Overview of the PI System in Basic Industries and Mining-Metals

Presented by

Osvaldo A. Bascur

Enterprise Business Executive

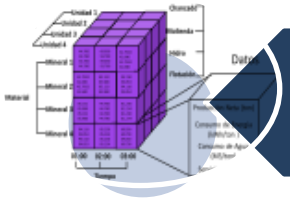
Agenda

Overview of the Large Industrial Complexes

Sustainability Strategies are good business

Real Time Enterprise Collaboration

Endesa, Southern Peru Copper, CS Huachipato, Rio Tinto Kennecott Utah Copper



Further work and Conclusions

Earth Resources Triangle

- Technological innovations needed:
  - Decrease energy requirements
  - Increase recovery of from lower grade resources and metal recycling (more energy resources)
  - Collaboration between Operational and Strategic Teams
  - Proactive avoidance of downtime events (Waste Management)





Partial list of M&M Customers

Large Water and Energy Costs

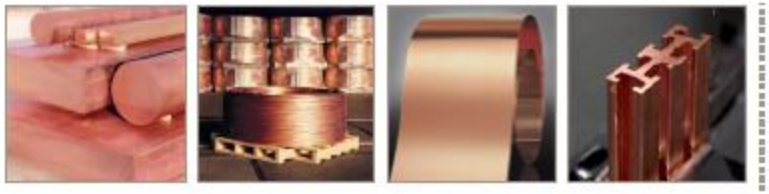
Ore

Energy

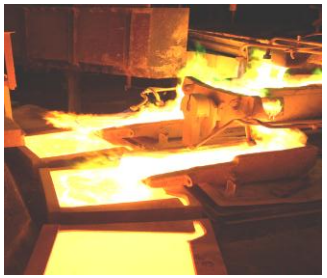
Water

Sag Milling

Concentrate

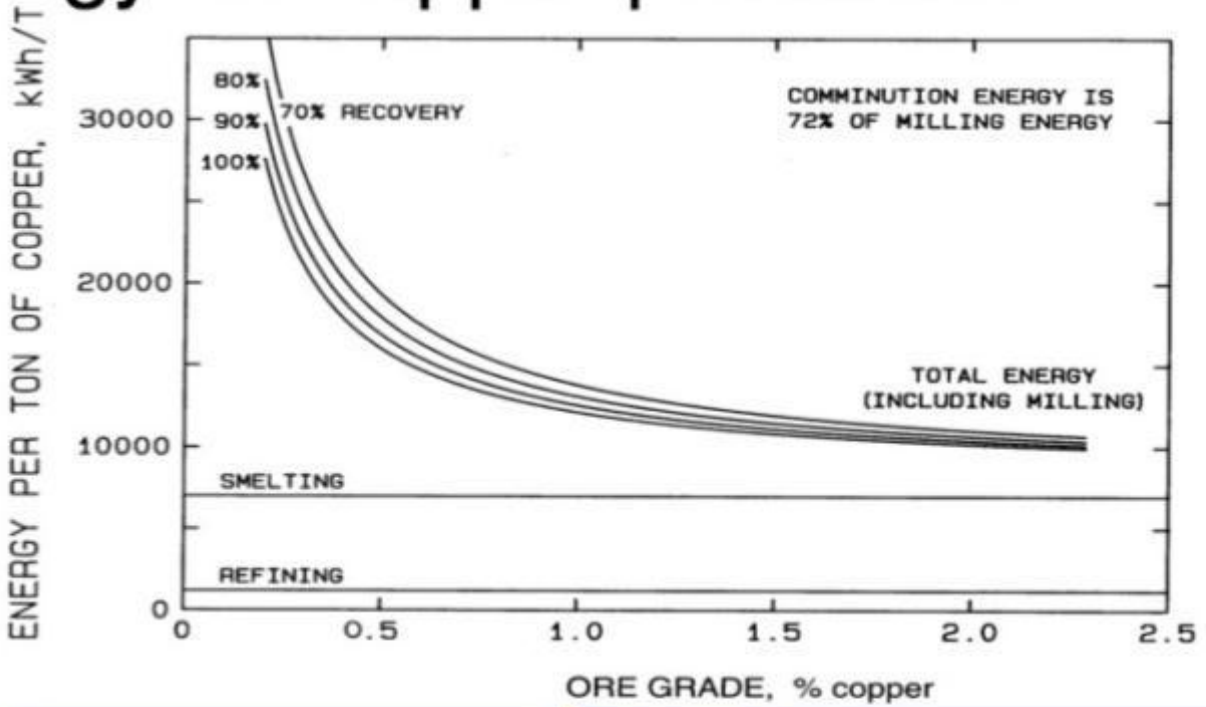


Products



Metal

Effect of grade and recovery on energy for copper production



Open pit:

Mining 3-5kWh/t ore
Milling 15-24 kWh/t <100mesh grind, flotation

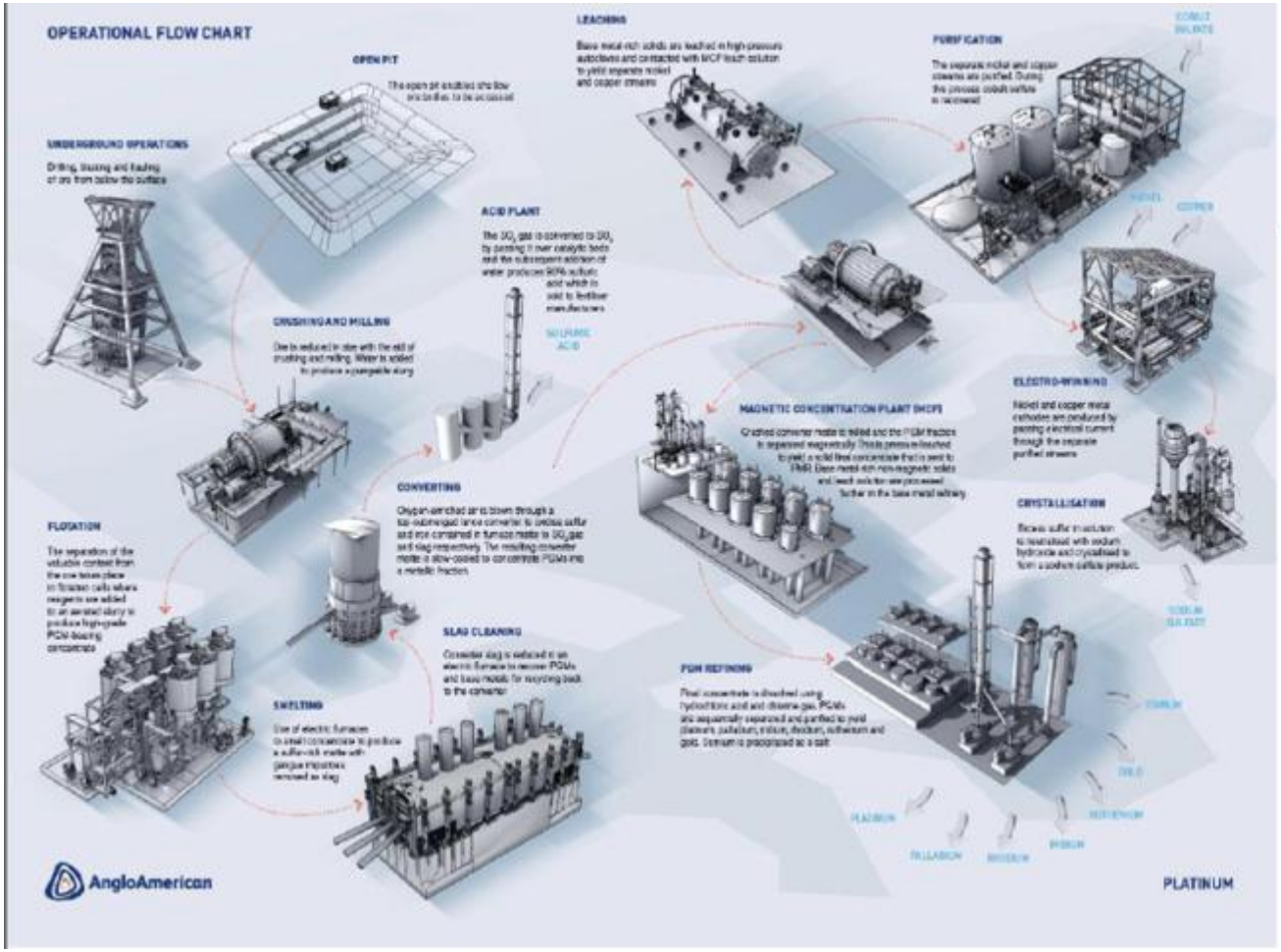
Underground:

Mining 12-40 kWt/ore
Milling 24-34 kWh/t <200mesh grind, flotation

Source :Douglas W. Fuerstenau Douglas W. Fuerstenau, University of California, Berkeley

