

Smart Performance Management, Improvement and Reinvention

Presented by **Osvaldo A. Bascur, Metals Industry Principal, OSIsoft, LLC.**

Summary

- Large Metallurgical Complexes are substantial users of energy, water and assets. To improve the effectiveness of energy and assets the quality of the data and events becomes paramount for real time operational management. A lack of resources at the local operations and at the enterprise makes it impossible to process the sea of information and many projects have failed. As such, a novel approach for implementation of continuous improvements at the local level and innovations at the strategic level was implemented at all operating plants at Anglo American Platinum. Sixteen concentrators, three smelters and two refineries process systems were integrated to scale the information for manufacturing services at the local and enterprise level. The new capability of an enterprise real time monitoring and diagnosis software infrastructure was available to implement many business strategies in tandem. Mineral and metallurgical processing knowledge is used to simplify the implementation of the data model. As such, asset monitoring, energy, production and process control management was implemented in an integrated approach reusing the same data but with different context and time horizons to have a standard methodology for local root cause analysis. This paper will highlight a sustainability management approach to change and empower the local and strategic team to collaborate using a new approach for adaptive reporting, condition based event management and notifications. The results based on the integrated and collaborative team efforts will be presented. OSIsoft PI System was installed and configured to achieve a targeted reduction in energy consumption of 15% by 2015.



Current Forcing Factors



Early work and challenges



What is being done?



Competence Centers



Further work: Cloud

Challenges for Metals and Mining



Sustainable Process Productivity

Volatile Global commodity prices

Lower ore grades means more rock has to be mined to produce the same amount of metal

Lack of information to understand the current process productivity

Loss of knowledge from aging workforce as they retire

Production optimization (better use of resources, and maximizing returns)



Energy and Water Management

More energy consumption for blasting, mobile equipment, crushing and grinding

Water treatment and reuse

Data silos and lack of integration throughout the value chain (mine to mill)

Higher cost of energy and raw materials

ISO 50001



Asset Performance and Reliability

Extending asset life of critical assets

Unscheduled equipment downtime

Improve equipment uptime and availability

Lack of insight into asset performance and benchmarking



Environmental, Health and Safety Compliance

Lack of automation and communication

Monitoring venting operations

Monitoring underground and above ground equipment.

Disparate sources of information for compliance reporting and audits

Compliance risk management for regulations and standards like ISO 140001 and ISO 9001

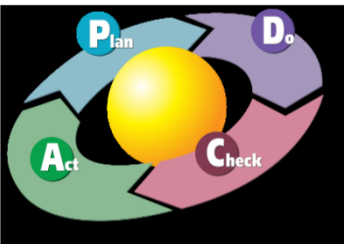


Quality Assurance

Lack of real-time notifications for product quality deviation

Track of product genealogy

Compliance with regulations such as ISO 17025



- What is Sustainability?
- Process Manufacturing Excellence – The Heart of a Sustainability Program



Sustainable Mining

- Sustainability of the Company
 - Production and Ore Grade Control (revenue)
 - Work Index Control (energy use)
 - Operating Cost Control (costs)
- Sustainability of the Environment
 - Monitoring and Control of Emissions
 - Monitoring and Control of Contaminants
 - Prevention/Mitigation of Emissions
- Sustainability of Local Communities
 - Employment Opportunities
 - Occupational and Community Health and Safety
 - Cultural Issues (First Nations)

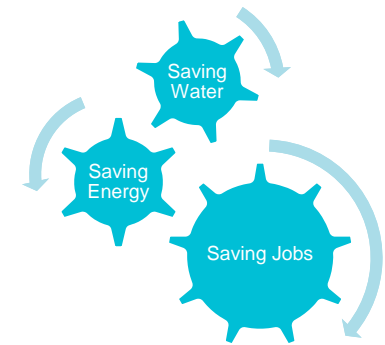
OSIsoft Vision on Sustainability

- Sustainability
 - ... is NOT a project
 - ... is NOT a product
 - ... is NOT achieved (in the long term) with disjointed efforts



Sustainability:

1. Is an opportunity for innovation
2. Requires data (timely & accurate) plus a common decision making infrastructure
3. Is best approached as a continuous improvement process (will emphasize this practice!!!!)
4. Just good business for today and tomorrow !



What Could Manufacturers Achieve with Better 'Information'?



- Financial Value (EBITDA / Working Capital)
 - Process Productivity / OEE
 - Quality Tracking / Product Genealogy
 - Asset Management / Condition Based Monitoring
 - Energy / Raw Material Management



- Improved Environmental, Health and Safety Performance
- Reduced / Eliminated Excursions – Maintain Expected Performance through Early Problem Detection and Recovery



PI System: An Infrastructure for Sustainability

- OSIsoft (in brief):
 - helping industrial, utility & public sector customers better manage resources, assets, and costs for 30 years
 - addressing Energy Efficiency, Energy Demand, Water Usage, Green House Gas Accounting and Waste Minimization for its customers.
- Observations:
 1. Opportunities for impact exist both on the Demand side and on the Supply side for water & for energy. These are even GREATER at the nexus
 2. Organizations that tackle sustainability driving innovation and capitalizing on a culture of continuous improvement can simultaneously and pre-emptively address profitability, compliance, and public mandate.
 3. Innovation & Continuous Improvement each require an Infrastructure; Data-driven decision-making is the key
 4. Collaboration and payback require a policy environment that support, encourage and reward sharing information & gains across “borders”
 5. Its about Green (Energy, Water, GHG) and it’s about GREEN (\$\$) !

Overall Integrated Industrial Effectiveness

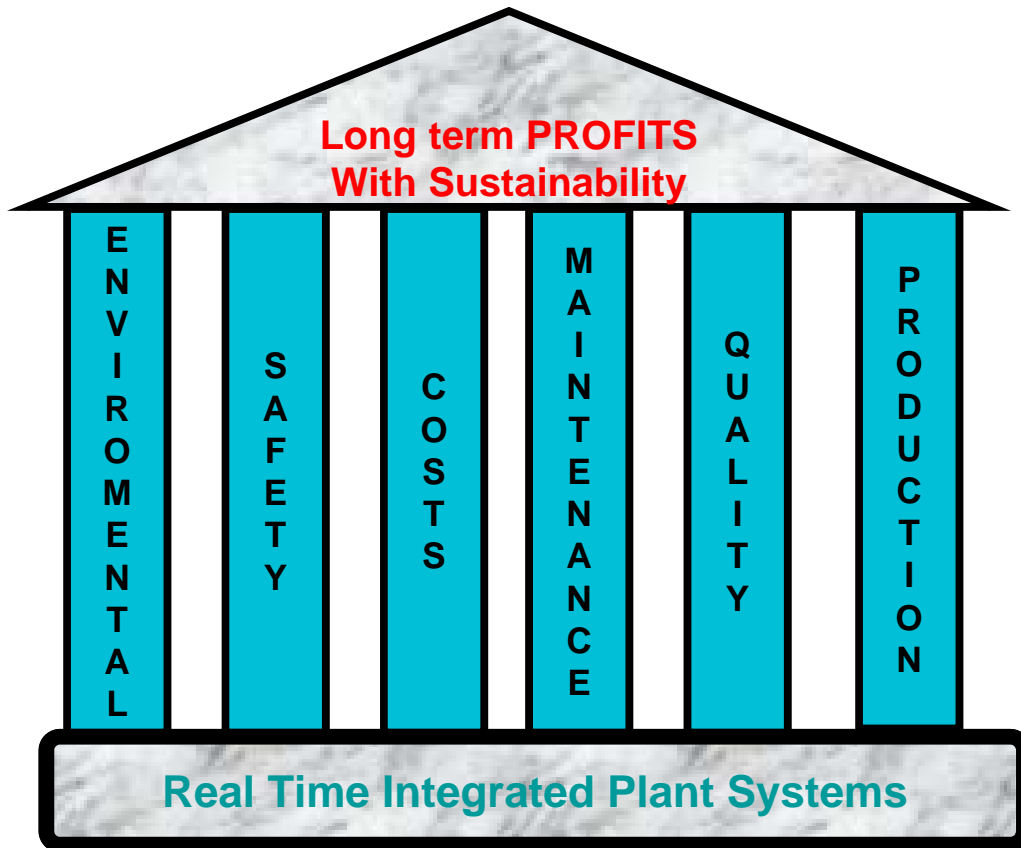
Results

Opportunities \$

*Shared VALUE
Strategy for
SUSTAINABILITY*

*Big Data Convergence
Advanced Analytics
Smart Manufacturing*

- **Systems**
- **Standards**
 - ISO50001
 - S95





2.

