The SMART Manufacturing Business Case

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ALCOA

Session Agenda

- Alcoa at a Glance
- Establishing the SMART Vision
- Building the SMART Business Case
- Adopting SMART as part of the Business Operating System
- Where Are We Today? – SMART Manufacturing in Alcoa
- Questions?

Alcoa at a Glance

Alcoa at a Glance

- Founded in 1888
- 200+ locations
- 31 countries
- $25.0 billion revenue in 2011
- 61,000 employees
- 10 times safer workplace than US average
- Award-winning sustainability leadership
- 120 years of patents, including the original aluminum process

Global Primary Products

Bauxite: 51 mmt | **Alumina:** 18 mmt | **Aluminum:** 4.2 mmt | **Energy:** 3.4 GW

Mining

#1 in Bauxite

Lowest cost producer of bauxite in the world with latest mine in Amazon jungle.

Smelting

Global Leader in smelting

Most efficient producer of smelter and chemical grade aluminum at 22 smelters worldwide

Refining

#1 in Alumina

World's leading producer of alumina, with global refinery capacity of 18 million metric tons per year, nearly a third of the international market.

Energy

2/3 of energy assets are renewable based energy

Dedicated to securing energy assets for our facilities by controlling more than 3 GW of generating capacity

Establishing the SMART Vision

Establishing the SMART Vision
Why?

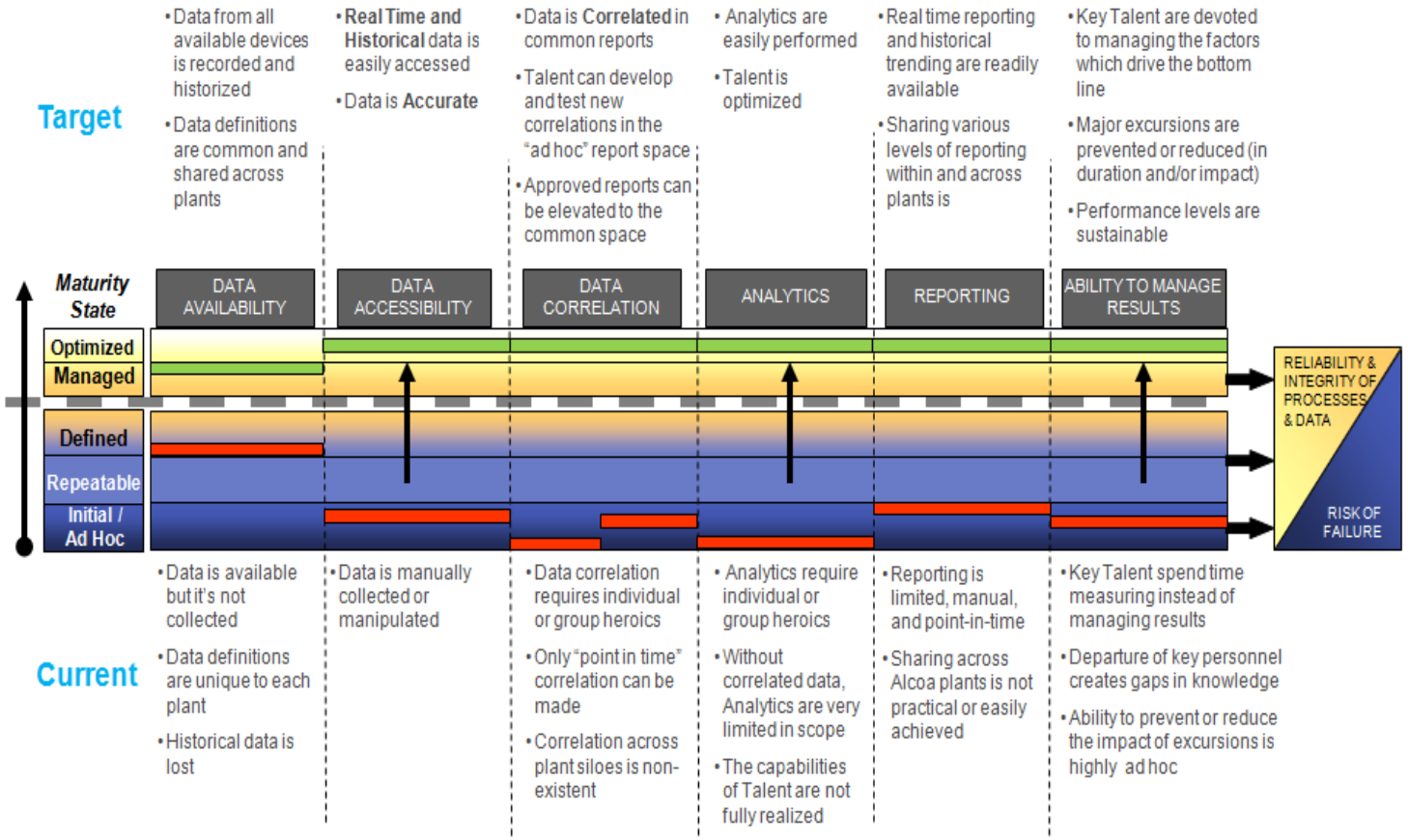
- Significant challenges in today's manufacturing environment
  - ✓ Sustainable Production
  - ✓ Agile Supply Chain
  - ✓ Plant / Enterprise Optimization
- Transition is needed to migrate from traditional strength in manufacturing to *manufacturing excellence* in the 21st Century

