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Analysis of Rolling Speed Parameters at the ArcelorMittal Ostrava Wire Rod Mill

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ArcelorMittal

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Agenda

- About Company
  - AMO introduction and flow (from iron ore to flat/long products)
  - IT and MES architecture in use
- Business Challenge General
  - Renewal of the PI System environment and need for operational data to feed needs of process engineering team
- Applications and Use Case / How the PI System was applied
  - Never ending story, platform first, business priorities and data availability as priority factor , security concept
- Implementation Details and Project Roles
- How Individual Product Capabilities Solved Business Challenges
  - Showing Wire Rod Mill (WRM) only,
  - 3 use cases using Assets structures, Event Frames, user defined PI ProcessBook and PI Coresight screens
- Results Obtained and Business Impact
  - Quick analysis available on demand for mill staff, cost saving on analytical tools and visualization on MES L2
- Conclusion and next challenges

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Steelmaker

ArcelorMittal Ostrava a.s. is the largest steelmaker in the Czech Republic...

Production activities of the company are focusing mainly on production and processing of hot metal and steel and rolled products production. The largest share of rolled products is represented by long and flat rolled products. Mechanical engineering production is focusing mainly on production of mine supports and crash barriers. Maintenance and servicing activities are ensured mostly by internal service plants.

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Heavy-Section Rolling Mill produces medium and heavy section steel from single round bars, through shaped profiles, up to profiles of special cross sections.

Continuous Wire-Rod Mill produces hot-rolled steel wire rod of 5,5 to 14 mm, and the reinforcing bars of small diameters.

Medium-Section Rolling Mill produces a wide assortment of rolled steel: fine and medium sections of basic shapes, ribbed reinforcing bars, I, IPE up to the dimension of 140 mm, U bars up to the dimension of 120 mm and some special sections.

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PI System Landscape Renewal Project

PI System landscape renewal and expansion has started 2015 with technical installation and setup, followed by rollouts on plant level :

- Coke plant
- Blast furnaces
- Steel plant
- Mills
- Energy consumption (cross plant)

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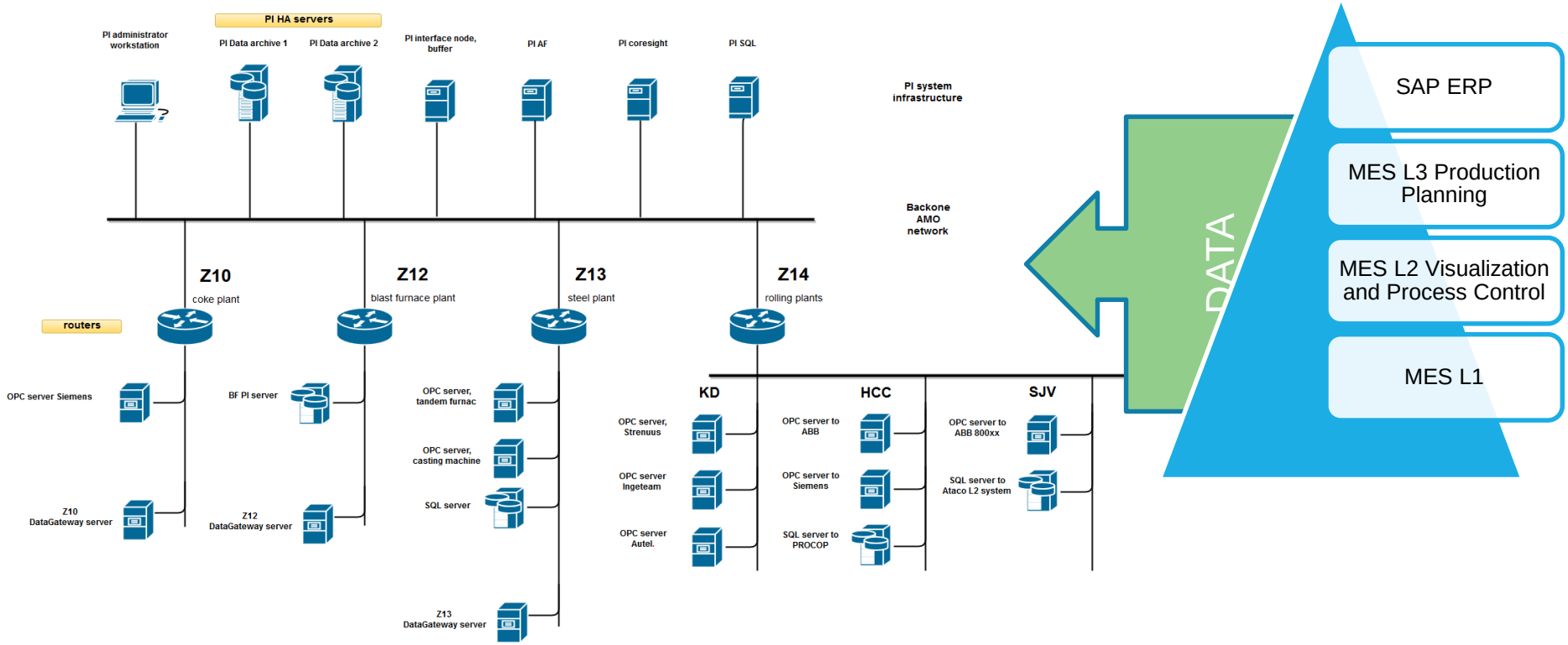
PI System Landscape