Power Generation to the rescue

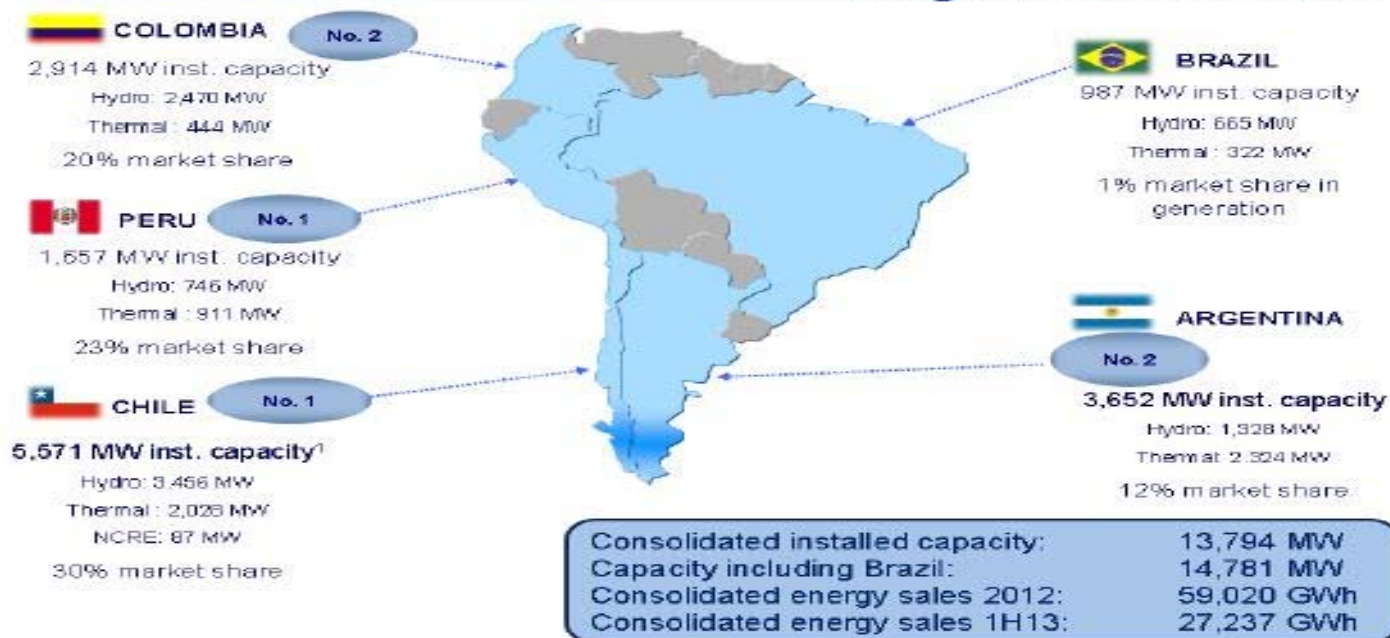
Endesa LATAM. Power Generation

Total Capacity
14,881 MW (2012)

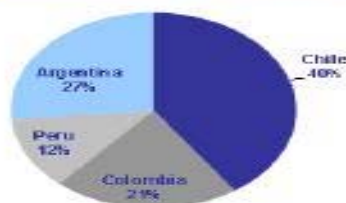
Total Generation
57,296 GWh



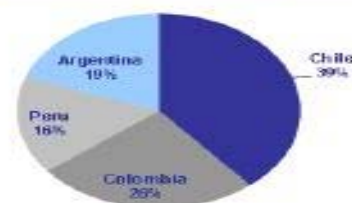
Endesa Latam Enterprise Strategy



Total Installed Capacity[†]: 13,794 MW



Total Generation[†] (TTM): 57,286 GWh



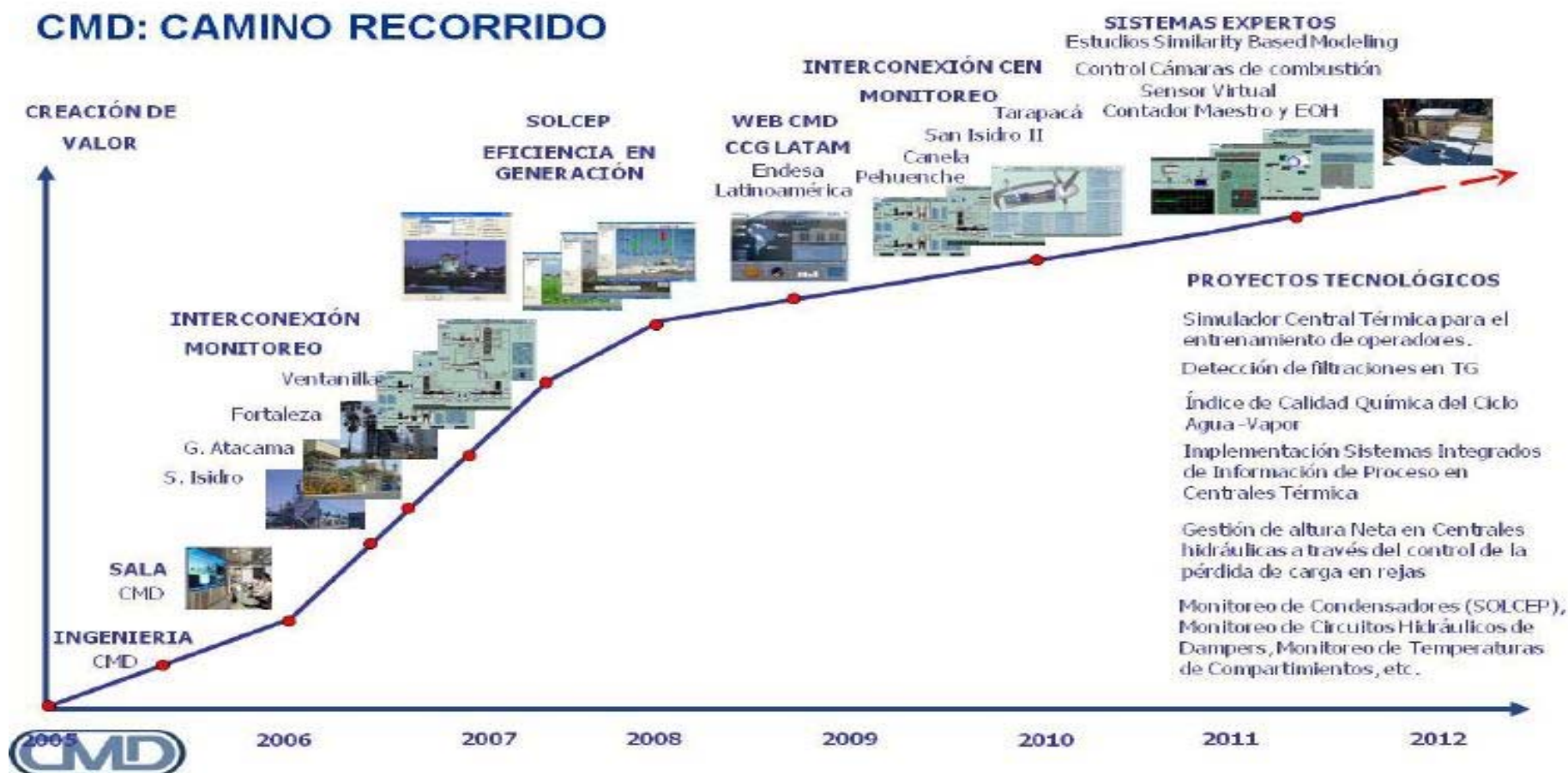
[†] Excludes the proportional assets from Gas Atacama (390 MW).

Sustainable Value Added to the Enterprise

area del Grupo Enersis

Centro de Monitoreo y Diagnóstico

CMD: CAMINO RECORRIDO



Data Transformation into Actionable Information

empresa del Grupo Eseris

Validación de datos

Elementos

DATOS
CRUDOS



PI-PERFORMANCE EQUATION

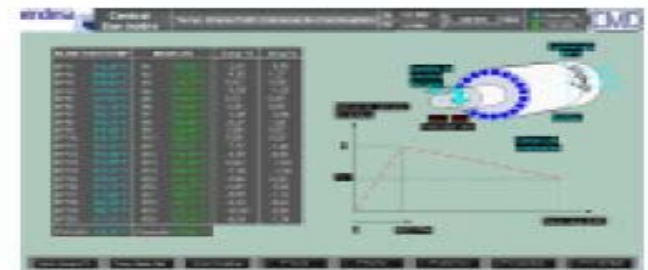
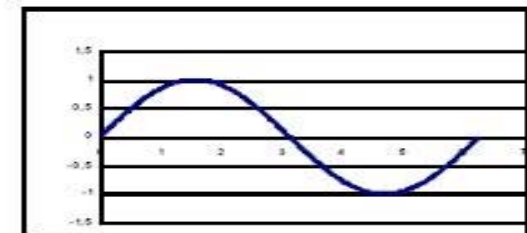
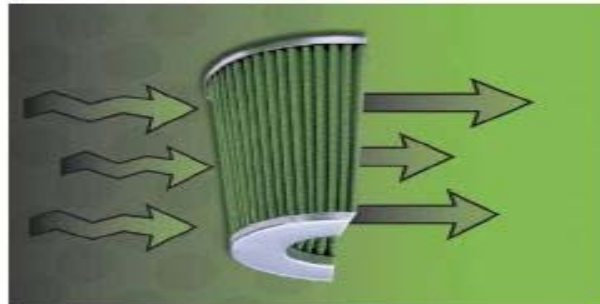
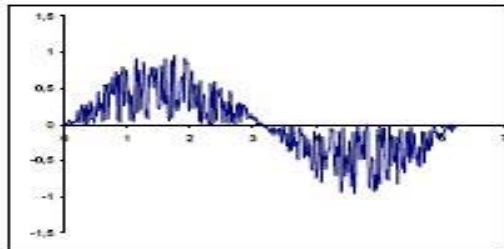
PI-ACE: Advanced Computing Engine

