



The two blast furnaces rise like two enormous towers at SSAB in Oxelösund. Blast furnace 2 has been there for more than 50 years but is after a renovation more modern than ever when digital PROFIBUS technique and approx. 400 instruments from ABB are keeping a constant eye on the production of the pig iron. "We are pioneers when it comes to using PROFIBUS in this type of process", says Sten Åhlin, manager for the electric and system construction in the metallurgy department at SSAB Oxelösund.

## 1 Company Profile

SSAB in Oxelösund is the world's largest supplier of casehardened construction steel and tearing plates. Well known trademarks are Hardox, Weldox, Toolox and Armoz.



SSAB Oxelösund totally produced 1,394,000 tones substances a year and 600,000 tones plates. The number of employees was approx. 2,800 while the sale increased with approx. ten billion SEK (Values from 2006). SSAB are investing 140 million SEK on the renovation of Blast furnace 2. In total they calculate on investing another two billion on renovation and upgrading during the next 10-15 years.

## 2 Introduction

Inside the blast furnace hall the 1,500 centigrade warm iron is tapped from the lower part of the furnace in order to get further transported with underground torpedo wagons. The pig iron production that takes place here is the very first step in the process at the only integrated steel plant in Sweden.

Above rises blast furnace 2 which was renovated a year ago. That is except the top which has been lifted off and reused.

"The wear normally forces us to renovate the furnace every 8th year", tells Sten Åhlin. "But with new technique which limits the longer stop we count on it to hold now for 15 years".

A tough task for a process which is being used 24 hours a day, 365 days a year. An important factor for the increased life span is a continuously more efficient cooling through so called "staves" – 1.5 meter wide and 3 meters high copper plates with water canals mounted on the inside of the furnace wall.



*24 hours a day, all year round the melted pig iron is flows from Blast furnace 2 at SSAB in Oxelösund. With the help of new technique SSAB count on being able to increase the renovation cycles from 8 to 15 years. Tomas Ulander from ABB (at the right) can tell that ABB has delivered instruments to approx. 400 measuring points on the furnace to Sten Åhlin, Björn Olsson and Hans Holgersson from SSAB.*

### 3 Secure following-up

"To have control over a blast furnace is much about having control over the cooling", explains Sten Åhlin. And it is there that ABB's instruments for measuring temperature, water flow and pressure come in. With their help from our operating engineers get a secure following-up of the process. There is plenty of dynamic in a blast furnace, it is important to keep an even temperature all around so that the iron melts slow enough but in an effective speed.

"Our experts also want to know how much effect we cool away per surface area on the blast furnace body. There is also a lot of temperature measuring, both in the brick body and in the copper plates but also in the water where the temperature differences are noted. The communication between the control system and the measuring instruments is nowadays, with a few exceptions, realized with the help of PROFIBUS".

"The sensors in the furnace are of the same type as before", says Sten Åhlin. "The difference is that the measuring transformers are now returning a digital value instead of as before an analog signal".



*In the central control room all the wires are gathered from the control system that has been developed at the company, and which monitors and controls the two blast furnaces at SSAB in Oxelösund. The regulator Mats Dunder is making a note on the blaster temperature which has been collected by the PROFIBUS based digital measuring system.*

### 4 More study visits

"SSAB in Oxelösund are handling their own projects and developing its own control system. But we were rather anxious when we decided to go for the digital solution for measurement", tells Hans Holgersson who had the responsibility for the construction of the instrument circuits in the project.

"Traditionally the blast furnaces have also only used analog instruments and we had very little experience of digital communication", he tells. In the old facility there was no PROFIBUS solution.

"We made several study visits to different industries before we decided to invest in PROFIBUS", continues Hans Holgersson. "We were among others at the package and paper producer, which we thought had a good PROFIBUS solution in its process. They also work similarly to us with their own system development".



## 5 Savings in time and cost

The decision was taken to convince the project manager and maintenance employees that it was the right solution.

