Advancing each generation.

ALCOA

Pot Health Analysis with Smart Manufacturing

Geff Wood – Director GPM IPS Manufacturing & Process Control Systems and Automation

OSISoft User Conference: 3/27/2014

Global leader in lightweight metals engineering and manufacturing

- Celebrating **125 years** in 2013; **inventors** of the original **aluminum process**

- Delivers **value-add products** made of **titanium, nickel and aluminum**, and produces **best-in-class bauxite, alumina and primary** aluminum products

- **200+** locations in **30** countries

- 2013 revenues of **$23.0 billion; 60,000** employees

Downstream - EPS

- Fastening Systems
- Power & Propulsion
- Wheels & Transportation
- Building & Construction
- Forgings & Extrusions

2013
**57% Revenue
80% ATOI
value-add**

Midstream - GRP

- Global packaging
- Aero, transportation and industrial
- China and consumer electronics

Upstream - GPP

- Bauxite mining
- Alumina refining
- Aluminum smelting
- Power

GPP: Combined Alumina and Primary Metals segments, **GRP:** Global Rolled Products, **EPS:** Engineered Products and Solutions
Source: February 24, 2014 BMO conference

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Typical Smelter for Scale

- Aluminum smelter has very large physical footprint
- Legacy has created many dissimilar systems used to generate overall system
- Before PI, each of these systems were information silos, some with limited history
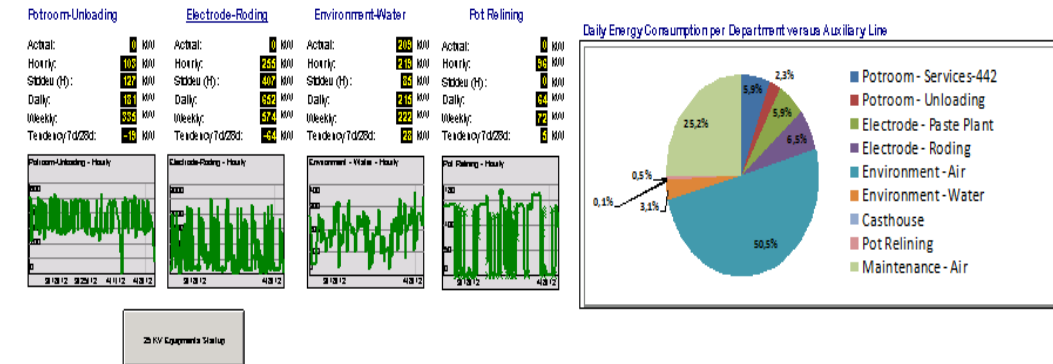- Now over 1M tags per plant in PI
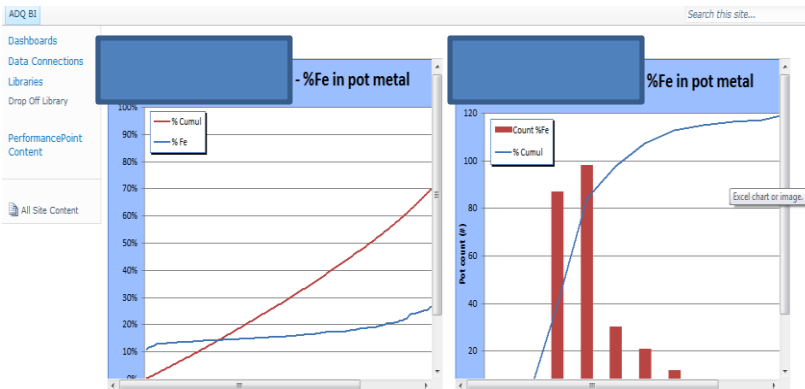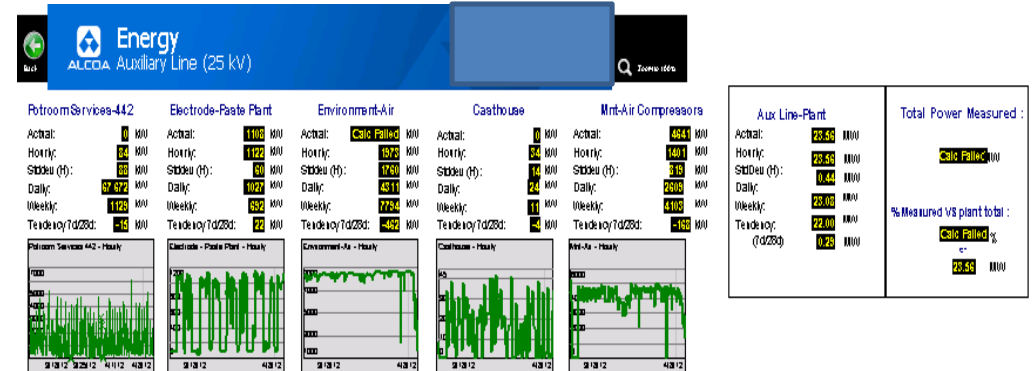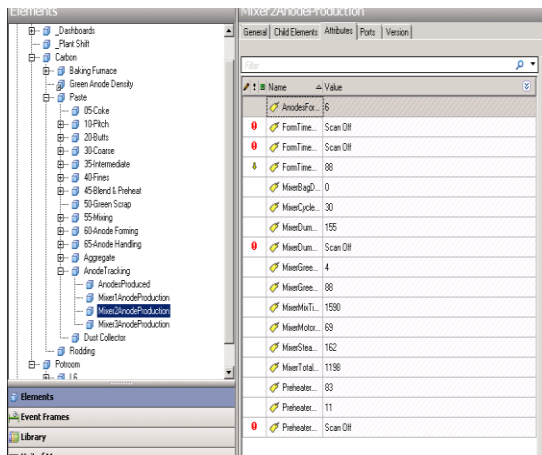- All plants using same 'Data Model' at base