PI-AF: Analysis Framework

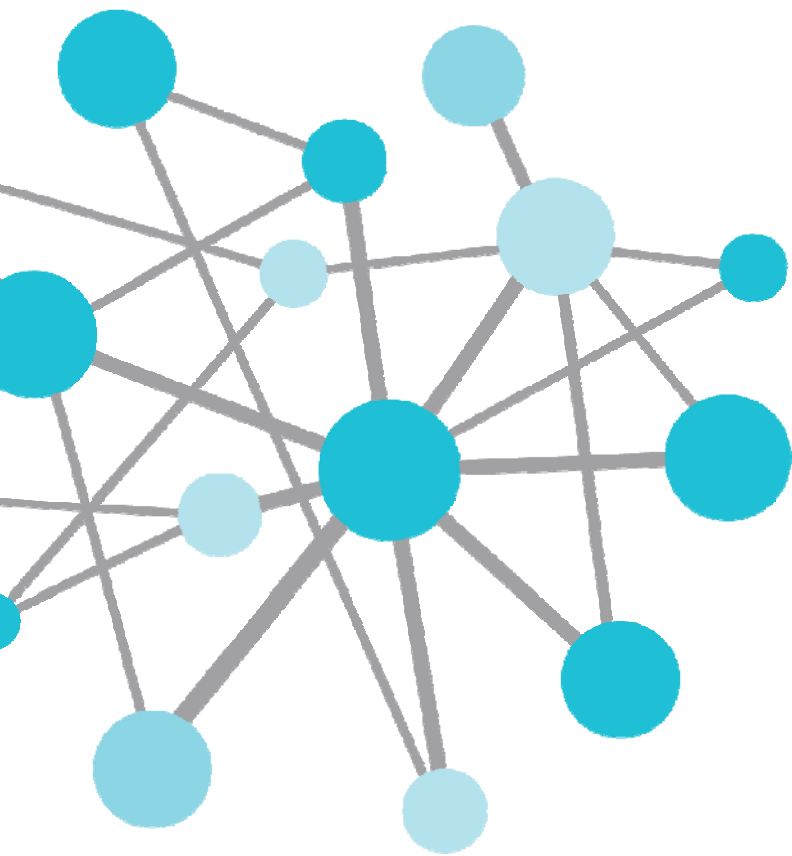
SOLCEP (Modulo de Validación de Datos)



DATOS VALIDADOS Y
CONCILIADOS



12



3.

Leveraging Enterprise Smart Process Management

Anglo American Platinum



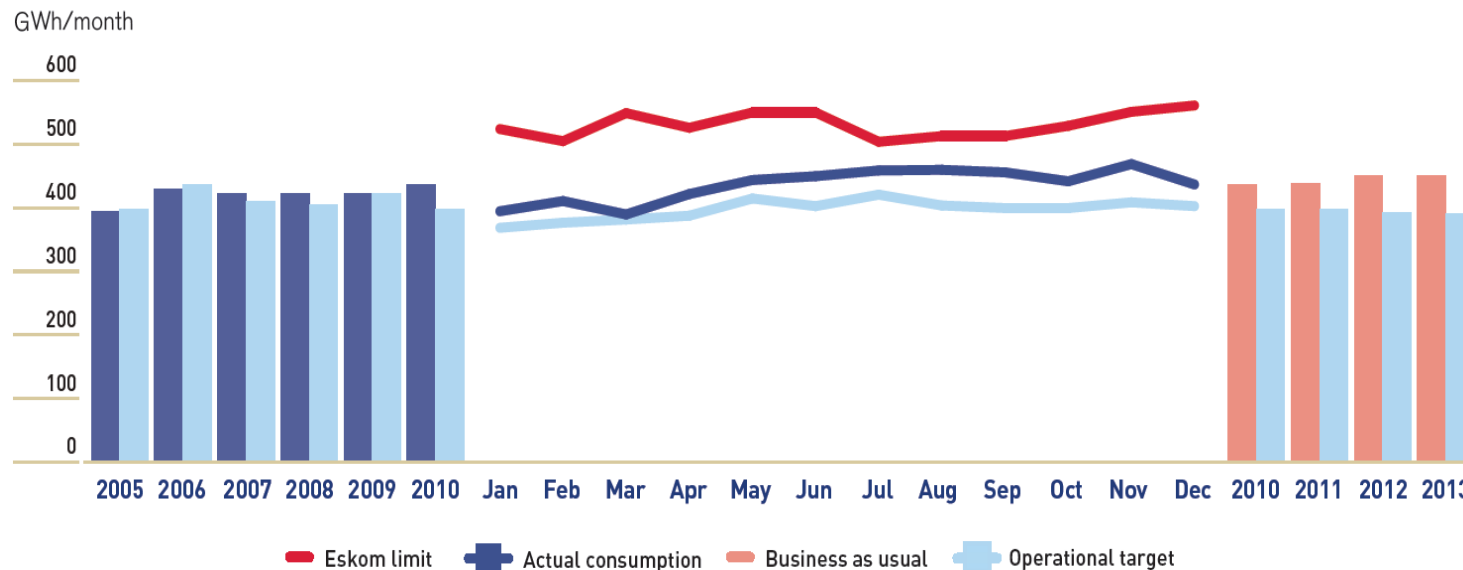
- Anglo American Platinum is the world's premier PGM producer, supplying approximately 40% of the world's newly refined Platinum.
- Process Division:
 - 14 Concentrators
 - 3 Smelters
 - 2 Refineries
 - 9 geographic operating areas



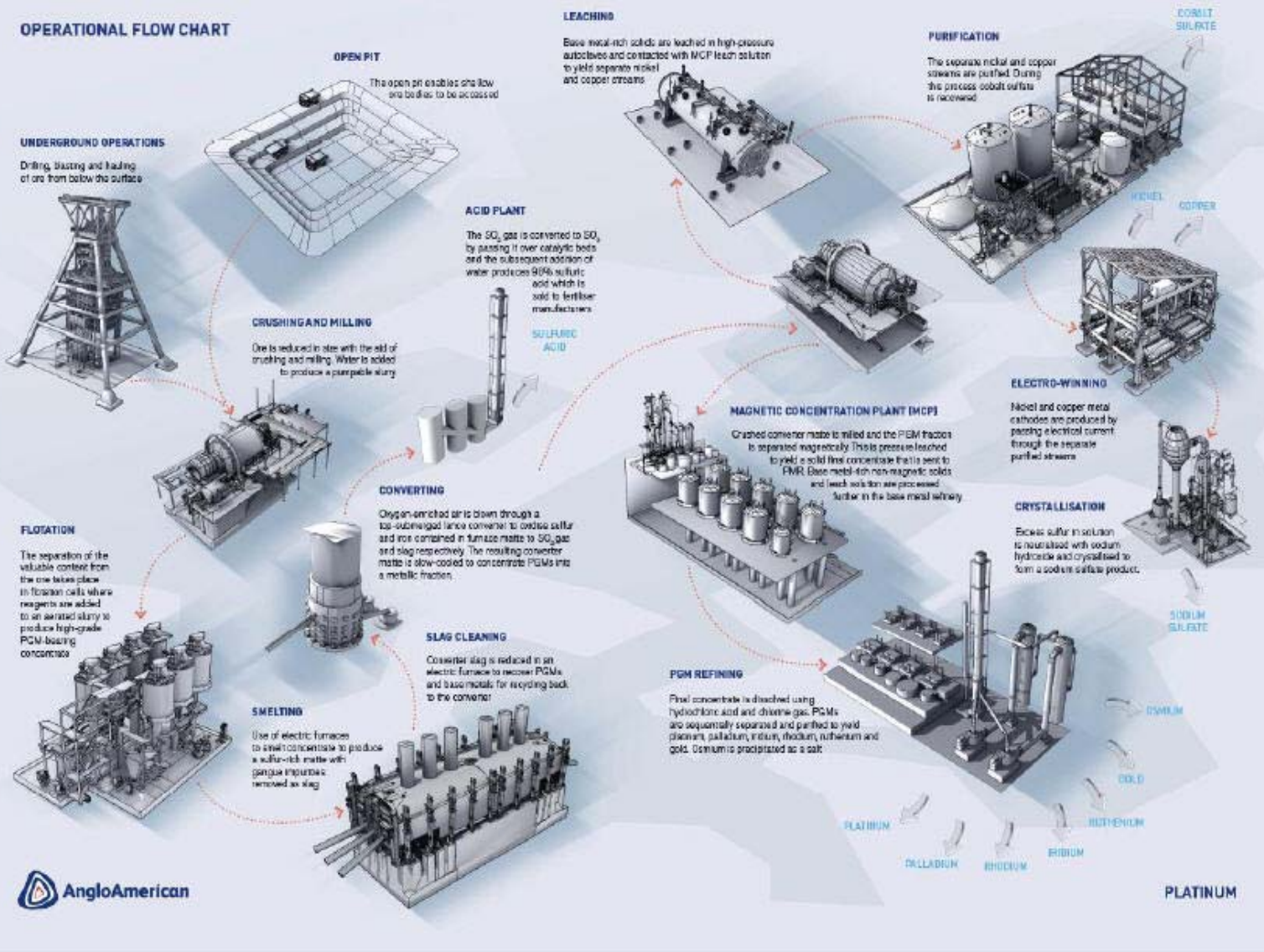
Business Challenge



Multiple Energy Sources: Electrical, Diesel, Steam from Coal Fired Boilers
Electrical energy is key focus
Anglo Platinum is a large consumer of electricity