PI System
Current Infrastructure Overview



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Project Approach and Team Roles I

Separate project track for each mill, schedule depends on local MES conditions, project staffing and other influencing factors.

Mills: Starting from wire rod mill to the more complex mills …

We are still following the idea of reusable library asset templates/library for all rolling mills (still in learning and development phase ☺)

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Project Approach and Team Roles II

MES IT Department roles:

- Running IT environment
- Tag management
- Development of interfaces, templates and analytical support

Process Excellence team roles (main users at business side)

- Demand for information ☺
- Tags identification and definition
- PI ProcessBook and PI Coresight screens design (mostly by themselves, which makes free capacity of IT staff ☺)

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PI Asset Databases

Separate databases approach – each plant or plant group (AMO mills) has it's own database.

Cross plant database as next step (further development – maintenance models, vibration analysis, SAP PM connectivity) and sandbox for PI System engineers.

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PI System Database and Asset Structure for WRM

WRM asset structure is generally based on mill production flow schema.

Billet input, furnace data, production output data are delivered via interface from MES L2 system

Rolling technology data (stands setup, speed parameters, online dimension measurements etc.) are delivered via OPC interface

Use of templates for mill stands, drives helps us to maintain structure in a simple way.

Event frame templates for creation of product campaign events (day, shift, wire dimensions).

