POSCO PICKLING LINES MODERNIZATION[1]

Woo Taeck Kwon [2]
J. Leroyer[3]

Abstract
In order to meet the tomorrow market demand Posco has rebuilt the pickling part of the PLTCM N°1 in Gwang Yang and the PLTCM N°2 in Pohang. The Gwang Yang PLTCM with a capacity of 2.2 millions tons per year has the particularity to have been designed to process high strength steel material with a yield point up to 1100 MPA. The first commercial coil was produced on May 15, 2006. The Pohang PLTCM has a capacity of 1.7 millions tons per year. This line is designed to pickle carbon steel product and has the particularity to be able to process and condition high silicon steel and stainless steel material with on-line skin pass mill. The first commercial coil was produced on February 20, 2007.
Key words : Pickling line equipment ; High strength steel; Welding.

1 *Technical Contribution to the 45th Rolling Seminar – Processes, Rolled and Coated Products, October 21st to 24th 2008, Ipojuca - Porto de Gainhas - PE*
2 *Posco*
3 *Siemens VAI MT*

INTRODUCTION

Posco and Siemens VAI have recently built two top of the art hydrochloric acid pickling lines at the Gwang Yang and Pohang works. The K1C and P2C projects have been carried out successfully by both parties and our expectations have been meet in term of productivity and product quality.

K1C LINE GENERAL DESCRIPTION

The Posco Gwang Yang N° 1 Coupled Pickling line was built to replace the old pickling line, utilizing as much as possible the existing concrete structure. Production of the unit has increased from 1.1 to 2.2 million tons per year. This full automatic line has been specially designed to process High Strength Steel with a tensile strength up to 1380 MPA. The high levels of strip tension required and installed make this pickling line the most powerful line of it kind.
Special attention was taken for critical technical challenges as:

- Take into account the spring back effect of the strip during coil manipulation ;
- Mechanical equipments sized for High Strength Steel material using our know how on stainless steel processing lines ;
- Specific strip tension in all sections and mainly into the loopers area ;
- Avoid strip brightness after pickling;
- Possibility to proceed bad shape material.

This Pickling line is the reference for today and tomorrow High Strength Steel material

Plant design data :
Yearly production : 2 150 000 ton/year
Thickness : 1.4 – 7 mm
Width : 750 – 1880 mm
Material : Hot rolled carbon steel
Tensile strength: up to 1380 MPA

Figure 1 : P2C process section overview

Project Schedule

This project has been achieved with a very aggressive schedule:

- Demolition of the old pickling line and erection of 2000 tons of mechanical equipments performed in 2 months from February to March 2006 ;
- Commissioning work performed in 6 weeks;
- First commercial coil on May 15, 2006;
- Full production reach in the two following months.

P2 C LINE GENERAL DESCRIPTION

The Posco Pohang N°2 project is very similar to the K1 C in term of lay out, complexity, and technology. The line is used for carbon steel, high silicon steel and stainless steel. These two last grades are pickled on different units and conditioned in the process section before rolling.

The tank design is adapted to run into the process section with empty tanks.

Plant design data

Yearly production: 1 640 000 ton/year
Thickness: 1.5 – 5 mm
Width: 600 – 1670 mm
Material: Hot rolled carbon steel, Stainless steel, High silicon steel

Project Schedule

- Demolition of the old pickling line and erection of 1800 tons of mechanical equipments performed in 3 months from December 2006 to February 2007 ;
- Commissioning work performed in 6 weeks;
- First commercial coil on March 22, 2007;
- Full production reach in the two following months;

PICKLING SECTIONS MAIN FEATURES

Pickling tanks technology

The process section used the Siemens VAI high turbulent tanks.

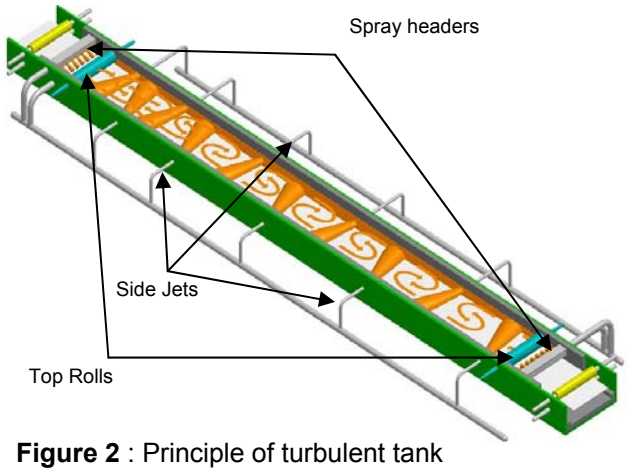

Figure 2 : Principle of turbulent tank

This arrangement has been chosen due to :

- The high operating flexibility of the process section and adaptation to low speed situation;
- The low maintenance on the pickling tanks;
- The high surface quality of the finished product;
- The design guarantees that the strip will not touch fixed part to avoid any surface defects when processing HSS product no well flatten ;
- The high efficiency of pickling at low temperature;
- The pickling tanks are designed to follow the shape of the strip under tension between the two top deflector rolls partially immerged in the acid bath.

The top deflector rolls installed above the strip will:

- Prevent the strip from being raised out of the acid bath in case of tension control inaccuracy;
- Prevent any hydroplaning effect of the strip ;
- Together with the side jets avoid acid drag out.

Figure 3 : Pickling tank

Process control system

The Siemens VAI Fully Automatic Pickle Liquor Analysis and Control (FAPLAC) system has been implemented.
All the process sections main parameters as acid-iron content, rinse water conductivity and so on are automatically measured and controlled trough a mathematical model
The main benefits for operators, production cost reduction and line productivity are:

Operator friendly

- All process information is available at Operator's station ;
- Minimum process section management judgements required from the operators ;
- Acid and Iron concentrations are automatically controlled ;
- Insensitive to the concentration of incoming acid ;
- The control system automatically protects heat exchangers during start-ups and shutdowns

Production cost reduction

- Optimize the use of acid to reduce operating cost ;
- Minimize the amount of acid in the waste pickle liquor ;
- Minimize the use of rinse water to reduce waste processing cost.

Line productivity

The model will predict the optimum process speed for each coil by taking into account the process parameters as strip quality, baths concentration, baths temperature,…
On the K1C the FAPLAC have been adapted to the HSS products to be treated.
Some special featured have been implemented to take into account the specificities of the HSS as brightness after pickling.

CONCLUSION

Posco does have top of the art tools to respond to the steel market trend for high value steel production
To this day 6,500,000 t/y of carbon flat product are process in POSCO trough Siemens VAI pickling section.