OSIsoft® UC 2010

Real Time Information — Currency of the New Decade

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Development & Implementation of the PI System at Cuajone Concentrator – Southern Peru

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AGENDA

- About Southern Peru – Southern Copper Corporation.
- About Cuajone Concentrator
- PI System Architecture
- Some Applications
- Use of PI System for Process Optimization
- Benefits

ABOUT “Southern Peru – Southern Copper Corporation”

It is the largest copper company in the world based on amount of copper reserves.

Four Open-Pit Mines:

- Cuajone & Toquepala, located in southern Peru.
- Cananea & Caridad, located in northern México.

Metallurgical Complexes:

- Ilo (Peru)
- La Caridad & San Luís Potosí (México).
- Additionally, owns and operates 5 underground mines producing various metals as Cu, Zn, Mo, Ag, etc.

Projects:

- Expansion of the Toquepala and Cuajone concentrators.
- Tía María project, located in Arequipa.
- Los Chancas project, located in Huancavelica.

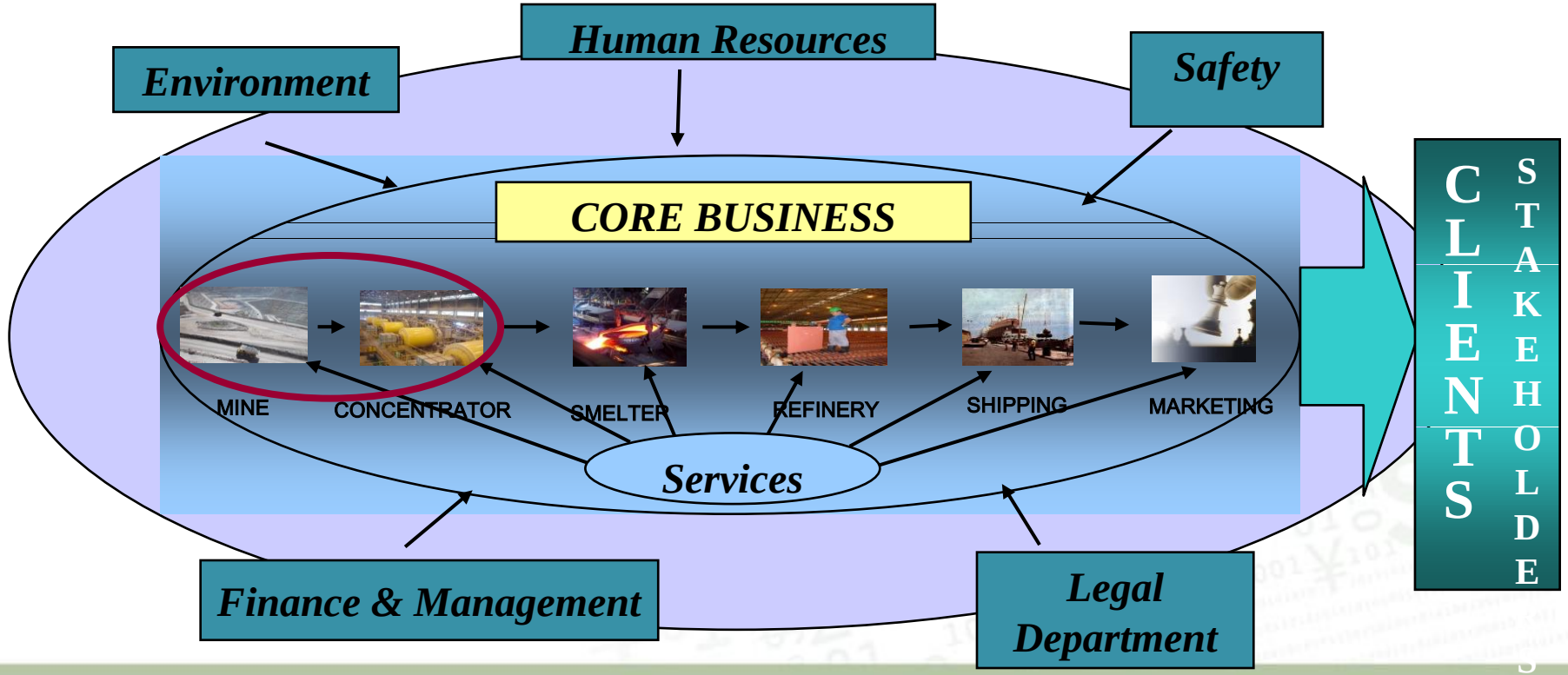
CORPORATION STRUCTURE

MAIN ACTIVITY

Cuajone

- The Cuajone facility operates an open-pit mine and a concentrator located in the southern part of Peru, 30 kilometers from the Moquegua city and 840 kilometers from Lima.
- The Cuajone Concentrator is one of the most important industrial plants in Peru, because of its production level and up-to-date technology applied on the many processes. It has a nominal capacity of 87,000 MT per day.
- Operations were commissioned in 1976.
- A conventional open-pit mining method is used to obtain a copper ore that is then processed in our concentrator plant.

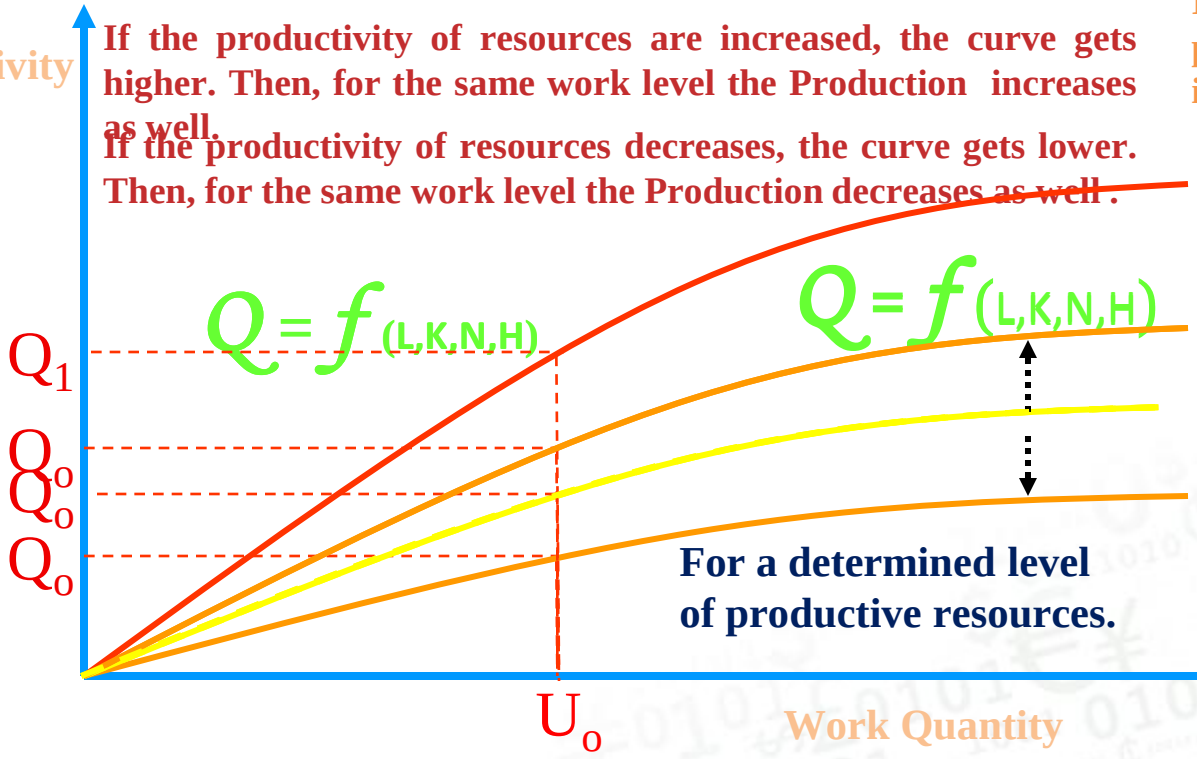
Actual Value Chain of the SPCC Production Process



Within the SPCC value chain, efforts are made to:

How can technology help to place value on our production processes?

…the answer



If technology is included, the production curve is going to increase remarkably.

$$Q = f(L,K,N,H,T)$$

Becomes Asymptotic

* Q = Productivity.