- Information is an expectation for continued success
  - ✓ SMART Grid
  - ✓ SMART Phones
  - ✓ SMART Applications
- Overcoming challenges means understanding the contributing factors

Let's review some information challenges in the current condition…

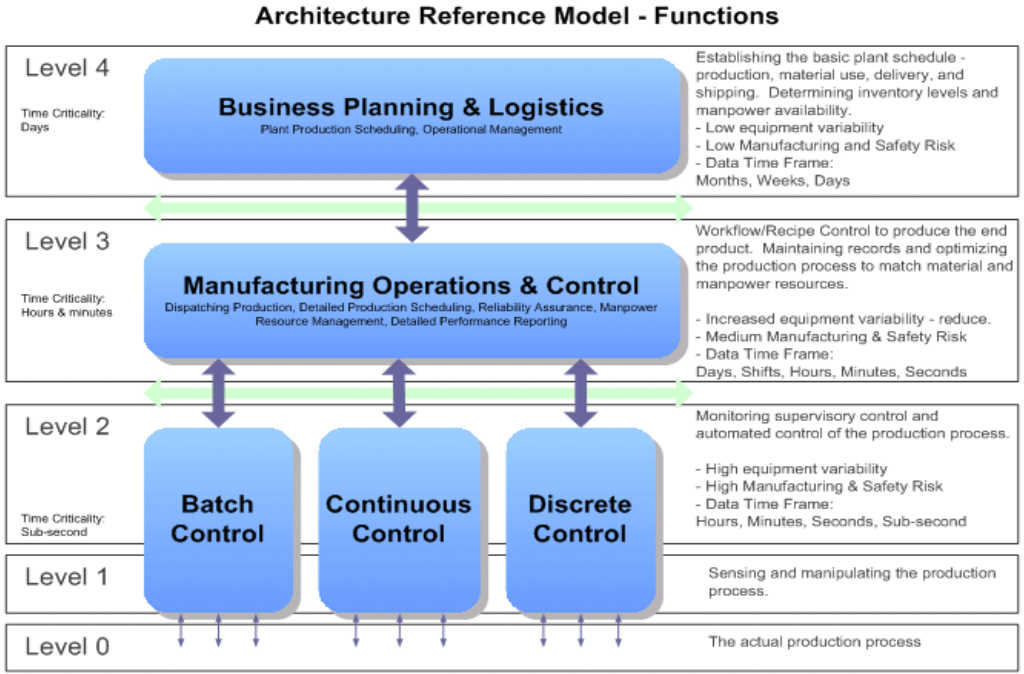
Establishing the SMART Vision

The Data Capability and Maturity Model



Establishing the SMART Vision
Contributing Factors in the Current Condition

1. Complexity of Information Sources



External Sources:
Web Services, Partners, Public Exchanges, etc.

Application / DB Examples:
Oracle, SAP, SQL Server, Proprietary Legacy, Access, Excel, etc.

Visual / Analytics Examples:
OSIsoft, Honeywell, SAS, etc.

HMI / SCADA Examples:
Factory Talk, Citect, Wonderware, Intellution, Scneider Electric, etc.

PLC / DCS Examples:
Rockwell Automation, Siemens, Honeywell, Square D, Emerson, GE Fanuc, etc.

Instrument Examples:
Yokogawa, Rosemont, ABB, etc.

Establishing the SMART Vision
Contributing Factors in the Current Condition

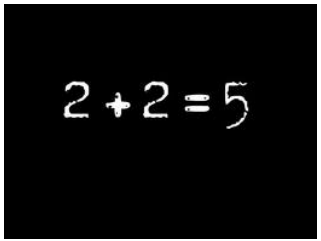
2. Manual Data Entry and Publication of Metrics

Human resources are being used for data collection and aggregation instead of analysis

21st Century technology solutions are not being leveraged to simplify shop floor operations and management