Lower Grade MORE Energy, More Water, Higher AVAILABILITY

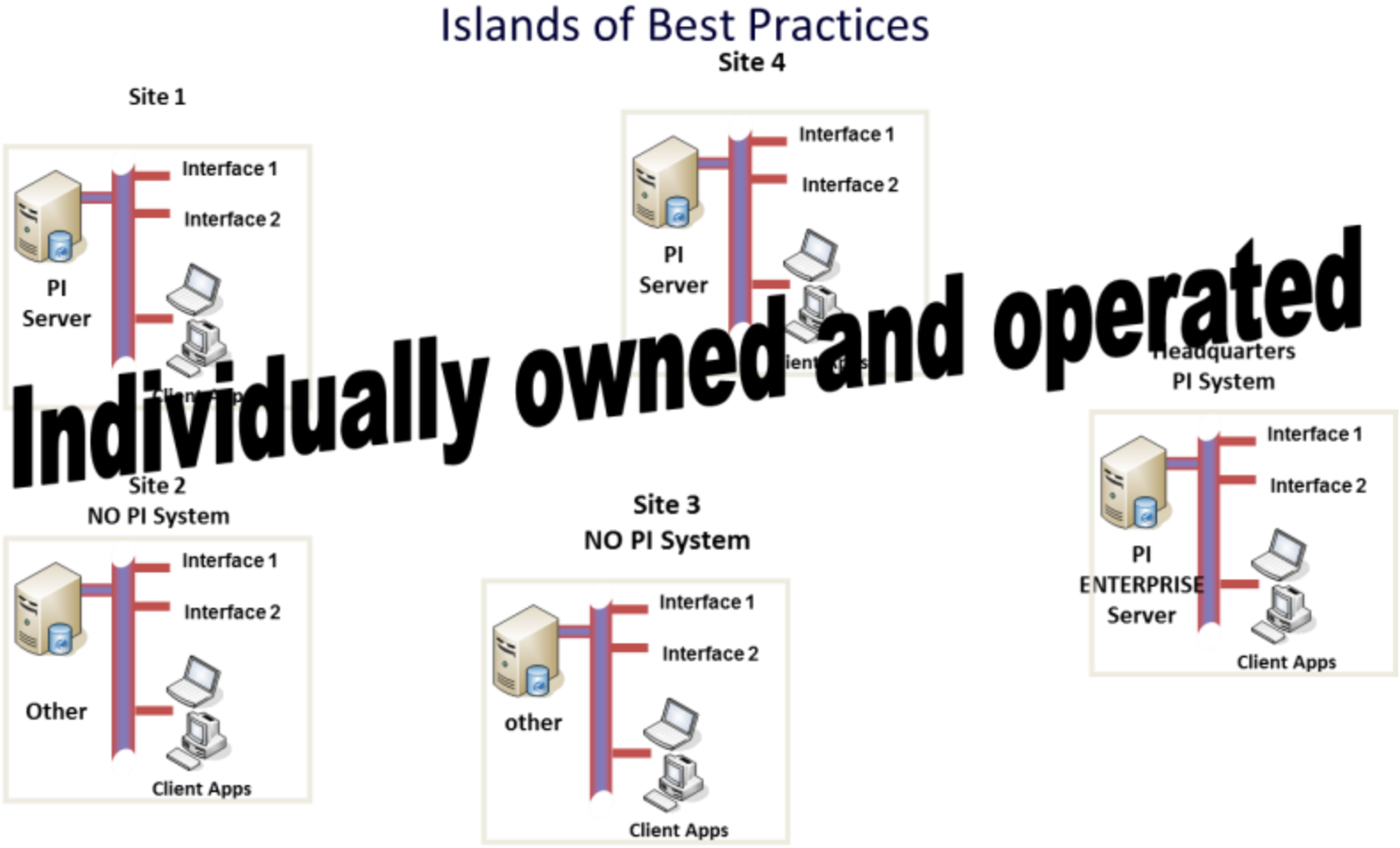
Variety of Assets



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

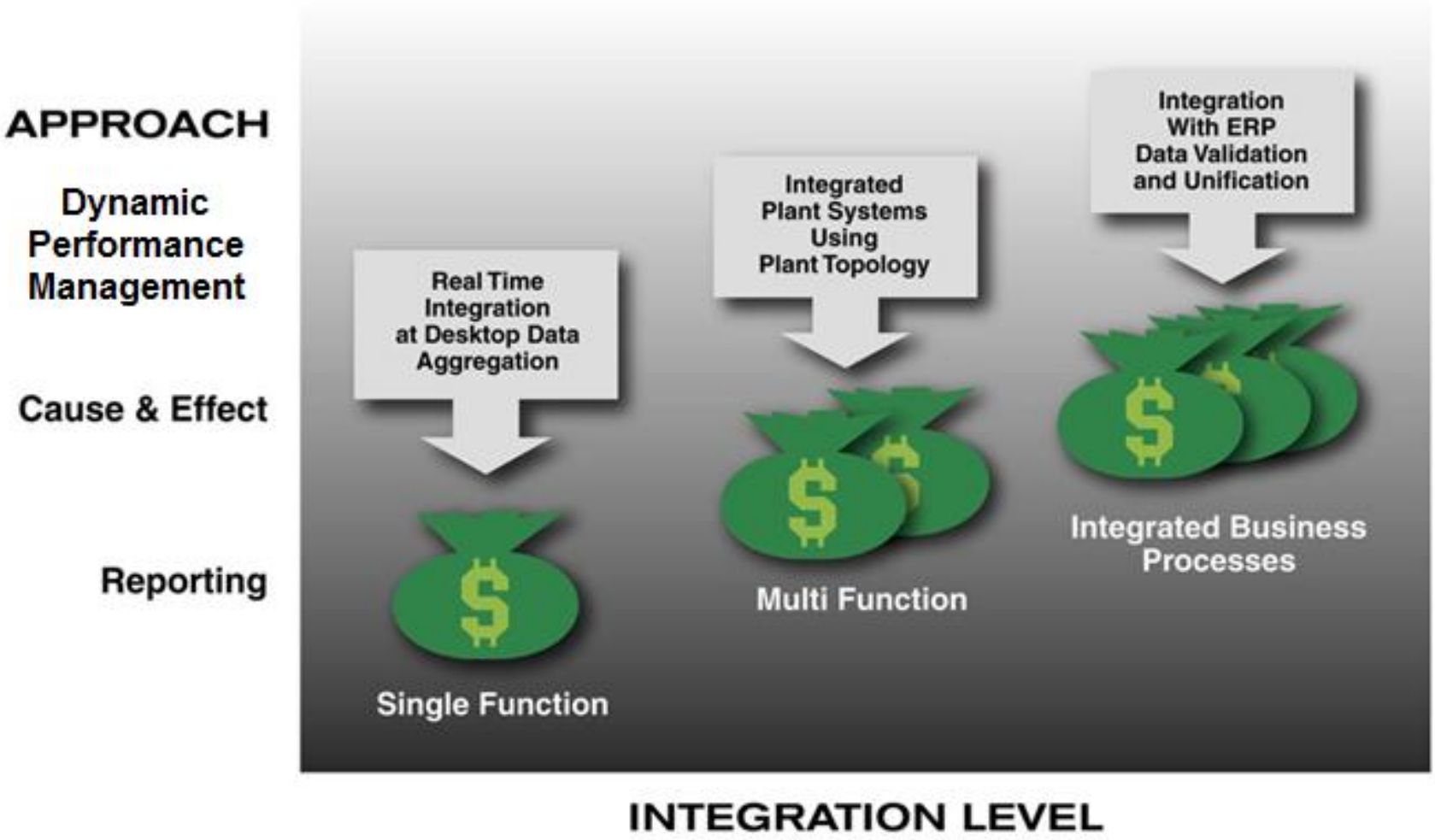
Typical Situation NO Integration



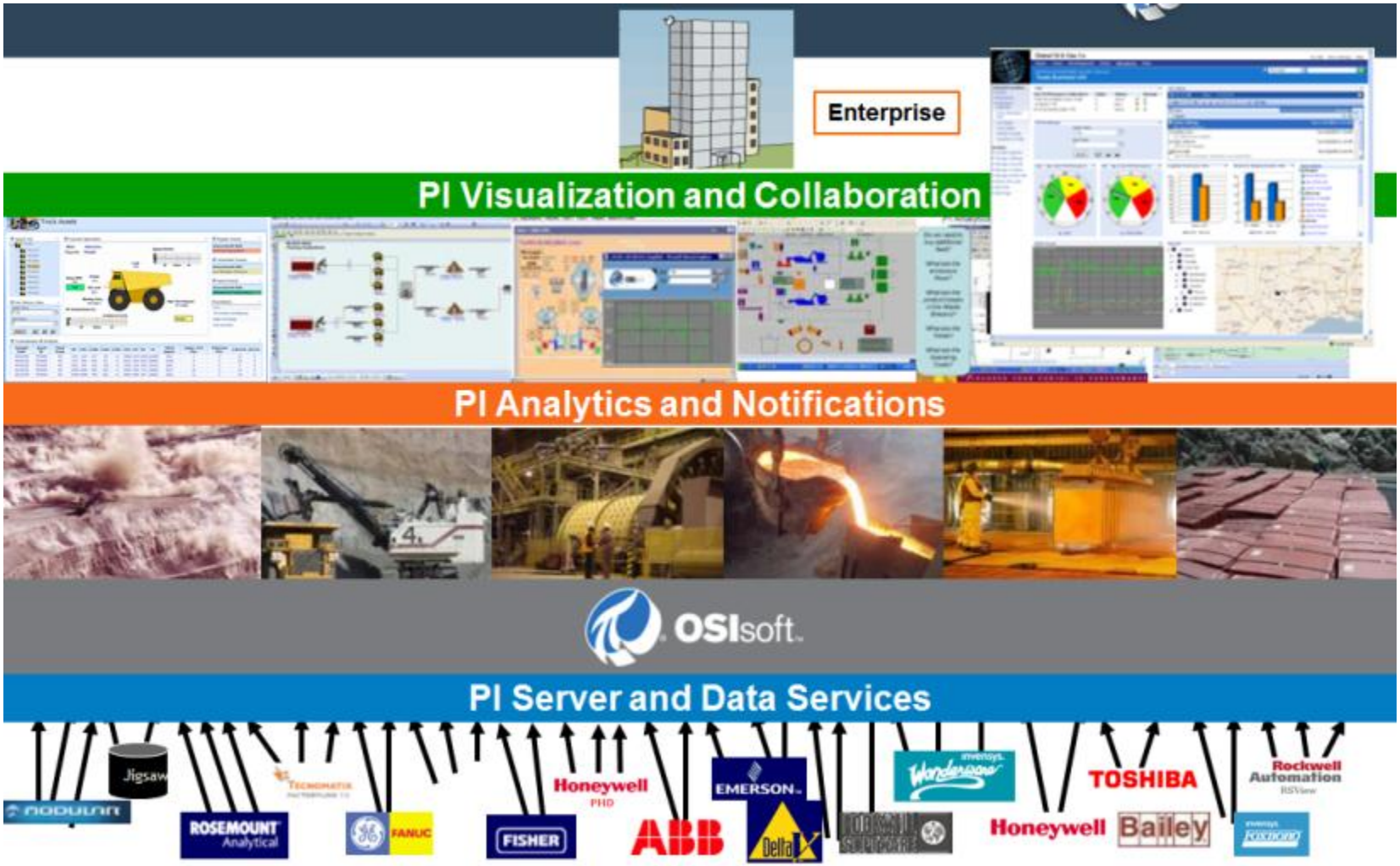
Business Strategy Value Proposition

- Business Process (Production vs Availability vs Resources
- People Collaboration (Water Management, Energy Management, Equipment Availability)
- Dynamic Diagnostics Competence Center
- (or Manufacturing Services for the Enterprise)