Quick look inside the plant

Recognizing phases of 'SMART Manufacturing'

- Phase I – Data Integration → Visualization of Actionable Information
- Phase II – Advanced Analytics / Modeling / Intelligence
- Phase III – Product & Process Innovation / Market Intimacy

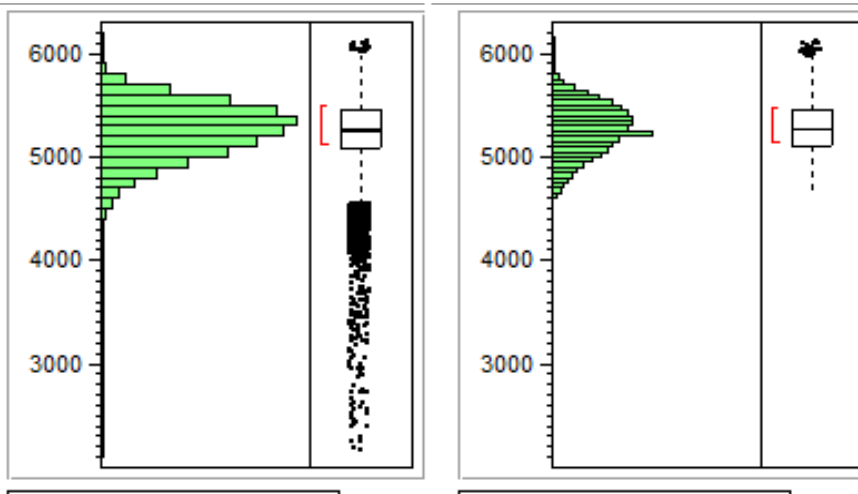# How does Smart Mfg, Adv. Analytics and Big Data Relate?

