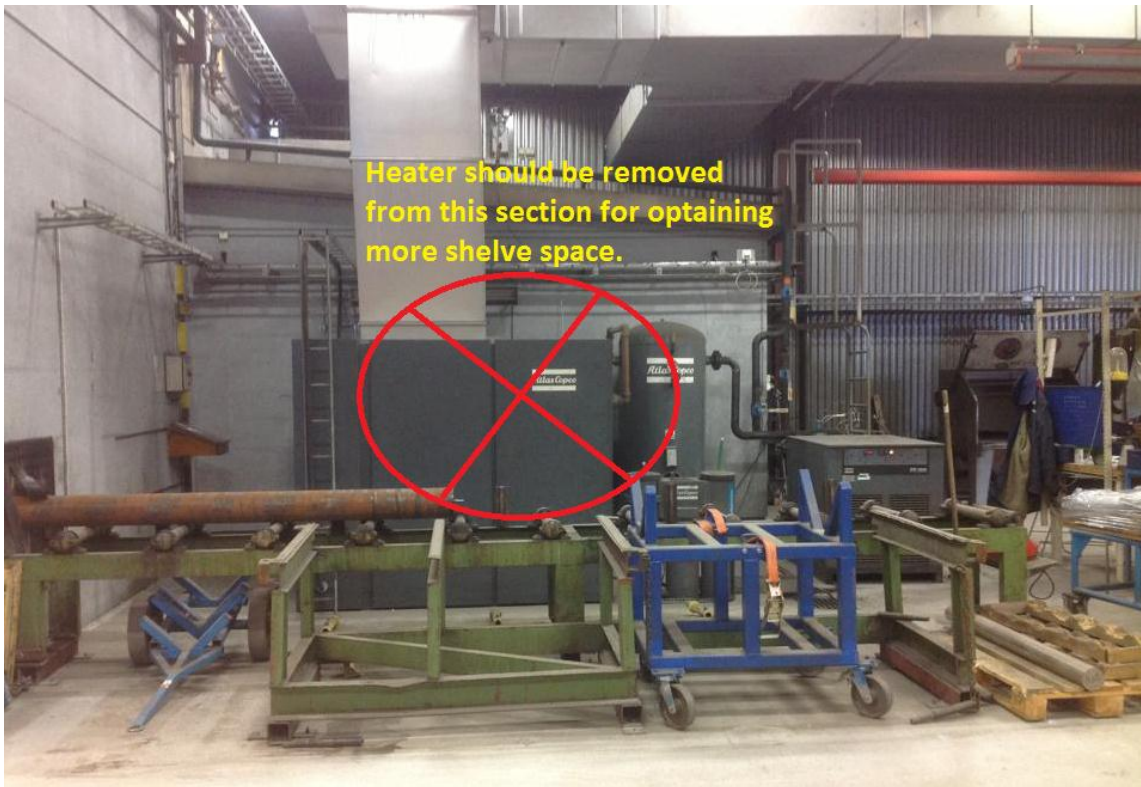
Rulle 7 7/8 tum, Rulle 9 tum, Rulle 9 7/8 tum, Rulle 10 and 10 5/8 tum, Rulle 12 1/4 tum, Rulle 13 3/4 tum, Rulle 15 tum and Rulle 16 tum. The products are in series of 3 kinds of every sort, 1, 2, and 3. The shelves should be rebuilding so there are room for 3 pallets instead of two as it is now so the series could be stored together.