Business Process and Operational Assets

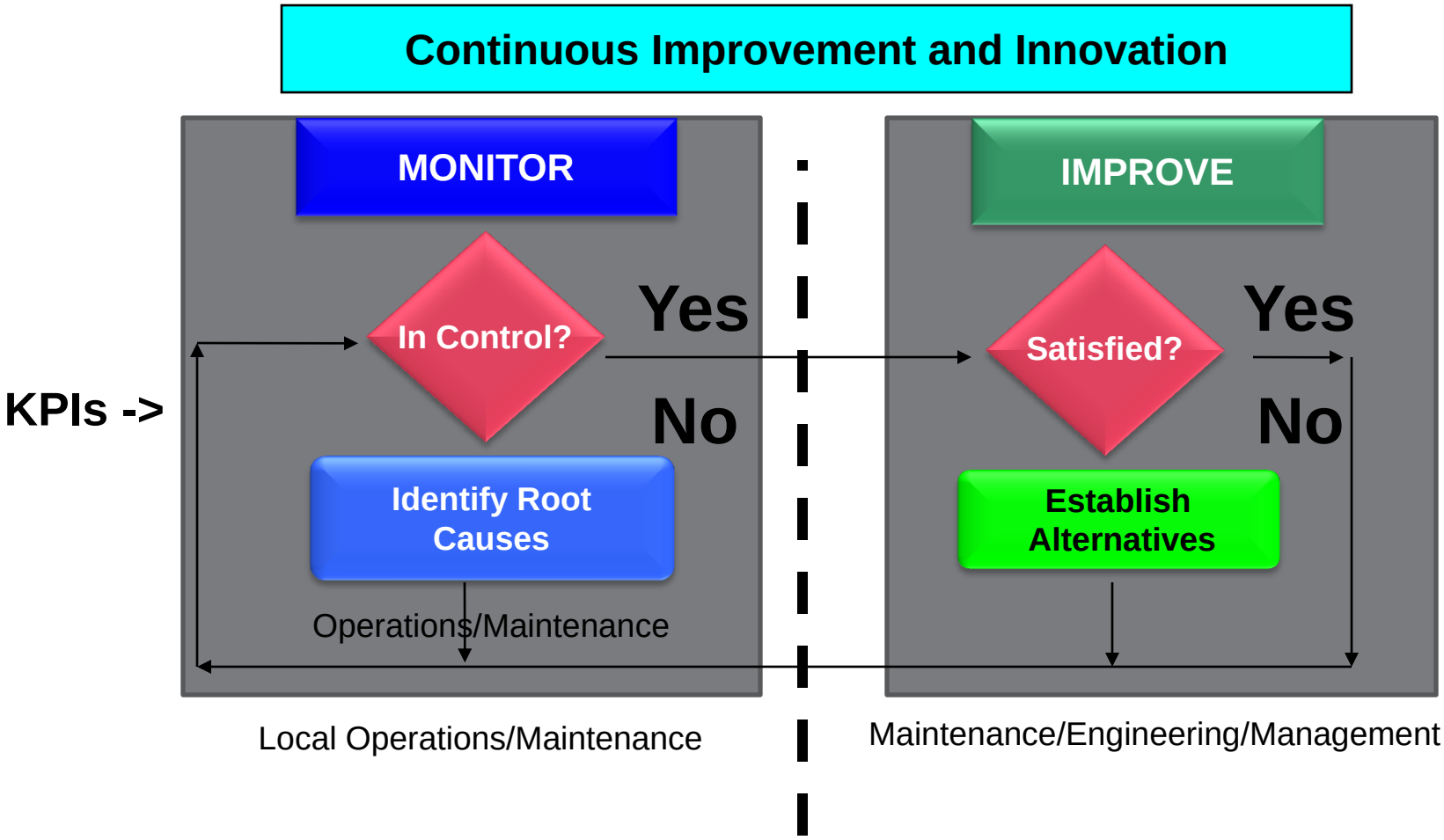


Strategy: Business Value Chain Integration

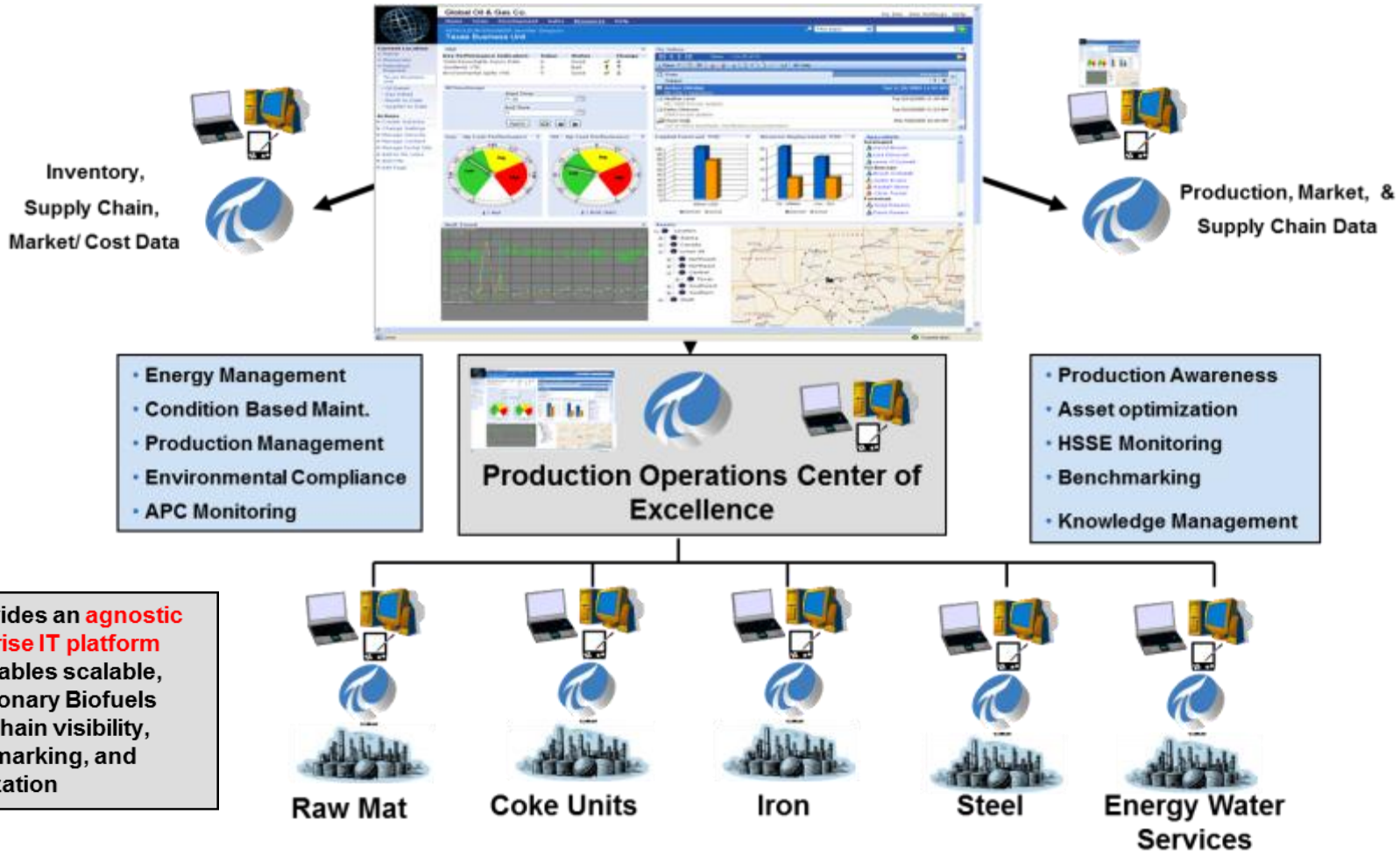


THE PEOPLE EFFECT
Local vs. Collaborative Decision Making

KPI Examples: Production, Quality, Costs, Equipment Availability, Environmental and Safety alerts with fast resolution and improved decision making.

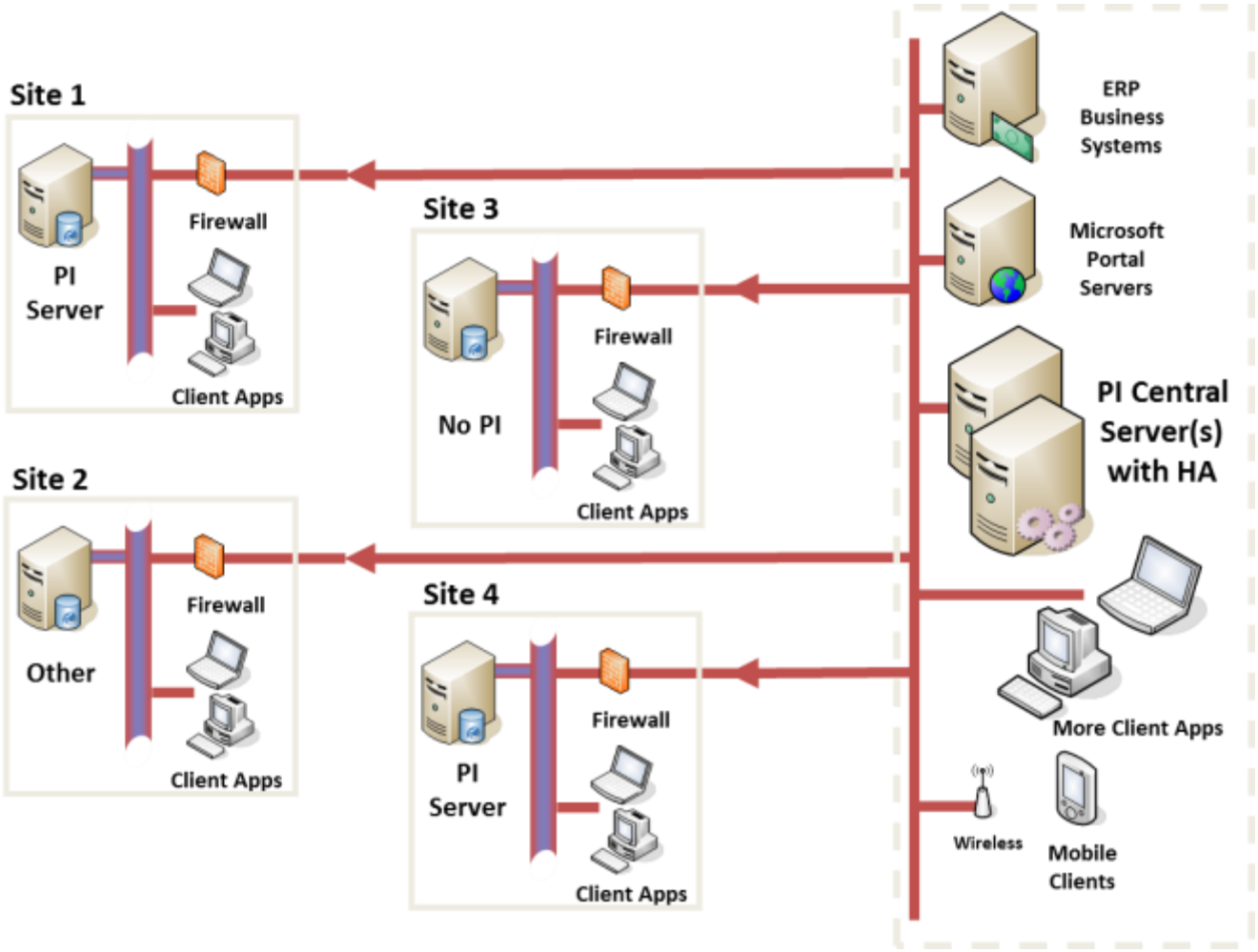


Real Time Enterprise Competence Center



PI provides an agnostic enterprise IT platform that enables scalable, evolutionary Biofuels value chain visibility, benchmarking, and optimization