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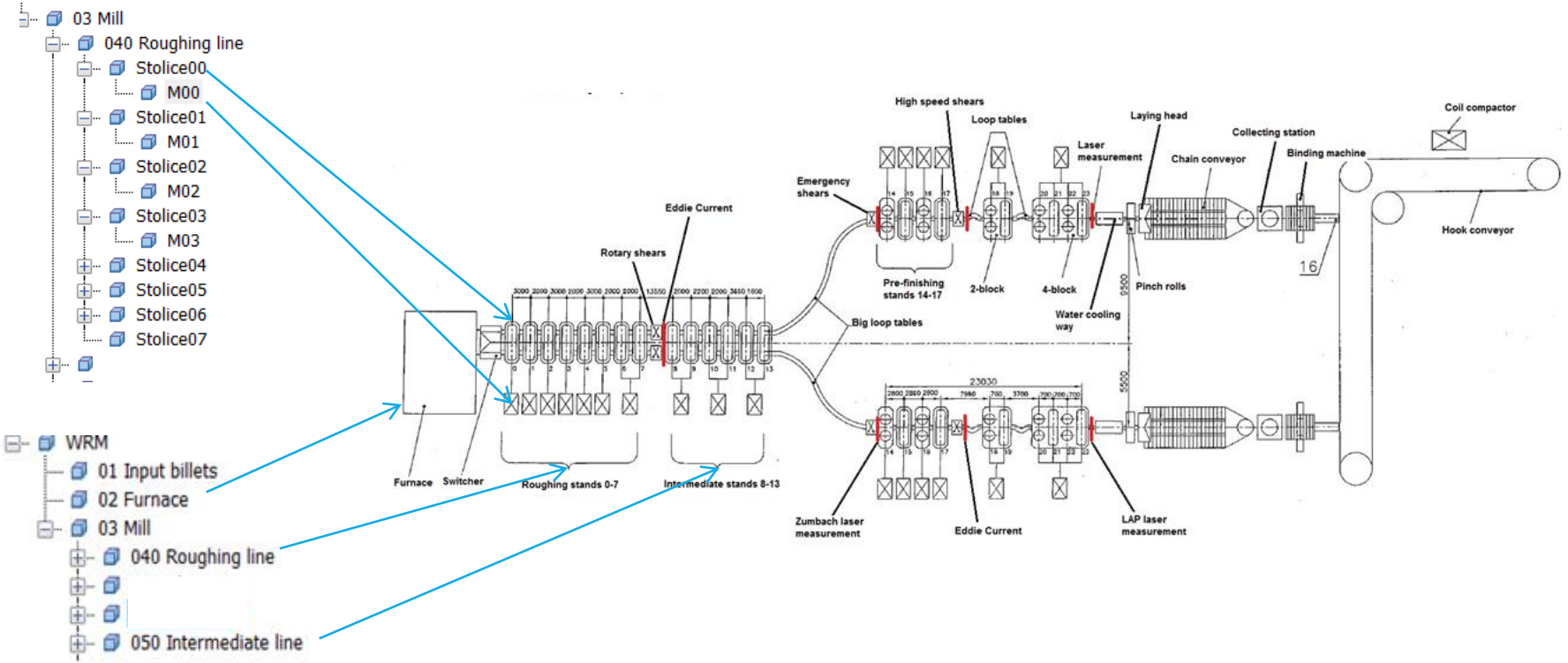
PI Asset Database Structure for WRM



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PI Asset Analytics & ProcessBook at WRM: Example #1

Challenge: right rolling speed ratios (of subsequent stands) are crucial for production without delays, influencing also production quality and yield.

Solution: calculation and visualization of speed differences for all roll stands.

MES L1 + L2 tags as input for analysis – calculated speed difference ratios are stored as calculated tags, to be used for analysis of speed parameters of all stands.

Results are displayed via PI ProcessBook or PI Coresight.

