Water and Energy Performance Monitoring at the MMM Enterprise

Presented by

Dr. Osvaldo A. Bascur

Global MMM Business Executive

About OSIsoft

- Established in 1980
- Founder - J. Patrick Kennedy
- Private
- Headquarters - San Leandro, CA
- 720 + employees
- 200 + employees in product development
- PI System Installed base
  - 14,000 + systems (excluding OEMs)
  - 110 + countries
- Footprint in:
  - 40% of Fortune 1,000 process & manufacturing companies
  - 65% of Global 500 process & manufacturing companies

Mission

"We are rewarded when we deliver superior value. This means delivering and implementing an infrastructure through which our customers can continuously improve their business performance"

***Dr. J. Patrick Kennedy** CEO & Founder*

"OSIsoft has released continuous upgrades for over 20 years and we have never had to repurchase PI software. Even though we have a 20 year old system, we currently run our PI System at its most updated version. I know of no other software company that has this kind of commitment to its products and its customers."

WEYERHAEUSER CORPORATION

THE PI WORLD in Mining and Metals

Leading Vendor…

Coal & Energy	Iron Ore	Copper	Nickel, Zinc, Lead, Silver	PGM & Gold	Diversified and other Mining Companies
MEC Murray Energy Corporation	bhpbilliton	CODELCO	PEÑOLES	ANGLO PLATINUM	bhpbilliton
RIO TINTO	VALE	GRUPOMEXICO	teckcominco	goldcorp inc.	xstrata
CONSOL ENERGY	RIO TINTO IRON ORE	RIO TINTO	xstrata	ANGLO AMERICAN	RIO TINTO
Xstrata Coal	USIMINAS	bhpbilliton	QNI	BARRICK	ANGLO AMERICAN
SASOL reaching new frontiers	CLIFFS	IVANHOE MINES NEW HORIZONS	ZINIFEX LIMITED	umicore Precious Metals Refining	RioTinto Alcan
Peabody	CSN Companhia Siderúrgica Nacional	Sumitomo Corporation	Votorantim	NEWMONT	LOGAN ALUMINUM
SUNCOR ENERGY	Dongbu	FREEPORT-McMoRan COPPER & GOLD	VALE	KINROSS	ADITYA BIRLA GROUP ADITYA BIRLA
Syncrude	SeverStal RESURS	SOUTHERN COPPER GRUPO MEXICO	xstrata nickel	OCEANAGOLD	RIO TINTO ALUMINIUM
Energy Coal	ArcelorMittal	ESCONDIDA CHINALCO	ASTURIANA DE ZINC	GOLD FIELDS	Mosaic
Alpha Natural Resources	CAP	Aurubis	Grupo PARANAPANEMA	Cameco	HYDRO
Cameco	TATA	Kennecott Utah Copper			dubal Dubai Aluminium
bhpbilliton		KGHM			ALCOA
					CEMEX Building the future — UNITED STATES
					Climax Molybdenum A Phelps Dodge Company

Mines, Concentrators, Smelters and More

Non-Ferrous Metals	Precious Metals	Aluminium	Iron/Steel	Energy Minerals	Industrial Minerals
Glencore	Glencore	Glencore	Glencore	Glencore	Glencore
Rio Tinto	Rio Tinto	Rio Tinto Alcan	Rio Tinto	Rio Tinto Coal	Rio Tinto
IncoVale		Vale	Vale		
Chinalco		Chinalco			
BHP B	BHP B	BHP B	BHP B	BHP B Coal	BHP B
Freeport McMoRan	Newmont	Rio Tinto Comalco	Xstrata Cr	Xstrata Coal	Cemex
Codelco	Barrick Gold	Alcoa	AHMSA	Foundation Coal	ItalCementi
Grupo Mexico	NewCrest	Aluminerie Alouette	AK Steel	Peabody Energy	Melon
Xstrata Cu	Oceana Gold	Alunorte	ArcelorMittal	Syncrude	Lafarge
Xstrata Ni	Kinross Gold	Dubai Aluminium	Cliffs Minerals	Suncor	Mozaic
Xstrata Zn	UMICORE	Logan Aluminium	CSn	AngloAmerican	Cargill
Teck Cominco	Agnico Eagle	Norandal	Ecometales	Bitumar	Potash Corp
KGHM	AngloPlats	Norsk Hydro	Essar Steel	Cameco	Aditya Birla
Aurubis	KCGM	Novelis	JFE	Cliffs Mineral	Asahi Glass
Anglo American		Parapanema	Kobe Steel	Sunoco	Corning
Antofagasta Minerals		Queensland Alumina	Nippon Metals		Imerys
Cerro Matoso		Sherwin Alumina	Nippon Steel		Nippon Sheet Glass
Koniambo		Titania	Severstal		Straits Bulk
MIM Holdings		Windalco	One Steel		Taiheliyo Cement
Minera Alumbrera			Quebec Metals		
Minera Pelambres			Tata Steel		
OK Tedi Mining			ThyssenKrup		
Penoles			Tokyo Steel		
PortoVesne			US Steel		
Quadra Mining			Usiminas		
Sandvick			Votorantin		
Southern Peru Copper			Wabush Mines		
Sumitomo					
Votorantin					
Yanggu Xiannguang					
Zhejiang Tianhong					

2011 Enterprise Agreements

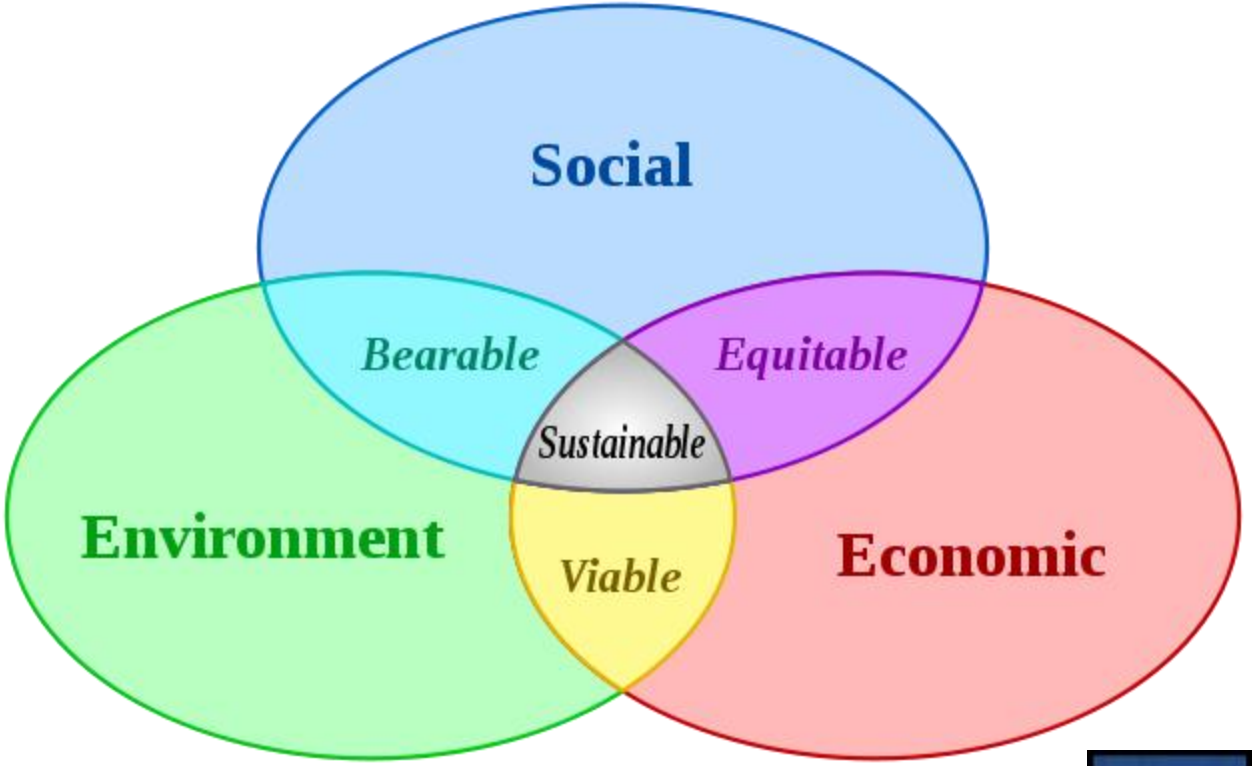
PI System in Metals and Mining

- The metals, materials, and mining industries are generally characterized by remote site operations, large capital investments, ever tightening environmental regulations, and large numbers of plants with diverse information. These industries are driven by stringent quality demands, globalization, and the pressure to improve margins.
- Enables metallurgical companies to improve their asset optimization and to empower their people by simplifying the integration of metallurgical sites and the integration of real time information with operations, engineering, business, suppliers and customers. PI is also helping companies facilitate deployment of their Six Sigma, Quest for Zero, and Operational Excellence programs across the industry.
- Helps capitalize on vast quantities of data, use them to attain real-time intelligence, and in turn realize economic benefits such as:

PI System in Metals and Mining

- Increased plant equipment reliability and reduced maintenance costs by moving from schedule-based maintenance to condition-based maintenance
- Reduced equipment breakouts and decreased end product waste and energy consumption
- Improved responsible care performance and environmental stewardship
- Reduced new equipment capital expenditures
- Optimized energy consumption by leveraging inexpensive fuel sources to minimize energy consumption from outside sources
- Capitalization on a greater number of opportunities by streamlining the access to and expanding the reach of time-critical information
- OSIsoft's install base consists of over 11,000 systems which are installed in 107 countries world wide. In addition, many metals, materials, and mining companies around the world have streamlined their businesses with the PI System. The PI System is used by 5 of the 16 Metal companies listed on the 2007 Fortune 500 list and 10 of the 14 Metal companies listed on the 2007 Fortune Global 500 list.

Sustainability: Energy and Water Conservation Strategies







Metals and Mining Large Water and Energy Costs

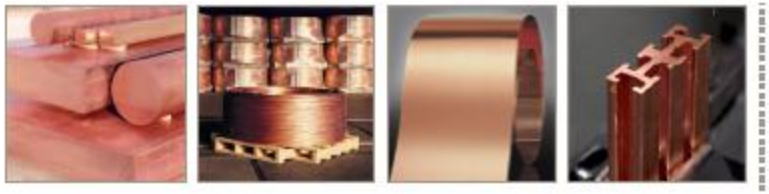
Ore

Energy

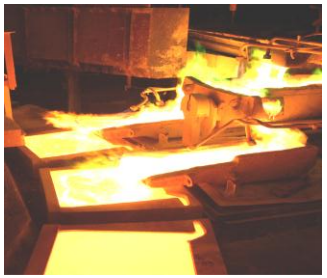
Water

Sag Milling

Concentrate



Products



Metal

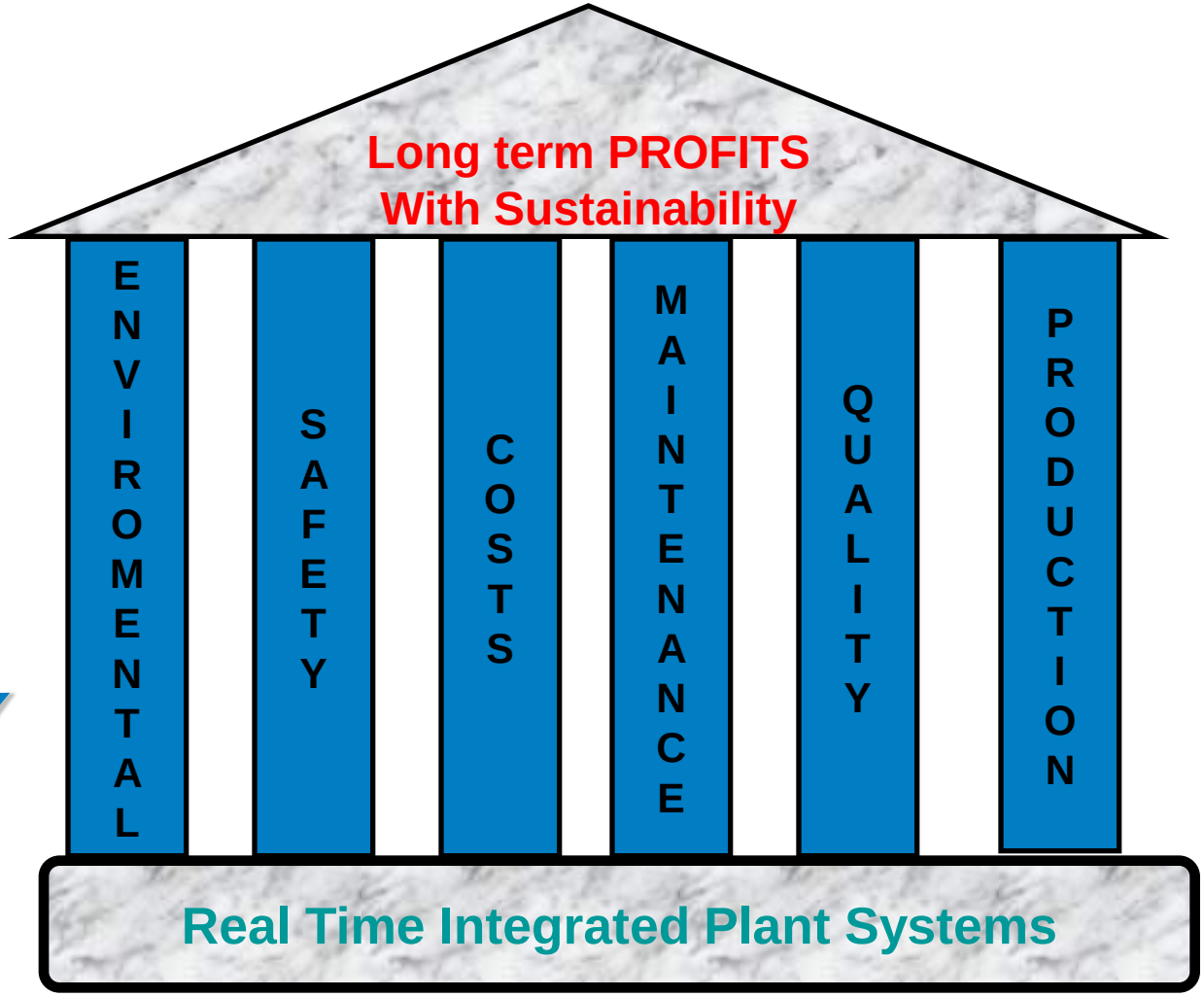
Overall Process Effectiveness

Results

Opportunities $

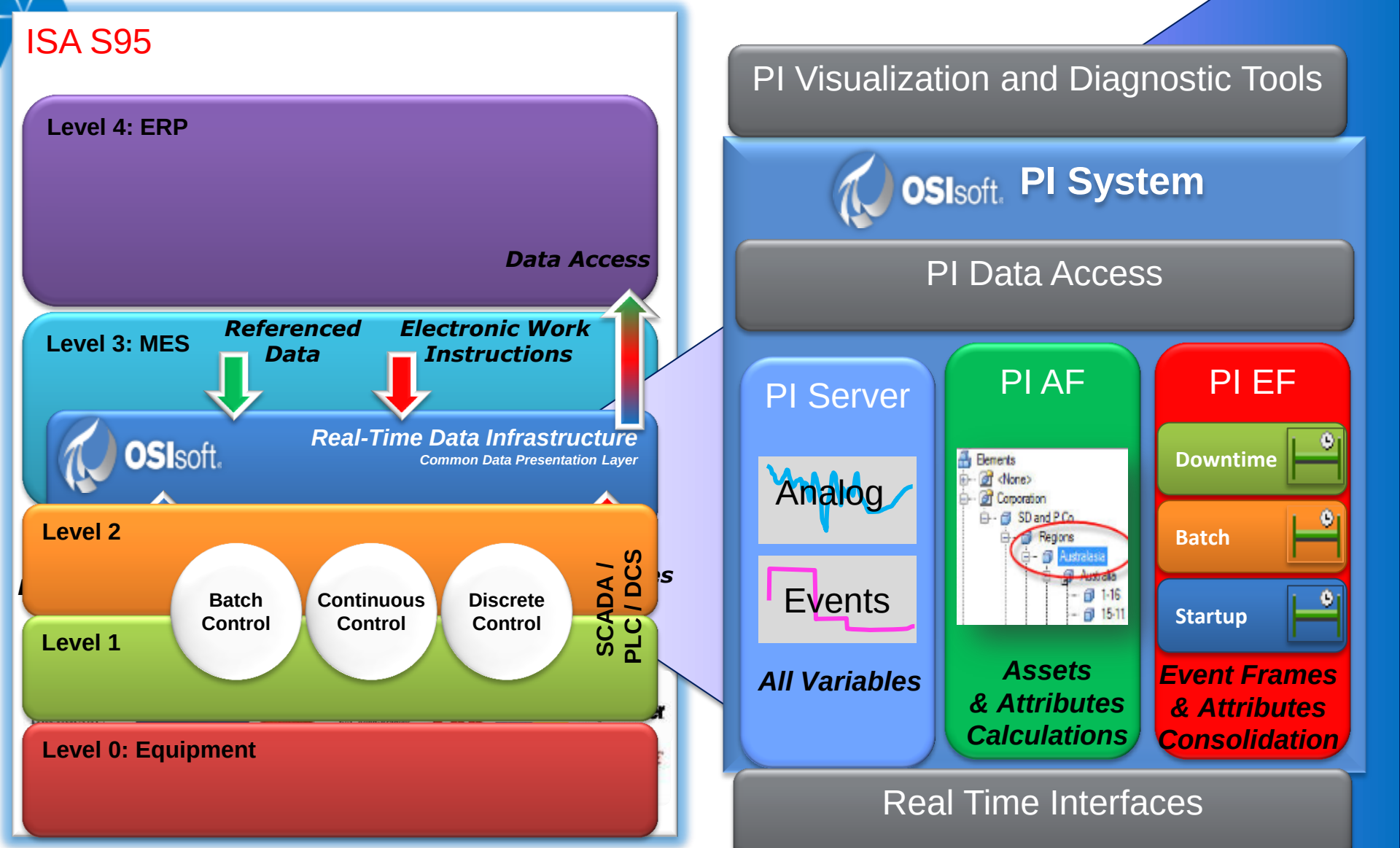
Porter
Shared VALUE
Strategy
SUSTAINABILITY