L = Work.

K = Capital.

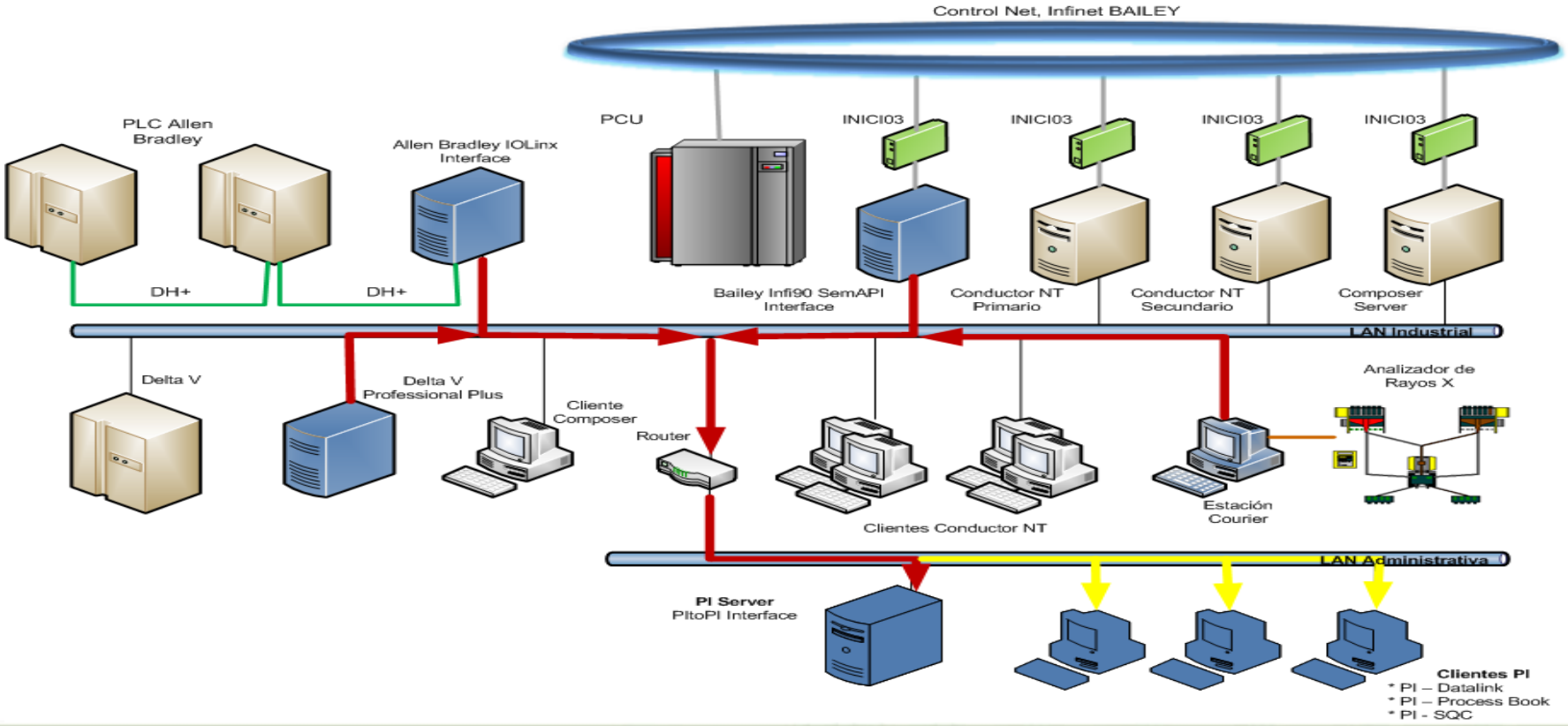
N = Natural Resource. (Raw Material)

H = Human Resource..

T = Technology.

PI SYSTEM ARCHITECTURE

Initial PI System Architecture



Initial PI System Architecture

PI Server keeps history of plant information

- Used from 1998.
- Gathers information from 3 different control systems.