Strategy: Enterprise Driven Standards



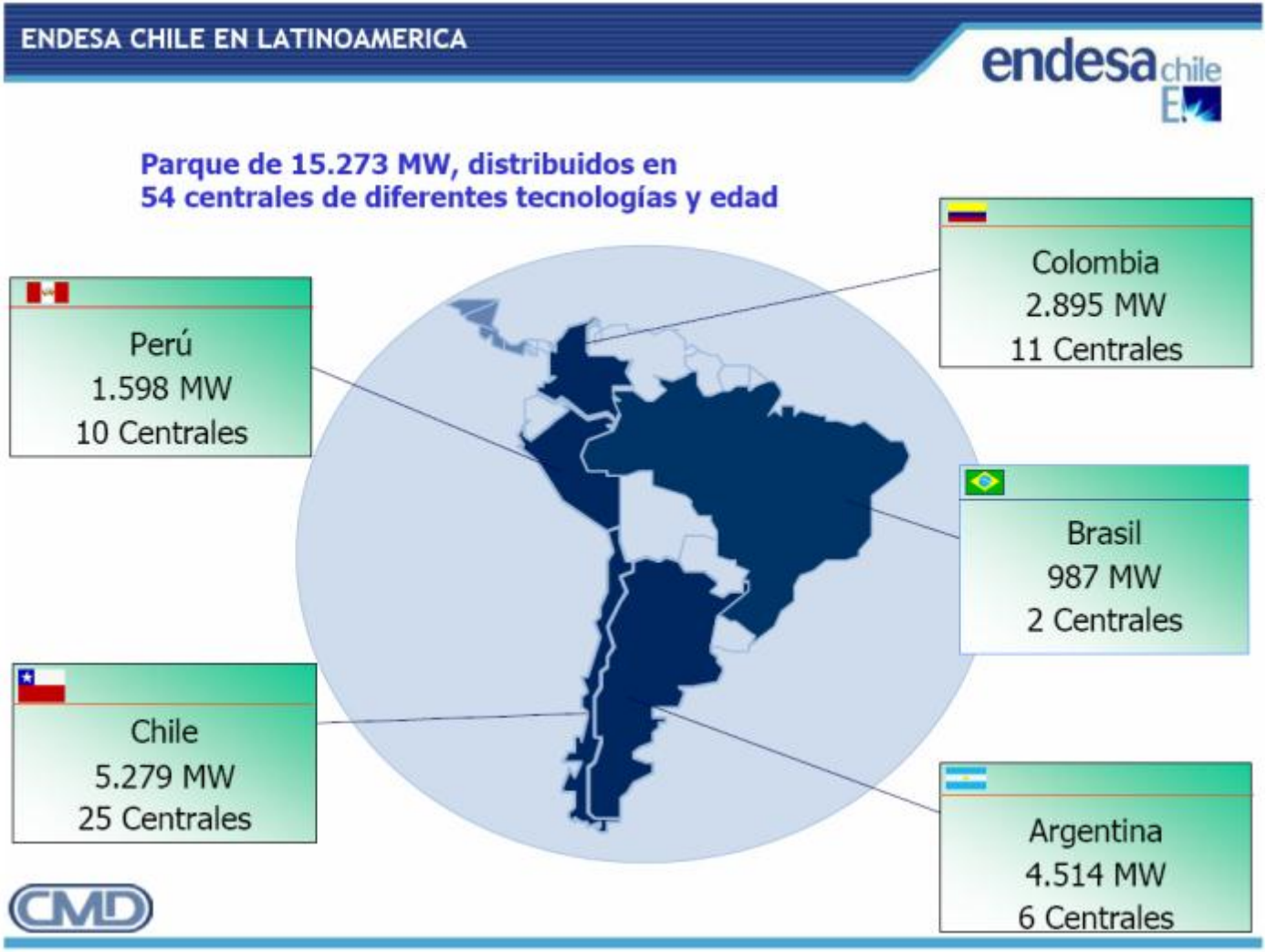
Weather and Country Energy Limitations

Most Arid Region in the World

Large Energy Requirements

Water is very important for ENDESA

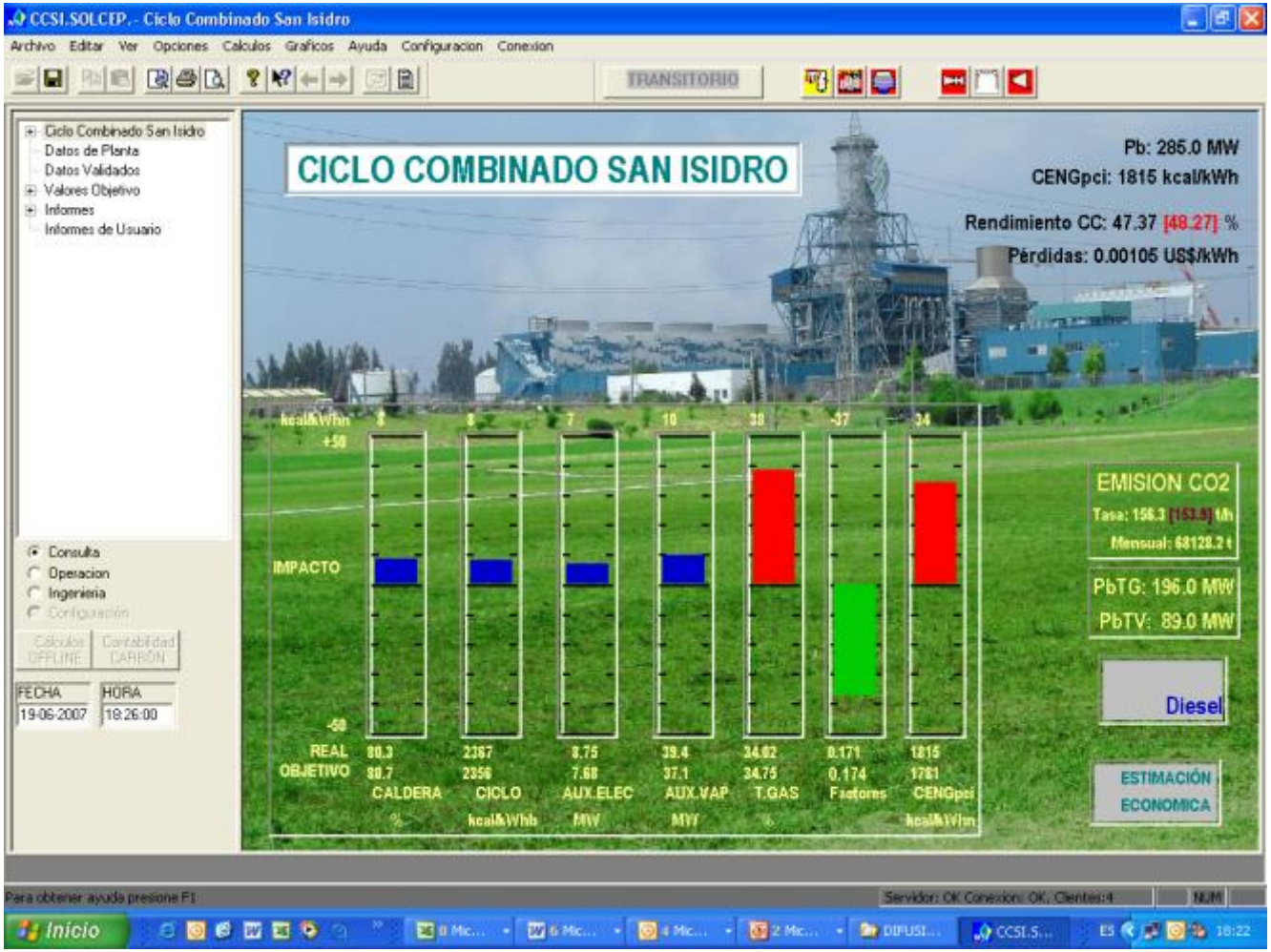
Optimizing Latin American Energy Generation Management



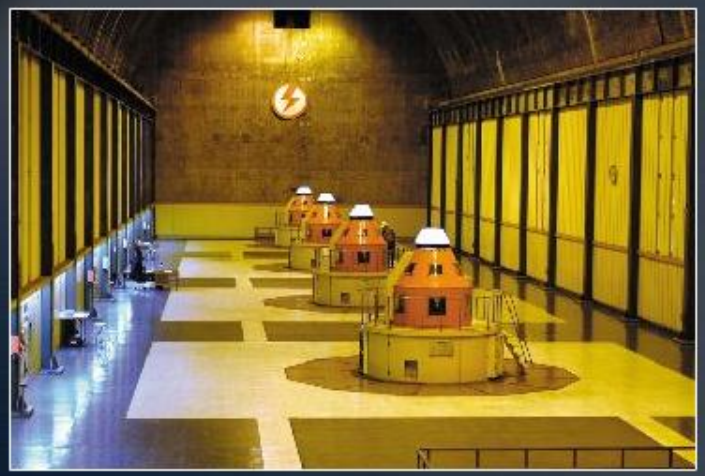
Endesa Dynamic Performance Diagnostics Competence Center

Hydro
Gas
Fuel
Wind
Solar

Dynamic Energy Efficiency Estimators



Central El Toro



Datos de Generación

Unidad	Tipo	Potencia Activa [MW]	Potencia Nominal [MW]	Disponibilidad Dia Anterior %	Estado Interruptor
Unidad 1	Pelton	17	113	100	
Unidad 2	Pelton	23	113	100	
Unidad 3	Pelton	35	113	100	
Unidad 4	Pelton	33	113	100	
Total		108	452	100	

INFORMACIÓN TÉCNICA

Nota:
Información provisoriamente no disponible de las Centrales:

- Betania, en Colombia
- Cartagena, en Colombia
- Diego de Almagro, Chile
- Ventanilla unidad 5 (TV), Perú
- Detalle por unidad en Chocón, Argentina