Systems

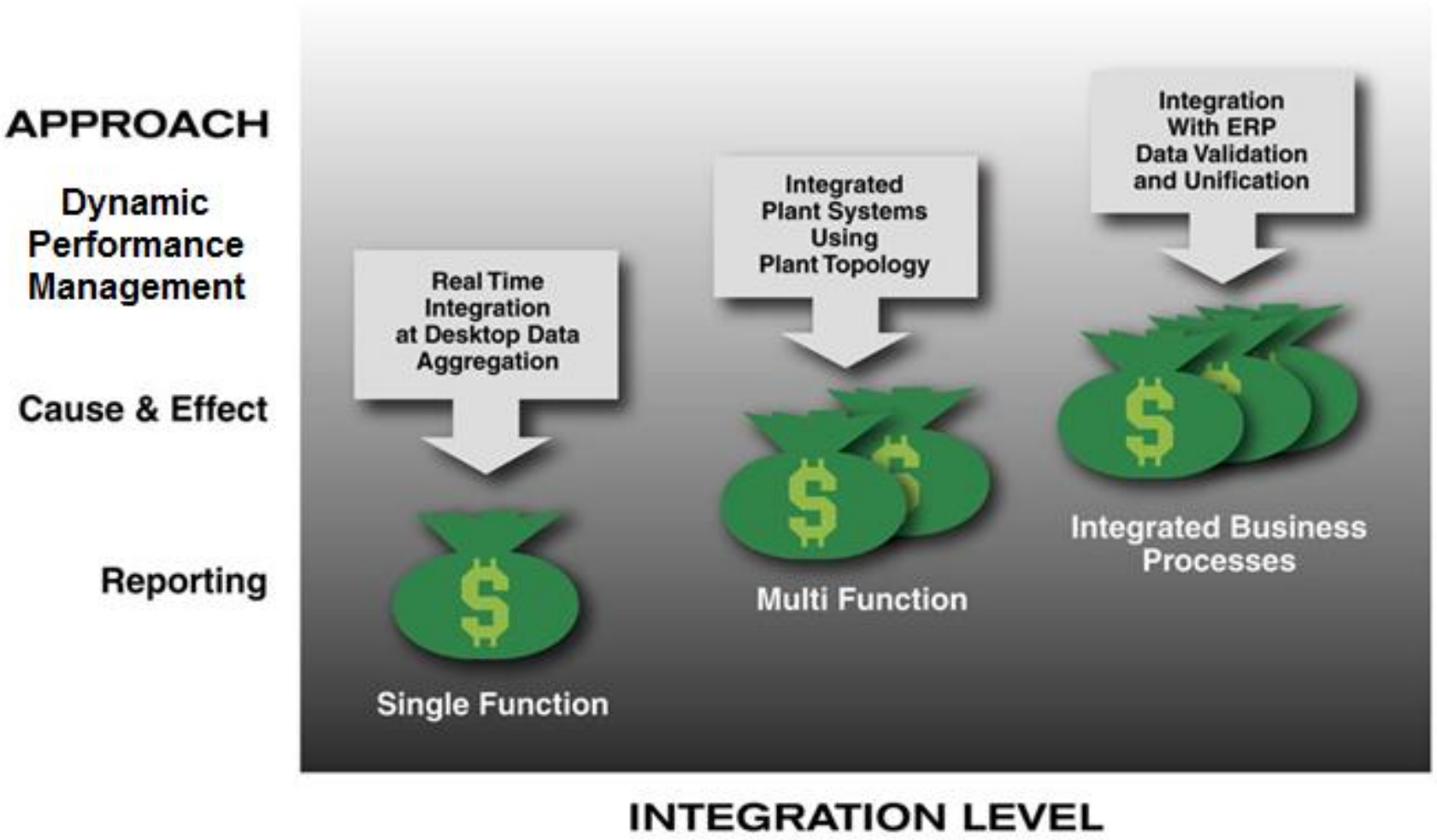


Making available data from many sources, most often databases.

