Innovations for Competitive Advantage and Sustainable Developments
Leadership in Innovation with Clear Targets

Trends

- Volatile Market
- Plants for high Quality Steel
- Environmental Regulations
- Raw Material & Energy Costs
- Low Cost Competition

Innovation Fields

- New Technologies
  - Flexible operation
  - High steel grades
  - Energy & cost efficient production

- Modernization & Service
  - Technological packages
  - Robotic solutions
  - Service on demand

- Energy & Environment
  - Energy, raw material and water efficiency
  - Green solutions

- Safety
  - Zero accident
  - Hazardous areas without operators
  - Improved operation
Vertical Integration
Unique Approach for Innovations

Siemens VAI uniquely offers horizontal plant-integration capability – from mining to the finished product – and comprehensive vertical-integration expertise.

Customer benefits:
- Standardized design and interfaces
- Quick and smooth implementation for new and modernization business
- Fast ramp-ups of machines (e.g. connect & cast)

The integrated vertical approach leads to optimized plant components and performance.

Requirements for improved plant performance

Technological Packages
- Core Components

Metallurgical Expertise
Electrics
Automation
Mechanics & Fluids
Service
Manufacturing
Balance of Plant
New Technologies
New Technologies
Circular Pelletizing Technology (CPT)

Customer benefits:

- Small and compact plant layout
- Low specific investment costs, comparable with large pellet plants
- Excellent pellet quality based on straight grate induration
- Low operation costs
- No waste materials – 100% recycling loops for all input materials
- Possibility to process in-plant revert materials
- Plant locations at ore mine or in steel plant

CPT combines proven process with proven mechanical system

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New Technologies
WinLink® for Long Products

Customer benefits:

- Highest availability with directly linking high-speed billet caster and rolling mill
- Highest productivity with high speed billet caster >7 m/min
- Serve the local steel market for micro mills (400,000 t/a)
- Energy efficient and no reheating furnace required -> lowest carbon footprint
- Footprint just 50% of standard minimill
- From scrap to product in just 2 hours

Linking individual production steps into a seamless, uninterrupted production flow
Customer benefits:

- Innovative fully automated scrap charging system
- Scrap pre-heating
- Energy consumption of 280 kWh/t and with heat2power just 230 kWh/t
- Carbon footprint -20%
- Lowest flicker and network disturbances, smaller transformer
- Highest productivity with a ttt of 33’
### Current status of production

<table>
<thead>
<tr>
<th>Operation mode</th>
<th>Real endless</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual production</td>
<td>340 t/h</td>
</tr>
<tr>
<td></td>
<td>147,000 t/mo. in March’11</td>
</tr>
<tr>
<td>Heat size</td>
<td>250 t</td>
</tr>
<tr>
<td>Sequence length</td>
<td>10 heats (2,500 t)</td>
</tr>
<tr>
<td>Max. production/day</td>
<td>27 heats (6,750 t)/day</td>
</tr>
<tr>
<td>Casting speed</td>
<td>6.0 m/min</td>
</tr>
<tr>
<td></td>
<td>at 80 mm strand thickness</td>
</tr>
<tr>
<td>min. strip thickness</td>
<td>0.80 mm</td>
</tr>
<tr>
<td>Strip width</td>
<td>max. 1,570 mm</td>
</tr>
<tr>
<td>Steel grades</td>
<td>Low carbon, Medium carbon, HSLA</td>
</tr>
</tbody>
</table>

### Customer benefits:
- Reduced investments - compact design
- Wide range of special steel grades
- 98% yield
- 45% lower energy consumption and production costs compared with conventional casting/rolling routes
- Uniform strip quality
- Substitutes cold-rolled strip for many applications
Modernization & Service
Intensive Mixing and Granulation System (IMGS)
- No blending yards required
- Improved homogeneity of sinter raw feed
- Increased productivity
- Use of ultrafine ores / concentrates and revert material in sinter process

Sinter Plant Capacity Increase
- Up to 15% capacity increase by sinter strand width extension
- Lower specific waste gas
- Decreased specific energy consumption
- Low investment, short shut down time

Sinter Cooler Modernization
- Capacity increase by cooler width extension
- Better cooling efficiency with innovative cooler charging system for improved segregation
- Cooler heat recovery package for energy saving

Level 2 Automation
- Stabilization of sinter quality, decrease of quality deviation by 5 - 10%
- Increase productivity by to 5%
- Decrease of fuel consumption by typically 2 - 3%
Modernization and Services
Blast Furnace