Central El Toro

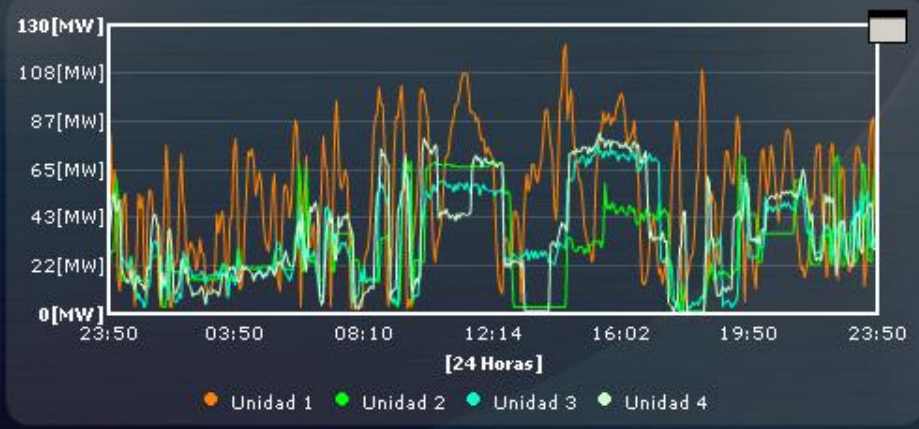
Características Generales

Ubicación: 90 km. al oriente de Los Angeles, VIII Región

Tipo: Hidráulica de embalse. Utiliza las aguas del lago Laja y los recursos del río Polcura, que son desviados hacia dicho lago mediante la captación Alto Polcura

Características Generales

Potencia: 452 MW

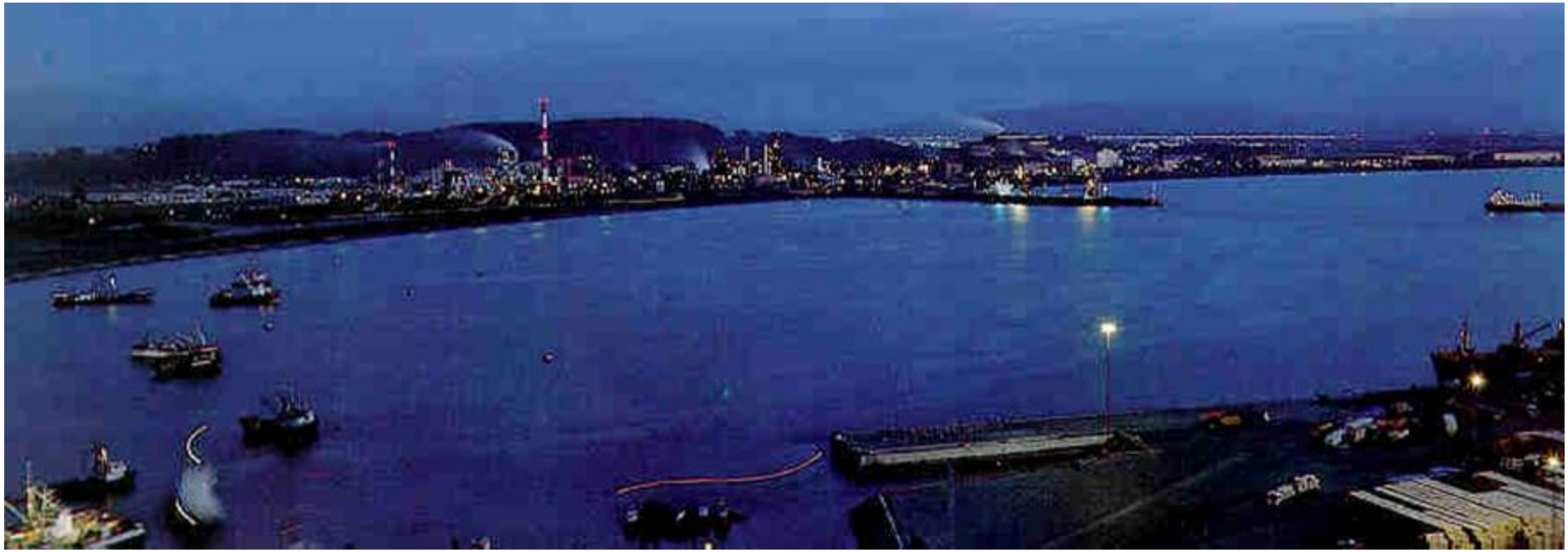


Centrales Térmicas
Centrales Hidráulicas Centro
Centrales Hidráulicas Sur

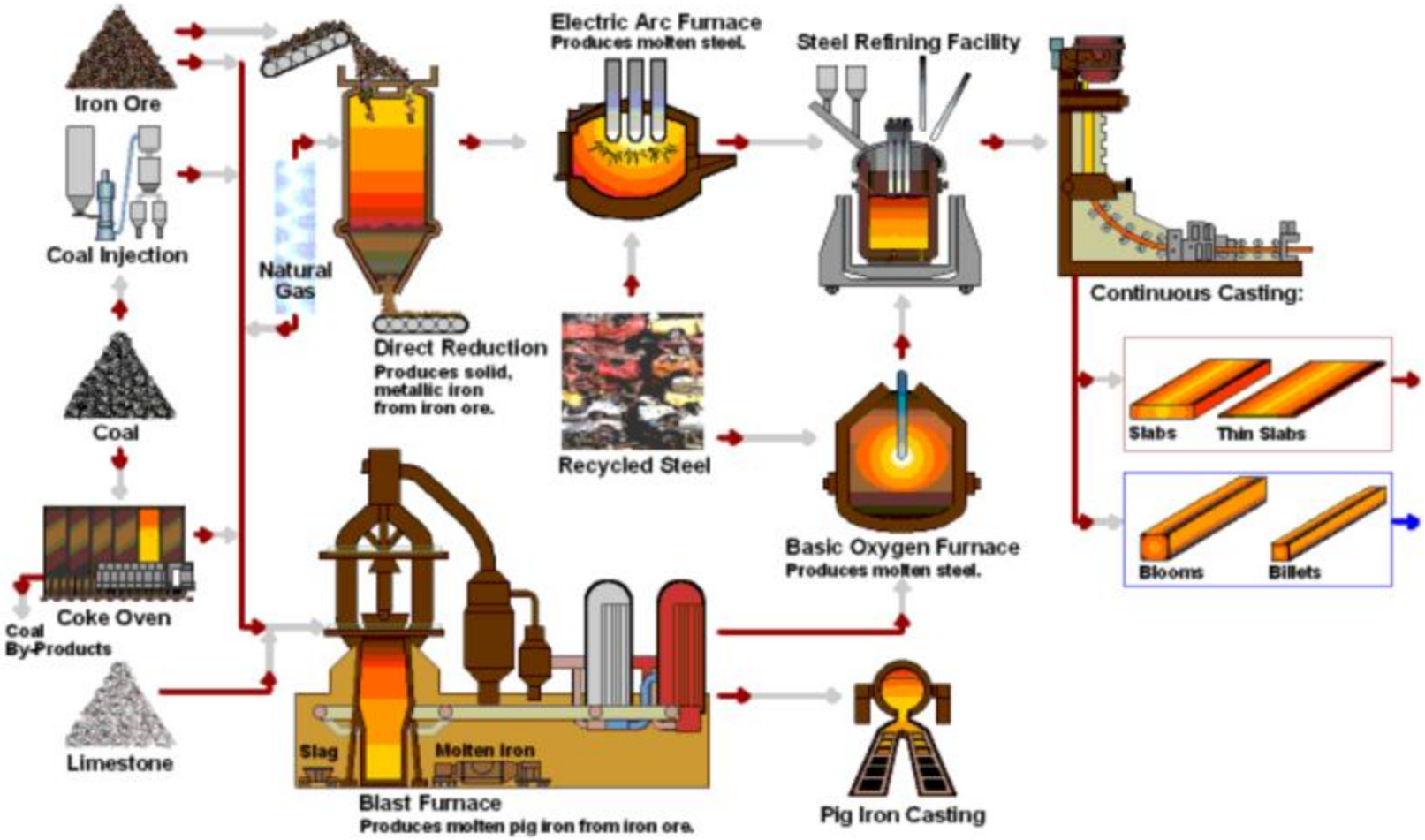
CAP Acero Huachipato Steel Mill

PI System Seminar Chile Y2009

- Fully Integrated Steel Company
- Reduction of Pellets in Blast Furnaces to produce Iron
- Steel produced in BOF then casted into Slabs
- 1.2 Tones of Steel per Year.