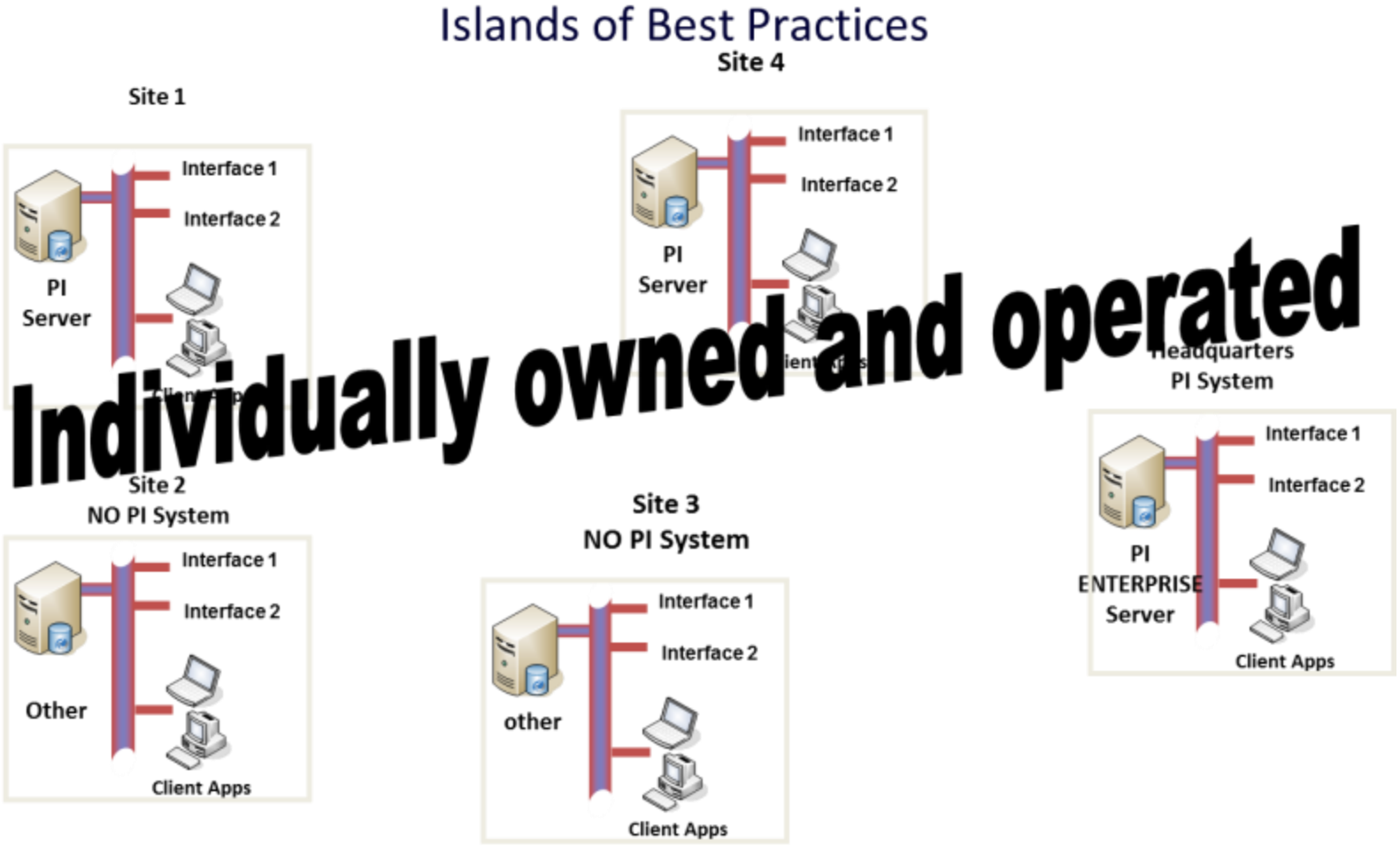
PI System Data Infrastructure



Business Process and Operational Assets

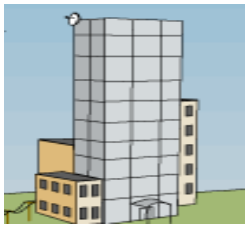


Typical Situation NO Integration



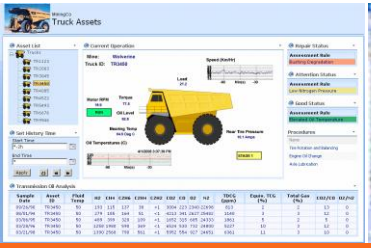
Mine to Metals Products

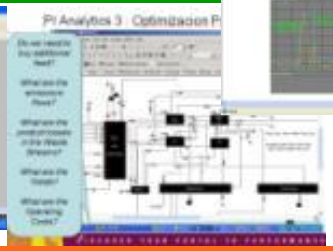
Microsoft



Corporate

PI Visualization and Collaboration





PI Analytics and Notifications

OSIsoft

PI Server and Data Services

Jigsaw

noduan

ROSEMOUNT Analytical

Tecnomatix FACTORYLINK 7.5

FANUC

FISHER

Honeywell PHD

ABB

EMERSON

DeltaV

invensys Wonderware

ROCKWELL SOFTWARE

TOSHIBA

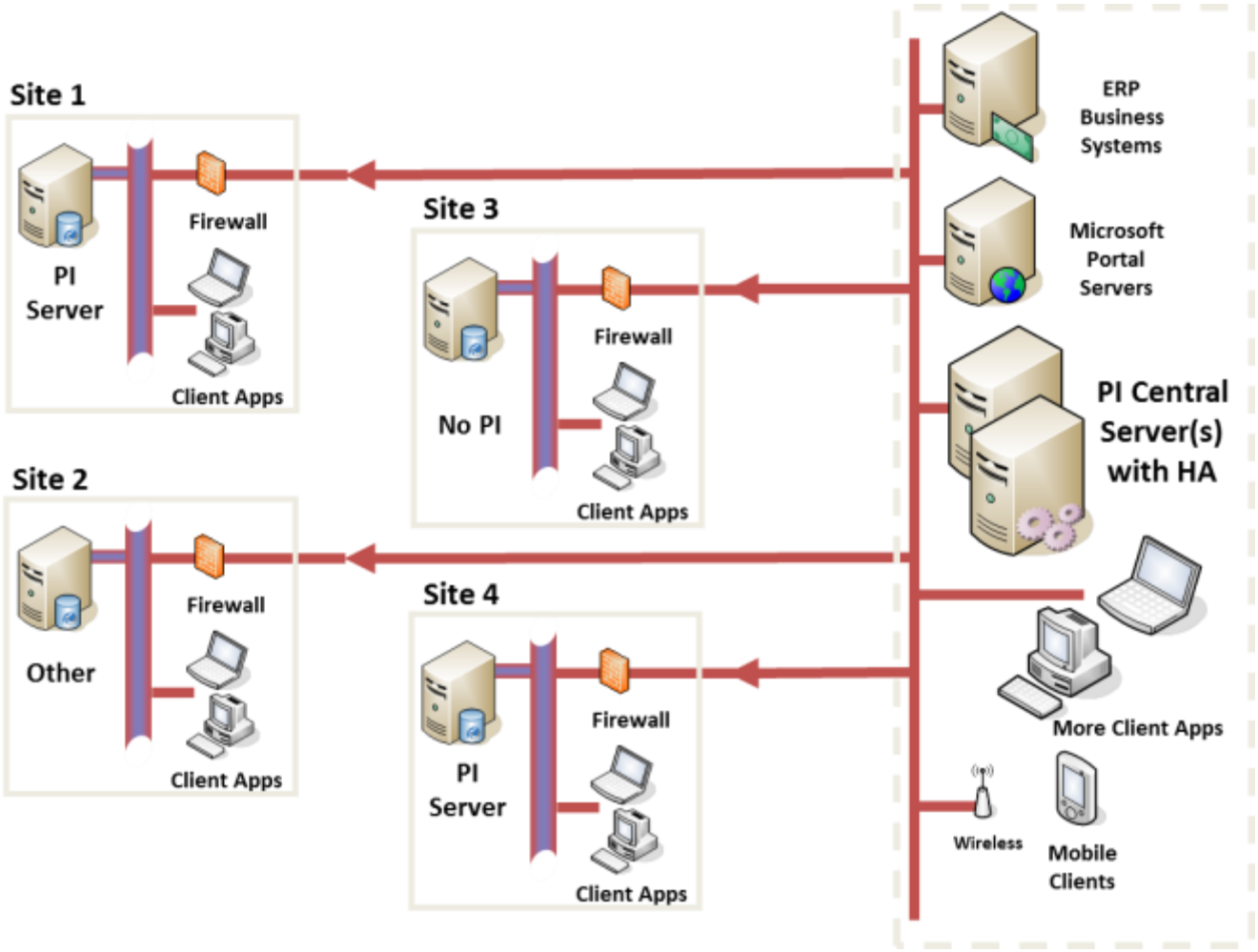
Honeywell

Bailey

Rockwell Automation RSView

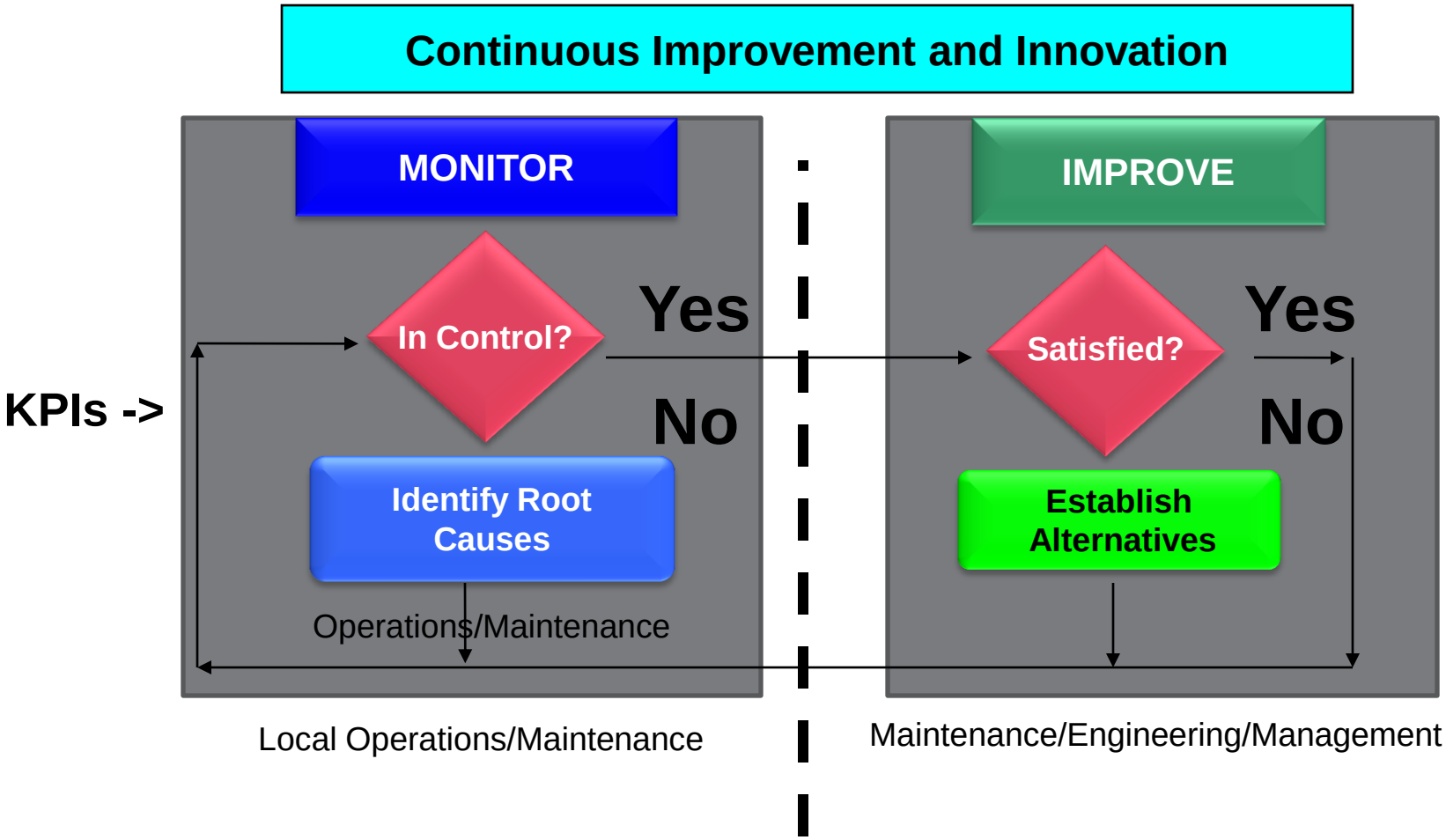
invensys FOXBORO

Strategy: Enterprise Driven Standards

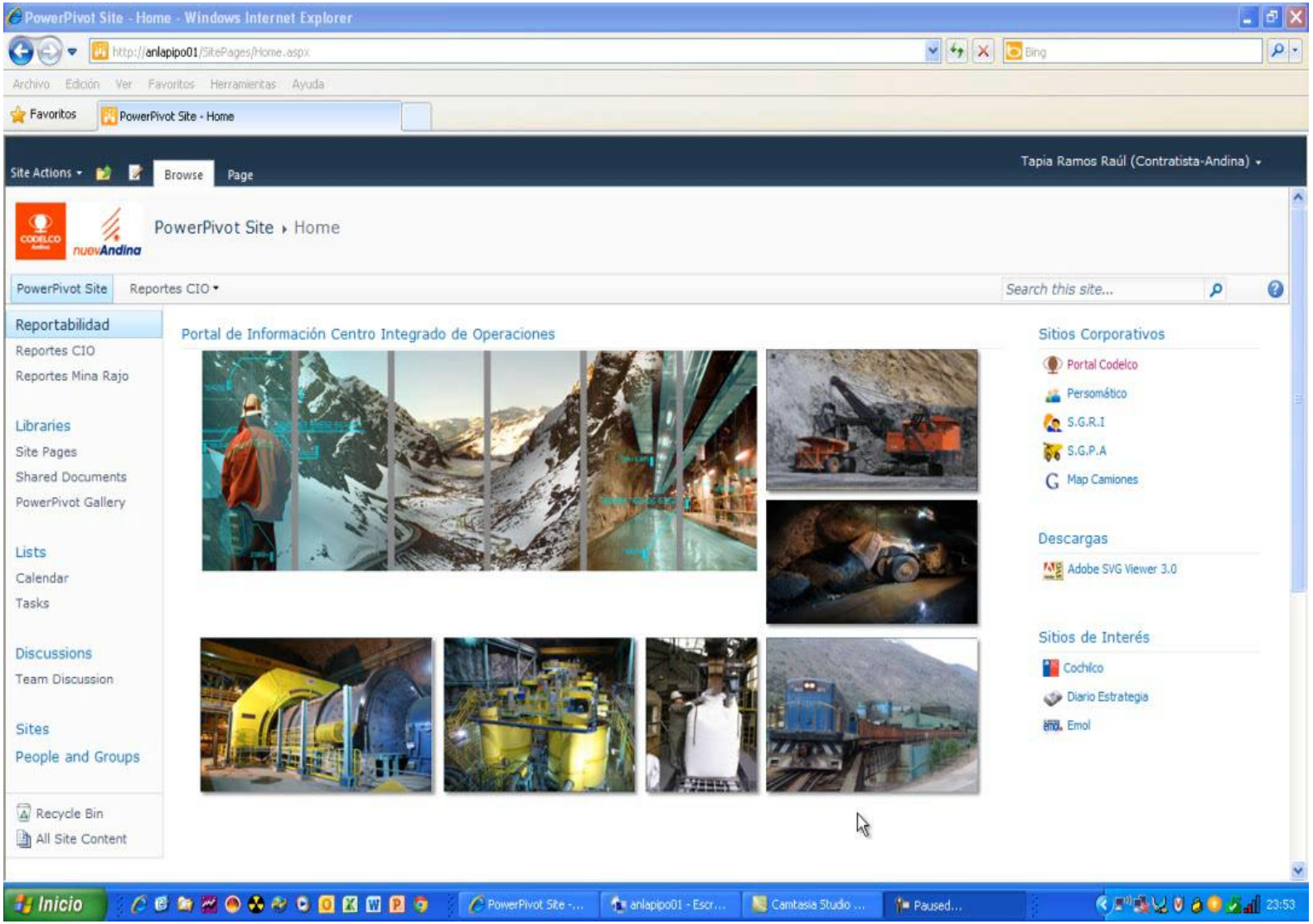


THE PEOPLE EFFECT
Local vs. Collaborative Decision Making

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



Integration of PI System and Microsoft Latest Technologies

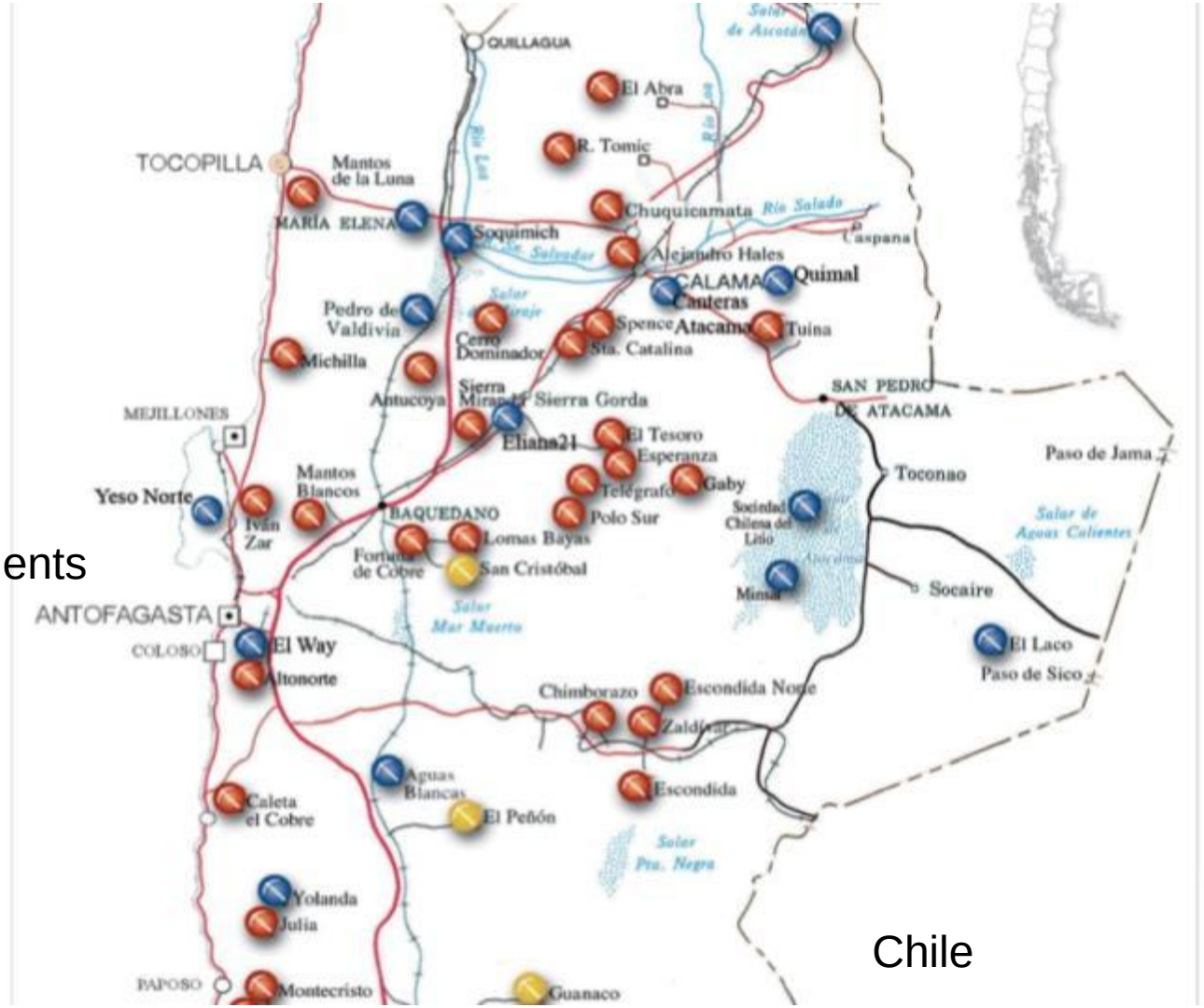


Mining Metal Processing Competence Center

Weather and Country Energy Limitations

Most Arid Region in the World

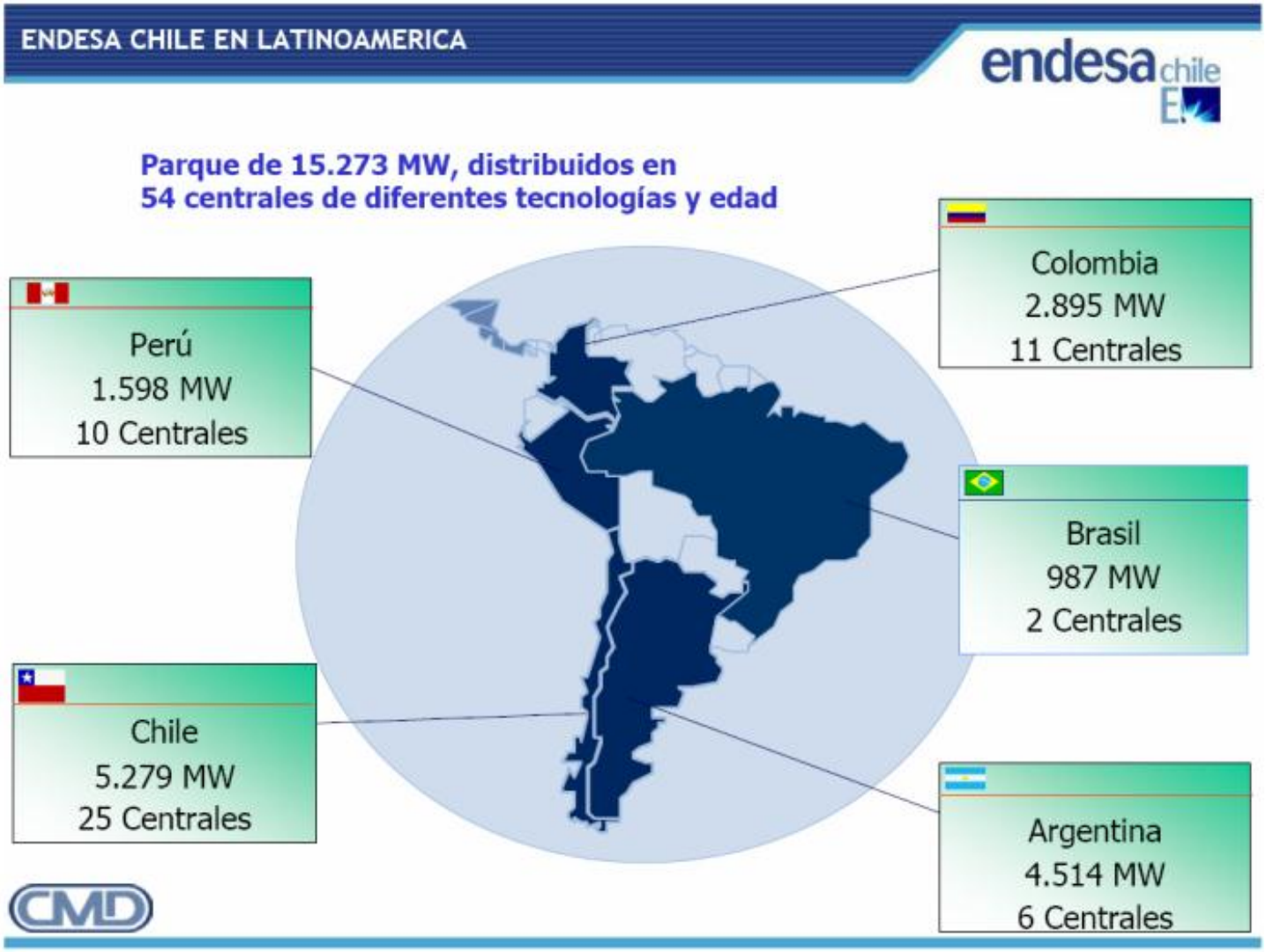
Large Energy Requirements



Chile

Water is very important for Endesa

Optimizing Latin American Energy Generation Management



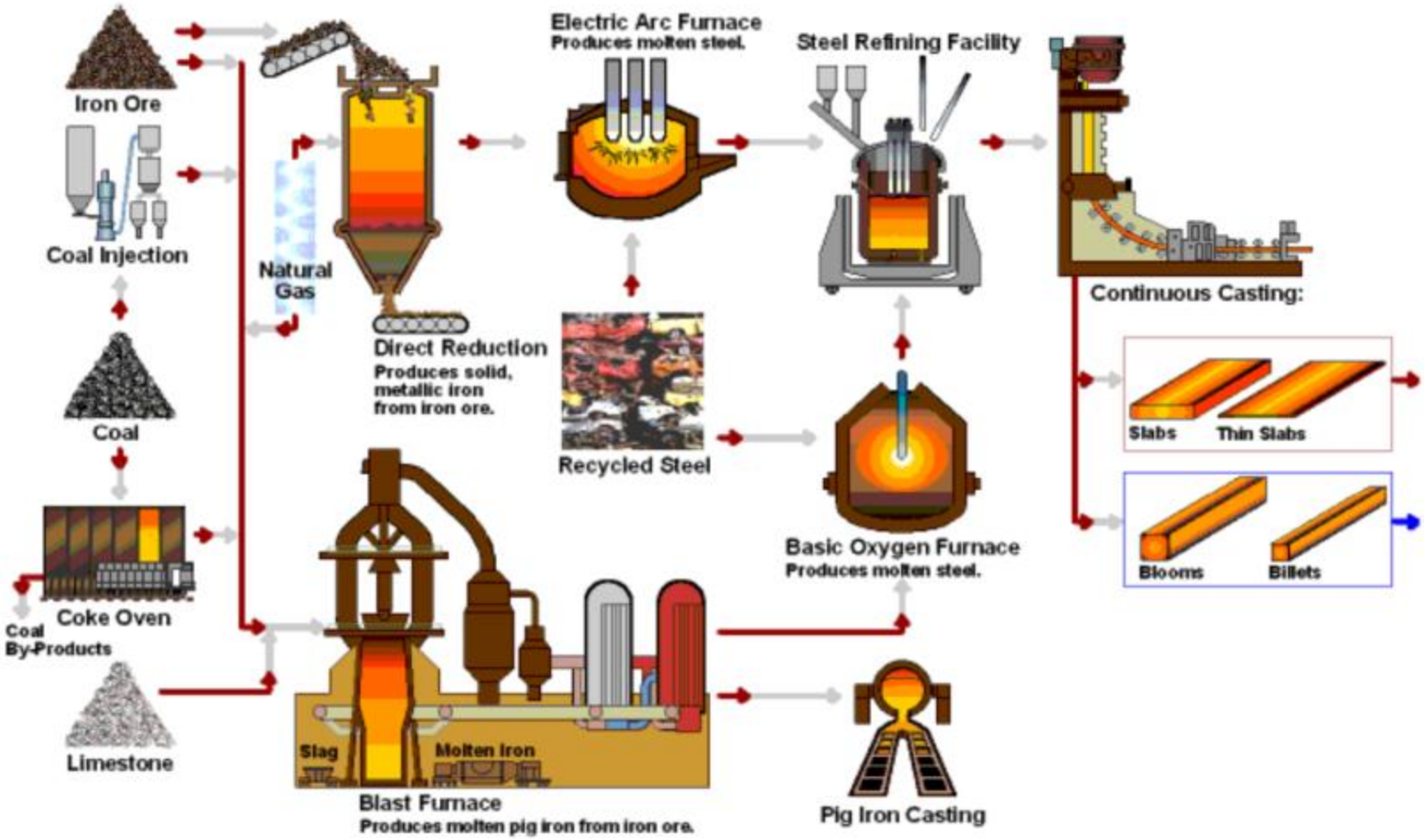
ENDESA Dynamic Monitoring and Diagnosis

Enterprise Driven Standards

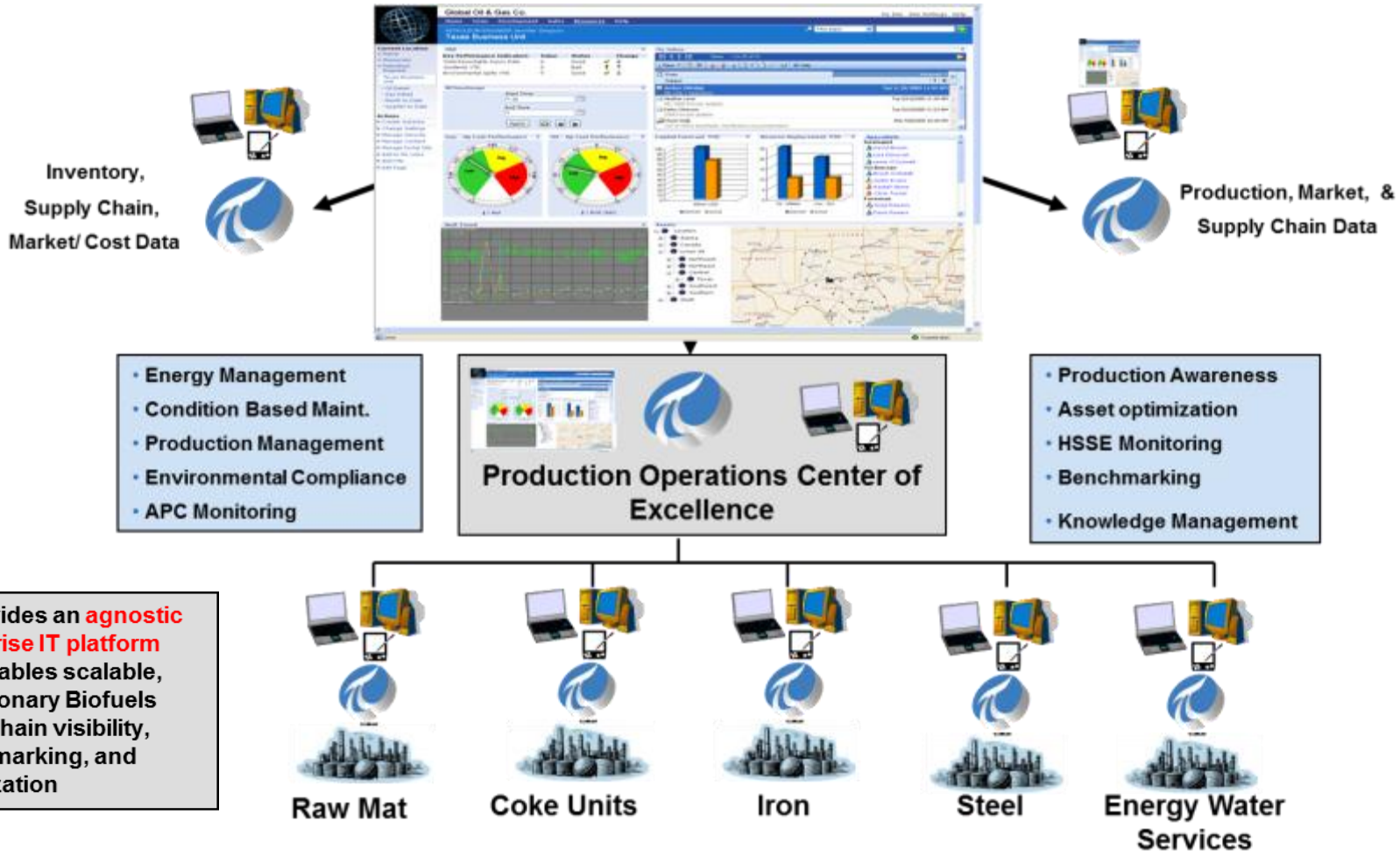
Implementation Examples

President of Spain @ Red Electrica

Iron and Steel Industrial Assets



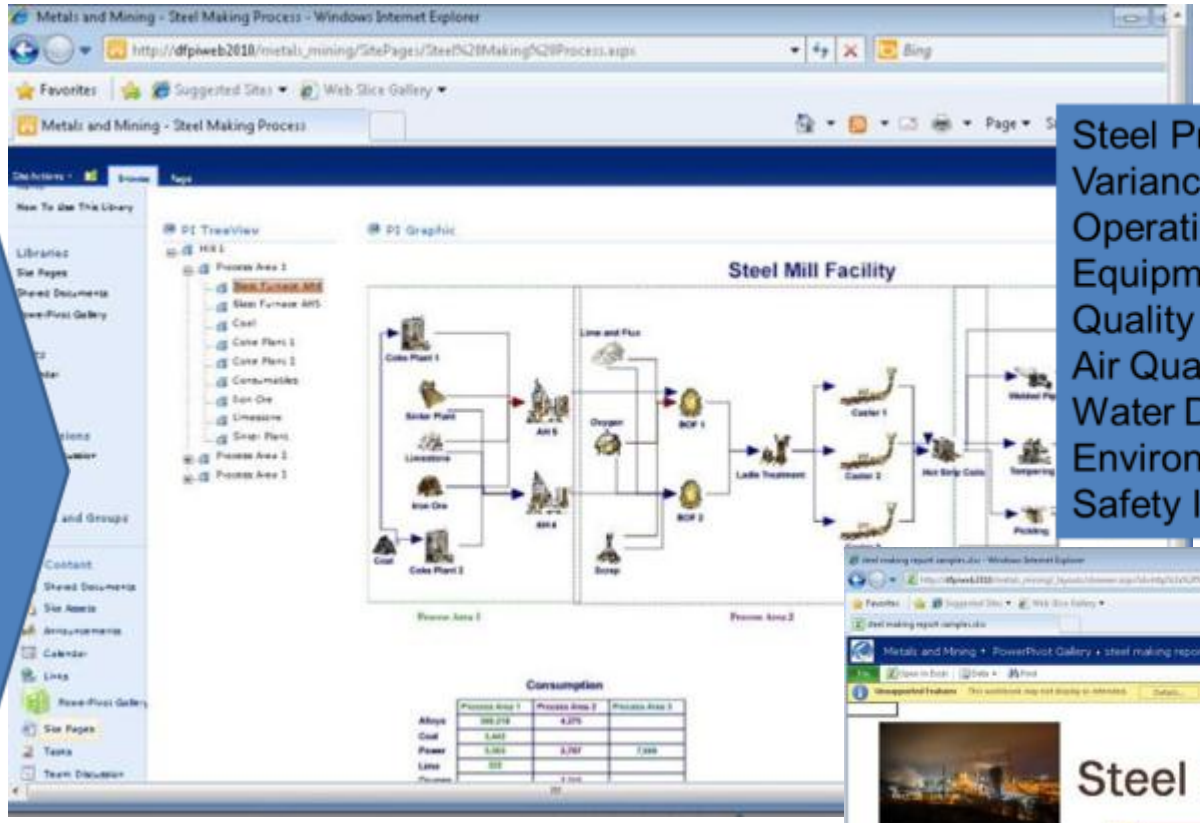
Real Time Enterprise Competence Center



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

Iron and Steel Metallurgical Complex

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

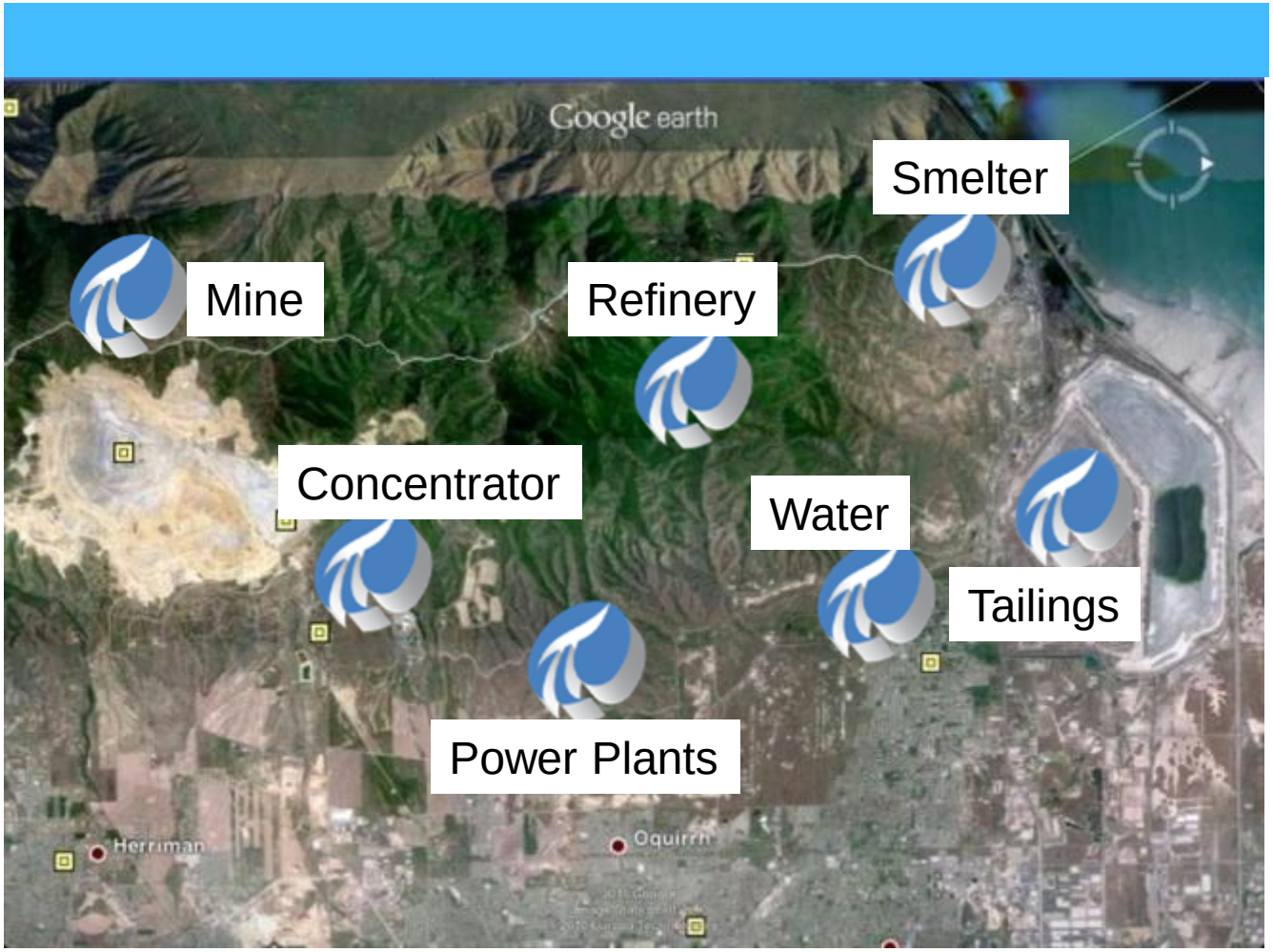


Steel Production
Variances
Operational Time Wasted
Equipment Availability
Quality
Air Quality Emissions
Water Discharge Emissions
Environmental
Safety Incidents

Rio Tinto Kennecott Utah Copper

- KUC Process Overview