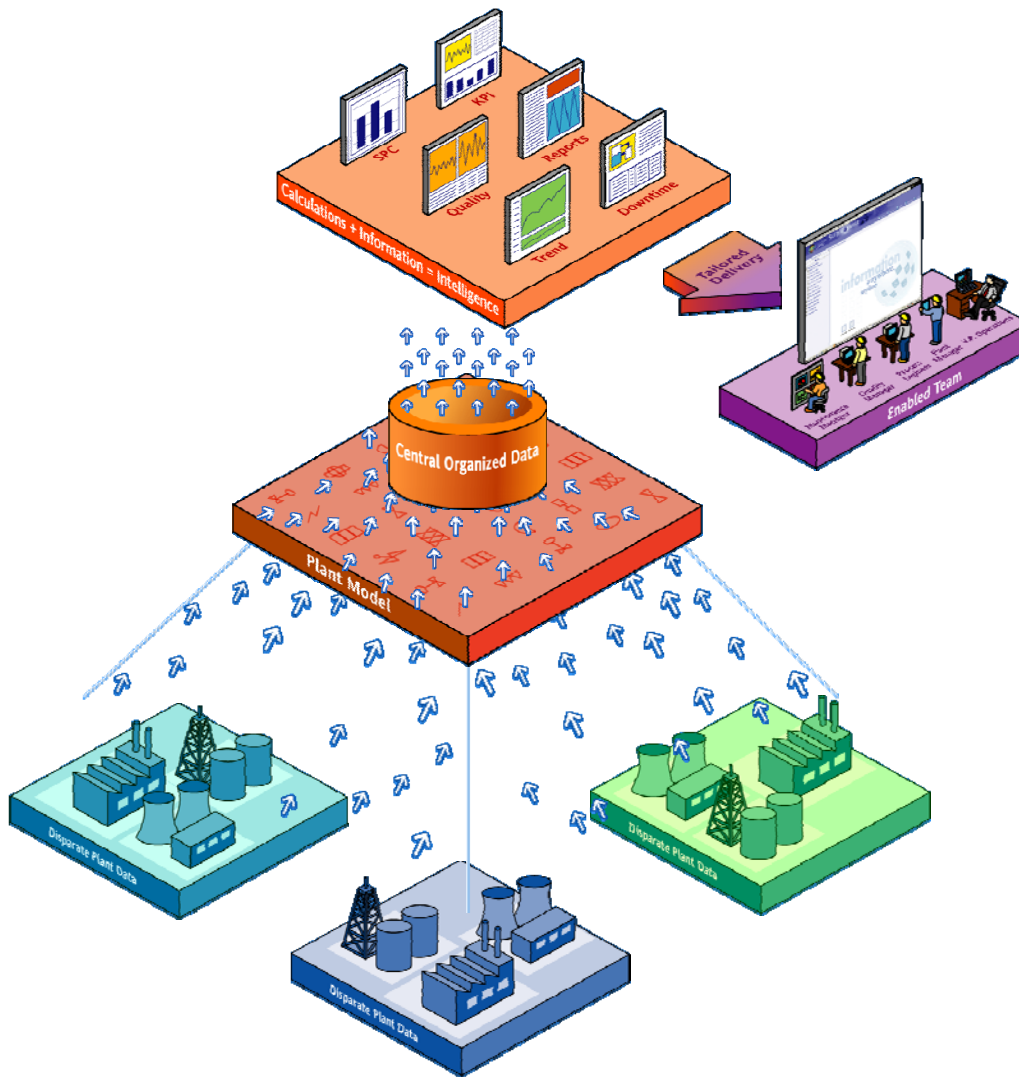
OPERATIONAL FLOW CHART



Platinum Process

- Long value chain in comparison to most minerals
- Technically complex
- Comparatively low volumes but high value
- A significant material pipe line
- Energy and water intensive

Enterprise Real Time Dynamic Continuous Improvement and Innovation strategy



- Calculations are performed primarily on the sites
- The central PI System is used for:
 - Group wide analyses
 - Maintain Knowledge and Strategic BI Analysis
 - Maintain Models and Plan Targets

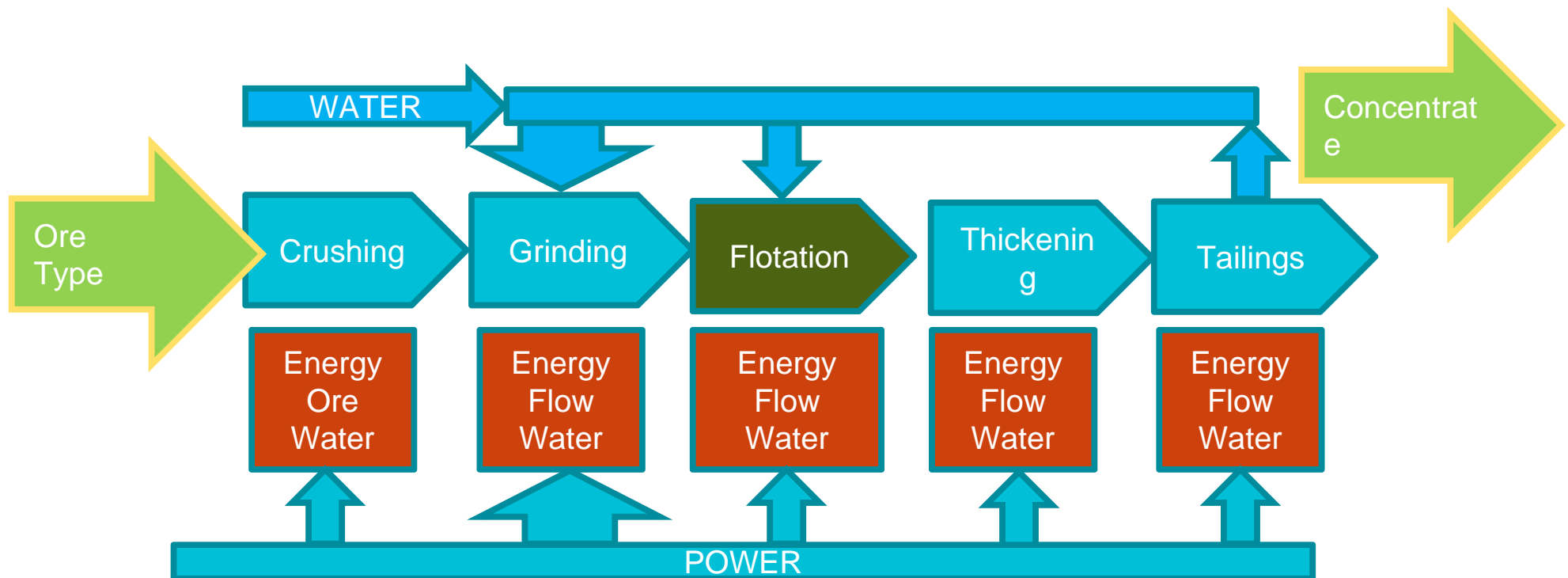
Establishing a Value Framework

By Driving Competitive Advantage through *Reduction of Controllable Cost* or *Delivery of Additional Revenue Opportunities*

Specific Process / Project Value Categories Include:

- **Process Productivity / OEE**
- **Optimize Asset Life / Reduce Maintenance Cost**
- **Reduce Energy / Raw Material / Natural Resource Consumption**
- **Environmental, Health, and Safety**
- **Product Genealogy / Quality**
- **Compliance and Reporting**

Integrated Concentrator Model



Event Driven Process Diary

Started out with condition based maintenance in mind. The resulting “Process Diary” can be used for Downtime, Slowtime, KPI’s, basically anything that can be configured.”

Michael Halhead
Lead Process Control Engineer



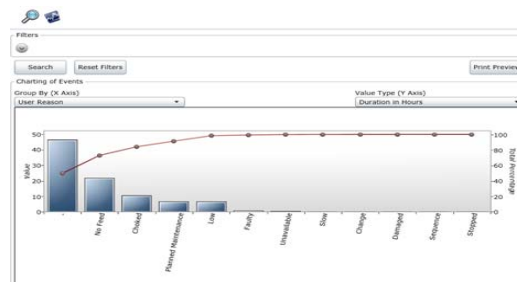
CONTINUOUS IMPROVEMENTS
AND INNOVATION PRACTICE

Challenge

Escalating Energy Costs
Electrical System Constraints
Integration with Energy SCADA
Non Standards methods
Replace Excel solution
Provide Enterprise easily configurable solution

Solution

- PI Event Frames and PI AF
- PI EV to sense and capture the events
- Custom Silverlight screens using PI AF controls to capture manual events
- Integration with SAP