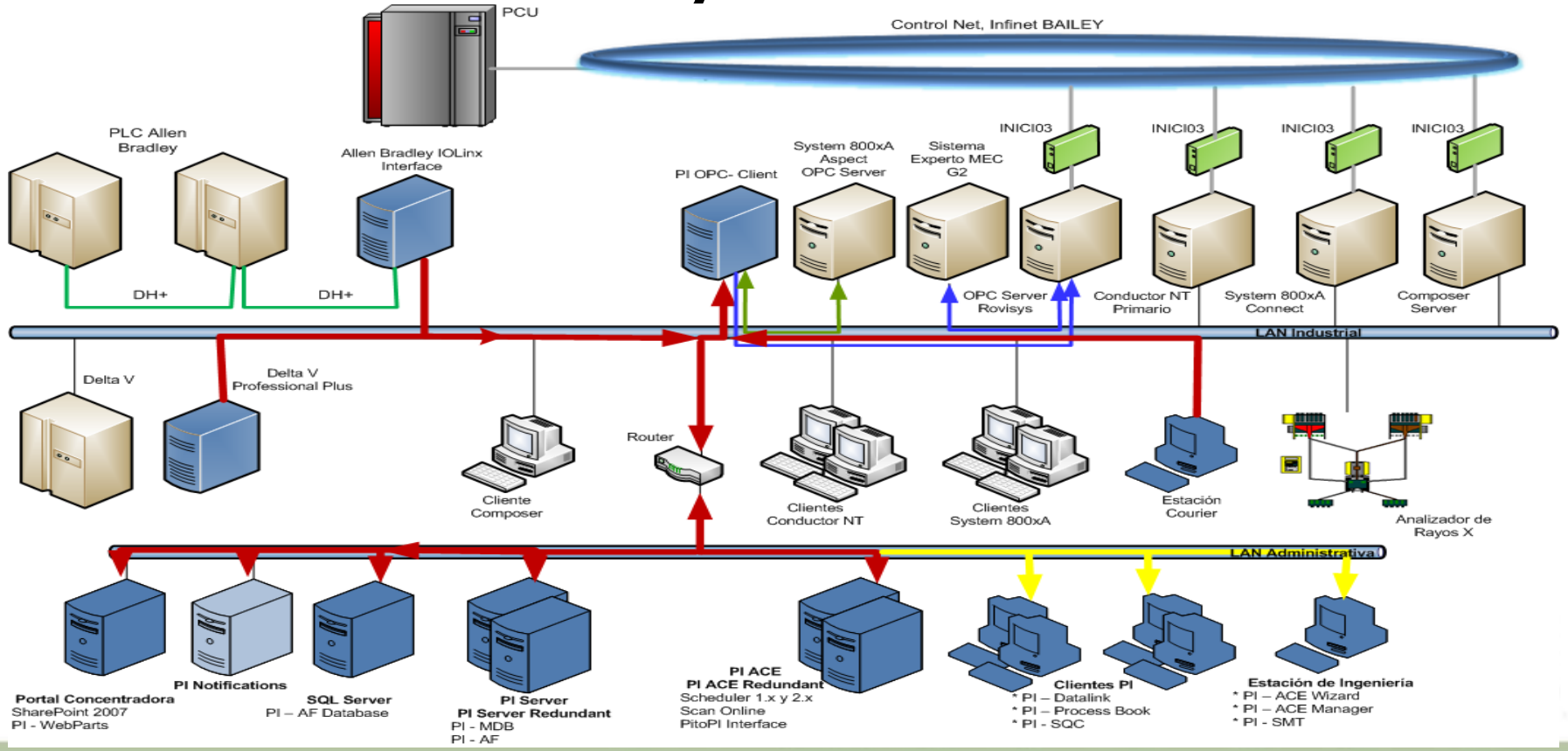
No System Redundancy

- System had to be stopped for updates or maintenance of the server.

A Limited Analysis of Information

- PI ProcessBook, PI DataLink and PI SQC.

Current PI System Architecture



Current PI System Architecture

Main system for performance management in real time

- Unifies information from all control systems.
- Allows to interact with other advanced control systems such as MEC G2.

A system with redundancy

- Maintenance and updates can be carried out without affecting the system availability.