  - Mine
    - Ore body of ~0.6% copper
  - Mill/Concentrator
    - Grind and float ore to get ~25% copper concentrate
  - Smelter
    - Smelt and convert concentrate to get ~99.5% copper anodes
  - Refinery
    - Refine anodes to get ~99.99% copper cathodes

Integration: Rio Tinto Kennecott Utah Copper



Integration: Rio Tinto Kennecott Utah Copper

Energy and Water Tracking

Mining

Mineral Processin

Metallurgical

Products

Energy **Assets** **Reagents** **Environmental**

INTEGRATE- FIND – ANALYZE- DELIVER-VISUALIZE

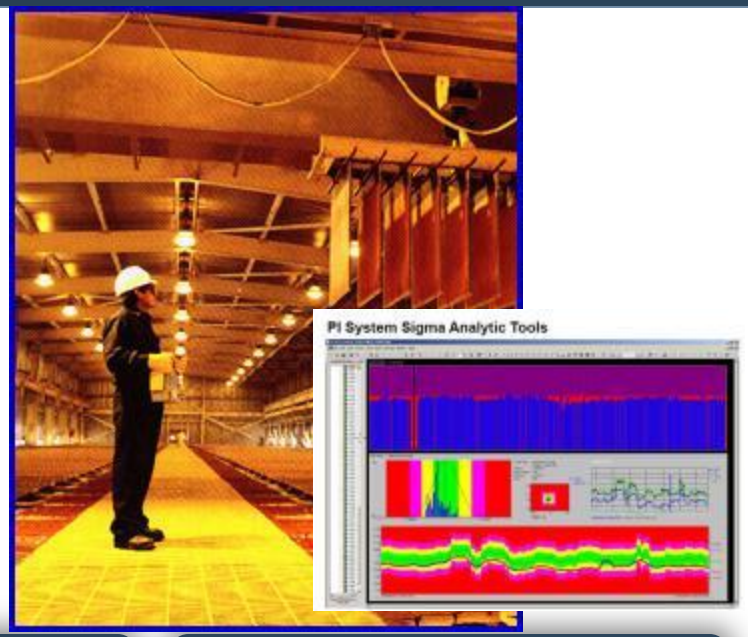
EXAMPLE Steel and Aluminum Complexes

- Integrating the whole chain supply on a large Steel mill enable customers to reduce ENERGY Consumption, increase Equipment Availability and REDUCE the environmental management and Reporting.
- We have many examples:
- Alcoa,
- Allouette, (Rio Tinto and Alcoa), Canada
- ArcelorMittal, Hamilton, Montreal, Mexico, Brazil, USA, Europe,
- CSN, Brazil
- CSH, Chile
- USIMINAS, Brazil
- Altos Hornos de Mexico
- Tata Steel, Netherlands, England, India
- US Steel, USA, Europe
- Nippon Steel, Kobe Steel, JFE Steel, Japan
- Dongbu Steel, Korea

Freeport McMoRan – El Abra: US$ 3.5 Energy Savings by detecting short circuits

"We're using OSIsoft's PI System infrastructure to run our Hydrometallurgical Plants.

The PI System has enable us to save more than US$ 3.5 millions in Energy consumption."
Ramiro Lara, El Abra, Chile Automining 2008



Customer Business Challenge

- Plant floor and business users needed one version of the truth for all facets of the Hydrometallurgical Complex in the Atacama Desert.
- Needed real-time data for alarming to monitor equipment status and quality alerts.
- Needed automatically generated notifications based on line statistical analysis .

Solution

- Implemented the PI System as real time data historian and analytical engine and visualization.
- Implemented a statistical process control notification system based on the amperage of each individual cell.
- Reported all information using Sharepoint and PI Webparts.

