GEMCO ROLLING MILL SOLUTION

GLRs - Long Rolling Mill Solution

GCRs - Cold Rolling Mill Solution
ABOUT GEMCO

Since inception in 1980, GEMCO has come to be known as a leading manufacturer of Industrial Automation and Power Control Systems in India.
ABOUT GEMCO

Gemco offers Fully Engineered cost effective advanced solutions for various Process Automation and controls, integrating Digital Drives, PLCs with networking and interfacing with Process Computers.
GEMCO’S MISSION

Gemco’s mission is to combine the best in Electronic Technology with specialised designing capabilities and valuable experience in several fields of applications, to offer to their clients complete control systems for Industrial Automation and Power controls.
1. Development and Acquisition of innovative Technology.

2. Good concepts and knowledge about the actual Industrial application to which this technology is to be applied.

3. Effective and reliable service and assistance from Project conceiving upto commissioning and life time operation of the system.
Customer Requirements

- High speed operation
- Easy maintenance
- High return of investment
- Flexible solutions
- Simple interface
- Modular Design
- Easily upgraded

**GLRs Answer:**

- The fastest CPU on the market Siemens Make
- An open solution, easily handled S7 + WinCC
- Standard HW & SW integration as much as possible GLRS + Plug & Play
GLRs Complete Solution for Long Rolling Mills

Line Layout BAR/WIRE ROD MILL

MILL CNTRL CPU

TMT & COOLING BED CNTRL CPU

GARROT/LAYING HEAD CNTRL CPU

2/23/2015
There will be 3 Nos of PLC used for better performance:

- PLC No 1 for Mill CNTRL CPU
- PLC No.2 for Auxillary Interlocks of Mill Area CPU
- PLC No 3 for TMT & COOLING BED CNTRL CPU

Laying Head CPU in WRM Case
Functions of MILL CNTRL PLC

- Mill Sequencing and Safety Interlocks
- Speed Reference Generation for Mill Stands
- Crop and Cobble Shears controls
- MTC Control
- Loop Lifter Control & Regulation
- Pinch Roll Speed Setup
- Upstream Cascade Control
- Section Start / Stop
- R-Factor Setting
- Alarms & Events

MILL AREA Control
Functions of TMT & CB CNTRL PLC

PLC Automation with Computer system.
The PLC shall be configured with necessary Software’s to carry out the following functions:-

• Controls for Continuous/ Flying shear
• Operation of the Cut Diverter.
• Operation of the Shifting Diverter
• Cut Accuracy
• Length Optimization
• Tail Brakers UP/Dn Controls.
• Tail Brakers Speed controls
• Pinch Roll UP/DN & Speed Control.
• Twin Channel Cylinder Control.
• Cooling Bed Rake Control & Bar Handling Area Control
Functions of Laying Head CNTRL PLC

- Controls for Water Box
- Pinch Roll UP/DN & Speed Control
- Operation of the Cut Diverter.
- Operation of the Chopping Shear
- Operation of Block Mill.
- Laying Head Pinch Roll Control
- Laying Head Control
- Laying Head Conveyor Control
- Coil Compactor Control
- Coil Transfer Control
The required sensors and interfaces

**Required Sensors**
- Infrared Detectors
- Loop Sensors
- Stand Loaded Signals (from drive)
- Shear Position sensor

**Required Interfaces from existing plant**
- All Mill Signals – Stand electrical, mechanical ok
- All Media signals - lube, oil, water ok
- All Entry and Finishing Area control

**Required Interfaces**
- I/O or Ethernet or Profi-Bus

**Required DC or AC drives**
- Digital and Analog I/O or Profi-Bus
TECHNOLOGICAL CONTROL SYSTEM

- Cascade control of the mill stands
- Bar tracking and mill sequence controls Pinch
- Impact Load Compensation
- MINIMUM TENSION CONTROL (MTC)
- Loop Controllers
- Drive interface to various drive control systems
- Mill visualization in the HMI system
Cascade control

• The PLC calculate speeds for each main stand motor according to the stored data of rolling schedule.
• Then the microcomputer shall send each motor speed signal to the respective drive control systems for these motors.
• The system shall have facility to update or modify the stored rolling schedule.
• Main stand motor cascade control can be adjusted and adjustment shall take place UP STREAM from the selected key stand. Last working stand is the key stand for cascade control of the working mill stand motors.
Bar tracking and mill sequence controls

• Hot Metal Detectors (HMD) are to be installed in the mill for tracking the hot bar.
• Necessary correction for the material tracking shall be done by the automation system using HMDs.
• Also flickering of HMDs shall be taken care to avoid any mal operation.