Progression from Unstructured Data to Smart Manufacturing & Advanced Analytics

Haresh Malkani, John Butler
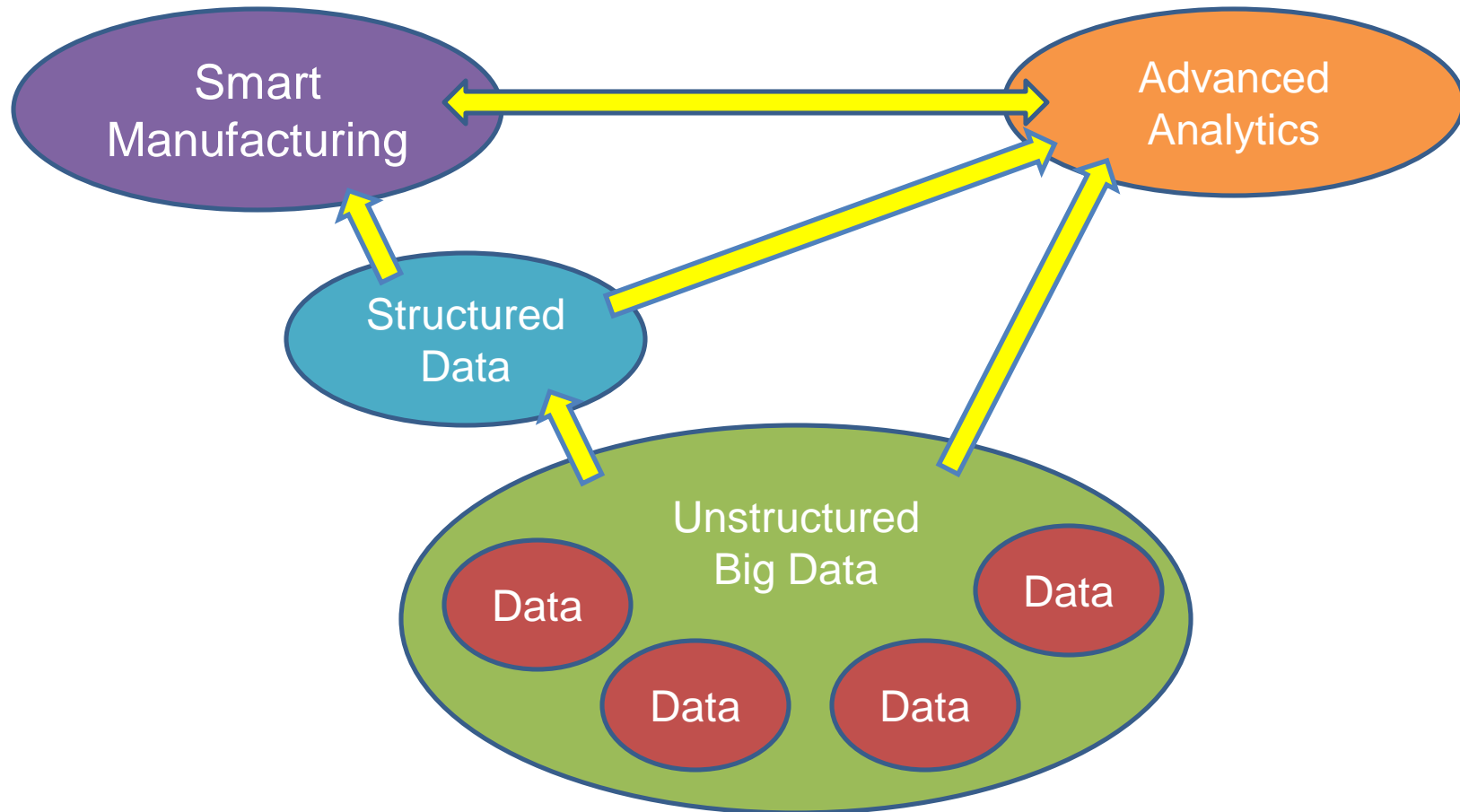
Develop/Deploy Solution with 'Smart' to Minimize Pot Variability

Distributions

- Description: Process of adjusting pot parameters and plant reactions to pots that are running outside the normal pot operation and move outliers to normal.