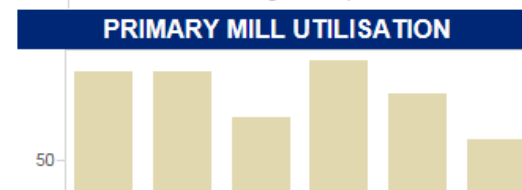
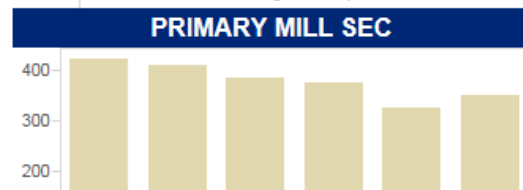
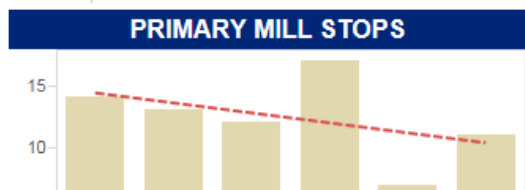
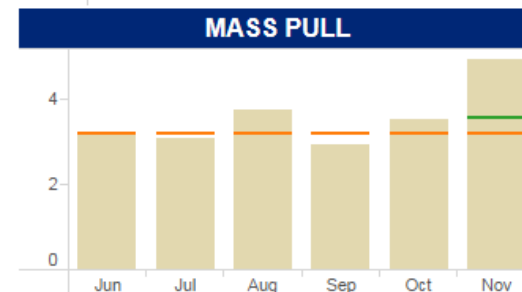
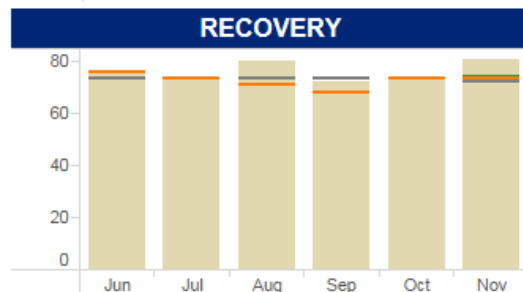
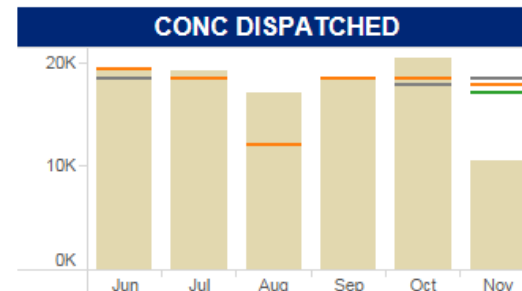
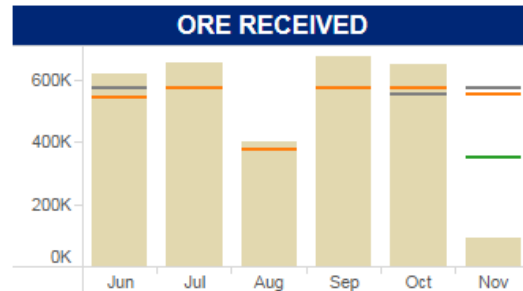
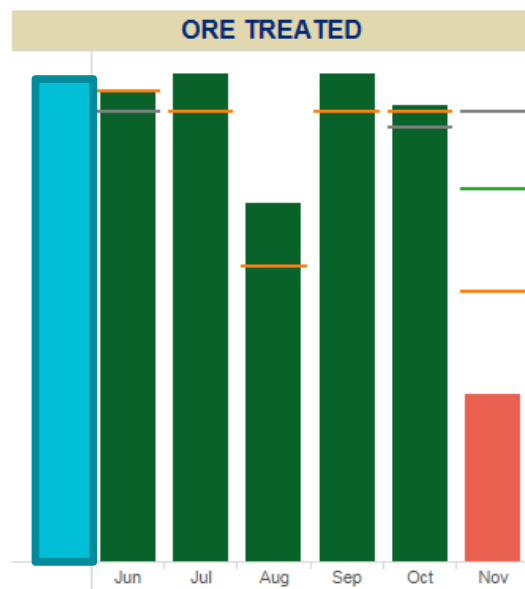


Results

Increased overall equipment utilization
Time savings
Enterprise-wide standardization
Flexibility – not just CBM
Target 15% Energy Reductions 2015
Compare years of data
User configurable

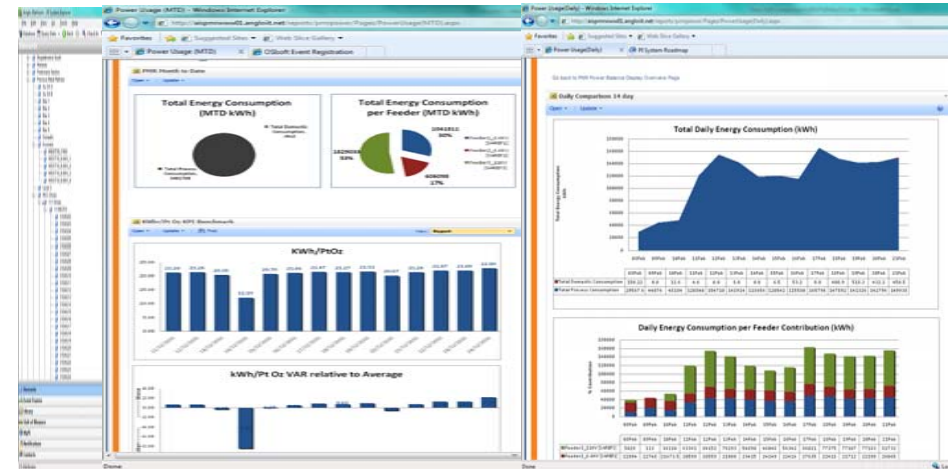


Concentrator Management Dashboard Process Area Monthly View



Energy Monitoring

- AngloAmerican Platinum
- “Implementing high level metrics and analyses linked to production clearly shows where the power is used allowing focused energy reduction initiatives. A roll out to the concentrators is in the planning stages. Due to the scale of the concentrator operations the potential benefits are enormous.”
- Thobile Mukuna, Energy Process Engineer



Challenges

- Large electricity consumption - 450 GWh/month
- Target 15% reduction in electricity consumption 2008 to 2015
- Company-wide integrated approach to energy saving is required

Solution

- Use PI AF - granularity and roll-up
- Visibility - power use at every level
 - PI WebParts and SharePoint, Silverlight
- High level metrics - KPIs
- Provided ability for users to drill down to every level of granularity

Results

- Enterprise visibility of all electrical consumption
- Significant time reduction for analysis
- Easy construction of BI cubes
- Just making the data visible resulted in a 1 % reduction in electrical power use.
- Target a 15% reduction by 2015



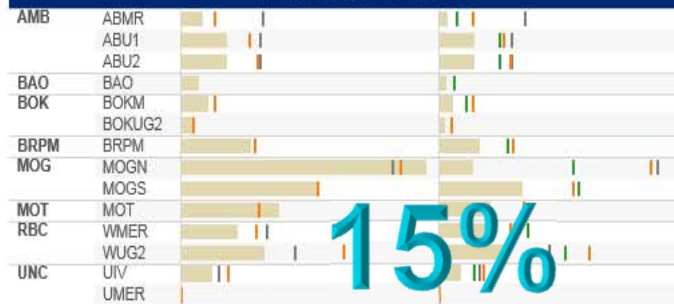
Concentrator Management Dashboard Site Monthly View

October
November

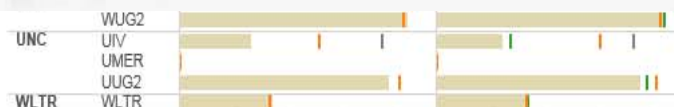
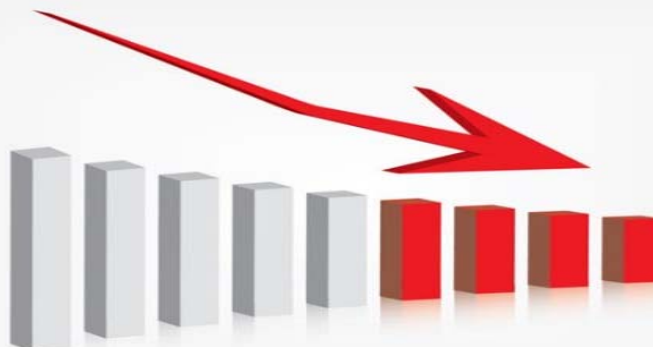
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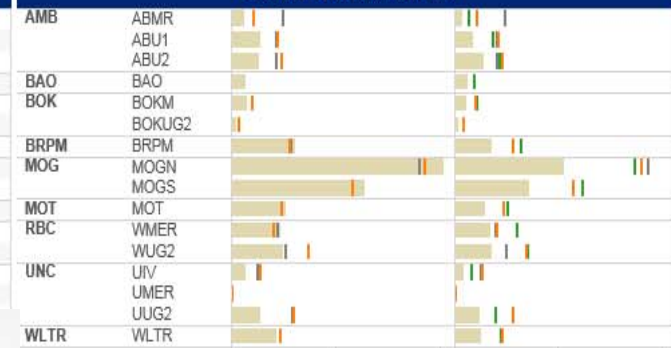
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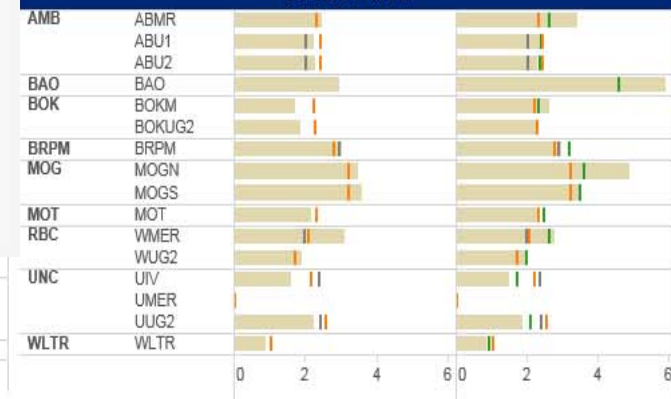
15%