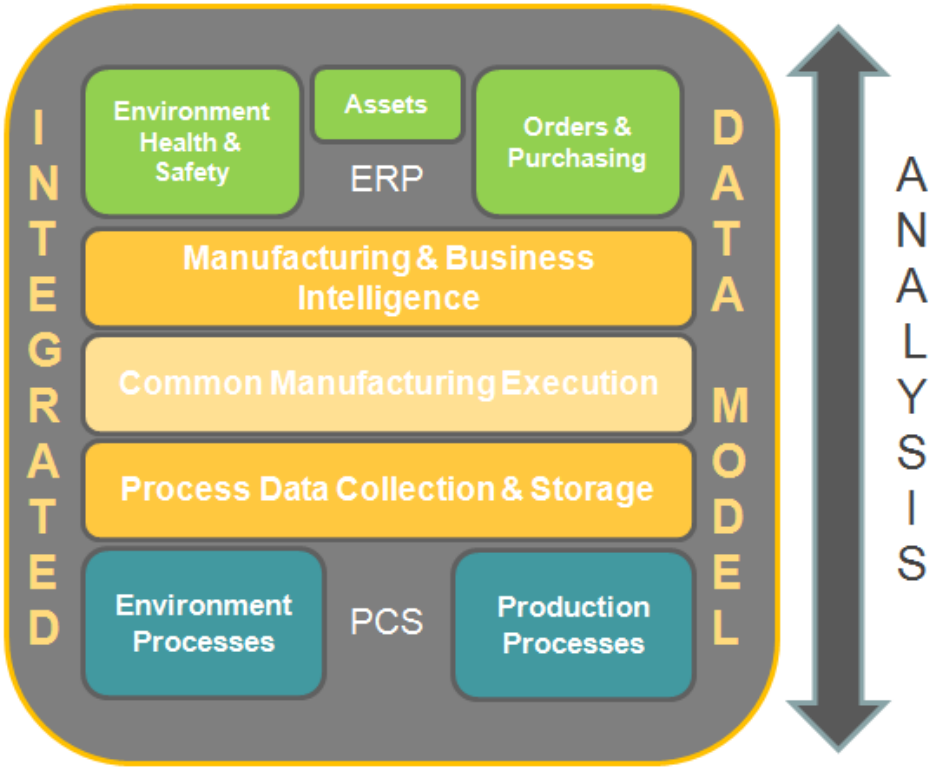
3. Actual Enterprise Performance is sometimes overshadowed…

- By site specific versions of the truth



Establishing the SMART Vision
The SMART Manufacturing Architecture at Alcoa

Transactions
Business



Action
Operation

Definition:
The integration of data with process expertise to enable proactive and intelligent manufacturing decisions in dynamic environments

Key Components:
1. Common Applications for Manufacturing Execution (MES)
2. REAL TIME and HISTORICAL data capabilities
3. Network / Data integration from shop floor to the enterprise
4. Comprehensive analysis toolset

The SMART Architecture Ties Together Information from All Sources within a Plant and Across the Enterprise

Building the SMART Business Case

Building the SMART Business Case – Overview ‘Achieving Value from the Vision’

Seven (7) Steps for Building the SMART Enterprise Business Case

1. Select a Pilot Location within the Business – CoE Concept
2. Engage plant resources in Value Brainstorming and prioritization activities
3. Introduce plant leadership to prioritized opportunities and gain support to proceed to Pilot Phase
4. Develop detailed use cases for identified opportunities focusing on both process value financial benefit; gain Process and Finance support
5. Verify use cases with plant leadership; gain site support for the SMART manufacturing concept
6. Estimate Value Potential of an enterprise-wide deployment
7. Present enterprise-wide Value Potential; gain business support for SMART Manufacturing Concept

Building the SMART Business Case Example – Value Brainstorming and Prioritization

Support the Process by **Engaging People**

- ✓ Onboard resources in the SMART Manufacturing vision
- ✓ Dedicate 'Brainstorming' sessions within each functional area
- ✓ Develop rough estimates of value, cost and ease of deployment for each identified opportunity
- ✓ Prioritize opportunities for initial Pilot focus

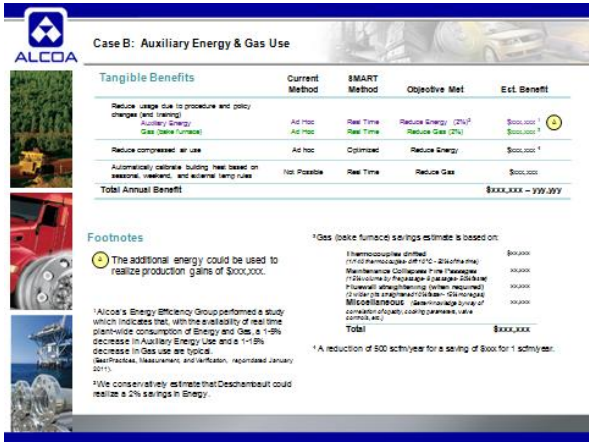
Massena West Smart Mfg Brainstorming Ideas