Customer Results / Benefits

- Reduced energy consumption by detecting short-circuits with savings in the order of US$ 3.5 million per year.
- Improved the quality of the cathodes and overall process effectiveness of the operations.
- Implemented statistical detection of short circuits and other KPIs.

Queensland Nickel QNI: Condition-based Maintenance

"We're using OSIsoft's PI System platform and interfacing to SAP PM to benefit our operations in many ways—from tracing product quality to justifying Six Sigma process improvement projects."

Dave Hunter
QNI, Australia

bhpbilliton
resourcing the future

Customer Business Challenge

- Plant floor and business users needed one version of the truth for all facets of refinery operations
- Needed real-time alarming to monitor quality
- Needed automatically generated maintenance notifications in SAP

Solution

- Implemented the PI System as data historian and analytical engine.
- Implemented connectivity to SAP PM for automated work order creation

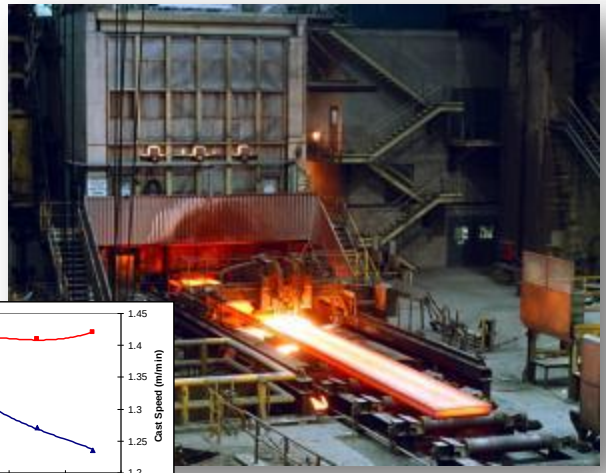
Customer Results / Benefits

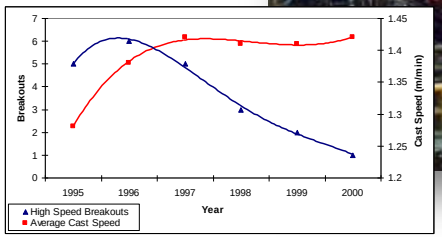
- Reduction in downtime
- Achieved 9001 certification Quality Assurance/Six Sigma goals
- Reduction in total steam consumption
- Users see profitability and growth historically and in real-time

Arcelor Mittal - Dofasco: Reducing Caster Break Outs from 7 to zero

"We're using OSIsoft's PI System platform to reduce the caster break out from 7 per year to zero. Savings in excess of US$ 2.5 million per year per caster. "

Vit Vaculik
***Arcelor Mittal**, Hamilton*





Customer Business Challenge

- Plant floor and business users needed one version of the truth for all facets of Steel Mill operations
- Needed real-time Data for alarming to monitor equipment status and quality
- Needed to reduce caster break outs due to nonlinear nature of the process.

Solution

- Implemented the PI System as real time data historian and analytical engine and visualization
- Implemented a data analysis strategy to identify the best operation pattern to be able to alert when the pattern started to change for normal
- Implemented more than 100% additional projects using the PI System infrastructure

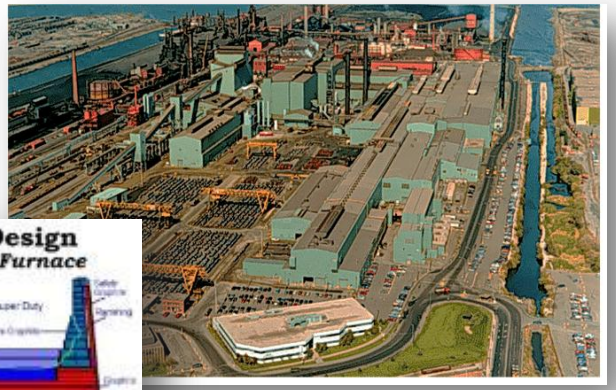
Customer Results / Benefits

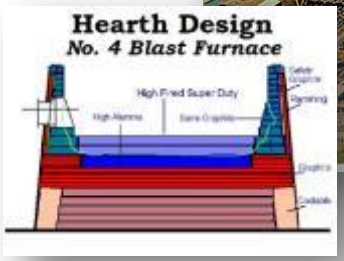
- Increased production and met production records
- Reduced caster breakouts from 7 to zero. Savings in the order of 2,5 million per year per caster
- Implemented statistical detection of breakouts and improved overall process operability
- Reduction total energy consumption
- Users see profitability and growth historically and in real-time

Arcelor Mittal – Dofasco: From Repair Mode to Operational Failure

"We're using OSIsoft's PI System platform to change the maintenance culture from Repair mode to Operational Failure. We have increased Average Equipment Availability from 78% to 91 %. We have increase the proactive maintenance of equipment from 30% to 70%."

Vlad Juric,
***Arcelor Mittal**, Hamilton*





Customer Business Challenge

- Plant floor and business users needed one version of the truth for all facets of Steel Mill operations
- Needed real-time Data for alarming to monitor equipment status and quality
- Needed automatically generated maintenance notifications into Dofasco CMM.

Solution

- Implemented the PI System as real time data historian and analytical engine and visualization.
- Implemented connectivity to Dofasco CMMS or automated work order creation
- Implemented more than 100% additional projects using the PI System infrastructure.

Customer Results / Benefits

- Increase Equipment Availability from 78% to 91%.
- Extend Life Cycle of all BFs for more than 20 Years with savings of more than $ 19 millions in BFs campaigns
- Implemented statistical detection of hot spots and improved BF hearth life
- Reduction total energy consumption
- Users see profitability and growth historically and in real-time

Dongbu Steel – Bay Works, Korea: Reducing Galvanizing lines Operating Costs and improving Quality.

"We're using OSIsoft's PI System platform to reduce the zinc consumption and improve quality in our galvanizing lines. Savings in excess of US$ 1.5 million per year per line. "

Kambo M. LeeVit
Dongbu Steel Co., Korea

DONGBU STEEL

Customer Business Challenge

- Plant floor and business users needed one version of the truth for all facets of Steel Mill operations
- Needed real-time Data for alarming to monitor equipment status and quality
- Needed to reduce zinc metal consumption on their galvanizing lines .

Solution

- Implemented the PI System as real time data historian, analytical engine and visualization tool.
- Implemented a data analysis strategy to identify the best operation patterns.
- Implemented Six Sigma Methods and Statistical Process Control and innovations strategies to improve quality and reduce operating costs.

Customer Results / Benefits

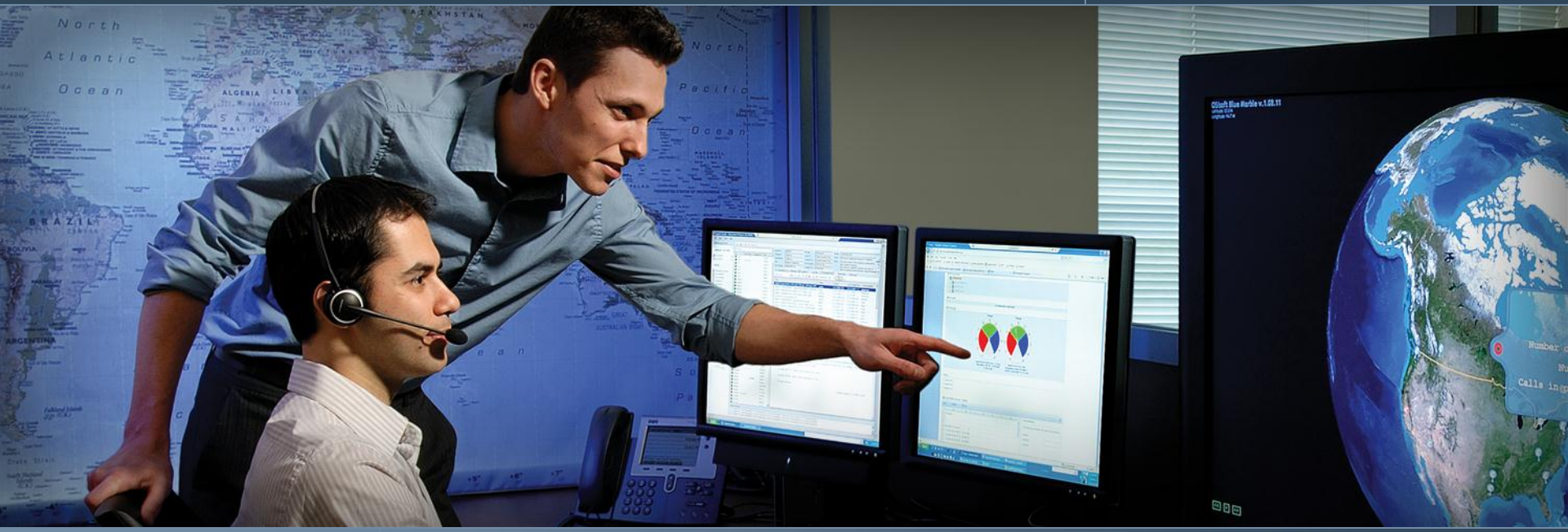
- Reduce Zinc Consumption.
- Improved quality by implementing Six Sigma Strategies and SPC techniques.
- Reduced operating costs in the galvanizing lines.
- Reduction total energy consumption

“ CSN ”

Geração de Valor

Seminário Regional 2010

São Paulo, Brasil



Presentation Title : O Cenário Industrial de Negócios da CSN em expansão, utilizando ferramentas da OSI

Speaker Name : Resilene Mansur, PMP
Speaker Title : Executivo de TI
Company : CSN – Companhia Siderúrgica Nacional – Diretoria de TI

Date : 27 e 28/10/2010

Empowering Business in Real Time.

“ CSN ”

Áreas de Negócios

Aço	Minério	Cimento	Logistica		Energia
					
Aços Planos Aços Longos (*)	Casa de Pedra e NAMISA	Fábrica de Cimento	MRS e Transnordestina	Plataforma Logística de Itaguaí	Hidrelétricas e Termelétrica
• Capacidade de 5.6 Mt de aço bruto (2009) • 2º maior produtor de aços planos no Brasil • Uma das maiores margens mundiais no setor	• 6º maior produtor mundial de minério de ferro (23 Mt em 2009) • Auto suficiência em minério de ferro	• Em 2009 a CSN inaugurou a fábrica de cimento em Volta Redonda, agregando valor à escória gerada na produção de aço • Capacidade de moagem de 2,8 Mt/ano • 338 kt produzidas e comercializadas em 2009	• Infraestrutura de transporte das minas de minério de ferro até a usina siderúrgica e os portos • Ferrovia MRS liga à Usina Presidente Vargas à mina Casa de Pedra e aos terminais do Porto de Itaguaí • CSN detém concessões para operar dois terminais (TECON/TECAR) para exportação de seus produtos (aço e minério de ferro) e para importação de carvão e coque		• Auto suficiente na geração de energia • Capacidade total de geração: 428 MW - Participações nas UHEs Itá e Igarapava • CTE de co-geração de Volta Redonda

... processos que serão incorporados ao sistema na segunda fase do projeto:

Monitoramento Ambiental
- ✓ Material Particulado
- ✓ Efluentes Hídricos
- ✓ Monitoração de SO2

Manutenção
- ✓ Sistema de refrigeração industrial
- ✓ Centro Integrado de Manut.
- ✓ Inspeção on line

Redução

- ✓ Altos Fornos 1, 2 e 3
- ✓ Máquinas de Sínter 1, 2 e 3
- ✓ Coqueria 2
- ✓ Pátio de Carvão
- ✓ Coqueria 3

Energia

- ✓ Caldeiras
- ✓ Sopradores
- ✓ Centros de Recirculação
- ✓ Balanço de Energia
- ✓ CTE 2

Usina Ipatinga

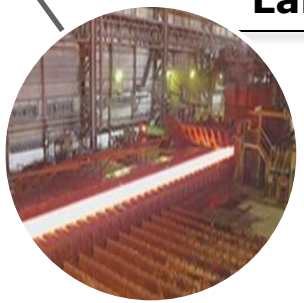
Aciaria

- ✓ Convertedor 4 e 5
- ✓ Máq. Lingotamento 1 e 2
- ✓ CAS-OB
- ✓ Forno Panela 2
- ✓ RH 2
- ✓ Aciaria 1
- ✓ Escarfagem
- ✓ Refratário

Lam. Frio

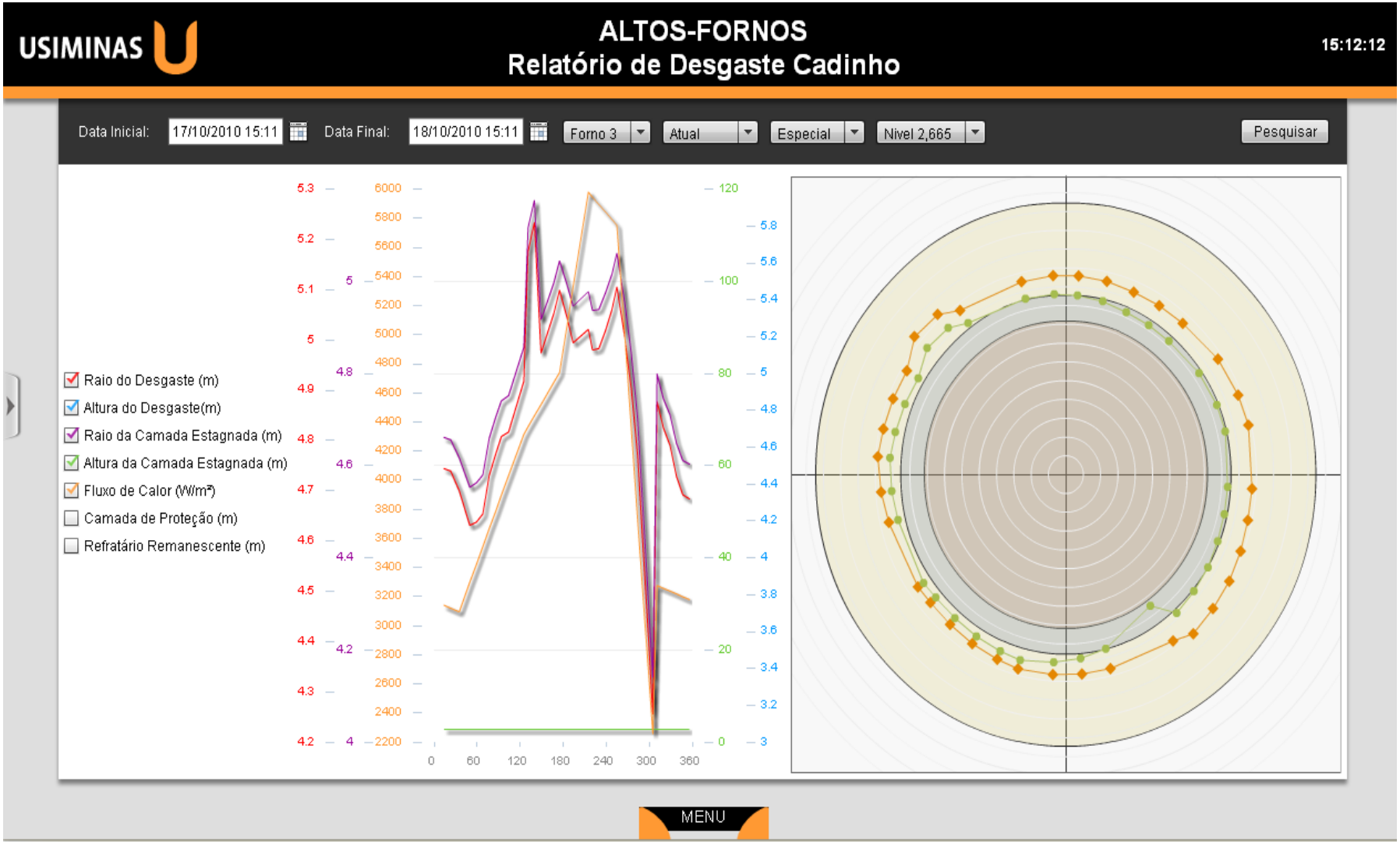
- ✓ EGL
- ✓ PLTCM
- ✓ Decapagem 4
- ✓ Rebob. 3, 5 e 6
- ✓ Recozimento 5