CONC DISPATCHED



MASS PULL

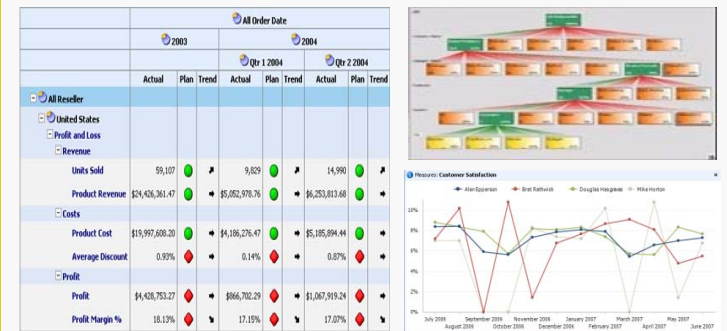
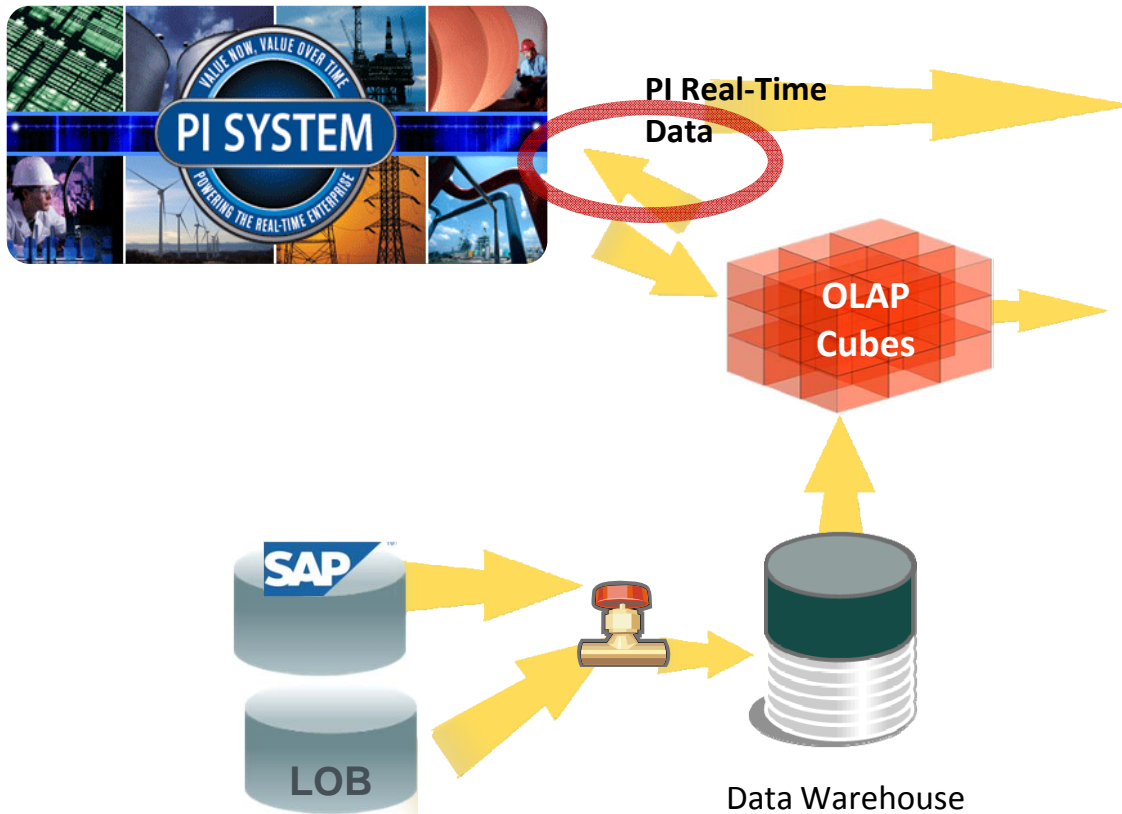


KPI (Again.. 0% 100%)

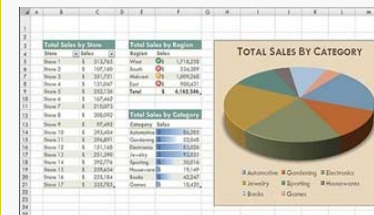
■ Latest Estimate
 ■ Business Plan
 ■ Forecast

Microsoft BI with PI System - Architecture

Design of PI AF for Data Mining.



Microsoft PerformancePoint



Excel Services & DLES



Reporting Services



OSIssoft PI WebParts & other Web Parts



Going BI with KPIs

“KPI building and maintenance was a nightmare, creating a lot of frustration due to long lead times”

Warren Armstrong, Process Control Support



Date	2014-03-05	Apply
Site	(Multiple Items)	Format
KPI Type	All	
Process Cell	(Multiple Items)	

Process Unit	KPI Name	Values						
		Design	StdDev Design	Daily	Variance	StdDev	Condition	StdDev Condition
WSML FD2 HGG	Bed Temperature			890.1		38.46	1.00	1.00
Gas Cleaning	CM-120 Circulation	65.00		90.23	25.23	0.645	5.00	1.00
	CM-120 Outlet Temperature	60.00		46.06	-13.94	1.33	5.00	1.00
	DC-160 Voltage	30.00		35.32	5.32	1.88	5.00	1.00
	DC-161 Voltage	30.00		0.016	-29.98	0.006	3.00	1.00
	DC-162 Voltage	30.00		34.56	4.56	1.91	5.00	1.00
	VT-140 Circulation	450.0		529.3	79.27	2.17	5.00	1.00
Gas Cooling	CM-170 Outlet Temperature	27.50		29.29	1.79	4.69	5.00	1.00
	DC-190 Voltage	20.00		9.48	-10.52	2.00	3.00	1.00
	DC-191 Voltage	20.00		27.92	7.92	0.757	5.00	1.00
Tower Plant flows	CM-300 Flow 535FIT590	150.0					3.00	1.00
	CM-310 Flow 535FIT610	150.0					3.00	1.00
	CM-330 Flow 535FIT630	300.0					3.00	1.00
	CM-350 Flow 535FIT651	450.0					3.00	1.00
	CM-400 Flow 535FIT675	450.0					3.00	1.00

Challenge

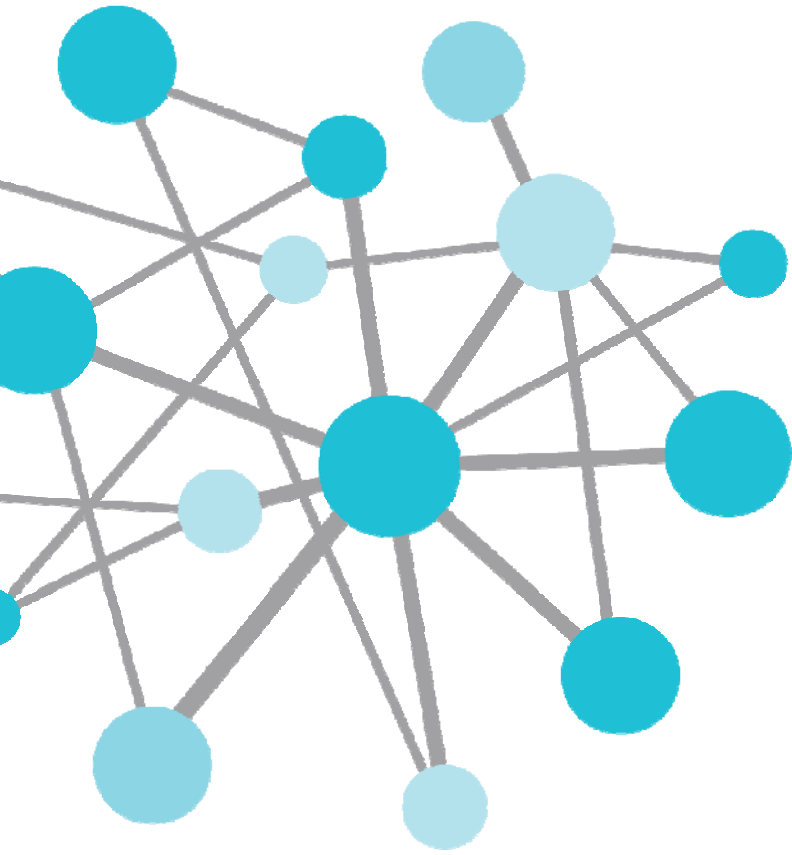
KPI were onerous to create and troubleshoot
 Configuration was complex
 KPIs growing
 More Plants wanted KPI Reports
 KPIs were inflexible

Solution

- PI system for daily/ shiftily totals
- PI Asset Framework for KPIs and hierarchy configuration and data extraction
- Microsoft Analysis Service tabular model to aggregate up
- Excel Pivot table for Reporting