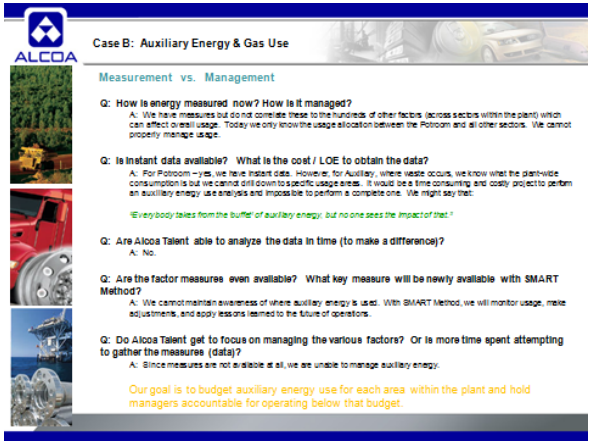
Dept	Opportunity Description	Priority	Smart NOW	Data For	Potential Svgs	DI #	SPA
Energy	Overall Power data collection & Management systems 1) Improve Auxilliary Power Management: manage turning on/off equipment (Eg. furnaces) with peak hours to reduce power & gas bills (Eg. Scheduling OT in Rodding for pours) 2) Metering major power usage equipment to gain real time usage that effects power (Kath to develop list of existing metered equipment & equipment amperage Eg. fans)	H	Y-Q2		$xxx,xxx		B. Murphy
Energy	Overall Natural Gas Data Collection & Management system to improve forecasting process (begin with making data available by area/dept to everyone/decision makers)	H	Y-Q2		$xxx,xxx		B. Welsch
Environment	East FTC boreal Air monitoring (ADQ example), provide ability to react in FTC	H	Y-Q2		$xxx,xxx		
Environment	Investigate solution for all remote outfall monitoring to improve collection and review of data (include WWT, Chem lab); process data first priority & flow data is second priority (this solution enables WWT checksheets to be eliminated and data go directly into a system to develop trends/dashboards)	H			$xxx,xxx		D. Chin
Environment	East & West Parametric data access with Smart Dashboard (data resides in PLC-alumina feed, air flow, etc)	H	Y-Q2		$xxx,xxx		J. Engstrom
Maint/Rel'y	Compressed Air Data collection & management system (generation distribution, leaks, equipment on/off, loaded/unloaded, dew point, flow meters)	H			$xxx,xxx		R. O'Connell
Maint/Rel'y	Overall Asset Hierarchy system (one stop shop),asset health, failure modes, BOMs, WO's data, Top 5, etc.	H			$xxx,xxx		Mike Tremper
Maint/Rel'y	Real-time PdM analysis data collection (vibration, IR, etc.)	H			$xxx,xxx		Larry Fraser

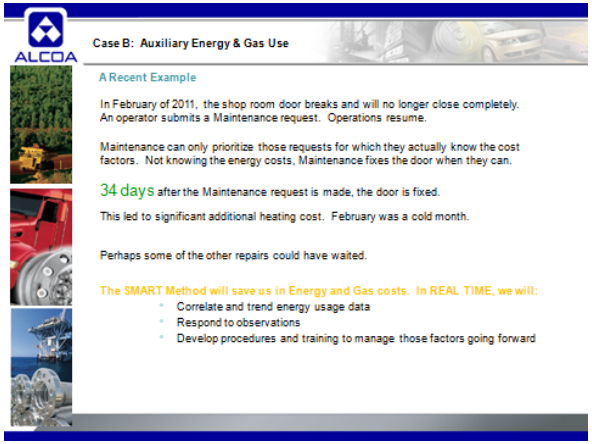
Building the SMART Business Case Example – Use Case with Process Detail

Initial Use Case Development is focused in Process Detail
Onboard Resources in the SMART Manufacturing Concept

- ✓ Development is completed with Area-Assigned Process Engineers
- ✓ General Approach is to focus on Production / Process Improvement