Lam. Quente

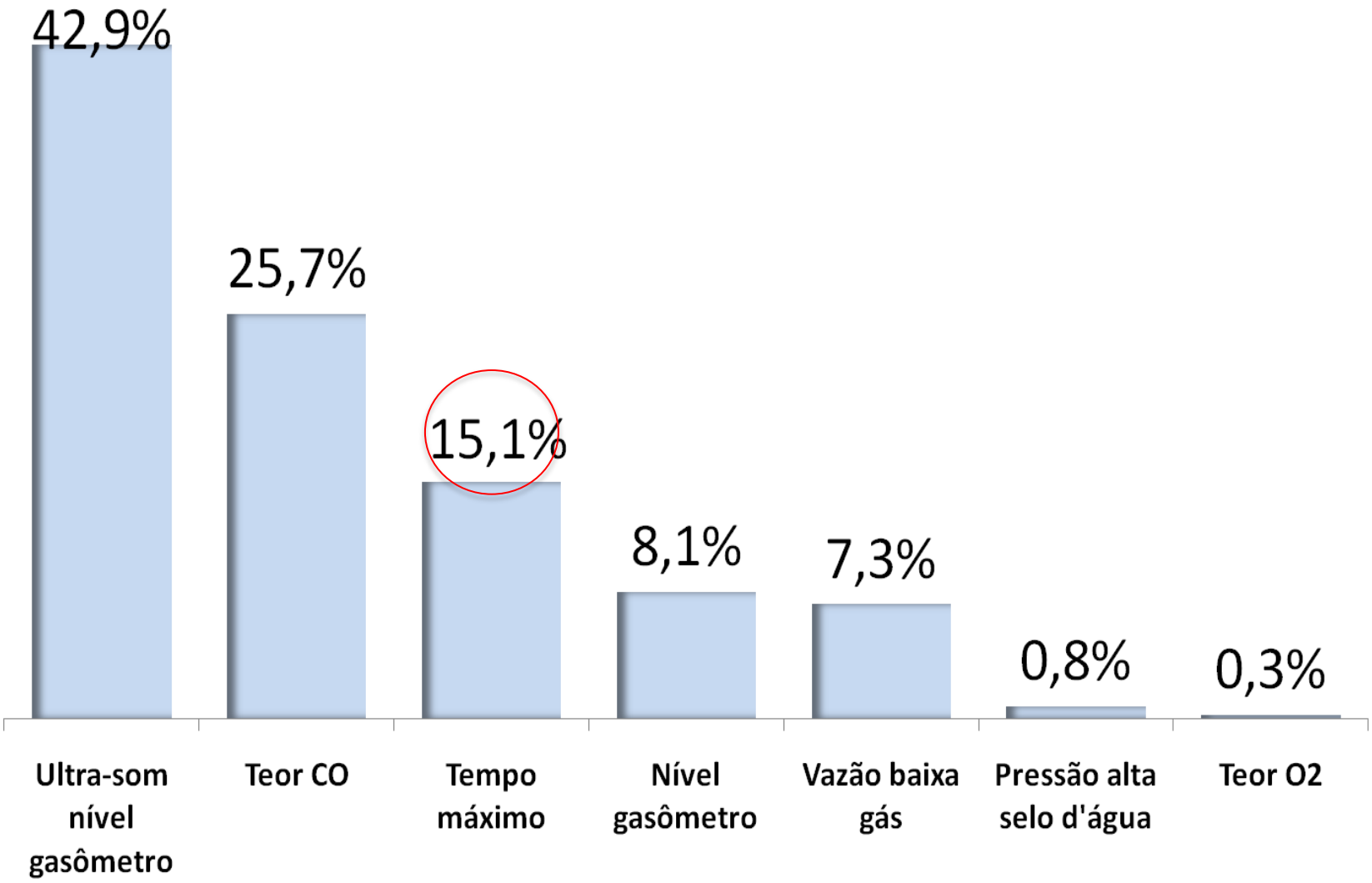


- ✓ Linha de Tiras a Quente
- ✓ Bombas de Descarepação
- ✓ CLC
- ✓ Fornos de Reaquecimento

Redução ... gráfico sobre desgaste do cadinho



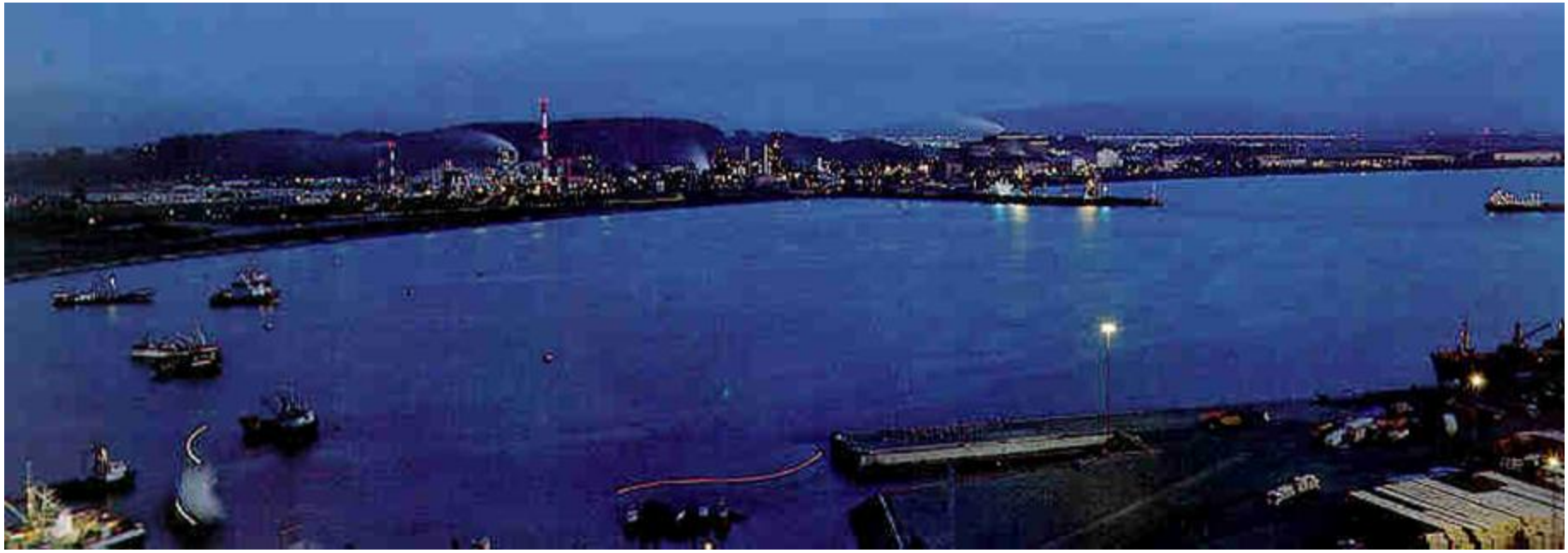
Motivos da Interrupção – 18 a 24/03/2010



CAP Acero Huachipato Steel Mill

PI System Seminar Chile Y2009

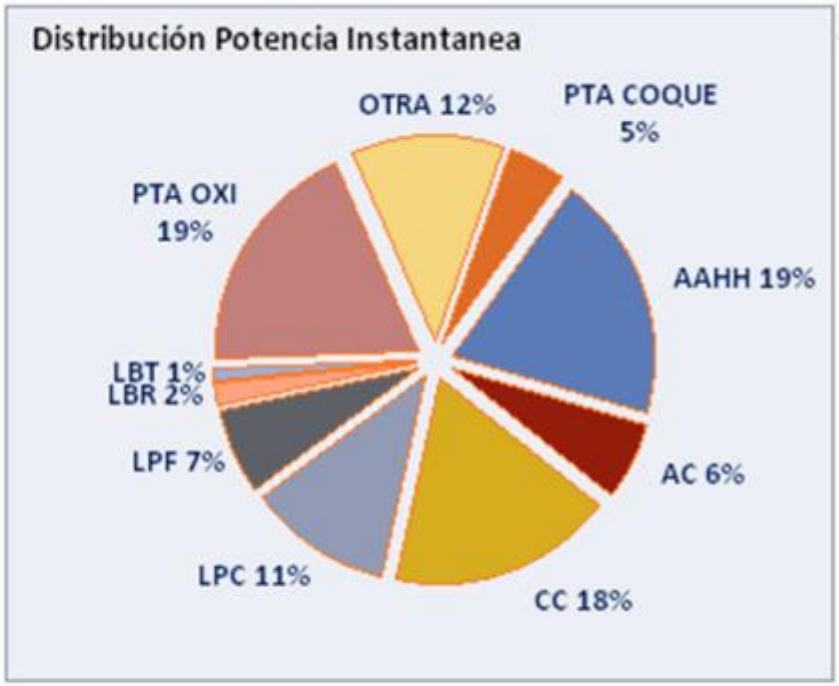
- Fully Integrated Steel Company
- Reduction of Pellets in Blast Furnaces to produce Iron
- Steel produced in BOF then casted into Slabs
- 1.2 Tones of Steel per Year.



Tangible benefits: Instant Power CAP ACERO

Actualizar

POTENCIA INSTANTANEA			
UNIDAD		MW	%
CAP-Acero	CAP	61,18	100
Planta de Coque	PTA COQUE	2,79	5%
Altos Hornos	AAHH	11,88	19%
Acería	AC	3,62	6%
Colada Continua	CC	11,05	18%
Laminador LPC	LPC	6,96	11%
Laminador LPF	LPF	4,23	7%
Laminador LBR	LBR	0,96	2%
Laminador LBT	LBT	0,61	1%
Planta Oxígeno	PTA OXI	11,54	19%
Otras	OTRA	7,53	12%

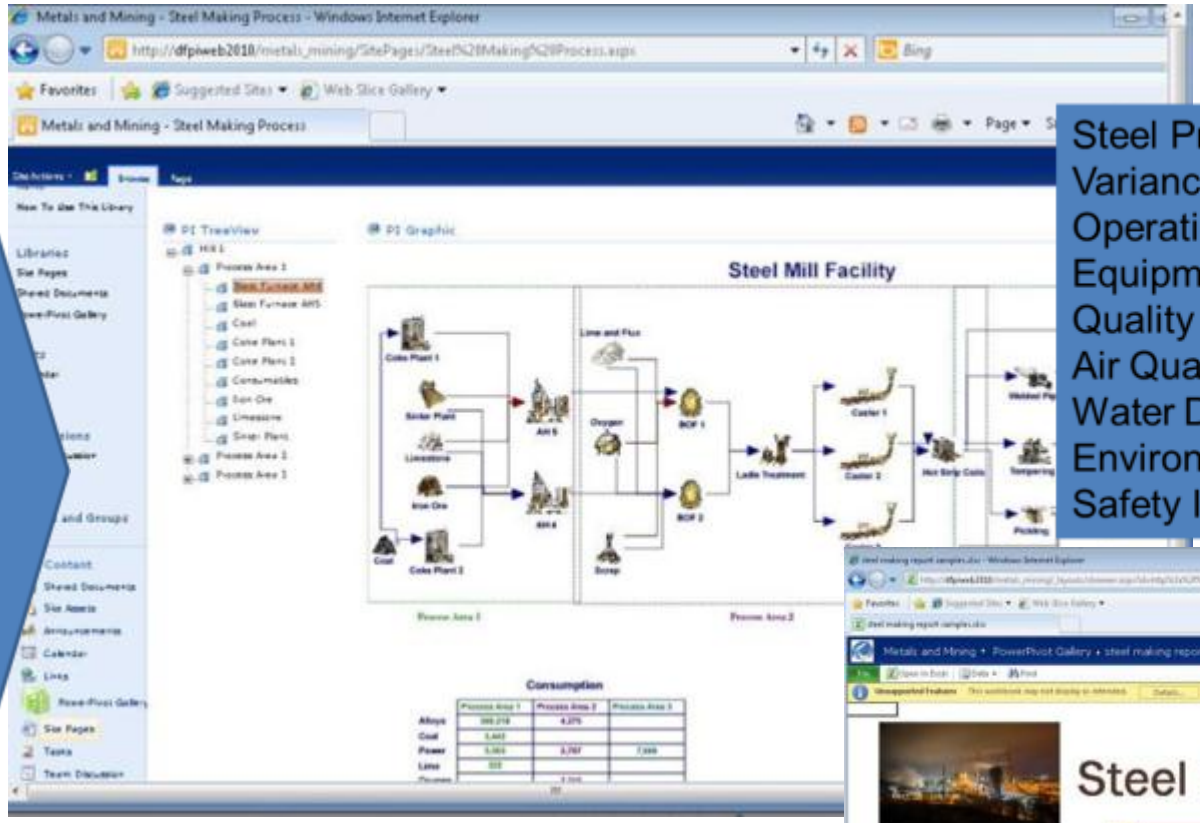


Periodo Potencia Instantanea

Start Time *-2h End Time * Apply

Iron and Steel Metallurgical Complex

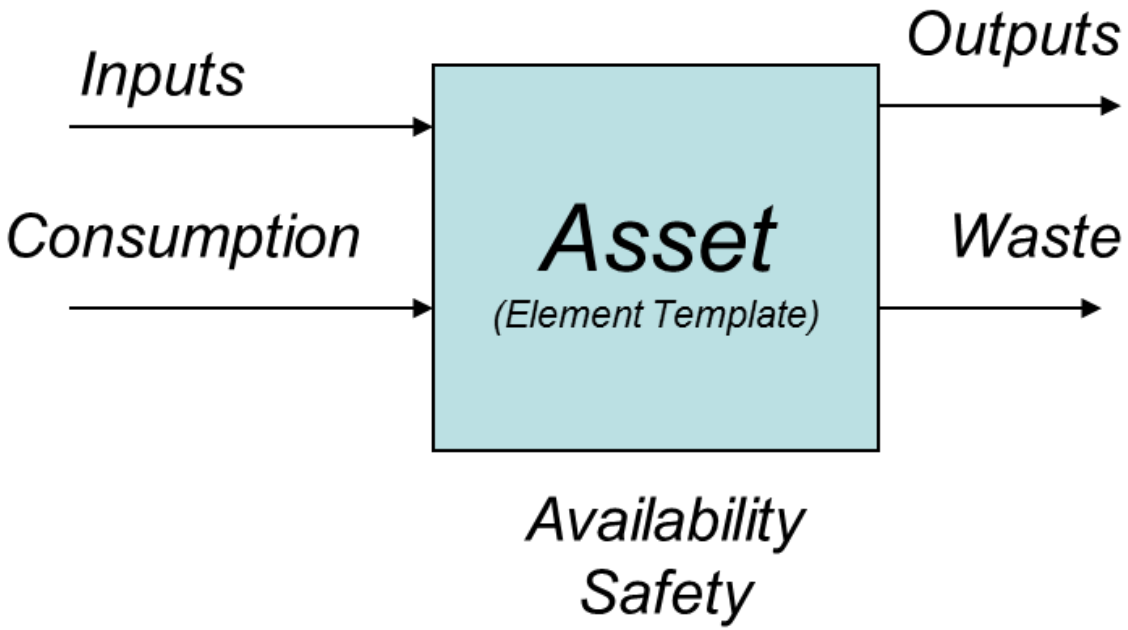
Iron
Limestone
Oxygen
Coal
Air
Fuel
Energy
Water
Alloys (Zinc, Moly, Chrome, etc)
Scraps



