Steel plant simulation

Siemens VAI’s Steel Library OSIRIS

Philipp Laaber, I MT SM TY CP
Siemens VAI Metals Technologies GmbH & Co
Turmstr. 44
A-4031 Linz
Introduction

- Industry
- Customer Services
- Drive Technologies
- Industry Automation
- Metals Technologies
- Customer Services
From Ore to Steel (1/2)

Charge Materials | Ironmaking | Steelmaking | Secondary Metallurgy | Continuous Casting
---|---|---|---|---
Ores: dressed, pelletized, sintered
Reducing agents: coke, natural gas, coal
Fluxes
Ironmaking
- Blast Furnace
- COREX
- Direct Reduction Plant
Steelmaking
- Basic Oxygen Converter
- Ladle Treatment
- Vacuum Treatment
Secondary Metallurgy
- Ladle Treatment
- Vacuum Treatment
Continuous Casting
- Thick Slab Casting Width: 600–3300 mm Thickness: >300 mm
- Slab / Medium Slab Casting Width: 600–3300 mm Thickness: 70–300 mm
- Bloom / Beam Blank Casting
- Billet Casting

Solid metallic materials
- solid charge materials
- hot metal
- liquid crude steel

Remark: applies for typical process route, special applications might not be covered.
Actual situation

Challenge
- Impact of transport system can not be calculated analytically
- Capacities of different aggregate groups have to be aligned
- Coordination within the plant
- Difficult to evaluate layout variants

Solution
- Use of metals specific industry library with decades of knowledge
- Implements a realistic simulation model
- Conduct experiment using the model
- Provide complex scheduling algorithms
- Siemens standard simulation software

Environmental benefit
- Reduced consumption of electrical energy

Typical customer benefit
- Increase production
- Identify bottlenecks
- Reduce lead times
- Decrease of setup operations
- Reduce refractory costs
- Optimize crane operations
SVAI’s steel library OSIRIS

- Steel specific library to model the material flows in a steel plant between melting aggregate and caster
Data management

- Definition of products, product routes and process parameters
- Predefined steel grades for standardized layouts available
- Flexible steel routes can be defined by using priority parameters
- Definition of several ladle cycles (hot metal, steel) is possible
Order Management

- Orders are created by using probability functions
- If a production orders are available these can be used instead of randomly created orders
- Revise caster start times (sequence remains unchanged)
- Plan primary metallurgy aggregates
- Plan secondary metallurgy aggregates
- Plan sub-aggregates (conditioning stands, ...)

APS Scheduler
Transport Management

- Transport management is universally applicable
- Transport heights are defined for each aggregate/crane
- Transporters are created on basis of this object
- Network planning is used to restrict certain areas/transports
- Intelligent collision control allows reliable crane transports
- Several strategies for crane dispatching are available
Transport Management

\[ t_{\text{Trolley}} = \frac{s_{\text{Trolley}}}{v_{\text{Trolley}}} \]

\[ t_{\text{Trav}} = \frac{s_{\text{Trav}}}{v_{\text{Bridge}}} \]

\[ t_{\text{Unload}} = \frac{s_{\text{Height/}v_{\text{Hook}}}}{v_{\text{Height/}v_{\text{Hook}}}} \]

\[ t_{\text{Load}} = \frac{s_{\text{Height/}v_{\text{Hook}}}}{v_{\text{Height/}v_{\text{Hook}}}} \]

\[ t = t_{\text{Load}} + \max(t_{\text{Trav}}, t_{\text{Trolley}}, 2 \times t_{\text{Lift}}) + t_{\text{Unload}} \]
Methodology

Product Mix

- Evaluate
- Layout
- Material Flow
- Orders
- Schedule
- Logistic System
- Experiment
Example
Steel plant with 3 BOF, 4 CCM
Results
Utilization of aggregates
Results
Lead time vs buffer time
Results
Crane cycles
Recent References

- Qatar
- Brasil
- USA
- Austria
- Russia
- Ukraine
- India
- Vietnam
- Canada
- United States
- North Atlantic Ocean
Contact

**Andreas Huber**
Senior Simulation Consultant

I MT PEP PL3
Siemens VAI Metals Technologies GmbH & Co
Turmstr. 44
A-4031 Linz

Phone: +43 – 732 – 6592 – 74281
Mobile: +43 – 664 – 88448362

E-mail: huber.a.andreas@siemens.com

**Philipp Laaber**
Calculation Engineer

I MT SM TY CP
Siemens VAI Metals Technologies GmbH & Co
Turmstr. 44
A-4031 Linz

Phone: +43 – 732 – 6592 – 74611
Mobile: +43 – 664 – 6150256

E-mail: philipp.laaber@siemens.com
Thank you for your attention!