Allows to do any type of information analysis

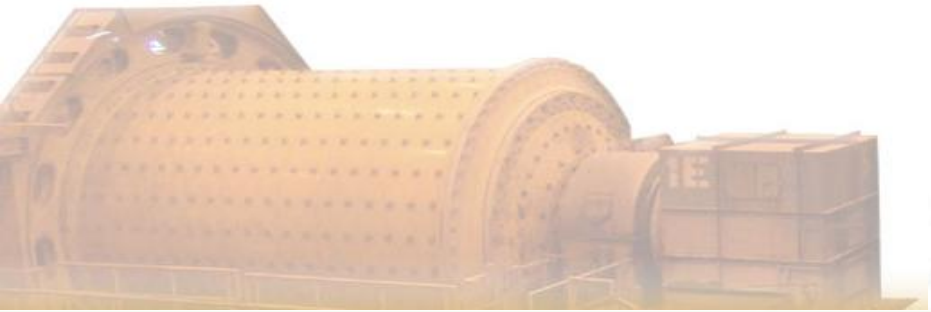
- Production personnel are developing Metrics so that they can determine whether objectives are being achieved.
- PI ACE allows calculation of KPI's for both operations personnel and management.

Allows to distribute information to any level

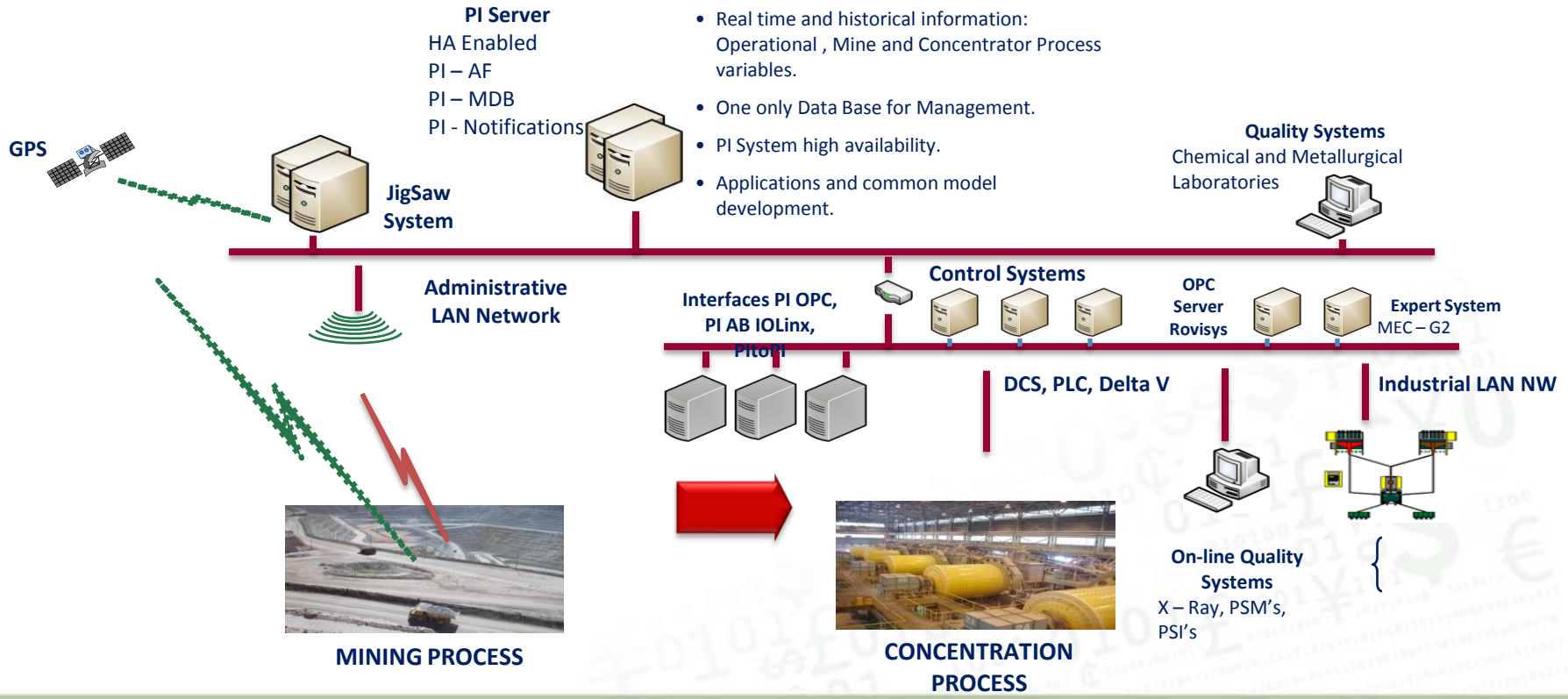
- Information is forwarded through a browser like Internet Explorer.
- It is possible to access information from any site including from outside the Company.