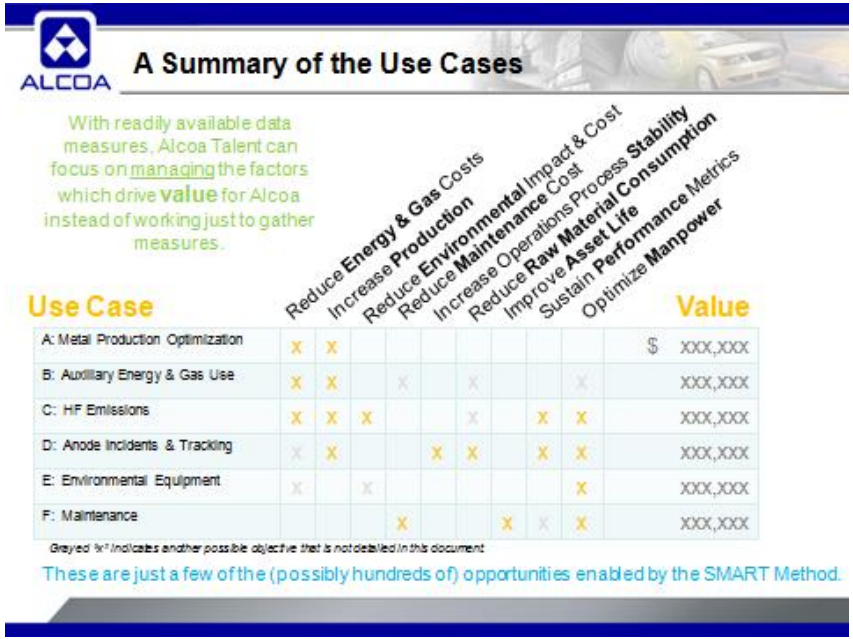




Building the SMART Business Case Example – Use Cases with Finance Detail

Later Efforts are Focused on Re-Packaging for Finance Onboarding

- ✓ Aligned with Enterprise Level Objectives (ELOs)
- ✓ General Approach is on Value / Savings to the Bottom Line ($$$)



Building the SMART Business Case
Risks in Proceeding without the Vision

- Partial Solution / Partial Deployment
  - ✓ Business Decides to Build Solution to Only Meet Specific Identified Opportunities
  - ✓ Risk: SMART Architecture is Not Complete, Limits Future Value Potential
- Technical Solution is Deployed with Limited Resource Engagement
  - ✓ Business Decision to Limit Resource Involvement or Inadequate Onboarding / Buy-In
  - ✓ Risk: Value Realization Does Not Meet Business Expectations
  - ✓ Risk: Solutions are Not Leveraged Across Enterprise

- **Desired Outcome: SMART is adopted as part of the business operating system to continuously deliver value**

Adopting SMART as Part of the Business Operating System

Adopting SMART as Part of the Business Operating System Introduction…

- An Enterprise Operating System delivers competitive advantage through:
  - ✓ Improved People Engagement
  - ✓ Adoption of Best Practices
  - ✓ Common Process Measurement (KPI)
  - ✓ Focus on Continuous Improvement

- The Alcoa Operating System is ABS (Alcoa Business System)
- SMART Manufacturing can be a key enabler for your operating system

Adopting SMART as Part of the Business Operating System People Engagement and Best Practice

With common data, talent across the globe will engage in **collective innovation** and the pursuit and sharing of best practices.

The SMART architecture also allows for the rapid deployment of 'Best Practices' through leverage of a common computing infrastructure

Who Derives the Benefit:

-***Operators*** leverage critical information when and where it is needed

-***Process Engineers*** develop ad-hoc analysis and 'Best Practice' process visualization standards to improve location production management and performance

-***Supervisors and Area Managers*** review real time KPI and have drill down capability for root cause analysis and problem resolution

-***TICoE Resources*** leverage 'Best Practices' visualization standards across the business for 'Power of Comparison', root cause analysis and improved performance

-***Business Leadership*** is ensured of timely, accurate and consistent information for evaluating performance and driving decisions

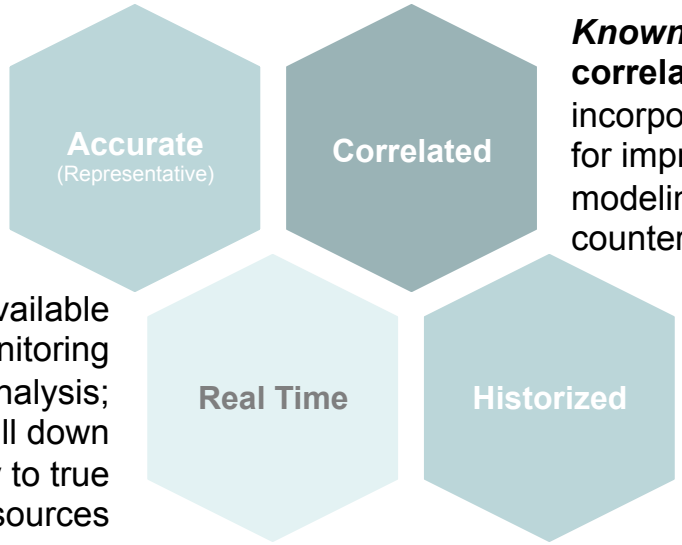
SMART:

- Will reduce the impact of attrition
- Will reduce ramp-up time for new talent
- Will increase people efficiency
- Will arm people with data
- Will allow users to create and share their own tools

Adopting SMART as Part of the Business Operating System Process Measurement (KPI) – Site Perspective

In order to focus our best talent on ***management*** of the plant, our measurement data must meet the following criteria:

All measures convey actual physical conditions across the plant



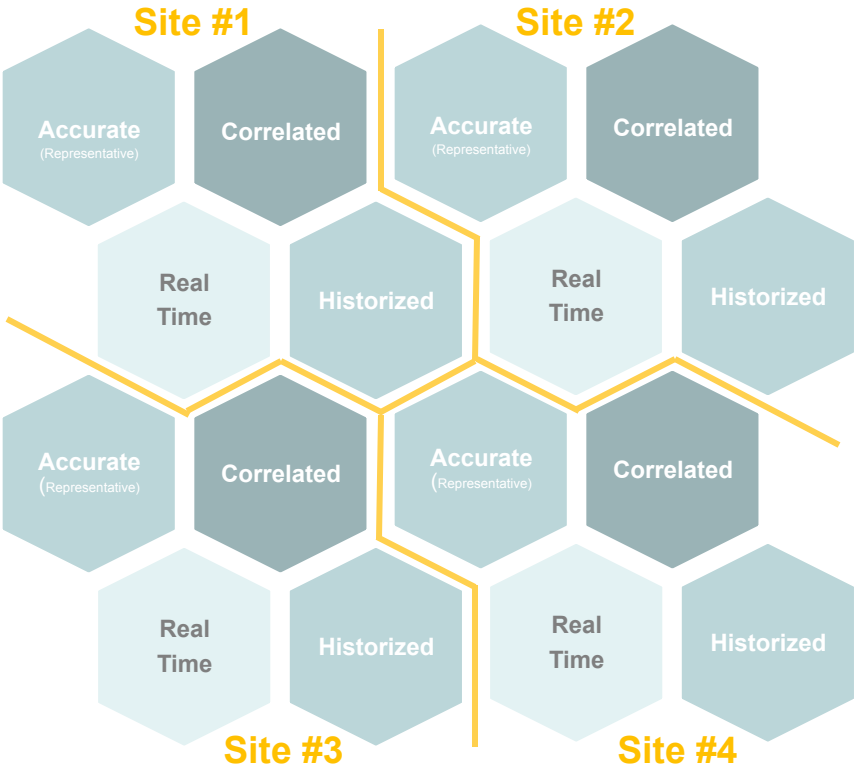
***Known and newly discovered* correlations** between measures can be incorporated into reporting logic to allow for improved problem identification, modeling, and innovation for resolution or countermeasures

Measures are available for constant monitoring and immediate analysis; users can drill down from summary to true sources

Measures are stored to enable cycle time analysis, trending and root cause analysis

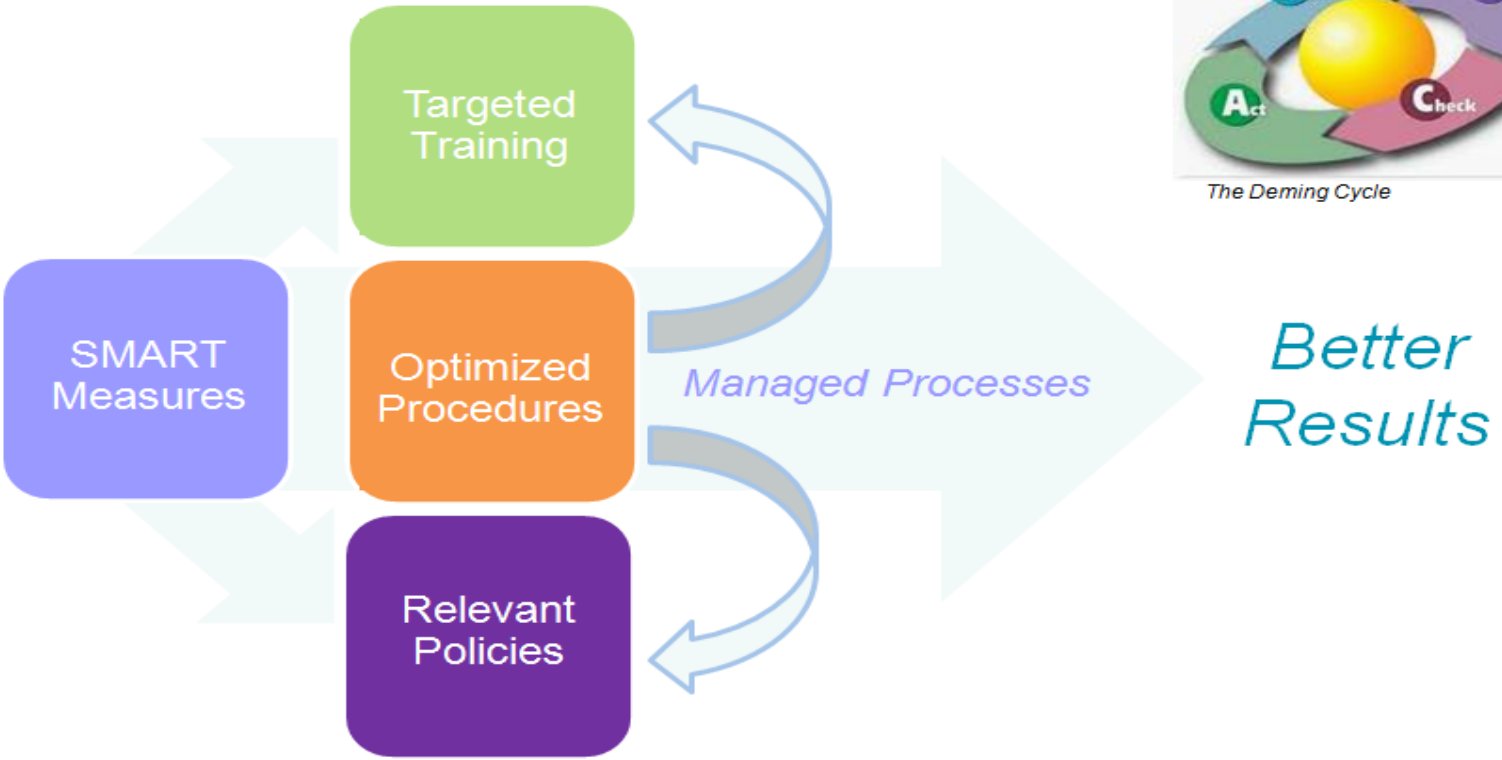
Adopting SMART as Part of the Business Operating System Process Measurement (KPI) – Enterprise Perspective