### 3.2. Ideal State

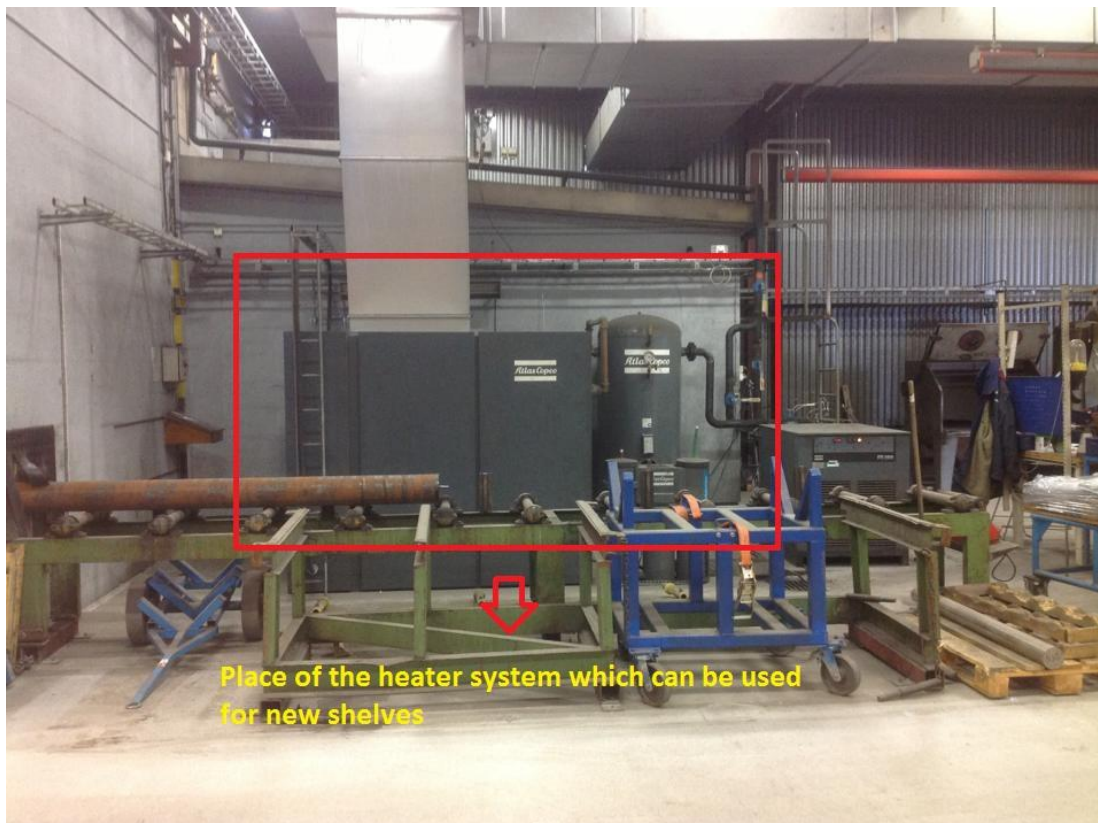
We suggested to the company some realistic solutions which might enhance operation quality immediately; however we can suggest more for long term enhancement with the following ideal state value stream map shows a long term perspective for improvements.

Obviously there is a need for extra forklift machine which can be available to use for just section A. Because all sections in the facility are using this machine together, there is no schedule or an order. Thus, it creates bottleneck. Workers complain about difficulty of reaching forklift machine in time because of being unavailable at the time they should use and this induces time management problem of facility.

Also planning extra storage by putting new shelves to the place of where heater is right now could be a great improvement for efficient space usage. This area can be used by replacing heater system somewhere else and developing new shelf area here. These new shelves can be used by section B. This would big improvements for the facility because they also need more space; the order of the shelves is not the only problem here.



Consequently, at the end of improvements; section A has more space for shelves, special forklift machine which is available all the time and proper order with all shelves store only raw material and finished goods of section A.



## 4. Investment/Cost calculation

Although suggested improvements will increase overall work efficiency which will come back as more productive and efficient work hours, it will need some investments and expenses shall be made. Implementing future state improvements will take roughly 3 men working for a full day on these changes such as moving and ordering the products, replacing the stairs and constructing the new shelf. If employees of the factory are charged with this task, it also means loss of workforce and delay in the production for a day. But as we contacted the production manager, he stated that they use an external company for that and there is no need to take cost into consideration.

Ideal state improvements will cost largely but it will also increase effectiveness and productivity in a much more distinguishable way. Implementing ideal state improvements will require roughly 5 men working for two days estimated because of moving the heater is a complicated job and require precision. Also constructing new shelves requires more men and time here. But again the same situation of external company applies here. Finally, for ideal state, a new forklift is a need which normally costs around 160'000 SEK.

## 5. Additional Projects: Inventory Management

After our main project was completed, we were asked to come up with some inventory management suggestions to improve the work flow in the inventory. In the present system the products are arranged according to their type and size. But there are overload on some products and a lot of empty places for other products. So we are now suggesting a computer system that will work very extensive in the inventory room. The features of the computer system should be as follows:

- Products that are not moved for a long time will be shown in red in the system and the main office will be notified so they can move these products to somewhere else. In this way they will not take place in the shelves of the inventory and make the daily work flow better.
- When a pallet of product is entering the inventory, the barcode on the box will be read by the computer system and it will show where to put the box. System will select the first empty place closest to the same product family.
- When you enter a product number into the system, it will show where the product is.
- Reports that show recent product activities can be printed from the computer system anytime. This will make the analysis on product flows very easier.

This computer system will need a developing time, working together with it specialists and an investment cost but in return it will provide considerably more effective work hours and prevent the need of a bigger inventory construction.

Another suggestion is about the shelves in the inventory room. At the moment, there are 2 pallets per a shelf. If the shelves are widen and can take 3 pallets, then all the sizes and variations of a product can stand together and make it easier to group them.

## **6. Conclusions & Recommendations**

The expected outcome of this project is to create a system that will increase work effectiveness by reordering the material flow. Final state of the project should meet the expectations of the employees working in the section. We hope that the suggested improvements that are presented to the company and the employees will be implemented. Through this work that was carried out by the group, we hope that the company will be pleased with the expected results.

These changes will save the Sandvik Company a lot of time and ease, also will increase productivity. But it should never be forgotten that there are still possibilities to make the flow and facility layout even more effective by conducting a factory wide project.