Architecture of PI System

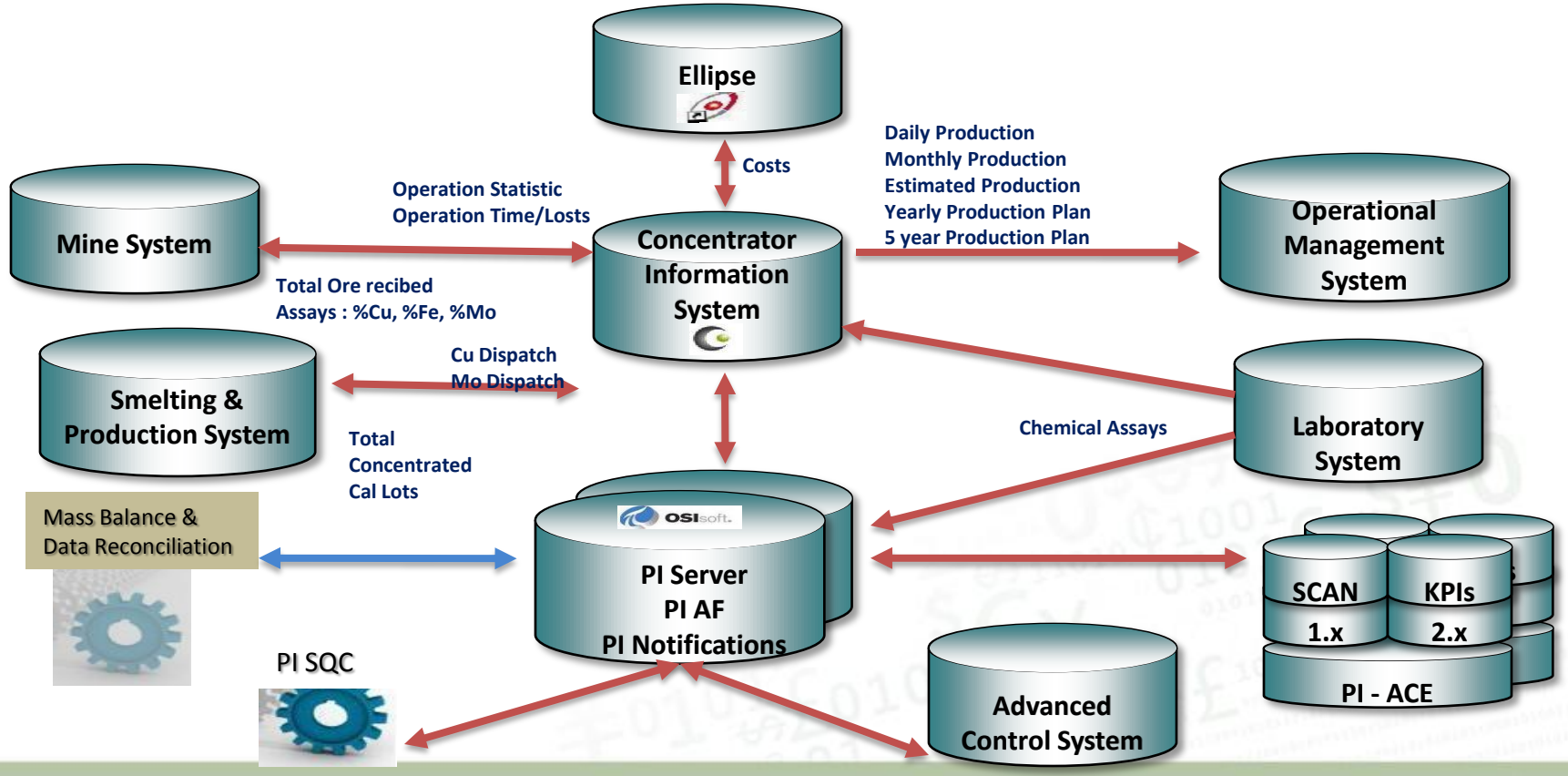
1. Server Architecture.
2. Analysis & Optimization Architecture.
3. Visualization Architecture.