- Benefits
  - More Stable Operations
  - Better Current and Energy Efficiency
  - Reduction of exception Pots
- Technical Challenges
  - Find Root Causes
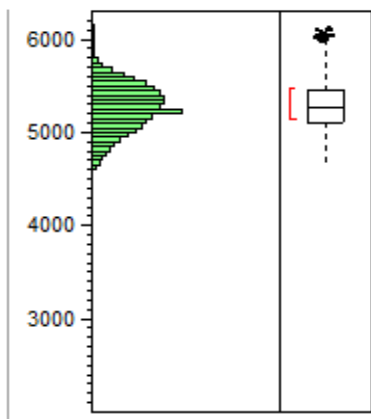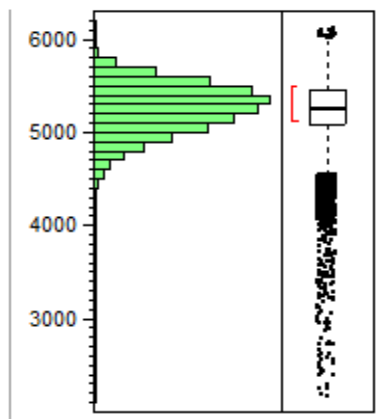 - Consistently Fix
- Status:
  - Business Case Analysis complete
  - Pilot for Visualization in Progress
  - Full Project plan being developed
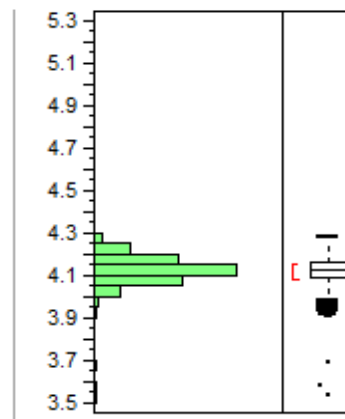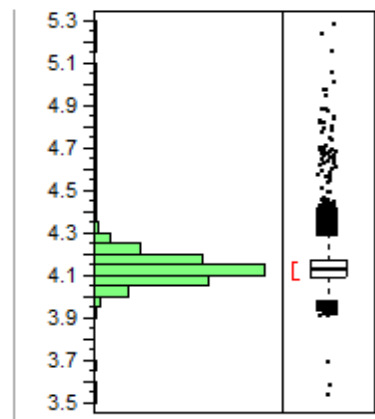- Applicability: All plants but Business Case is variable
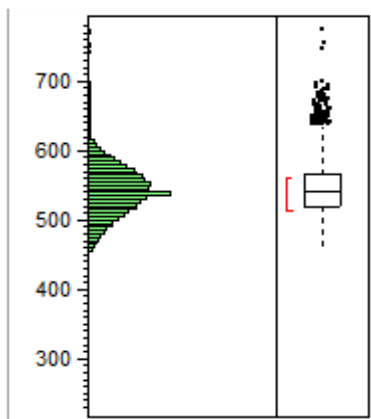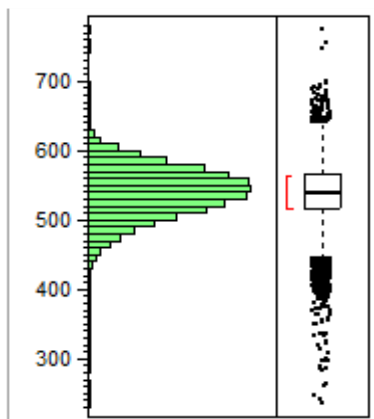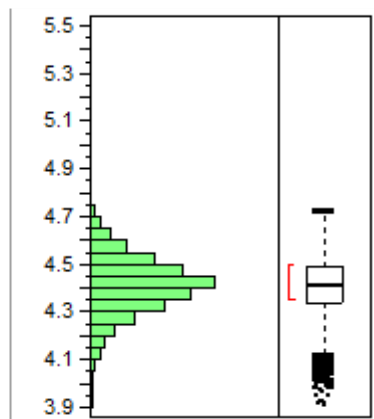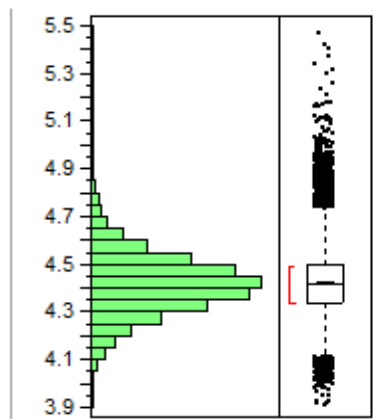
Typical Plant Distributions

# Solution outline to reduce pot to pot variability

The Fix

- Use Smart Manufacturing and Advanced Analytics to provide
  - Better Manual Intervention – **Codify the Best Practices**
    - Monitor / Alarm / Report exception pots
    - Monitor / Alarm / Report manual modifiers
    - Online PMS for above as well as:
      - Set on time and correctly
      - Tap on time and correctly
      - Cover on time and correctly
      - Applies to all standardized work
  - Better Operational Equipment Effectiveness (OEE)
    - Operations and Maintenance visibility of failed equipment
    - Monitor / Alarm / Report Waiting Time (Crucibles, Cranes…)
    - Online Visible Schedule and Performance to Schedule of Daily Work