Impact Load Compensation

• Mill motor drive controllers shall be compensated in case of impact load to avoid impact speed drop.
MINIMUM TENSION CONTROL (MTC)

• When the bar enters the first Pre-finishing stand, the current drawn from the stand is stored which is directly proportional to the torque requirement of the stand.
• As the bar enters the second intermediate stand, there could be some disturbances in second intermediate stand that may in turn affect the stand-1 and it results in a change in the current of stand-1. This current is actually measured and corrected referring to original memorized current.
• Thus any change in the current in stand-1 is regulated to a smooth degree within the permissible limits of ideal current and ensures minimum tension in the bar.
Start of the MTC

1. Measure $M_1(t1)$

Settling time for the initial-pass impact

Measure $M_1(t2)$

2. Settling time for the initial-pass impact

Store relationship stand 1-2

Measure $M_1(t2)$; $M_2(t2)$

Setpoint adjustment

3. Store $M_2(t1)$

$\Delta \text{rpm}$
GLRs Complete Solution for Long Rolling Mills
GLRs Complete Solution for Long Rolling Mills

Material flow

MTC control

Loop control

MTC control

Loop control

MTC on/off

Loop on/off

MTC/Loop on/off

MTC/Loop on/off

MTC/Loop on/off

MTC/Loop on/off
Loop Controllers

• This control function will be provided to keep the steel bar free from tension while being rolled by the finishing stands.
• An inter stand loop will be detected by hot metal position detectors (HMPD / Loop scanner) and the loop position will be detected.
• The loopers shall be used & integrated to the automation system to achieve the task of loop controls.
Drive interface to various drive control systems

• The speed set points calculated by the automation system Flying shear, main stands & other auxiliary drives shall be interfaced from the automation system to the respective drives.
• Similarly the speed actual values, position actual values, motor current Flying shear, main stands & other auxiliary drives shall also be interfaced from the automation system to the respective drives.
Mill visualization in the HMI system

The operation and monitoring of the mill is realized by the HMI system by the operator. Necessary interfacing and various real time analog and digital signal exchange between the PLC based automation system and HMI system for plant visualization shall be achieved by the automation system.
**HMI FUNCTIONS**

- Mill start / stop control
- Roughing mill control
- Cascade speed control (Individual / group)
- Min. tension control
- Loop control
- Shear Controls
- Mill drive presets operation.
- Actual value display.
- Input / output tracking
- Alarm display
- Event display
- Rolling Mill over view
- Real time / Historical process trends
- Interlock over view
- Pass schedule storage (max. 100 pass schedules)
- Production report generation
GLRs Complete Solution for Long Rolling Mills

Automatic Configuration For BAR Mill

AUTOMATION NETWORK DIAGRAM FOR HOT STRIP MILL

REHEATING FURNACE PULPIT

ROUGHING MILL PULPIT

FINISHING MILL PULPIT

DOWNCOILER PULPIT

RHF ECR

ECR ROOM

2/23/2015

27
Typical Automatic Configuration For BAR Mill

The given data are for reference only and not binding for execution. For technical data and scope of supply refer Technical Offer.

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<th>1</th>
<th>Date</th>
<th>SK</th>
<th>MS</th>
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</table>

2/23/2015
MAIN CONTROL DESK
GLRs Complete Solution for Long Rolling Mills

MAIN CONTROL DESK
Local Control Desk & Main PLC Panel
Main Pulpit At One Of Our Client Place
HMI SCREEN

GLRs Complete Solution for Long Rolling Mills

WELCOME

AUTOMATION DEVELOPED BY:

GEMCO CONTROLS LTD.