- ✓ Sharing a common language with other plants will allow us to truly realize Enterprise Advantage.
- ✓ A discovery in one plant can result in procedure, training, and policy changes in the other plants.
- ✓ SMART measures will become ***common*** measures. They will allow us to share best practices from one plant to another.
- ✓ Conventional manual data entry / transfers will be reduced.



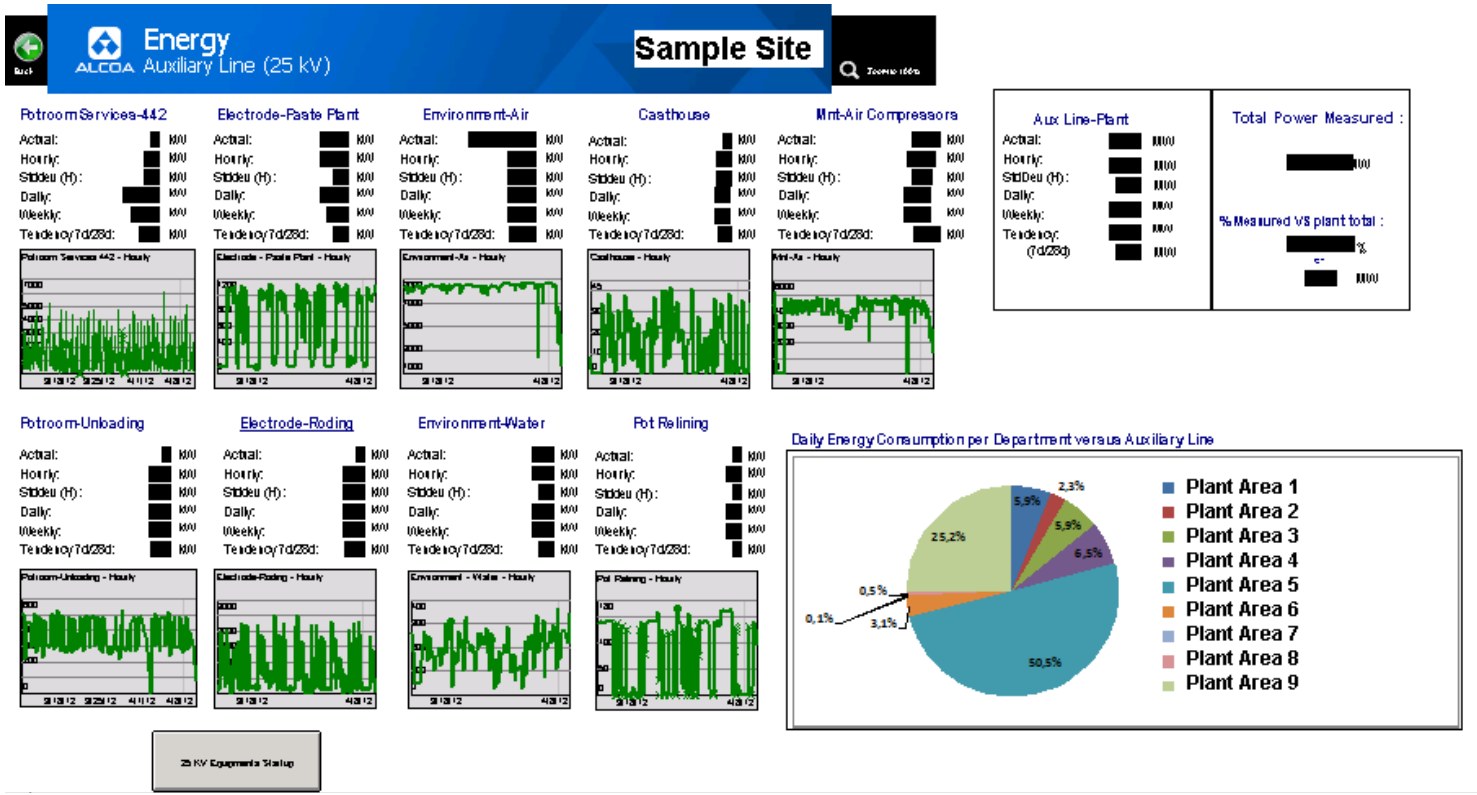
Adopting SMART as Part of the Business Operating System Production Management for Continuous Improvement