  - Better Control
    - Use Visible Statistics to set Resistance and Feed targets
    - Improve Noise Control and use visible statistics to tune
    - Make Real-Time Control 'Big Data' aware

Actionable Data at the Per/Pot Level

- Determine which pots are outside "normal operations"
- Determine which pots will be outside "normal operations" if not changed
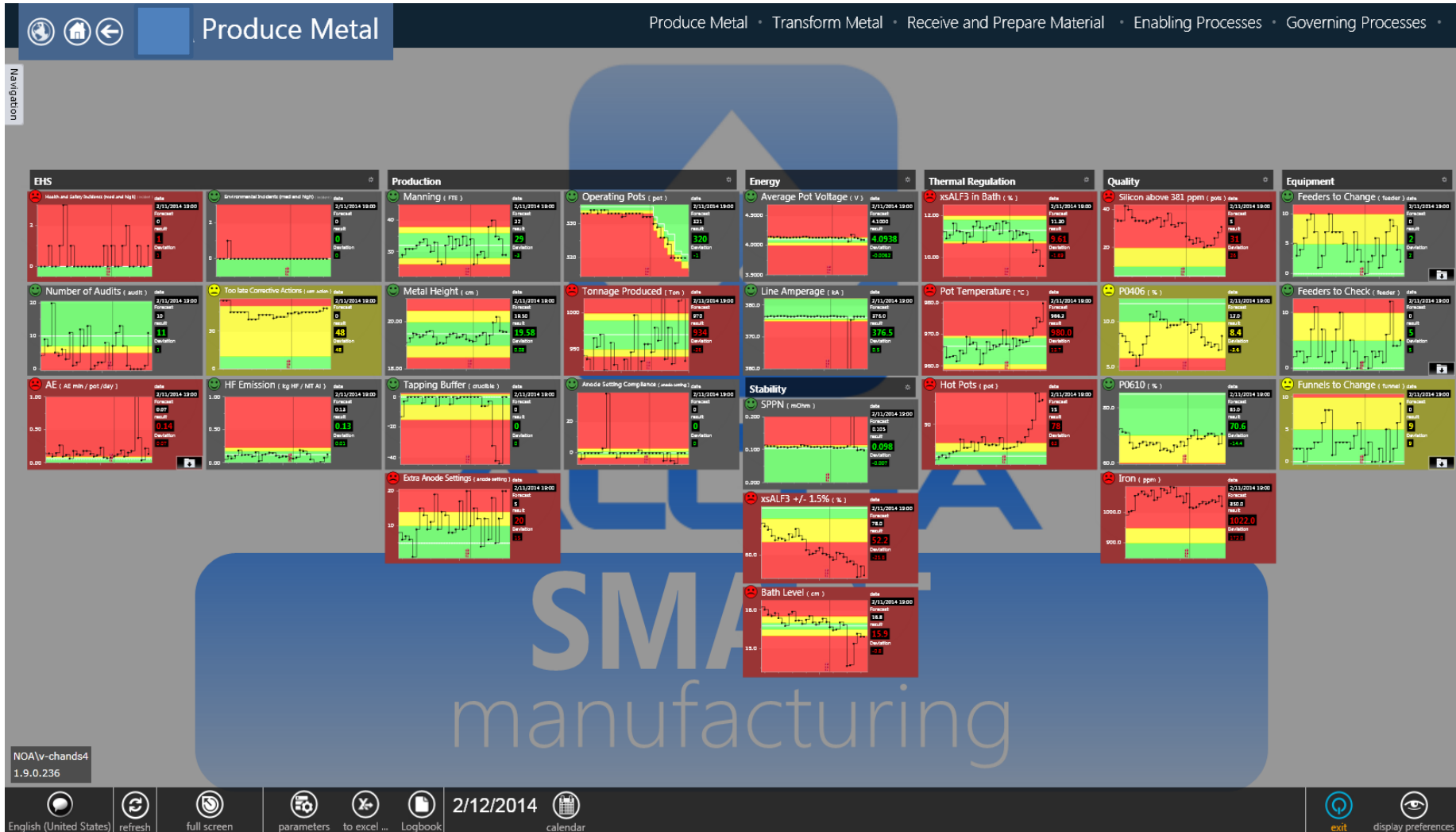- Recommend mitigating actions to return pots to Normal Operation