FARIDABAD
GLRs Complete Solution for Long Rolling Mills
Simple Operation

- Call Roll data & Pass schedule from HMI storage
- Pass data validity checking and release
- Start the production
- Modify and optimize Pass schedule
- Upload & store back to HMI archive system
GLRs Complete Solution for Long Rolling Mills

Drive Fault Screen

<table>
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<th>ALARMS</th>
<th>PR CCS1</th>
<th>CCS</th>
<th>I1</th>
<th>I2</th>
<th>C1</th>
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2/23/2015
### Looper Control Screen

**Looper PID Sheet**

<table>
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<tr>
<th>Looper</th>
<th>ARM ON/OFF</th>
<th>HMD</th>
<th>P_GAIN</th>
<th>I_GAIN</th>
<th>D_GAIN</th>
<th>HI LIMIT</th>
<th>LO LIMIT</th>
<th>SET VALUE</th>
<th>LOOP ON/OFF</th>
<th>PRO VALUE</th>
<th>CORR</th>
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<tbody>
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</table>

**Trend Looper-1**

Trend in the foreground ProcessValueAct Update started...

**Trend Looper-2**

Trend in the foreground ProcessValueAct Update started...

**Trend Looper-3**

Trend in the foreground ProcessValueAct Update started...
GLRs Complete Solution for Long Rolling Mills

Bar Graph Screen
GLRs Complete Solution for Long Rolling Mills

Trends Screen
## Alarms/Message Screen

### ALARMS

<table>
<thead>
<tr>
<th>Date</th>
<th>Time</th>
<th>Message text</th>
<th>Point of error</th>
</tr>
</thead>
<tbody>
<tr>
<td>02/07/14</td>
<td>11:04 40 AM</td>
<td>GEMCO2</td>
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<tr>
<td>02/07/14</td>
<td>11:06 06 AM</td>
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<tr>
<td>02/07/14</td>
<td>11:22 33 AM</td>
<td>GEMCO2</td>
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<tr>
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<td>11:22 33 AM</td>
<td>GEMCO2</td>
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<td>11:22 33 AM</td>
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<td>02/07/14</td>
<td>11:37 34 AM</td>
<td>I TRIP</td>
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<td>02/07/14</td>
<td>11:37 34 AM</td>
<td>I TRIP</td>
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<td>11:37 34 AM</td>
<td>C1 TRIP</td>
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<td>02/07/14</td>
<td>11:37 34 AM</td>
<td>C2 TRIP</td>
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<td>02/07/14</td>
<td>11:37 34 AM</td>
<td>TB2 TRIP</td>
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</table>

**Note:** The screenshot includes a table with various alarm entries for the date 02/07/14, indicating specific times and message texts related to the system's operations.
User benefits Of Continuous Shear

• No miss cuts.
• Accuracy of cutting even for first cut.
• Accuracy in cutting thus saving expensive steel material.
• Random (last piece) length control
• Increased productivity
GLRs Complete Solution for Long Rolling Mills

Drive Are The Muscle Power For The Rolling Mill

GLRs provide the Best & user Friendly Drive Solution
The Drive Controller used is of Sprint Electrics UK.

Salient Feature Of Drive System

• The PL/X DC motor controller uses closed loop control of armature current and feedback voltage to give precise control of motor torque and speed. The unit also controls the motor excitation field.
• The closed loop parameters are programmable by the user and a wealth of inputs and outputs are provided to allow very complex motion control processes to be achieved.
• The series is comprised of 3 chassis variants each with 2 and 4 quadrant models. Selected 2 quadrant models also offer a unique regenerative stopping facility.
• A large backlit alphanumeric display guides the user through a friendly menu structure to select options and parameter changes.
GLRs Complete Solution for Long Rolling Mills

Block Diagram for Drive Control
GLRs Complete Solution for Long Rolling Mills

Drive System For Rolling Mill

Incomer panel  Power Stack  Controller
Drive Line Up For Rolling Mill
GEMCO

HAS ITS SYSTEMS OPERATING WORLDWIDE

1. NIGERIA
2. MALAYSIA
3. NEPAL
4. JORDAN
5. SYRIA
6. DUBAI
7. BAHRAIN
8. SAUDI ARABIA
9. USBEKISTAN
10. INDONESIA
11. GREECE
12. KUWAIT
13. CHINA
14. KENYA
15. RUSSIA
16. IRAN
17. BANGLADESH
18. ITALY
19. VIETNAM
20. KOREA
21. CAMEROON
22. IVORY COAST
23. ZAMBIA
24. SRILANKA
25. ANGOLA
26. Argentina
Thank you for your attention!

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