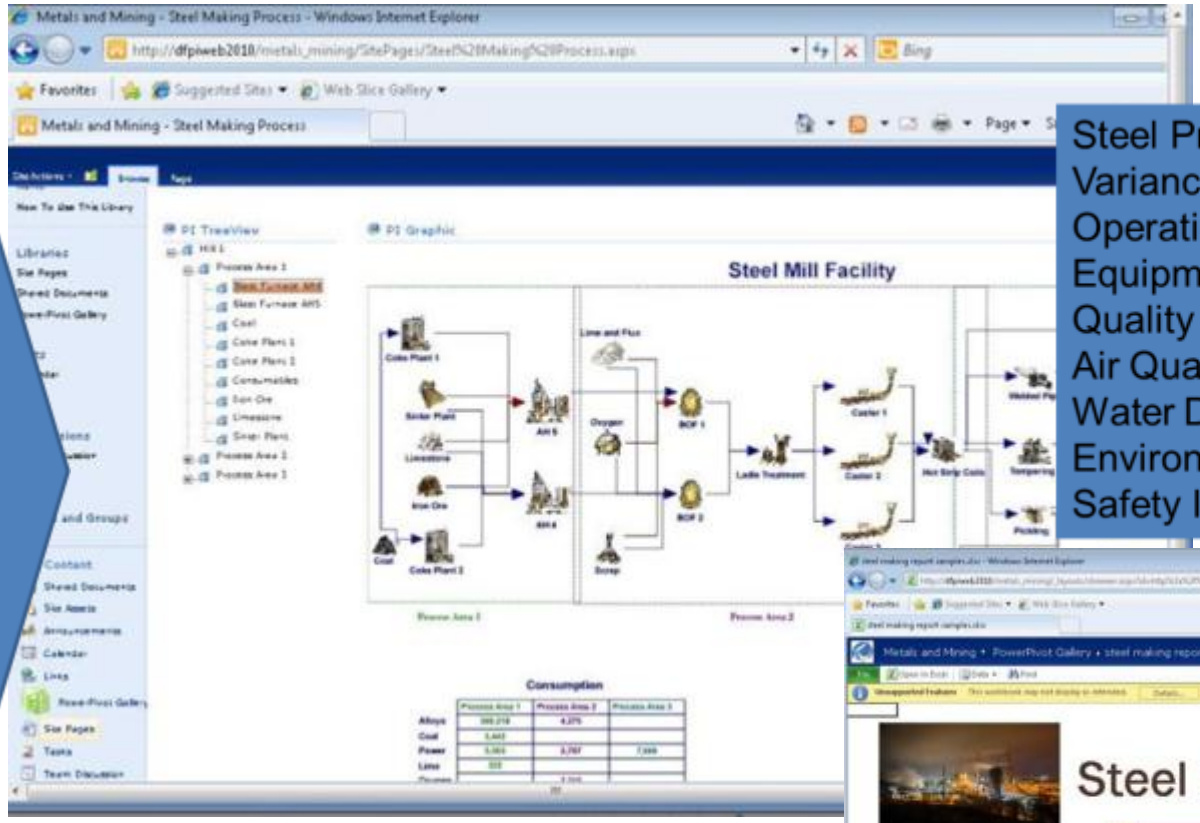


Iron and Steel Metallurgical Complex



Iron and Steel Metallurgical Complex

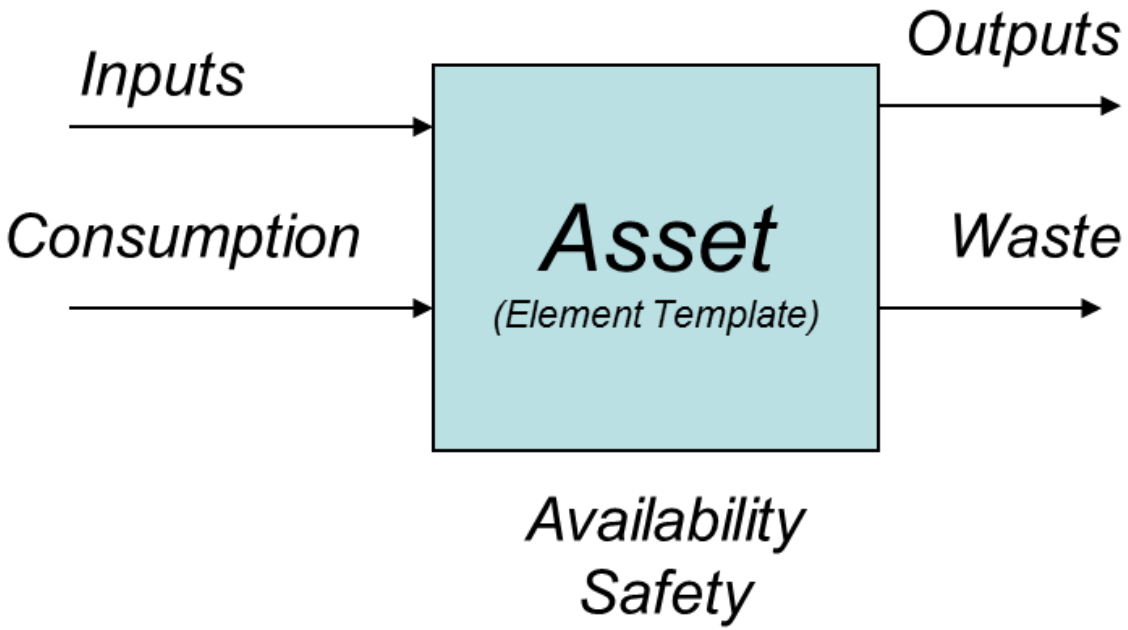
Iron
Limestone
Oxygen
Coal
Air
Fuel
Energy
Water
Alloys (Zinc, Moly, Chrome, etc)
Scraps



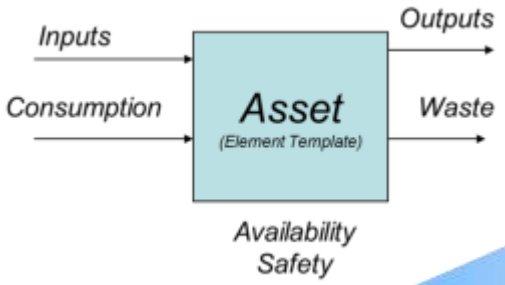
Steel Production
Variances
Operational Time Wasted
Equipment Availability
Quality
Air Quality Emissions
Water Discharge Emissions
Environmental
Safety Incidents

Enterprise Standard Asset Definition

- Strategic Block Diagram

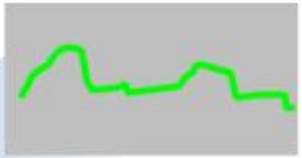


Strategy: Standardization of Assets and with Dynamic Contextual Information



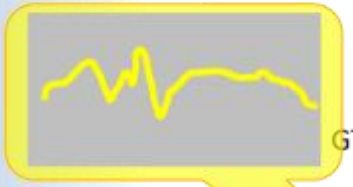
Data at the Original Resolution
Information at the desired aggregation and context
Anywhere, Anytime….