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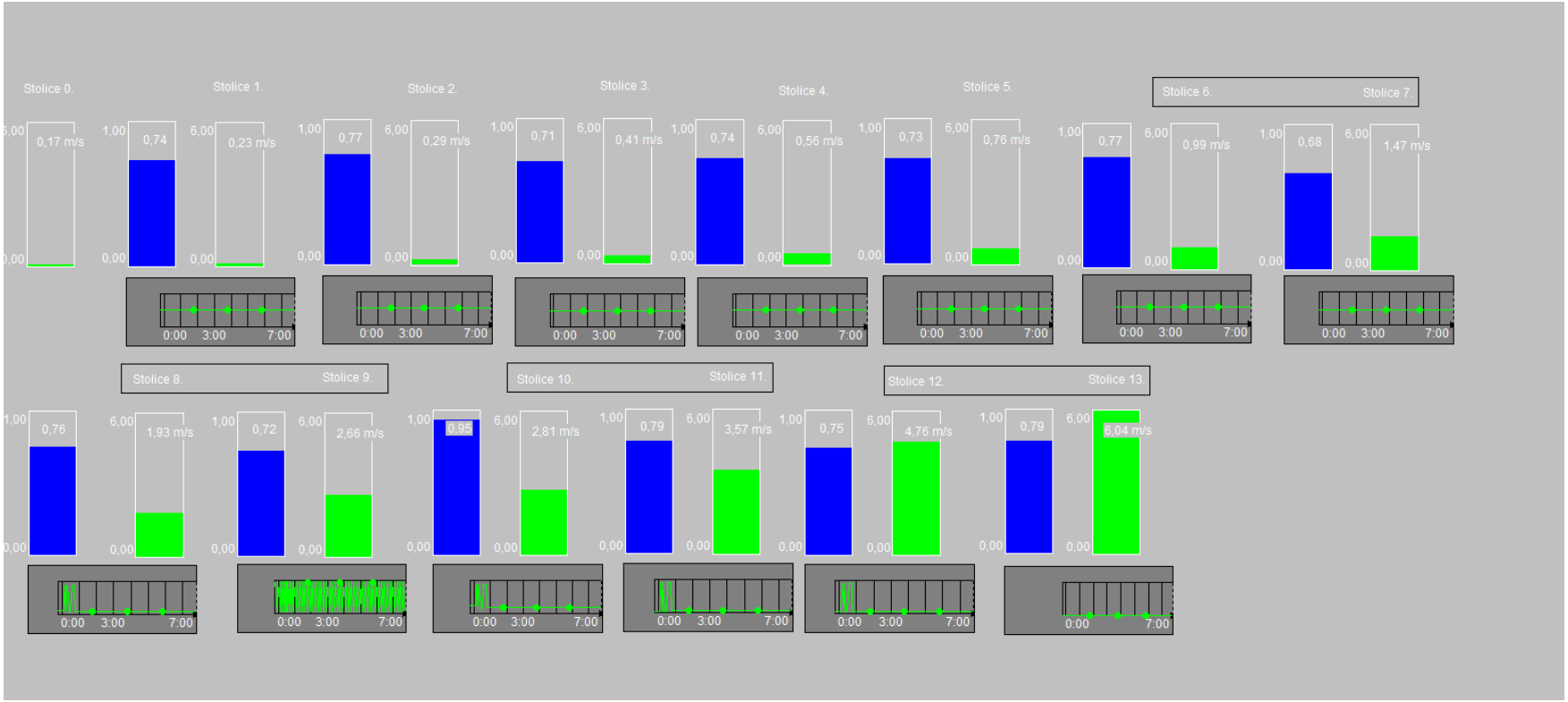
PI Asset Analytics & PI ProcessBook at WRM: Example #1



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PI Asset Analytics at WRM: Example #2

Challenge: rolling speed is one of the main KPI, usually reported and compared (by shifts, dates, campaigns) as one average number which is not fully decribing production process during time.

Solution: Event frame generation of dimension campaigns / batches. Main batch atribute is product dimension.

Significant tags assigned as frame atributes for further analysis (for example comparison of significant batch parameters as production speed)

Value added: quick and easy comparison of any batch production values – speed setup in this case and possibility to compare also additional parameters.