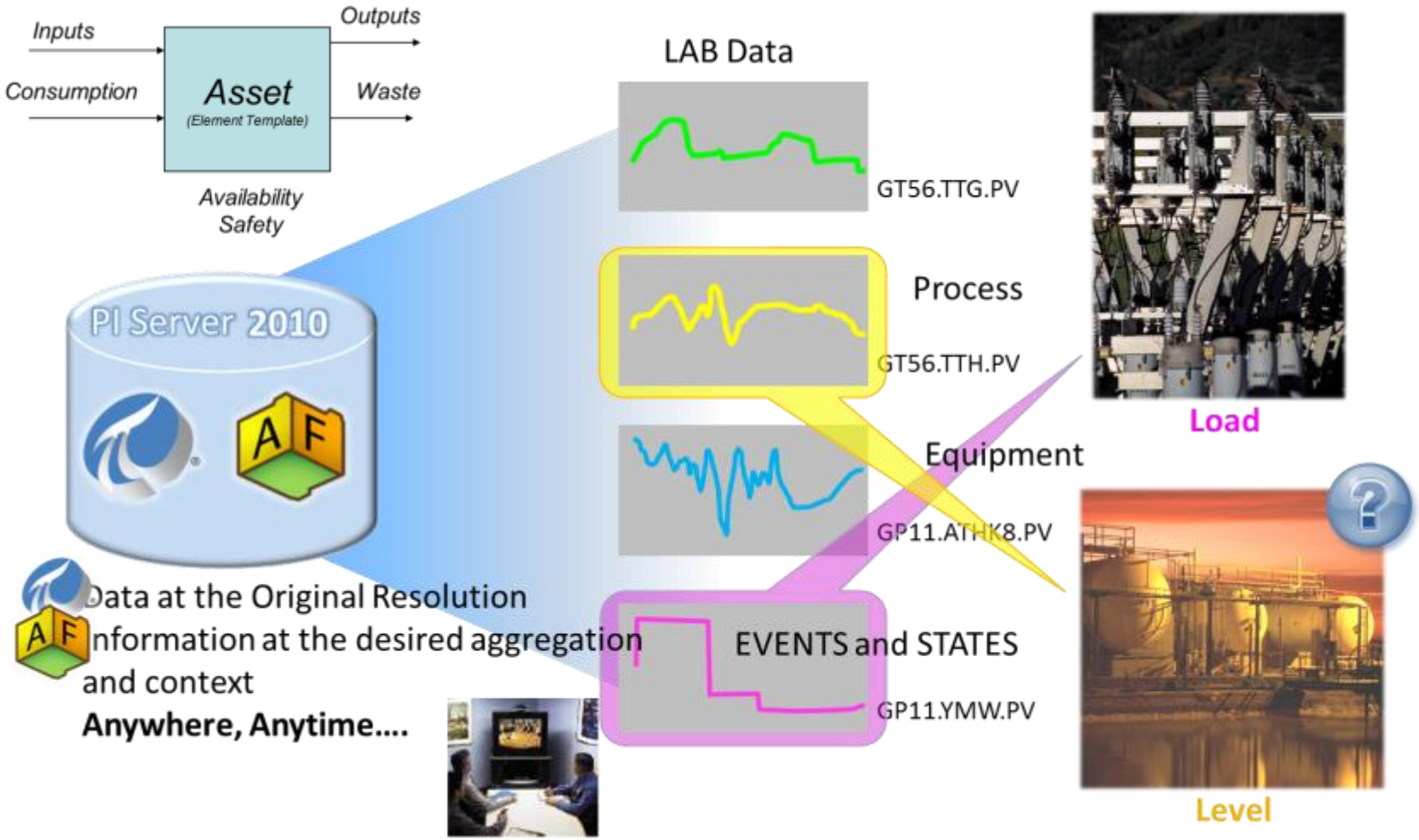
Steel Production
Variances
Operational Time Wasted
Equipment Availability
Quality
Air Quality Emissions
Water Discharge Emissions
Environmental
Safety Incidents

Enterprise Standard Asset Definition

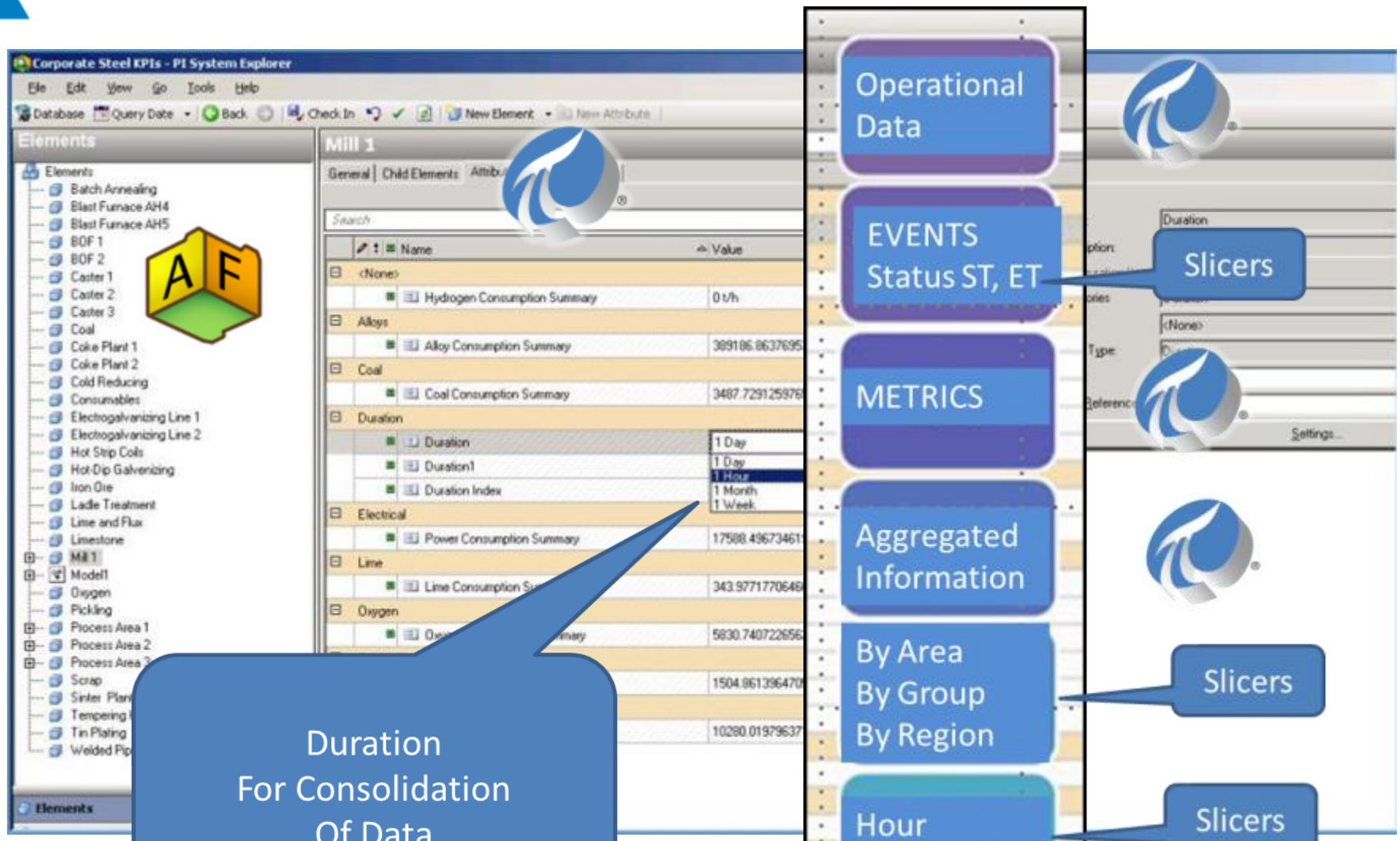
- Strategic Block Diagram



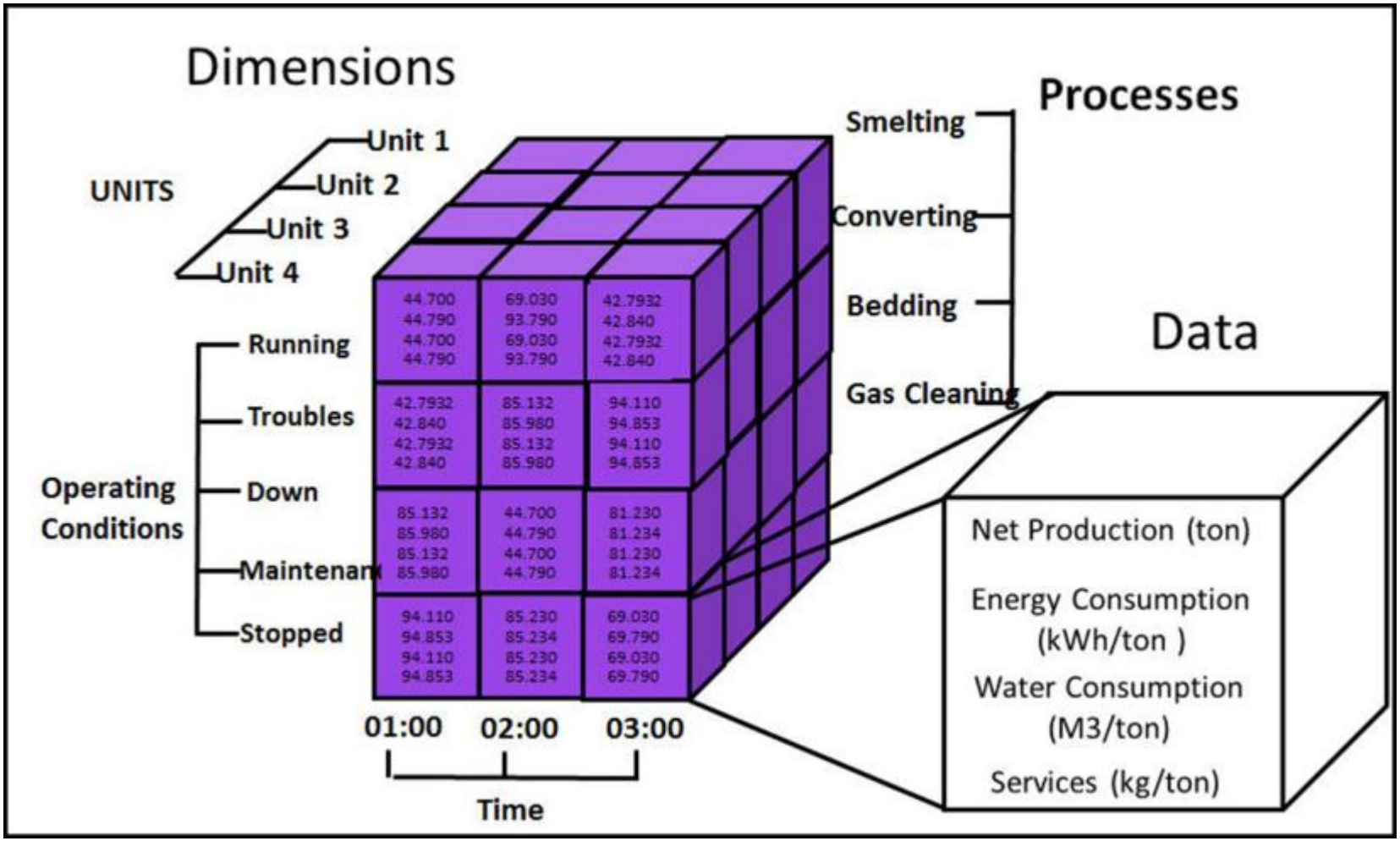
Strategy: Standardization of Assets and with Dynamic Contextual Information



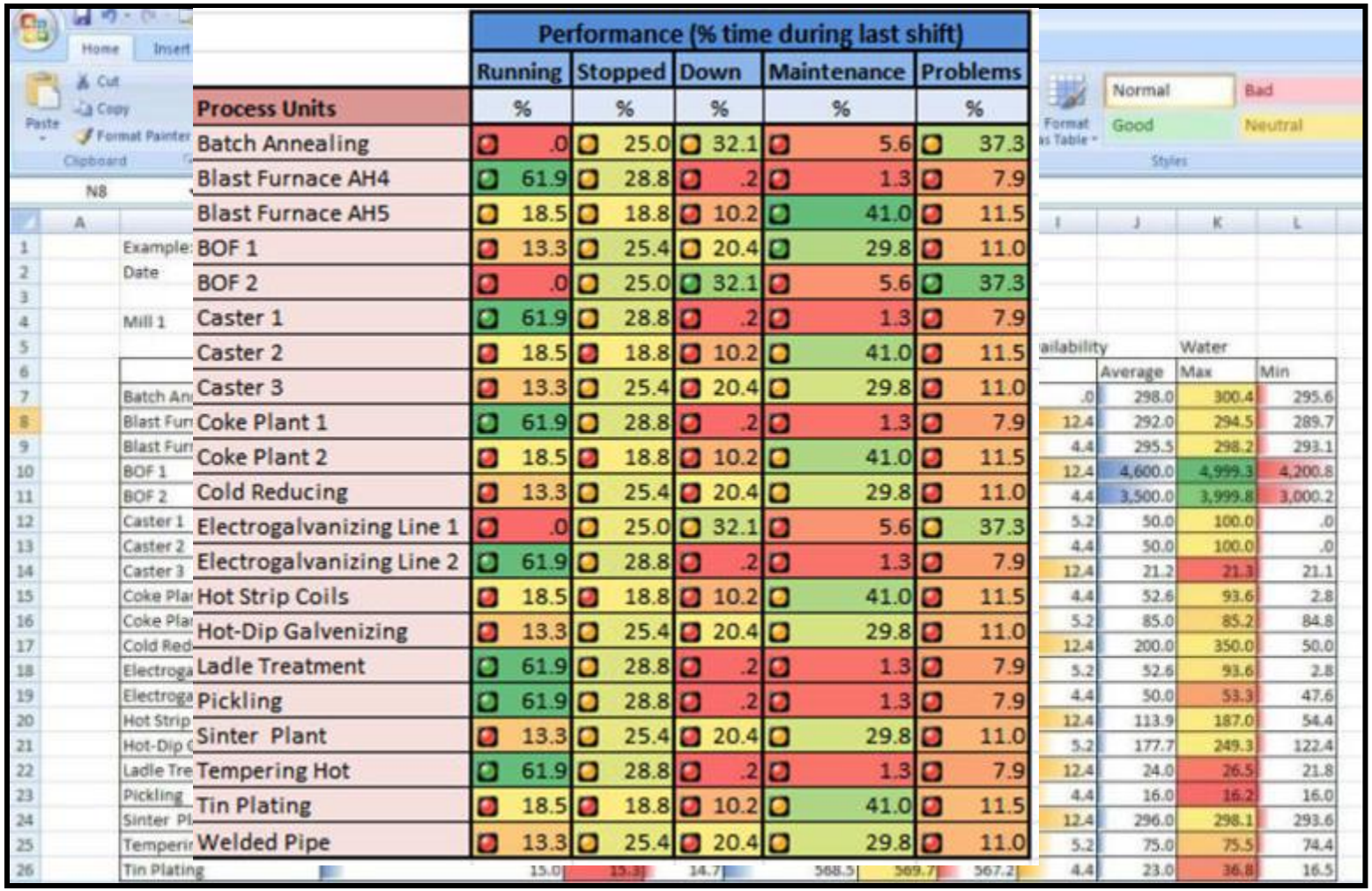
Integration of Data, Metrics and Events



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

Dynamic Analysis and Collaboration

SLICERS

PI Cubes and PI Slicers

Steel Making Process

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

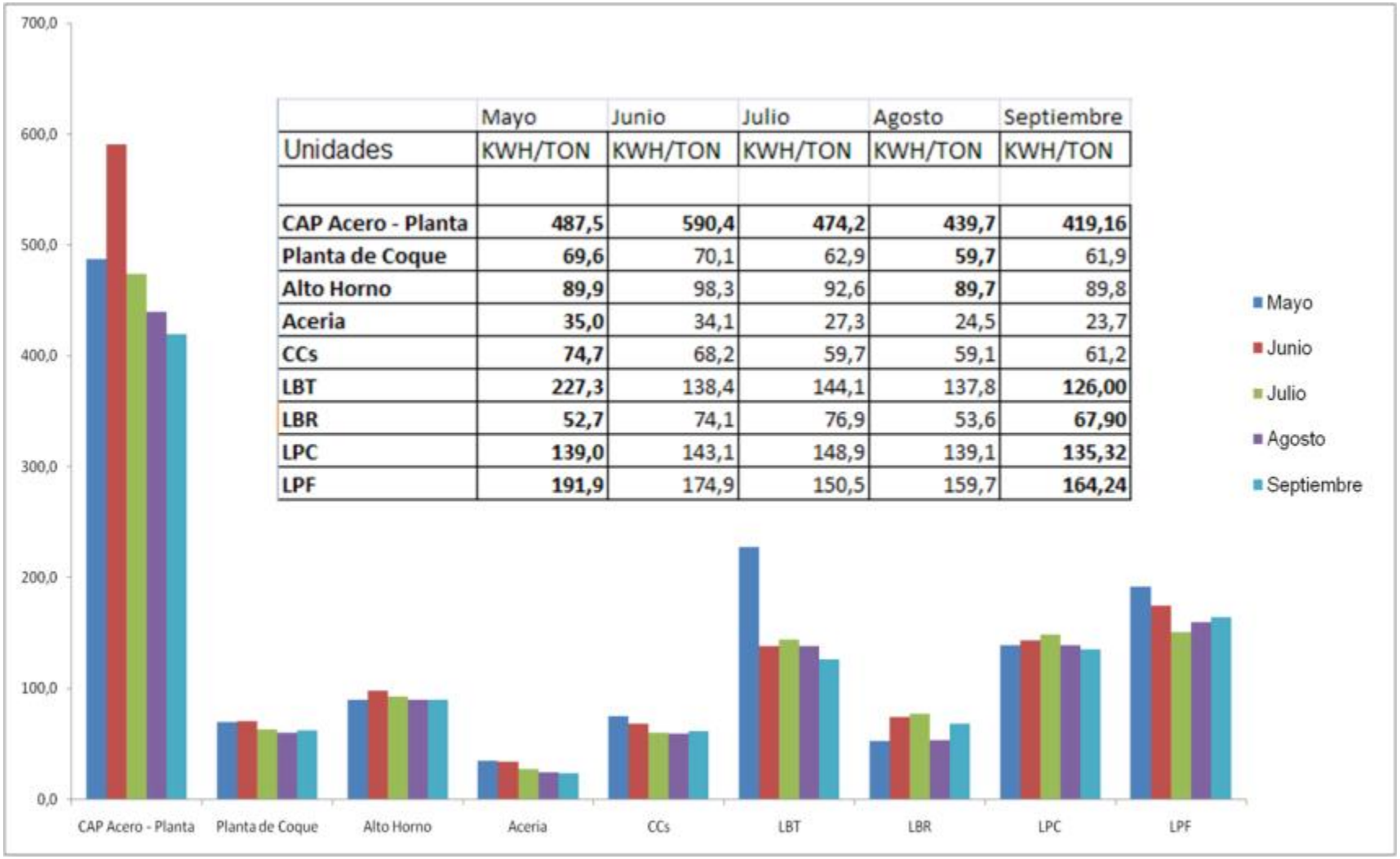
Operating State	Day	Hour	Shift
Down	18 19 20	0 1 2 3	Turno 1
Maintenance	21 22 23	4 5 6 7	Turno 2
N/A	24 17 25	8 9	Turno 3
Problems		... ...	