LAB Data



GT56.TTG.PV

Process



GT56.TTH.PV

Equipment

GP11.ATHK8.PV

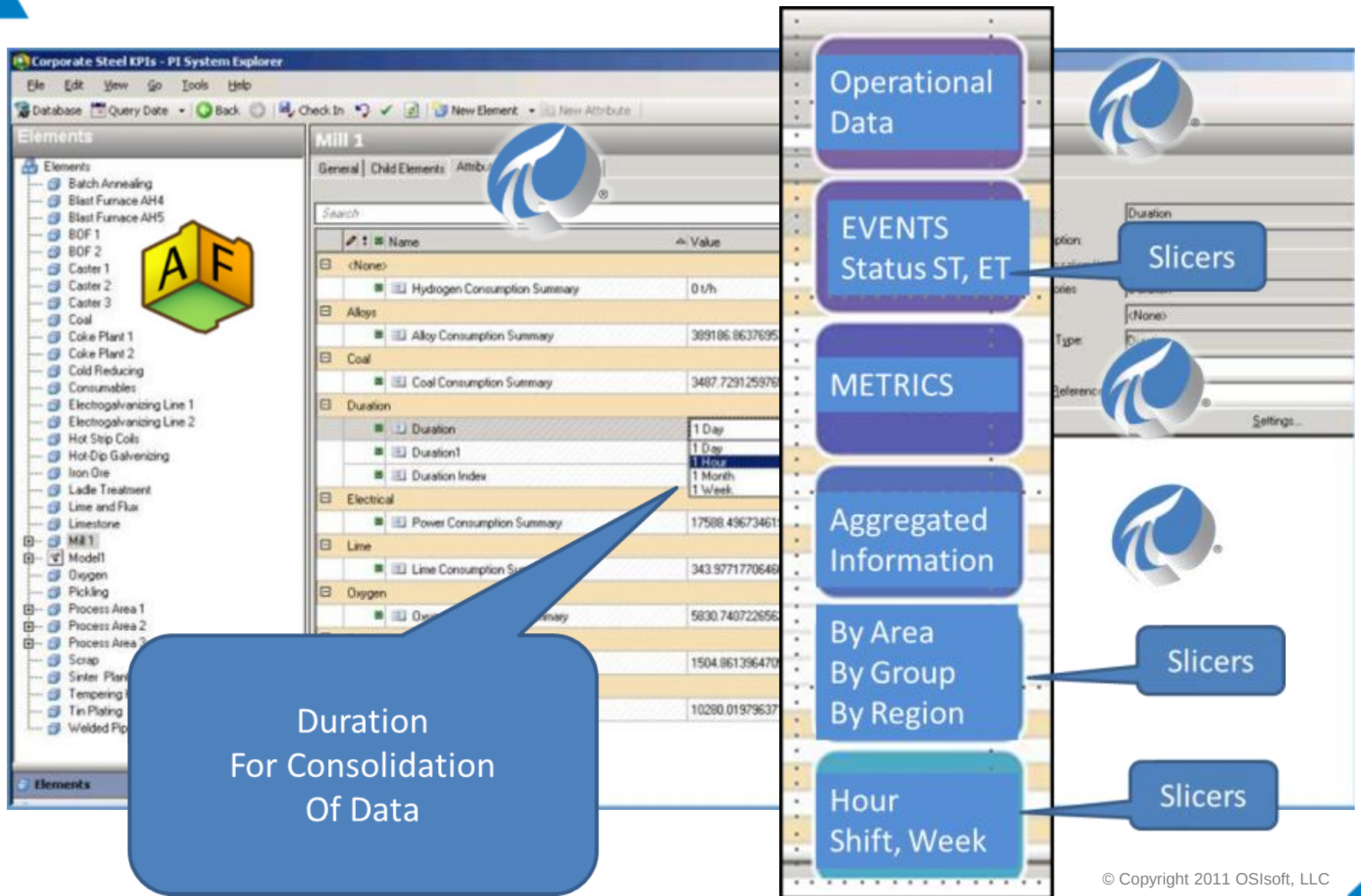
EVENTS and STATES

GP11.YMW.PV

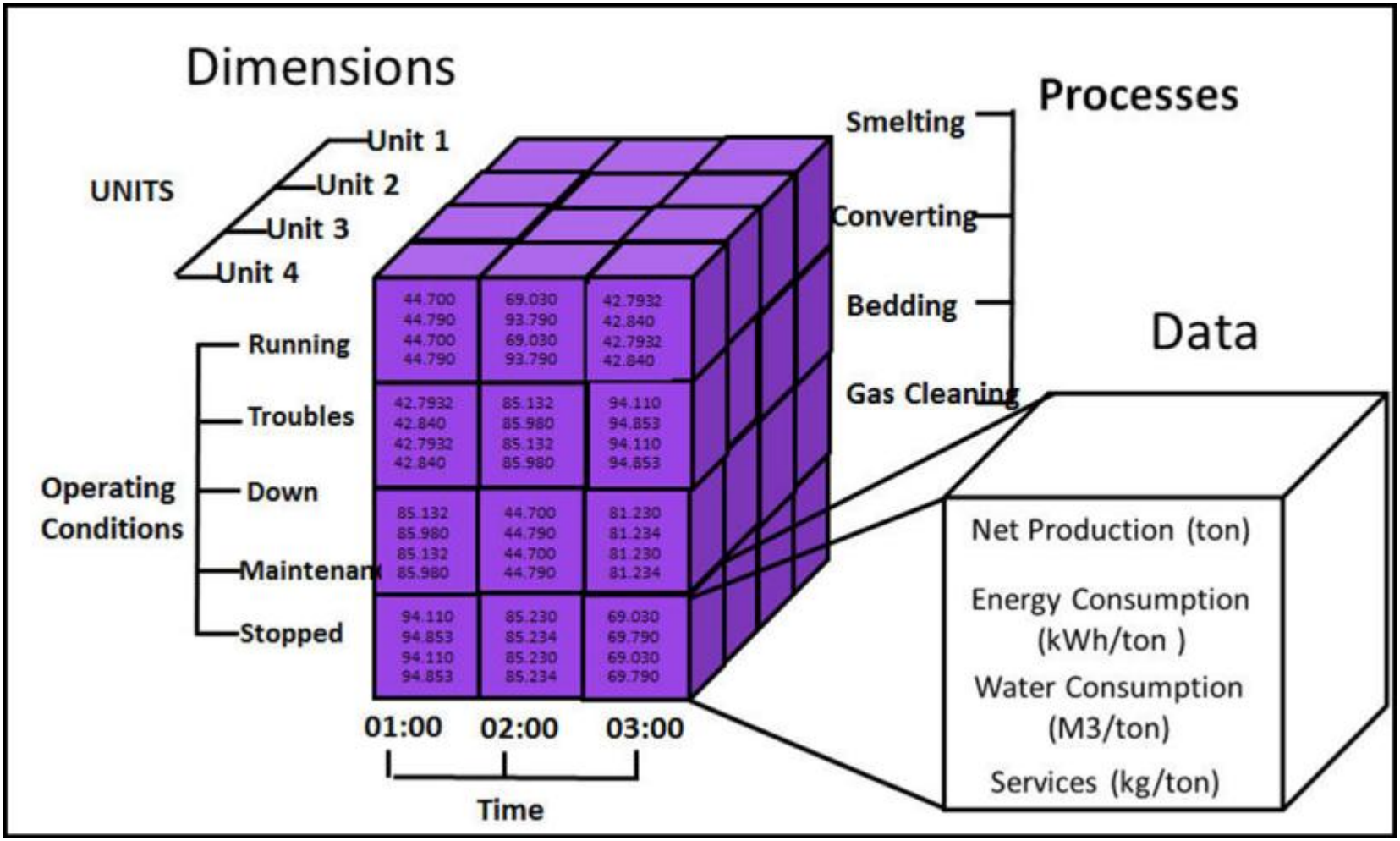
Load

Level

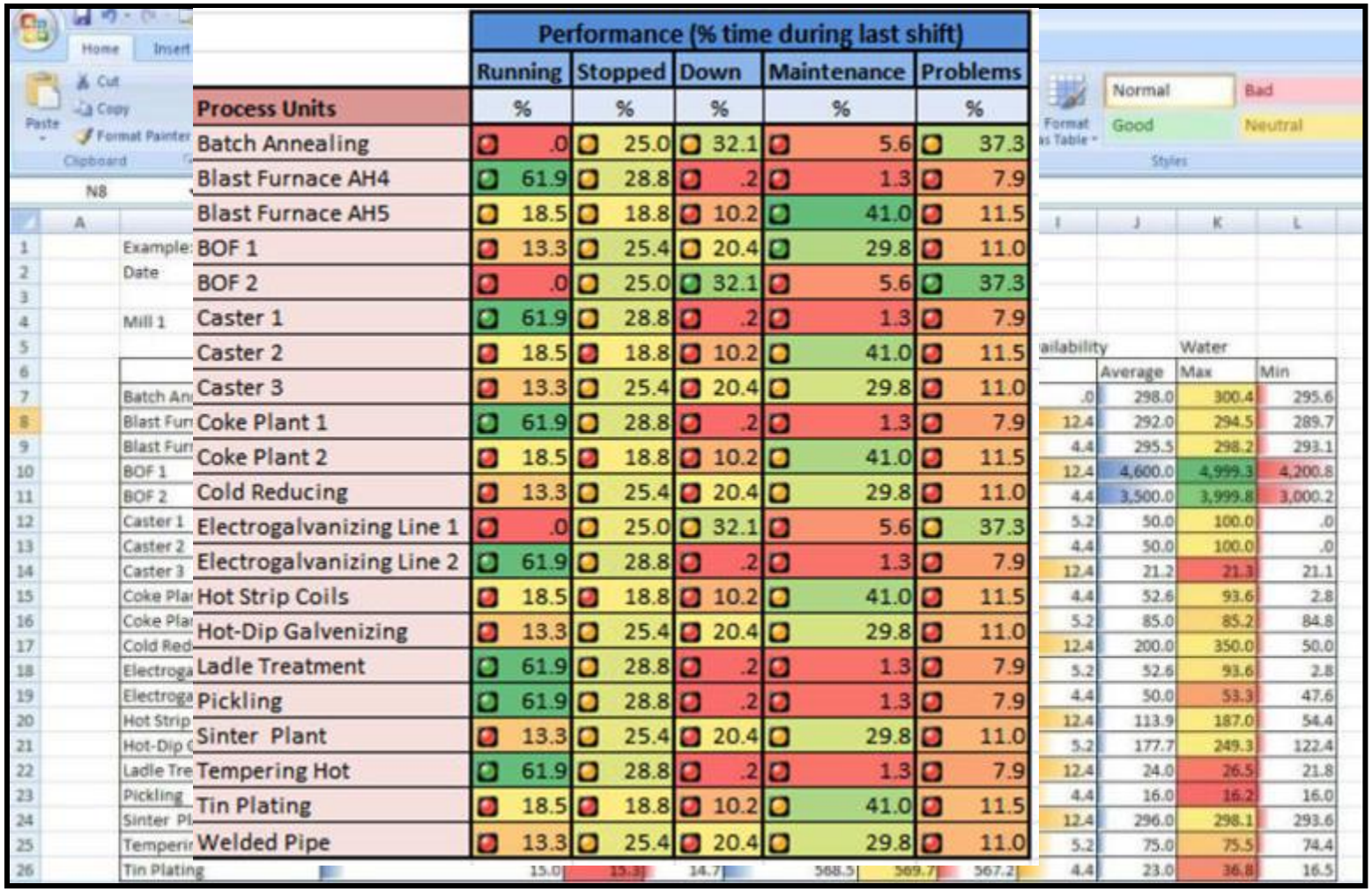
Integration of Data, Metrics and Events



Operational Multidimensional Analysis
PI Enterprise OLEDB (PI SDK and PI AF SDK)



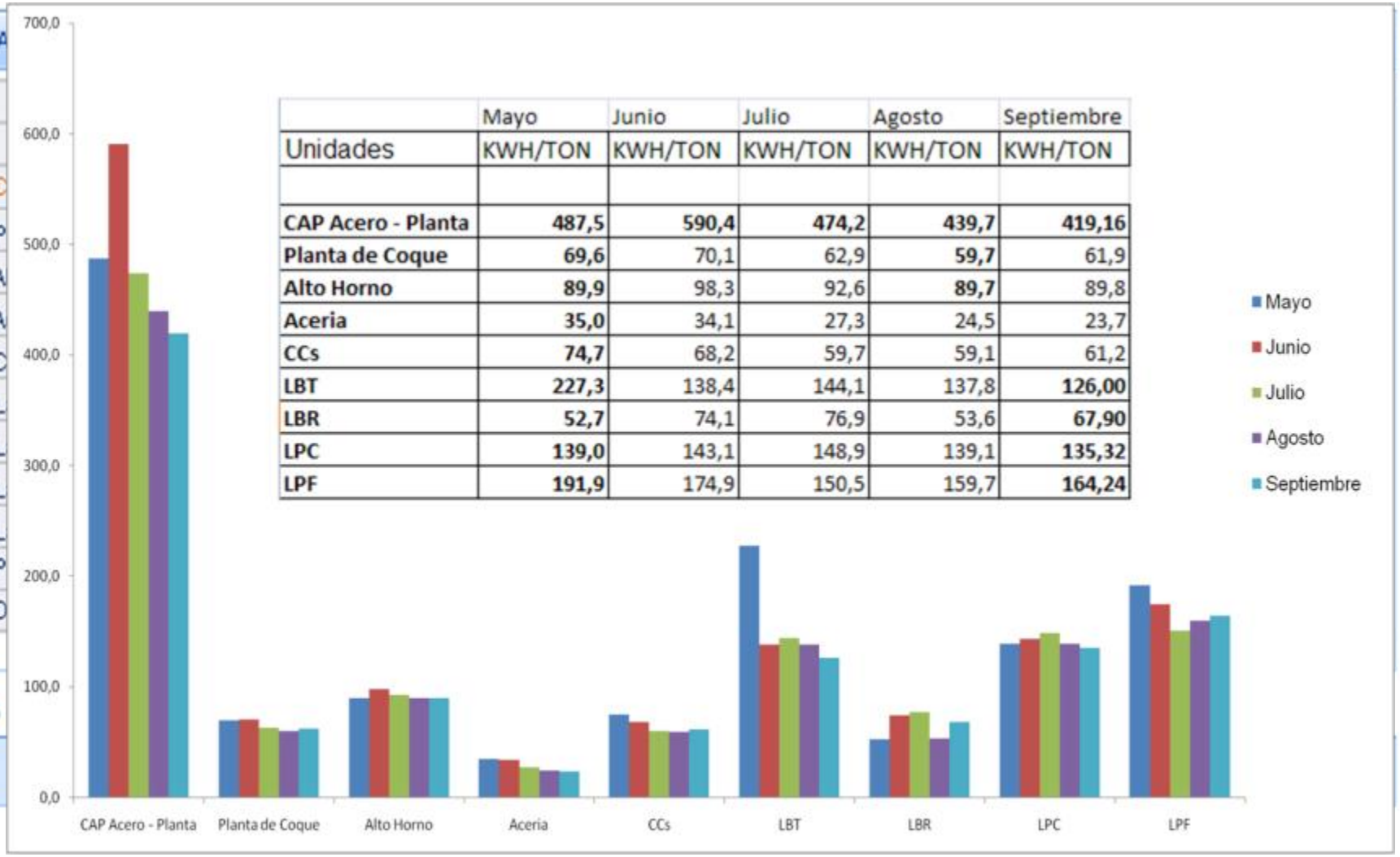
Report Based on Enterprise Driven Standards