The Deming Cycle

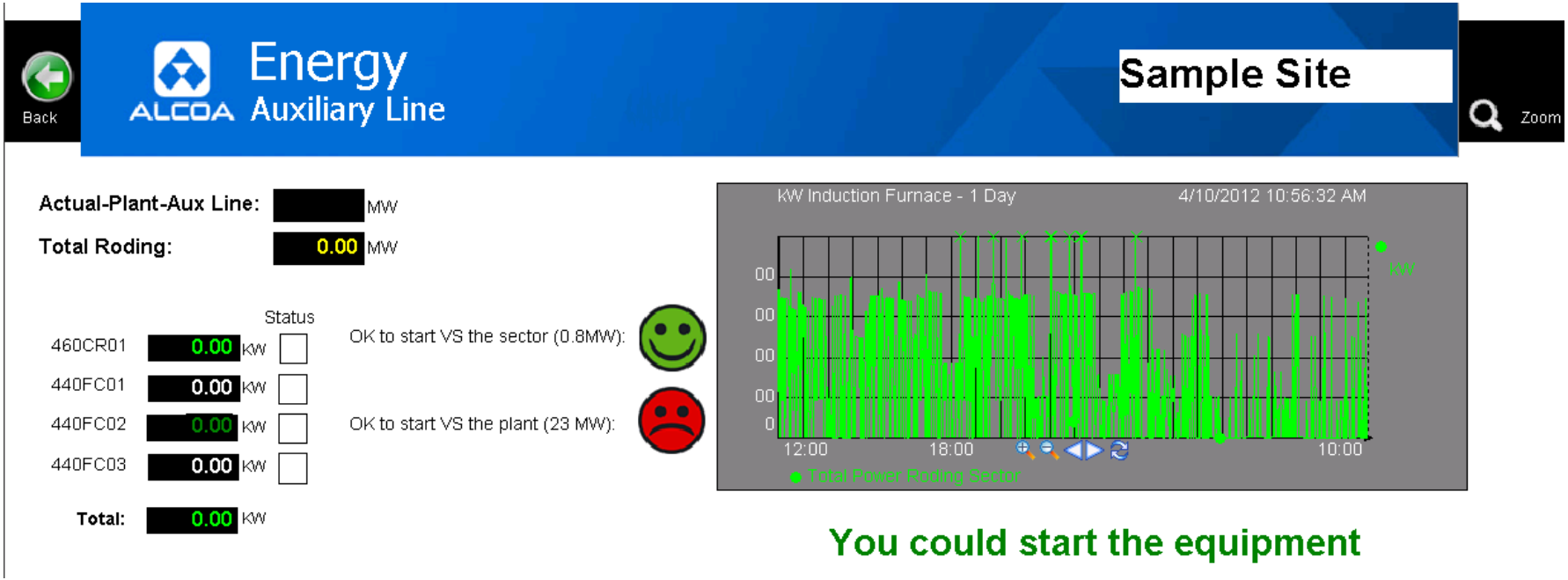


Adopting SMART as Part of the Business Operating System Examples – Process Measurement / Production Management

Adopting SMART as Part of the Business Operating System Examples – Best Practice



Adopting SMART as Part of the Business Operating System Examples – People Engagement (Operator Development)



Global Primary Metals Where Are We Today?

ALCOA

Alcoa – Where Are We Today?

Signed OSIsoft EA to support the SMART Manufacturing architecture – December 2011

Sites targeted for SMART Deployment in 2012-2013

SMART Deployment Completed at One (1) Location – Pilot Site

SMART Deployment In-Progress at Three (3) Additional Sites

Project Success Pending – Based on documented "Delivery of Value" to the Business from 2012-2014

at the 2013 OSIsoft UC…

Questions?

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THANK YOU

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