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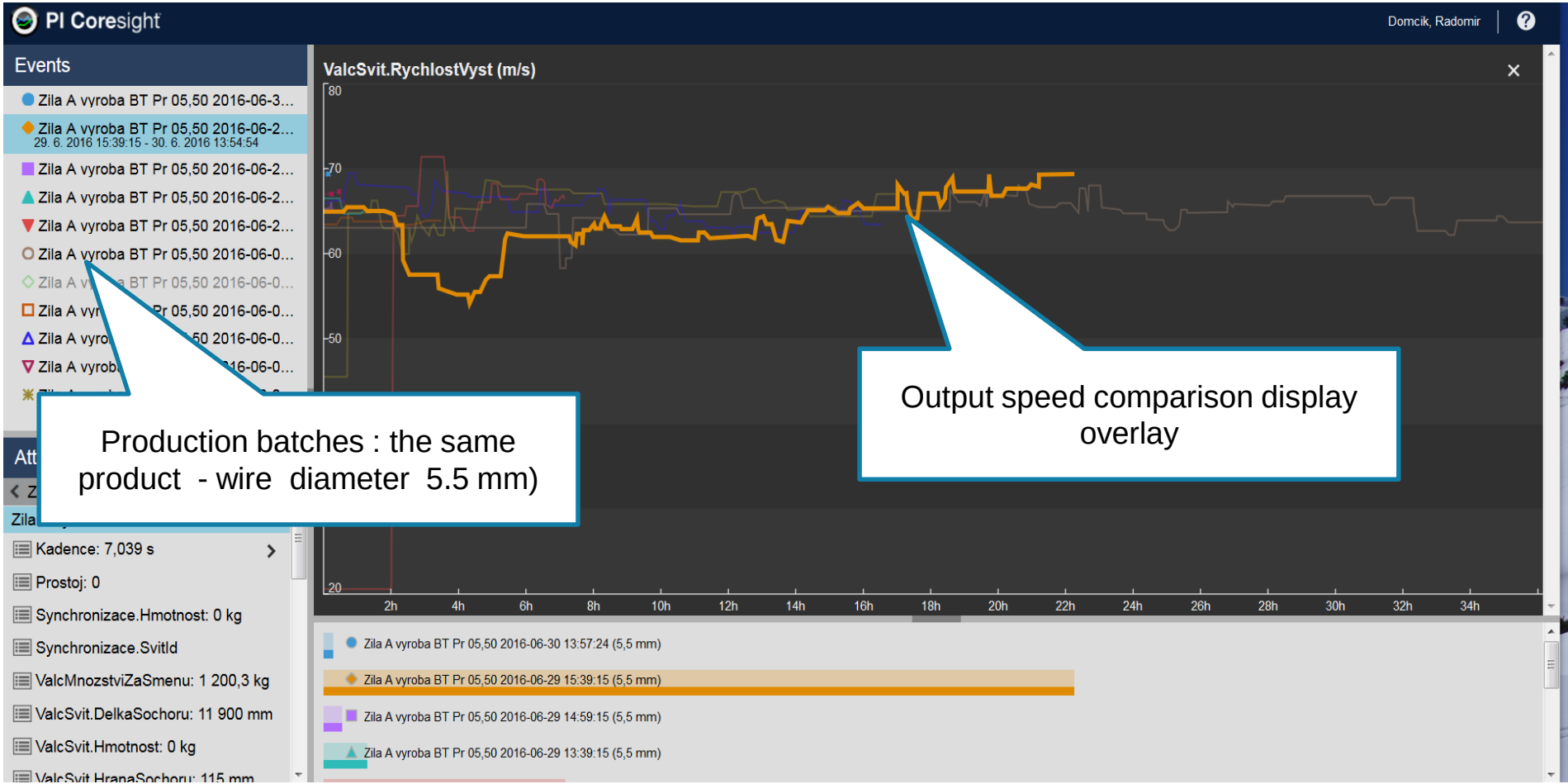

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PI Asset Analytics at WRM: example #3

Challenge: full utilization of production capacity : comparison of operational limits or optimal values and real life values

Analysis / comparison of operational values and control limits of rollling parameters.

Solution: Analysis is based on lookup tables defining operational values and parameters as a function of product definition (wire dimension in this case)