New Technologies

Modernization & Service

Energy & Environment

Safety

Modernization & Service
Blast Furnace

Mechatronics

Automation

Instrumentation

- VVVF Stockline Recorder
- Radar Stockhouse Recorder
- Gimbal Top / Distributor
- Profilimeter
- Under Burden Probe
- New Radar / Infra Red Microwave 3D Mapping
- a) 3D Mapping
- b) Burden Control Model
- c) Burden Distribution Model
- d) Temperature Profiling
- Level 2 – Expert System
- Level 1 – PLC System
- Furnace Top Weighing System
- Gas Analysis
- Process Level
- Process Temperature
- Process Flow and Pressure
Modernization and Services
Steelmaking

**New Technologies**

**Modernization & Service**

**Energy & Environment**

**Safety**

**Horizontal Sublance**
- Excellent reproducibility
- Single measurement ~20s
- Triple measurement (TSO) ~80s

**Long-life Blowing Lance:**
- Double/triple of lance head lifetime
- Less wear in nozzles (blowing efficiency)

**SIMETAL LiquiRob @ BOF**

**VAICon Compact Link:**
- Space saving converter suspension
- Vessel size increase (up to +15% productivity)

- Highest availability
- People safety, menless operation
- Excellent reproducibility
Modernization and Services
Mechatronic Slab Caster Packages

- Standardized design and interfaces
- Quick and smooth implementation for new and revamped casters
- Fast ramp-ups of machines (Connect & Cast)
Modernization and Services
Extended Service Support

New Technologies

Modernization & Service

Energy & Environment

Safety

Customer benefits:
- Simplified design
- Dry casting
- Just-in-time supply: 3 month -> 3 weeks

EcoStar Roller

Customer benefits:
- Longer service life by more than 10%
- Higher rolling force possible
- Reduction in maintenance time & costs

MORGOIL Babbitt welder

Unique Babbitt welding process and largest sleeve grinder available
Modernization and Services
Maintenance Service Contract with TKCSA

TKCSA maintenance outsourcing to Siemens VAI – an excellent role model

Key data of the contract
- Duration 15 years – starting 2009
- Full scope caster maintenance (segments, strand guide rollers, molds, hard facing)
- Central workshop and in-plant electro-mechanical maintenance for integrated iron and steel works
- 800+ employees in outsourced maintenance

Investment in maintenance infrastructure
- Investment in Workshop with about 16,500 m² including equipment and machines
- Managed and operated by Siemens VAI
- Financing with fixed interest rate over 15 years
Energy & Environment
Energy & Environment

Customer benefits:

- Reduction of operation and investment costs
- Complying with strictest environmental regulations
- Reduction of raw materials and energy consumption
- Direct utilization of non-coking coal without any pre-treatment possible

New Technologies

Modernization & Service

Energy & Environment

Safety

COREX Baosteel Module 01

COREX Baosteel Module 02
Customer benefits:

- Reduction of operation and investment costs compared to the traditional blast furnace route consisting of sinter plant, coke oven and the blast furnace itself
- Complying with strictest environmental regulations
- Direct utilization of non-coking coal without any pre-treatment possible
- Utilization of lower grade iron ores (e.g. goethite), or magnetite concentrate successfully applied
Energy & Environment
MERIM – Dry Gas cleaning for Ironmaking

Customer benefits:

- No sludge and waste water management necessary
- Clean gas concentration < 5 mg/Nm³ bzw. < 1 mg/Nm³ achievable
- higher TRT output + 20-30% due to higher temperature and less pressure losses
- Easy re-utilization of dry by-products (e.g. to sinter plant)
- Lower operation and investment costs compared to wet solutions (e.g. electricity, water)
- Due to additive injection and dust recirculation emission control possible (HCl, H₂S, …)

Blast Furnace, COREX, FINEX

Contracts:
JSW Corex based DR Midrex
Customer benefits:

- More than 20% of energy input to EAF leaving with the offgas. Generate up to 85 kWh per ton liquid steel.
- Equivalent CO₂: ~ 50 kg CO₂ per ton liquid steel.
- Waste Heat recovery can be applied for greenfield as well as brownfield.
- Salt liquefies as heat storage system to buffer discount. Energy flow from EAF (pressureless, safe, non-toxic, up to 550 °C).
Safety
Safety
LiquiRob Family for Safe Operation

Functions installed:
- measurement and compensation of contact rod deformation
- attachment of T, TSO and TSC probes
- non-functional probes separation

Customer benefit:
- highest safety standard
- reduced maintenance costs
- faster cycle times → increased output
- Higher reproducibility of all robot operations
Visit us at the METEC
Hall 4, Booth No. C01–C03