"Even if we ourselves felt a certain insecurity there were many things that spoke for PROFIBUS", says Sten Åhlin. "The field bus is used to connect the control system and measurement instruments in a common digital network and it means that there is much less cable installation than in an analogous system where each sensor has its own connection.

It gives great time and cost savings, both at the installment and when it comes to producing drawings. But at the same time it gets more sensitive with a network if a single sensor should brake. There we are guarding ourselves with special "barriers" in the system which enables us to connect around malfunctioning sensors so that they don't affect the rest of the network. That was also included in ABB's solution".



*Sten Åhlin, manager for the electricity and system construction at the metallurgy department at SSAB in Oxelösund is pleased with the PROFIBUS solution for Blast furnace 2.*

## 6 Twice as many measuring points

The PROFIBUS solution also contributed to a faster start after the renovation. It is now more than a year since blast Furnace 2 was started and the field bus solution has been going without any problems.

Totally ABB has delivered approx. 300 temperature measurers, 50 flow meters and 50 pressure meters to the project "Conversion blast furnace 2".

There are approx. twice as many measuring point as in the old furnace. This Tomas Ulander is telling, manager of ABBs unit Instrumentation who is also taking part in the tour in Oxelösund.

"When it concerns instruments it is important to prepare as much as possible", he says. "When you push the starting button it just must work and there we had a lot of help in that we where working directly with the end costumer. After all it was SSAB's own instrument technicians that made the installation and checked so that the instruments worked. There I can only congratulate to a nice job".

Sten Åhlin agrees that the installation work went smoothly.

"We had backup from ABB during the start-up but we didn't need to use it so much", he explains. "But the training that ABB held before the start-up was very good".



*Björn Olsson was part project manager for the electricity and control part at the renovation of the blast furnace, while Hans Holgersson had the responsibility for the construction of the instrument circuits. Here they are controlling a inductive flow meter from ABB that measures the cooling water temperature in the furnace.*

## 7 Unique addresses

An important part in the preparations was to go through every instrument and check the addresses. "All 400 instruments have unique addresses and they must finally be the same as the addresses that are in the control system", tells Tomas Ulander. "The control must be finished before the order goes to the factory so that every instrument can get it's own Tag-number to facilitate the mounting".

Tomas Ulander also stresses the big scale aspect of the project.

"We can say that we have entered the hot zone and invested in full in the field bus solution", he says. "Here we are facing totally different demands then for example in a office environment where it is not a total catastrophe if you loose contact with a writer. However, if you in in the process industry loose contact with your sensor, it can be devastating!".

He also points out the many new possibilities that the PROFIBUS is giving the user, especially when it is about documentation.

"You can download configurations and and get device diagnosis that are not accessible in a analogous solution. Depending on the instrument the operator can also go in and have a look at what has happened to a possible alarm. We have also added a computer program which makes it possible for the instrument technician to communicate with the instruments and even to go in and alter it".

## 8 Twice the durability

From ABB Instrumentation Tomas Ulander, Lars Forslund and Ulf Persson took part in the process.

The part project manager for the whole electricity and control part was Björn Olsson.

"The cooperation with ABB worked really well", he says. "If you look at the project in more general terms a lot more than instruments was included in ABB's delivery of measuring equipment, for example cables, barriers and DP/PA Linking Devices. And the assembling went on well, even if the tube guys had some problems putting the right sensor in the right place".

ABB's instruments and other measurements at the renovation will contribute to keep the blast furnace alive without brakes for another 15 years. The reason why the durability has almost been doubled compared to before the renovation is that SSAB counts on being able to avoid longer stops with the furnace cooling down. It is when the furnace is started again after such stops that the material in the furnace is worn out.

In the future the maintenance should be possible to take care of with short stops so that the process in the furnace is kept alive.

In three years time the other furnace will be renovated to, "Blast furnace 4". With the good experience they have from this project it could be guessed that SSAB in Oxelösund chooses to get a digital solution on the instrument side here too.

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