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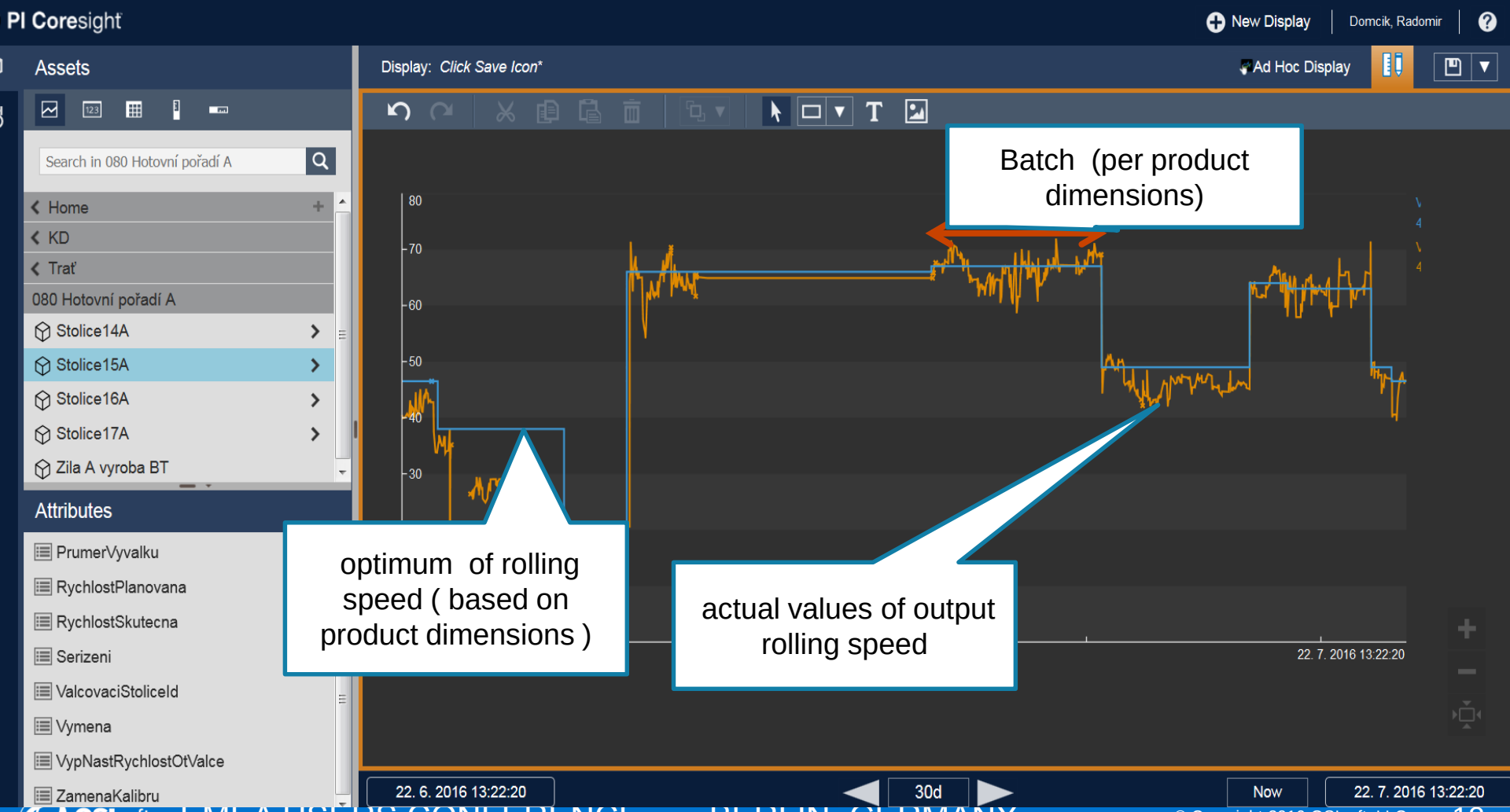