Roll Up Data to Various Levels of Business

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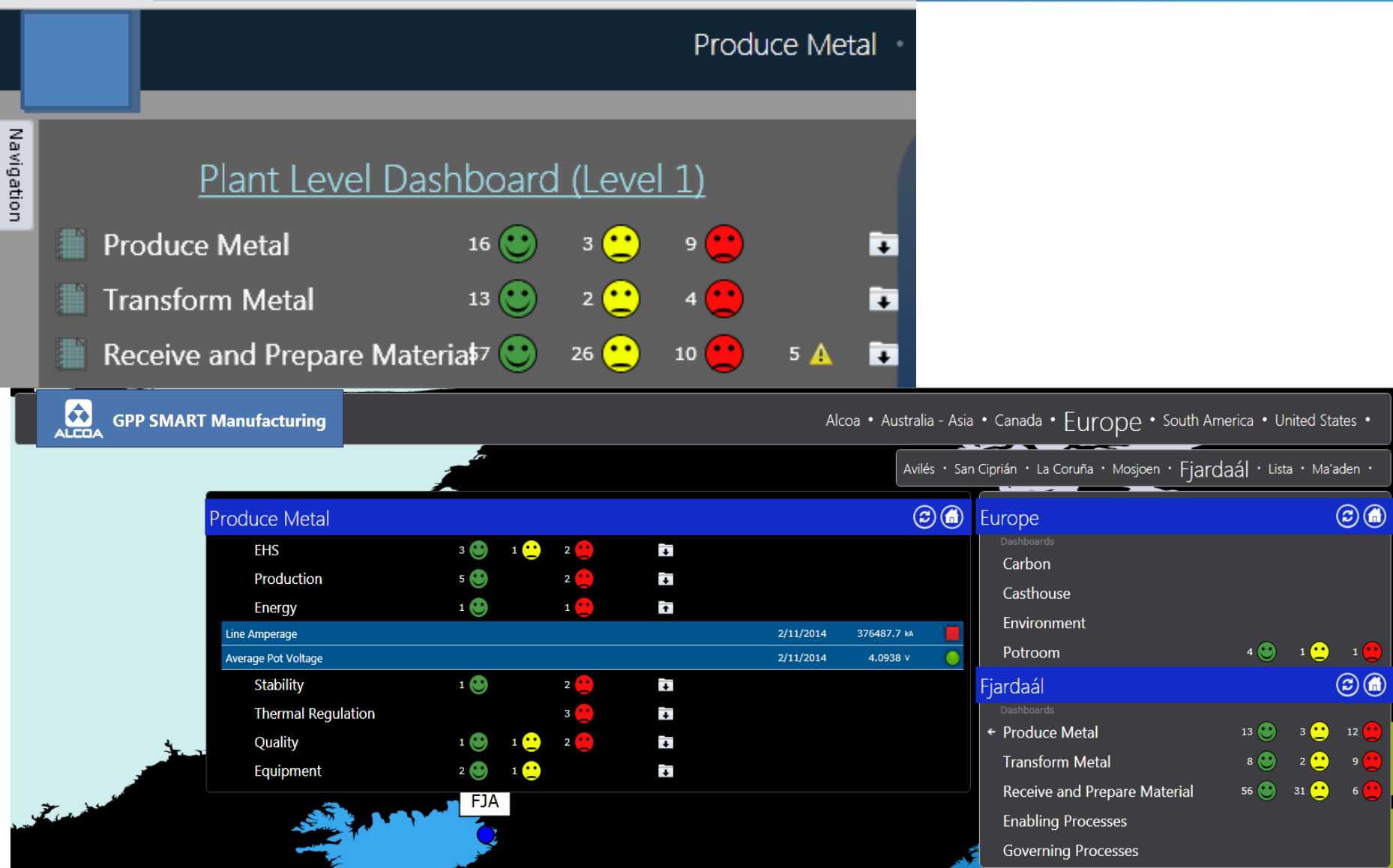
OR… Drill down to Individual KPI Performance

Drill Downs same format for all plants enforcing Alcoa Business Systems standards

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