Process Units	Performance (% time during last shift)				
	Running	Stopped	Down	Maintenance	Problems
	%	%	%	%	%
Batch Annealing	.0	25.0	32.1	5.6	37.3
Blast Furnace AH4	61.9	28.8	.2	1.3	7.9
Blast Furnace AH5	18.5	18.8	10.2	41.0	11.5
BOF 1	13.3	25.4	20.4	29.8	11.0
BOF 2	.0	25.0	32.1	5.6	37.3
Caster 1	61.9	28.8	.2	1.3	7.9
Caster 2	18.5	18.8	10.2	41.0	11.5
Caster 3	13.3	25.4	20.4	29.8	11.0
Coke Plant 1	61.9	28.8	.2	1.3	7.9
Coke Plant 2	18.5	18.8	10.2	41.0	11.5
Cold Reducing	13.3	25.4	20.4	29.8	11.0
Electrogalvanizing Line 1	.0	25.0	32.1	5.6	37.3
Electrogalvanizing Line 2	61.9	28.8	.2	1.3	7.9
Hot Strip Coils	18.5	18.8	10.2	41.0	11.5
Hot-Dip Galvenizing	13.3	25.4	20.4	29.8	11.0
Ladle Treatment	61.9	28.8	.2	1.3	7.9
Pickling	61.9	28.8	.2	1.3	7.9
Sinter Plant	13.3	25.4	20.4	29.8	11.0
Tempering Hot	61.9	28.8	.2	1.3	7.9
Tin Plating	18.5	18.8	10.2	41.0	11.5
Welded Pipe	13.3	25.4	20.4	29.8	11.0

Tangible benefits: Instant Power CAP ACERO

	Mayo	Junio	Julio	Agosto	Septiembre
Unidades	KWH/TON	KWH/TON	KWH/TON	KWH/TON	KWH/TON
CAP Acero - Planta	**487,5**	**590,4**	**474,2**	**439,7**	**419,16**
Planta de Coque	**69,6**	70,1	62,9	**59,7**	61,9
Alto Horno	**89,9**	98,3	92,6	**89,7**	89,8
Aceria	**35,0**	34,1	27,3	24,5	23,7
CCs	**74,7**	68,2	59,7	59,1	61,2
LBT	**227,3**	138,4	144,1	137,8	**126,00**
LBR	**52,7**	74,1	76,9	53,6	**67,90**
LPC	**139,0**	143,1	148,9	139,1	**135,32**
LPF	**191,9**	174,9	150,5	159,7	**164,24**



Dynamic Analysis and Collaboration

SLICERS

PI Cubes and PI Slicers

Steel Making Process

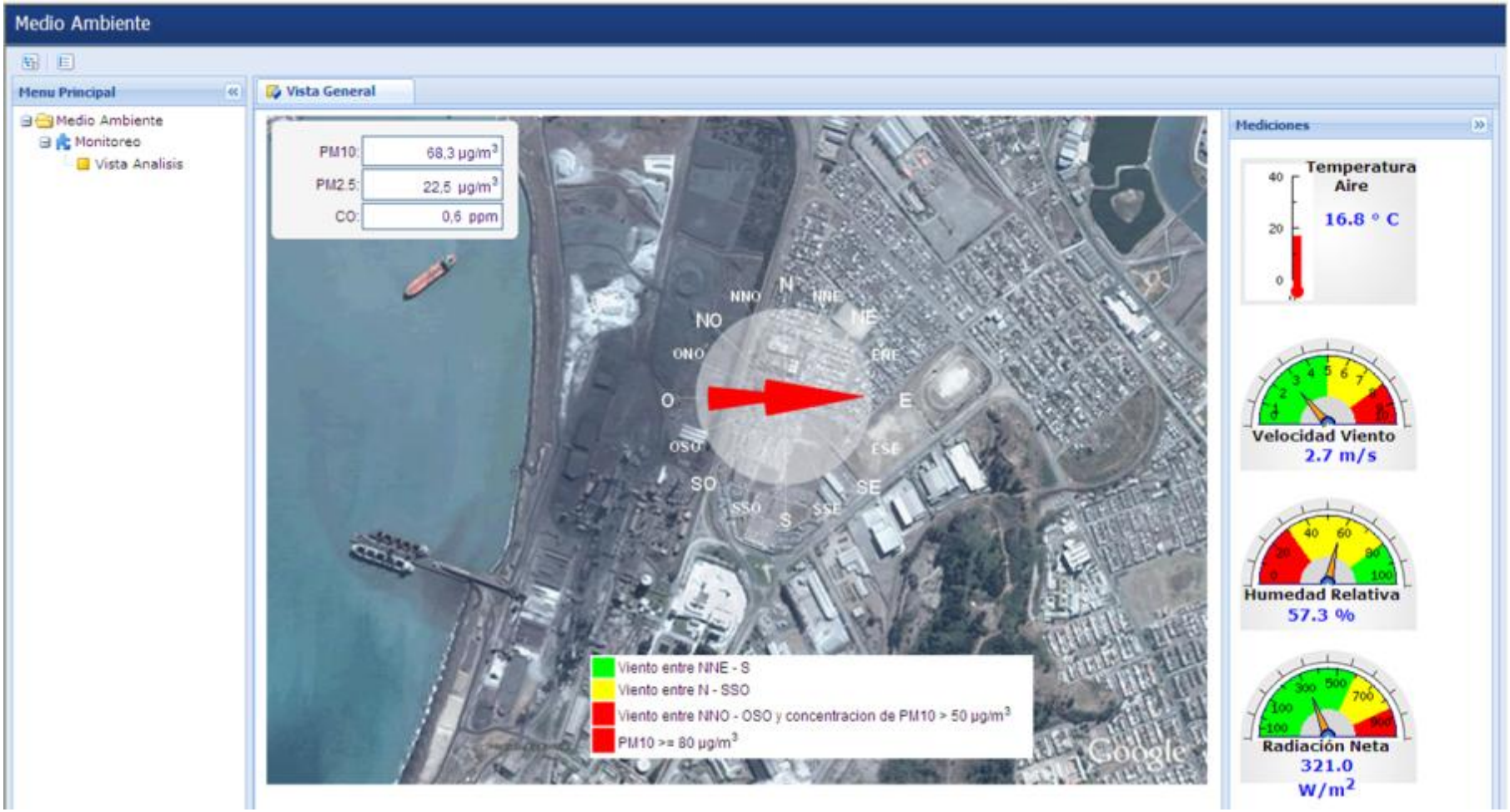
Integrated Production
And Manufacturing Services
(Production, Power, Water,
Consumption per Ton

Operating State	Day	Hour	Shift
Down	18 19 20	0 1 2 3	Turno 1
Maintenance	21 22 23	4 5 6 7	Turno 2
N/A	24 17 25	8 9	Turno 3
Problems		... ...	

		Consumption					
Element	Time	Alloy (t/h)	Lime (kg/h)	Oxygen (kNm3/h)	Power(kWh)	Water (m3/h)	Production (t/h)
Blast Furnace AH4	10/18/2010 1:00:00 AM	1.00	1.92	0.00	54.28	4.22	2.64
Blast Furnace AH4	10/18/2010 5:00:00 AM	2.00	1.92	0.00	60.53	4.23	2.44
Blast Furnace AH4 Total			1.92	0.00	57.41	4.22	2.54
Blast Furnace AH5	10/18/2010 1:00:00 AM	1.00	2.34	0.00	25.49	4.28	3.43
Blast Furnace AH5	10/18/2010 5:00:00 AM	2.00	2.74	0.00	25.20	4.29	4.40
Blast Furnace AH5 Total			2.54	0.00	25.34	4.28	3.92
BOF 1	10/18/2010 1:00:00 AM	1.00	0.00	10.26	4.10	68.54	0.76
BOF 1	10/18/2010 5:00:00 AM	2.00	0.00	37.57	4.13	68.56	1.14
BOF 1 Total			0.00	23.92	4.11	68.55	0.95
BOF 2	10/18/2010 1:00:00 AM	2.00	0.00	69.12	4.27	54.32	3.43
BOF 2	10/18/2010 5:00:00 AM	1.00	0.00	18.71	4.28	54.32	4.40

Tabla de Datos | Consumos por unidad | Rolling diario | Porcentaje de estados

Tangible benefits: Web Based Air Quality Management for Authorities



Performance data comparison with other units

1. Overall Rating

Star Ranking	2007-08	2008-09
4 Star	AC, VC, GC, GS, GCW, HCW and APCW	AC, VC, GS, GC, GCW, HCW and APCW
3 Star	RC and ACW	RC, ACW and NJFD

2. Energy Efficiency Rating

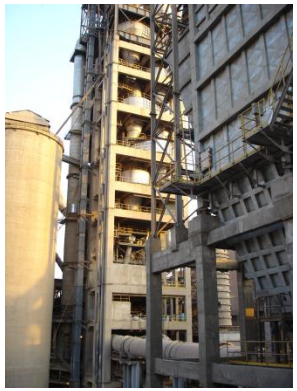
Star Ranking	2007-08	2008-09
5 Star	AC, VC and GC	VC
4 Star	GS, RC, GCW, HCW, ACW II, APCW	AC, GC, GCW, HCW, APCW, GS, RC and ACW
3 Star	ACW I and NJFD	NJFD

3. Kiln Reliability Rating (Mean Time between Stops)

Star Ranking	2007-08	2008-09
5 Star	AC and VC I/II/III	VC-I
4 Star	GC, ACW, HCW and APCW	AC, VC II/III, GS, GC, RC and ACW
3 Star	GS, RC I/II/III and GCW I/II	GCW-I, HCW and APCW

• 70 RMC units

Aditya Birla Ultratech Cement, India



Aditya Birla Ultratech Cement, India

Conclusions

A PI System for data acquisition is the **first step towards a fully integrated PLANT MANAGEMENT SYSTEM**

Integrated solutions can be rapid go-live and allow full scalability for a complete information system throughout the company supplying data at plant level as well as management level and allowing full benchmarking capabilities

Through data management it is possible to thoroughly customize & adapt the most diverse business requirements (generation technology, processes, company, business, organization, geography, etc…) providing an integrated and homogeneous view.

Ultimately the business was able to drive through difficult economic recession phase.

Tangible benefits: Advanced Mine to Mill Integration

UC 2010

Production Benefits:

- Increase of ore milling: 4.6%
- Decrease of mil power: 3.9%
- Decrease of fresh water consumption: 6.8%

Economic Benefits:

- Net profit: US$ 31.8 million (period: 2009/04/04 to 2009/12/31
- PI System contribution: US$ 7.95 million (same period)

Integration of Mine Feed Knowledge with Milling, Flotation and Dewatering.

Results

- **3 Clear References**
- **Full Integration for Reduction of Energy, Water and Environmental Reporting**
  - Gained data visibility across all operations
  - Gather data from multiple systems & sites,
  - Leverage opportunities to reduce resources
  - Identify and promote best practices

Results

- ✓ **Dynamic Performance Management Infrastructure with Collaborative Services**
- ✓ **PI Asset Framework standardization and cross-pollination at the local plant and at the Enterprise**
- ✓ **PI Asset Notification using Performance Metrics and Statistical Tools**
- ✓ **Visibility Using Internet Web Services with standard BI tools.**
- ✓ **PI System provides the required granularity and consolidation**

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Thank you

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