		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: 10 % REDUCTION SPECIFIC POWER or US$ 10 M

	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**



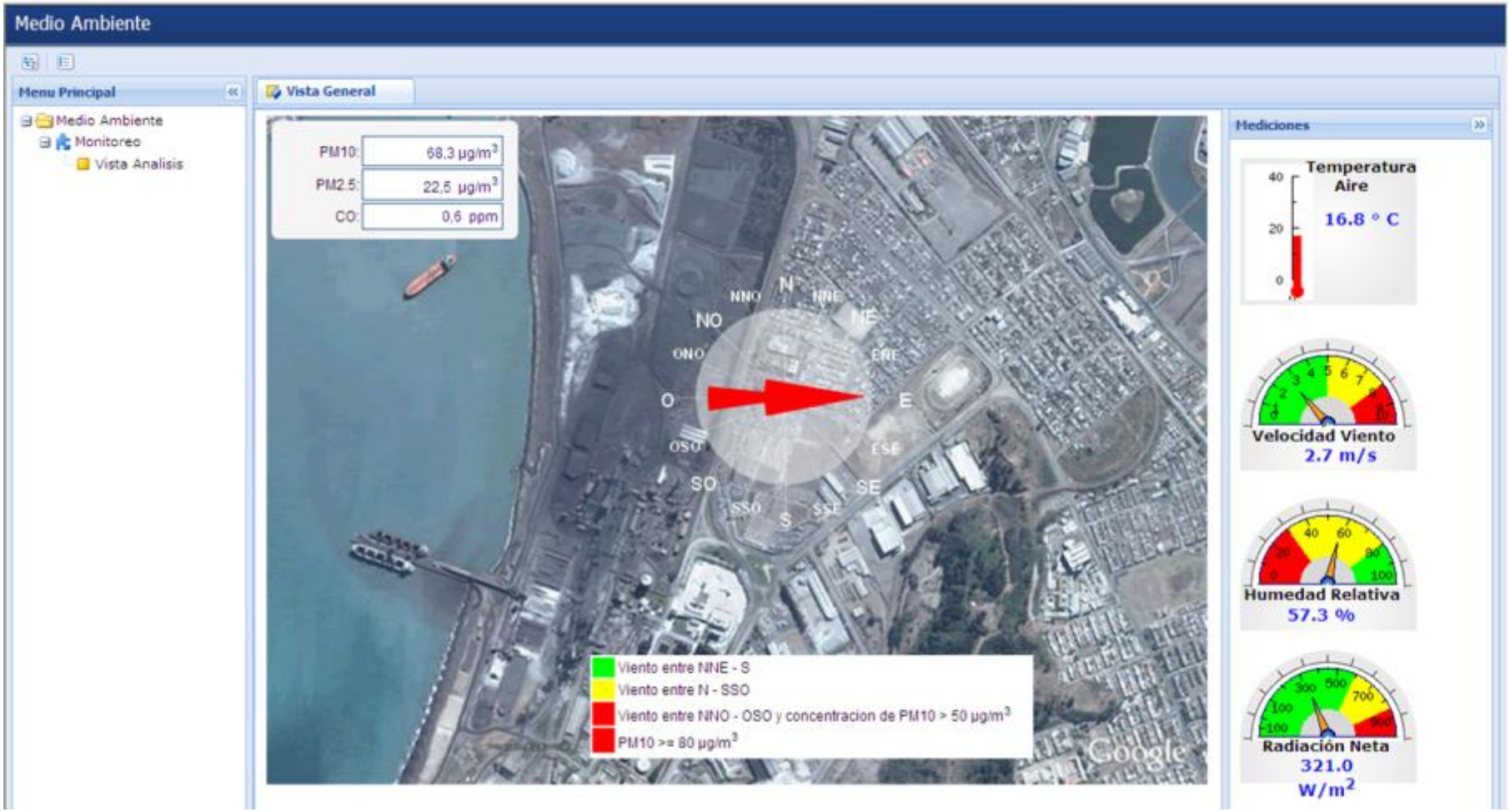
•Presentation of process information integrating areas, product quality, orders, consumption, reliability and enviromental systems.

•Organization of the information for operations, area supervision and management

•Organization of the information for analysis, diagnosis, reporting and visualization using PI AF and Microsoft Sharepoint with PI Webparts

•Integration: SCADA electrical substations, gas plants and crude oil to PI
•Integration: control systems and islands of automation through out the industrial complex and capture of process events/orders from MES
•Integration: PI System and MES

Tangible benefits: Web Based Air Quality Management for Authorities



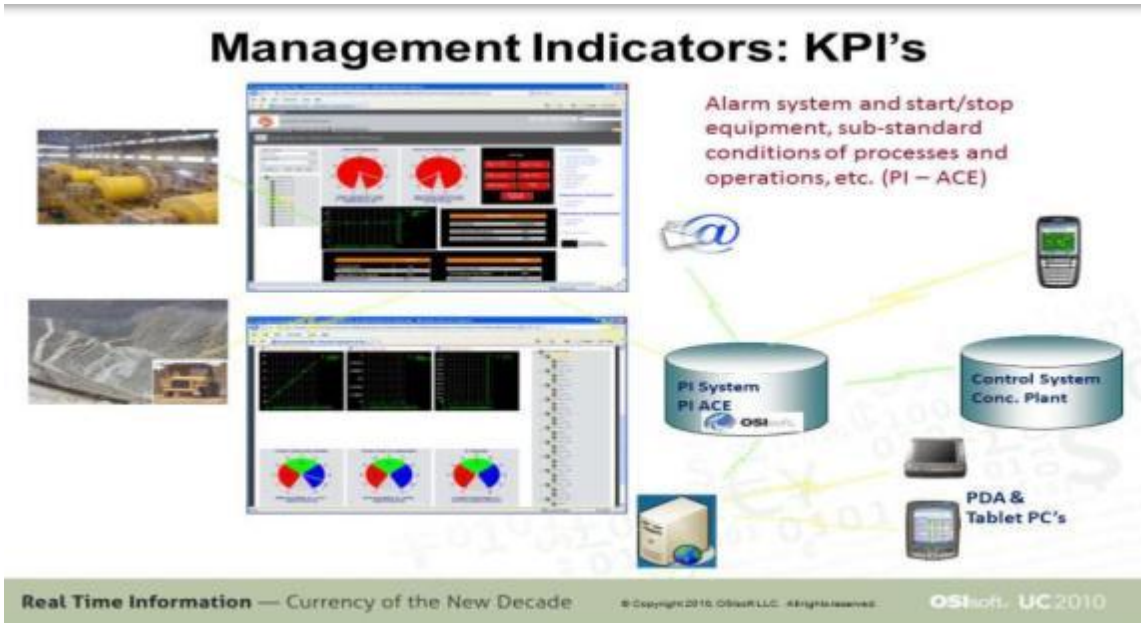
KEY EXAMPLES

- MINING TO MILL Integration.

- Running the Mine and the Mill in Real Time to Learn from the Process History to close the GAP Between Mine Planning and Optimize Grade Recovery.
- While reducing Energy Costs In Mining and Running the Process of Grinding which represent more than 50 of the operating Costs.
- Companies can save more than US$ 30 Million per year per plant if they use latest PI/Microsoft
- Examples: South Peru Copper, Codelco, Rio Tinto, Xstrata, Barrick, AngloAmerican, Antofagasta Minerals

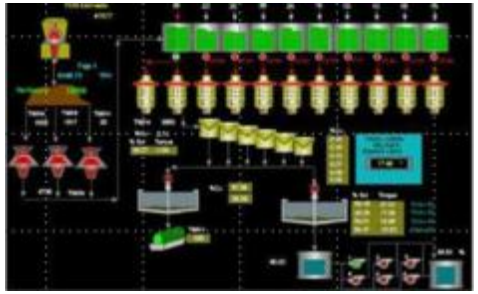
Southern Peru Copper: Cuajone

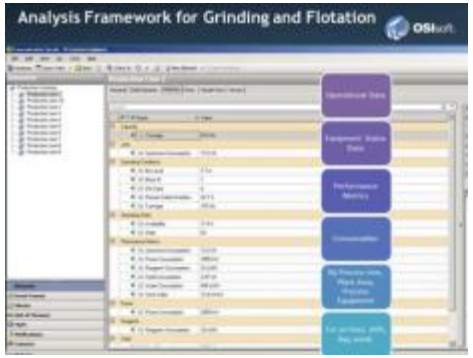
- Cuajone
- Production 87,000 MT fine Copper per day.
- Conventional open-pit mine
- Concentrator - 10 Grinding Lines.

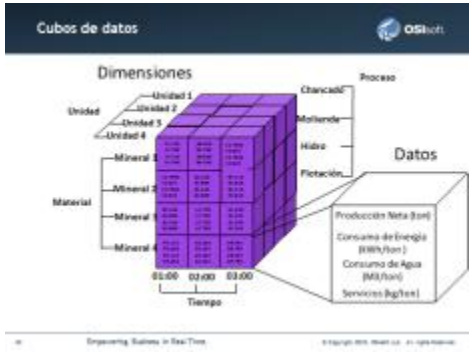


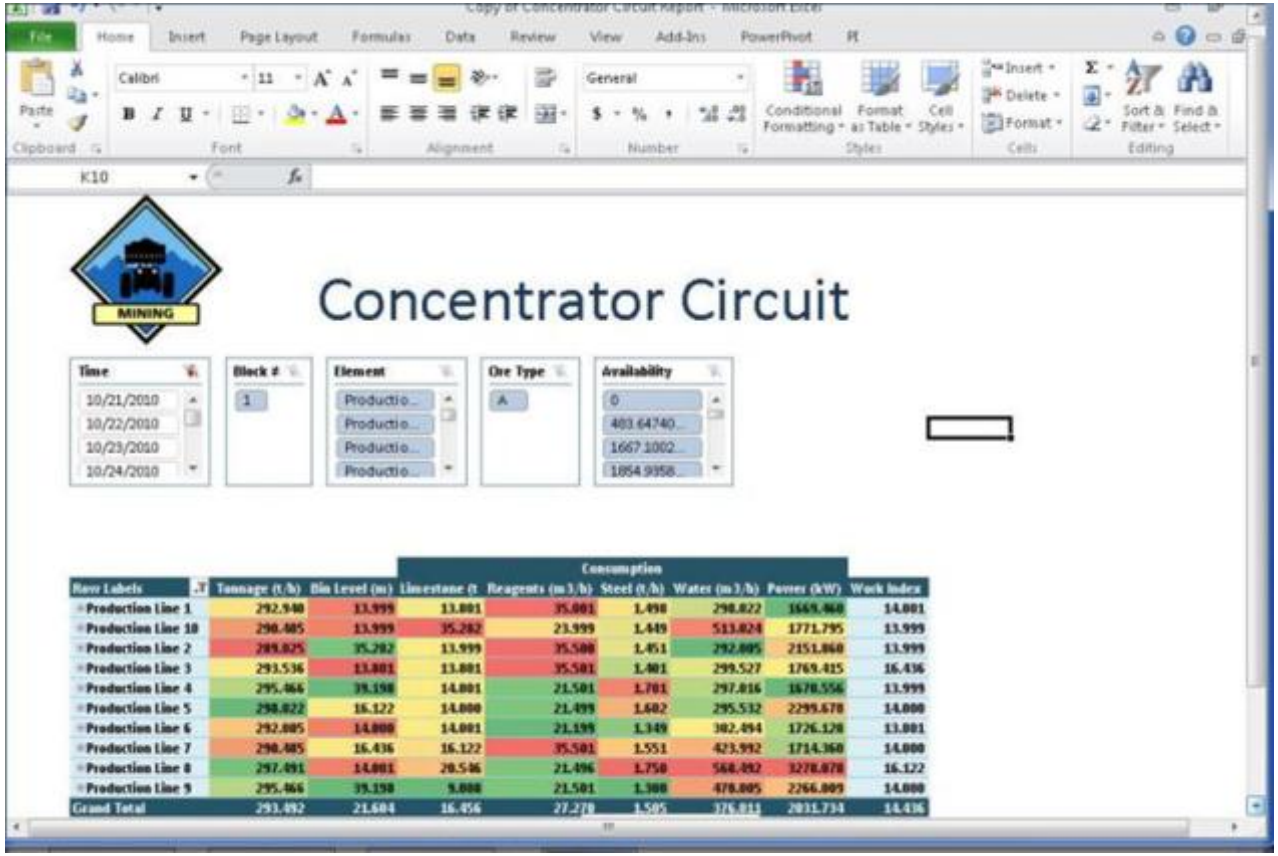
Southern Peru Copper: Cuajone

Sharepoint, PI AF, PI Slicers and PI Cubes
Using Latest Power Pivot in Memory technologies









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
  - 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**

References

- Anglo American Platinum, Michael Halhead, Data Validation with PI AF, UC 2011
- Anglo American Platinum, Michael Halhead, Energy Monitoring, OSIsoft Region Seminar South Africa, Y2011
- Anglo American Platinum, Warren Armstrong, Downtime Reporting, OSIsoft Regional EMEA Seminar, Y2011
- Southern Peru Copper, Nelver Benavides, Development and Implementation of the PI System at the Southern Peru Copper Cuajone Concentrator and Mine. UC2010
- Endesa Latam, Jose Lobo, PI System Seminar Santiago, Chile, Y2007
- Endesa Latam, Rodrigo Paredes, PI System Seminar Santiago, Chile, Y2009.
- Enel, Pestonesi, D., Scapeccia, Costarelli, and Franceschini, L, Remote Supervision Center for Enel Combined Cycle Plants, In Book, Modeling, Control, Simulation and Diagnosis of Complex Industrial and Energy Systems, Ferrarini L and Veber C. Editors. ISA, Y
- Cap Acero, Mario Flores y Rene Aroqui, Implementacion de PI en CAP Acero, Compania Siderurgica Huachipato, PI System Seminar Santiago, Chile, Y2009.
- Rio Tinto, Jake Mather, PI-Sigmafine Development at Kennecott Utah Copper (KUC), UC2007
- Rio Tinto, Roger Roth, Kennecott Utah Copper Company PI Server, UC2007
- DTE Energy, John Kapron and Sumanth Makunur, Fleet Optimization through PI, UC 2007
- Iberdrola, Maria Martin, Miguel Chavero, Ignacio Perezm,UC 2005, UC2011

Thank you

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PI ProcessBook Infraestructura Mina - Plantas de Chancado