Results

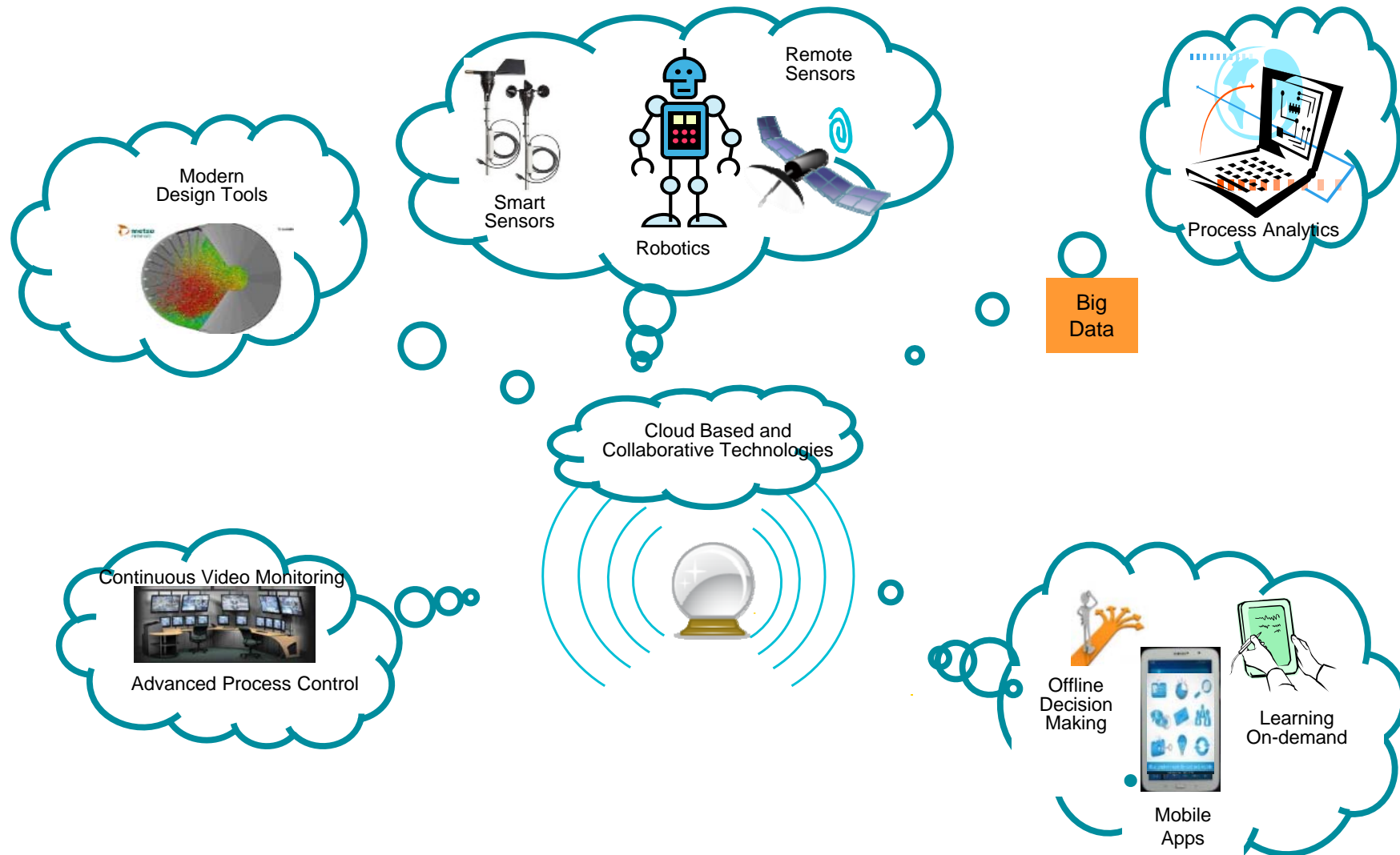
KPIs creation from 6 to 3 steps
 One Report
 Quick rollout
 More user control
 Flexible reporting



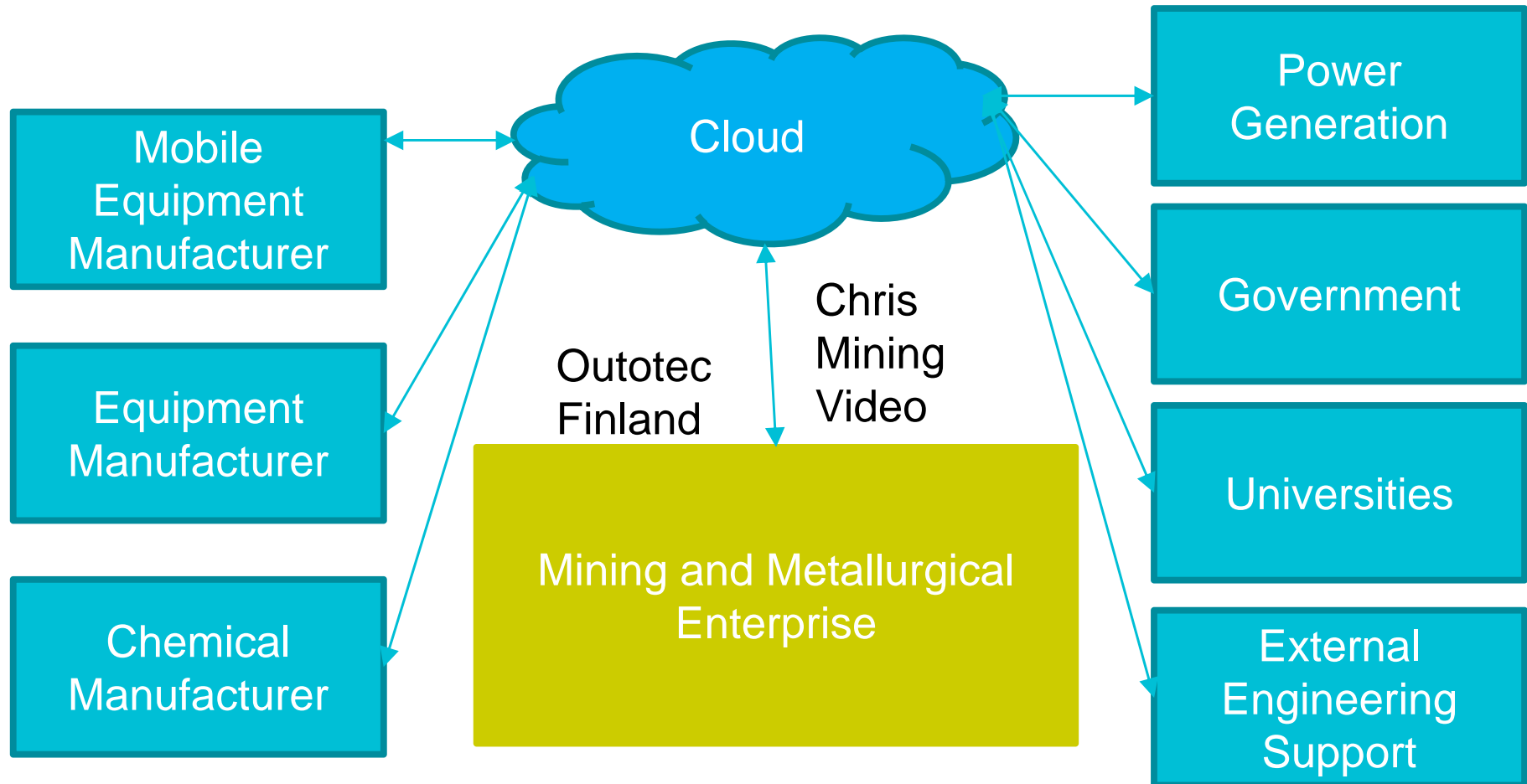
4.

Leveraging External Community for Smart Process Management

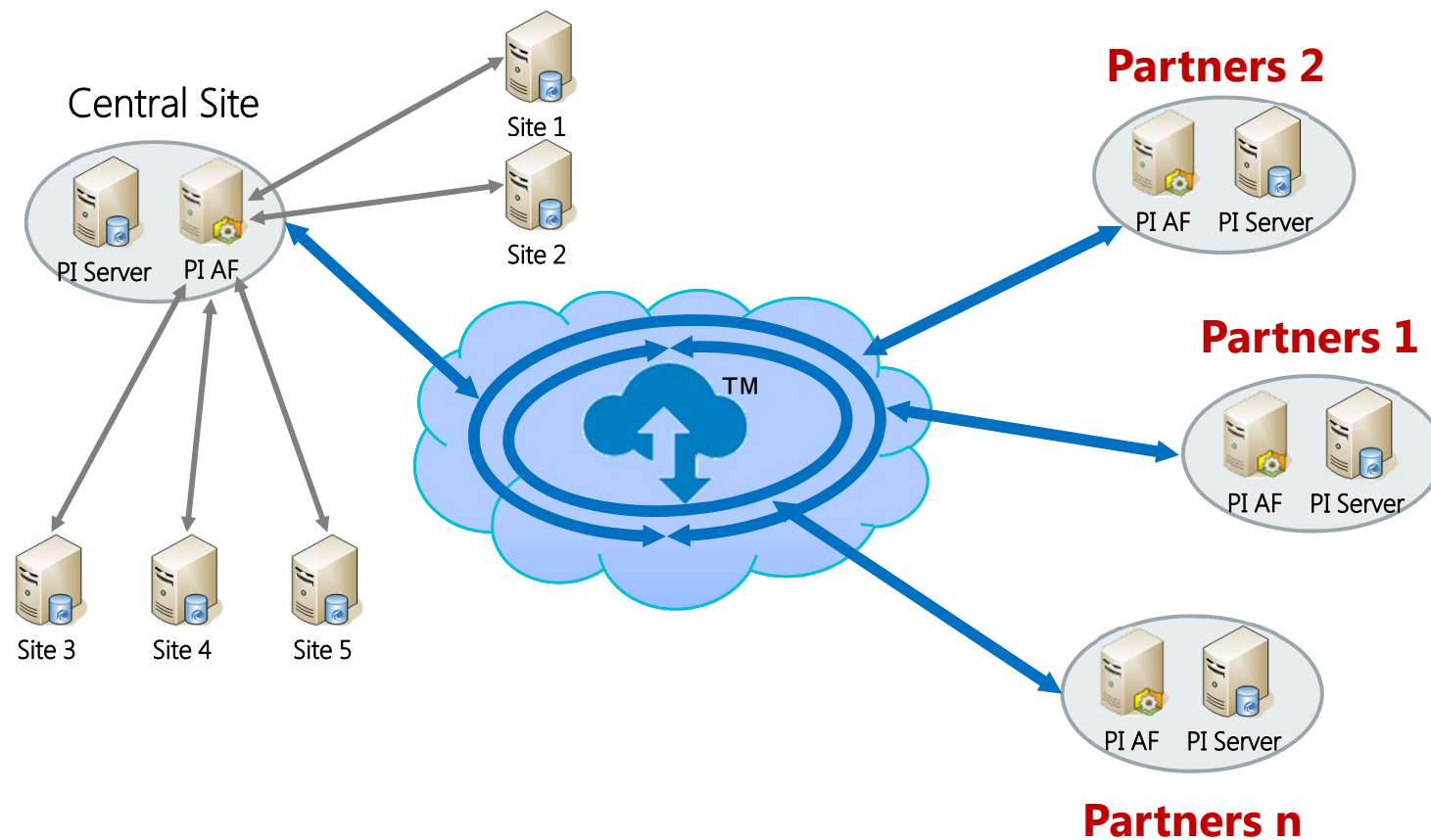
New Tools and Technologies in the 21st Century