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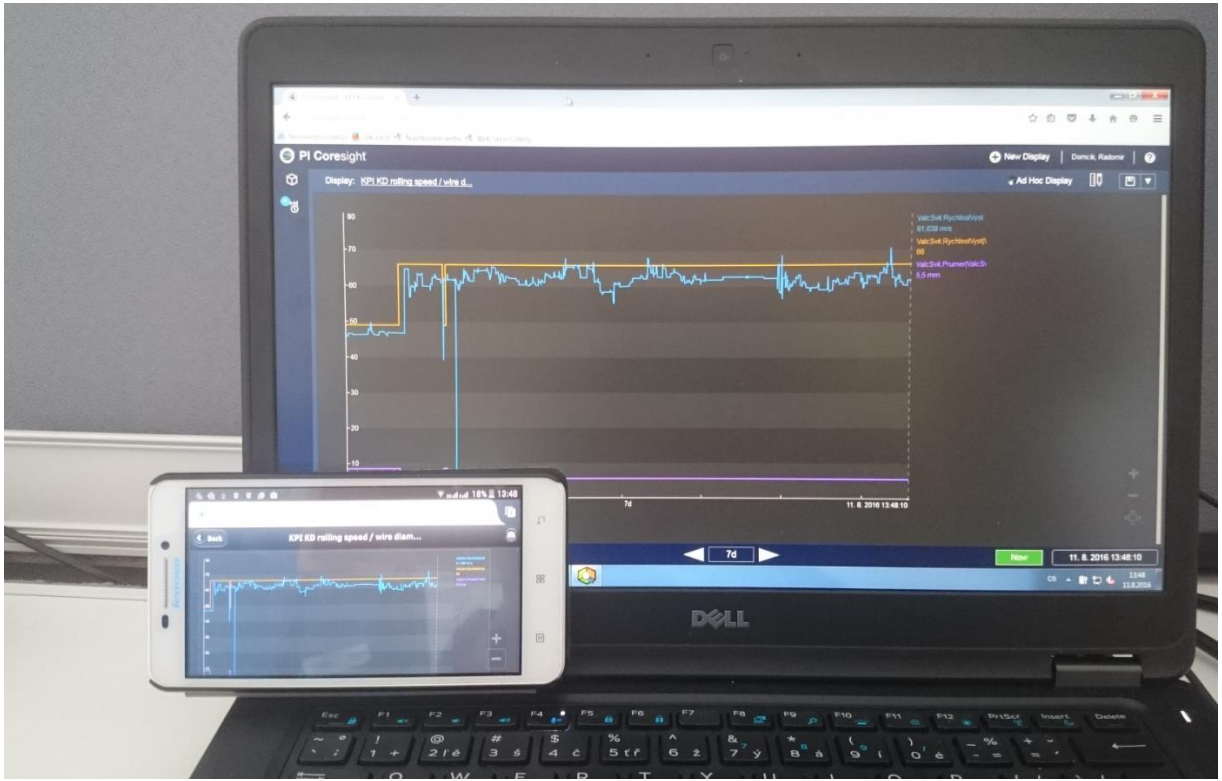
WRM Example #3: One Size Fits All ☺



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Actual Challenges

- Design of extended set of event frames for batch reporting (batch, heat number, shift and day reporting and analysis)
- Multilingual setup (CZ and EN)
- KPI database building (volumes, technological KPI)
- Rollout to last mill HCC
- Following the needs of new material traceability projects (mill, steel plant), notifications
- To be continued ….

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PI System and MES Landscape: Future Plans and Ideas

Based on positive experience at WRM: majority of visualization of time series data for analytic purposes might be done on PI System level…

…which means lower costs for development of MES L2/3.

Reusable component library items help us with setup of element and event frames for next mills…

…which means shorter implementation time and easier maintenance and development.

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Searching for easy accessible data data from mill…

COMPANY and GOAL

ArcelorMittal Ostrava Wire Rod Mill wants to improve production efficiency by eliminating production delays

ArcelorMittal

CHALLENGE

Analyse of production parameters such as rolling speed ratios is crucial for further improvement steps

- Compact visualisation tool not available for this purposes

SOLUTION

Several calculated tags and analysis created

Event Frames generated on PI AF Server

- New screens designed and created by users

RESULTS

Process Engineers have access to all process data available

- Easy to use tools available for all engineers
- Data available for further investigation and analysis

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Danke

Gracias

Merci

Thank You

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