Future: Moving into Interconnected Systems



PI Cloud Connect – Amplats Architecture



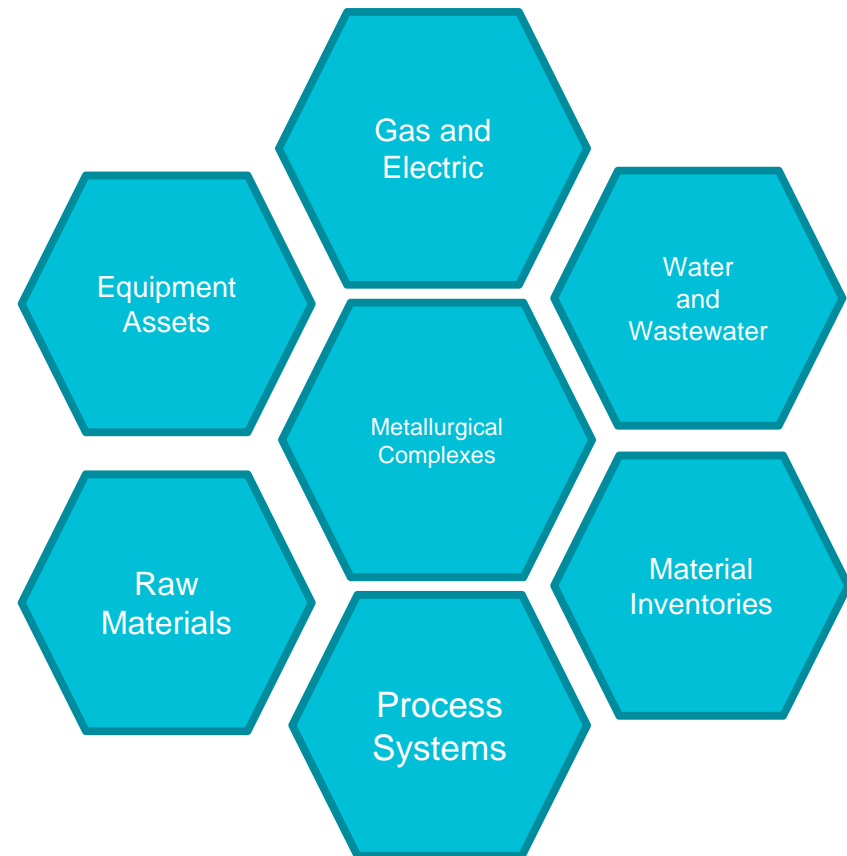
AF Accessible from the Cloud

The screenshot displays the OSIsoft PI System interface. On the left, the 'Elements' tree shows a hierarchy starting with 'AISPH2DB06 ModuleDB', followed by 'Amplats', 'Concentrators', 'Configuration', and 'PICC'. Under 'PICC', there is a folder 'AISHEXMOSSQA01\Amplats\Concentrators'. This folder contains 'FromOutotec', which in turn contains 'FromPetroLux'. Under 'FromPetroLux', there is a folder 'Mining trucks' containing a list of 'Truck' assets from 'Truck_071' to 'Truck_080'. Below this, there is a folder 'Outotec' containing 'Mogalakwena', which contains 'North', which contains '444FL001'. Under '444FL001', there is a list of assets from '444FL001_2' to '444LA01_V27'. Below this, there is a folder '444FL002' containing '444FL002_2', which contains a list of assets from '444FL002_3' to '444LA02_B501'. On the right, the 'Truck_071' asset is selected, and its 'General' tab is active. The 'Filter' section shows 'Category: <None>'. The 'Attributes' table lists the following attributes: 'Color' (Yellow), 'Fuel_Con...' (Pt Created), 'length' (15 Ft), 'Mileage' (Pt Created), 'RPM' (Pt Created), 'Serial Nu...' (XXX-YY-ZZZZ), 'Service date' (2013/06/27 02:00:00 AM), and 'Speed' (Pt Created). Below the table, there is a thumbnail image of a truck and a link to 'Outotec filtration solutions'.

The AF Models are “replicated” by PI Cloud Connect

The screenshot displays the 'PI Cloud Connect' interface. At the top, there is a header with the 'PI Cloud Connect' logo and a welcome message for 'Michael Hallhead'. Below the header, there is a 'Create Publication' wizard. The wizard has three steps: 'Data Source', 'Publication Scope', and 'Publication Name'. The 'Data Source' step is currently active, and it shows a progress bar with three dots. Below the progress bar, there is a dropdown menu labeled 'Select the type of the AF assets you wish to publish:' with the value 'Select AF Elements'. Below this, there is a section titled 'Browse your AF asset hierarchy to select the AF element that you want to publish'. This section shows a tree view of the AF asset hierarchy, starting with 'Outotec', followed by 'Mogalakwena', 'North', and '444FL001'. Under '444FL001', there is a list of assets from '444FL001_2' to '444LA01_V09'. On the right side of the tree view, there is a 'Data source:' field with the value 'AISHEXMOSSQA01.Amplats' and an 'AF element to publish:' field with the value 'Not specified'.

Large Metallurgical are large cities



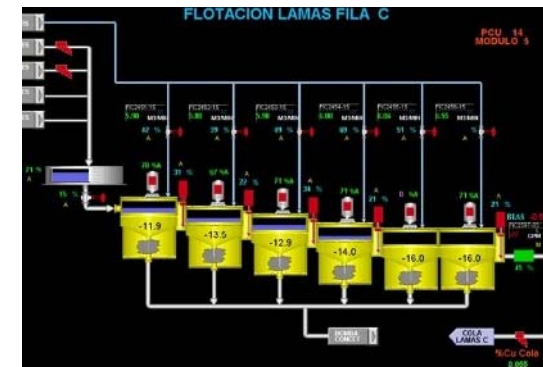
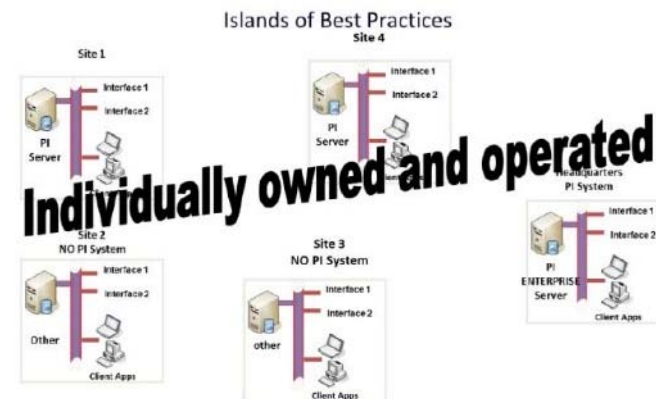
Conclusions

- Real Time Data and Events transform data into Actionable information
- Data Validation- Event Classification- Predictive Analytics - Collaboration
- Real time predictive event framing (analytics) is crucial to increase equipment availability to reduce specific fuel, electricity and water consumption.
- Integration and standardization of systems for local and enterprise collaboration are essential strategies to transform the organization using new proactive analytics and data analysis tools
- Drastic reduction in operating costs, increase productivity and add sustainable value to the enterprise.
- Competence Centers are **Knowledge Centers to promote change via people collaboration** at the local and enterprise business levels.

Questions?



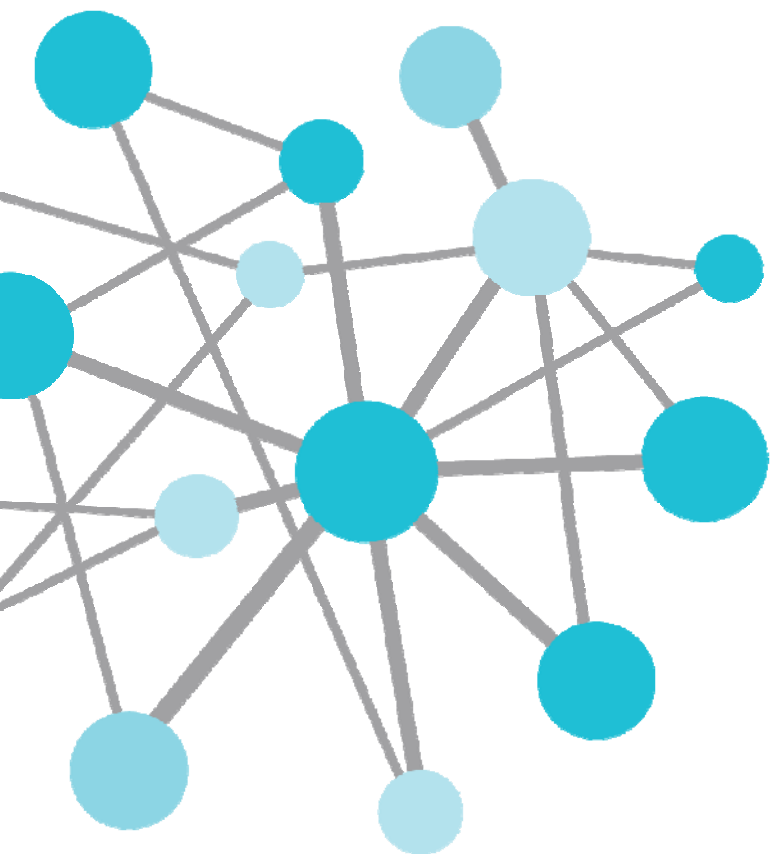
THE SYSTEM EFFECT



Thanks for your attention

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THANK YOU



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PI System Infrastructure