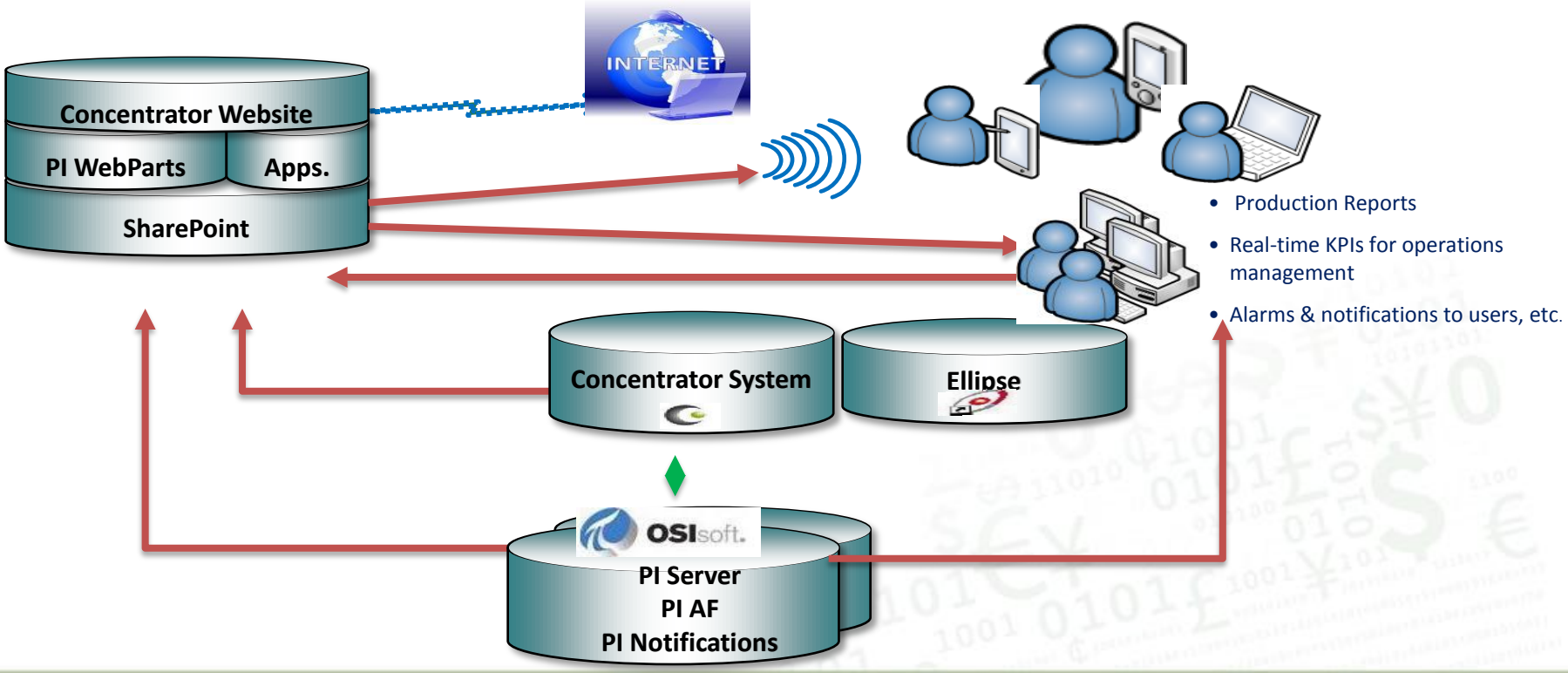
Server Architecture



Analysis & Optimization Architecture

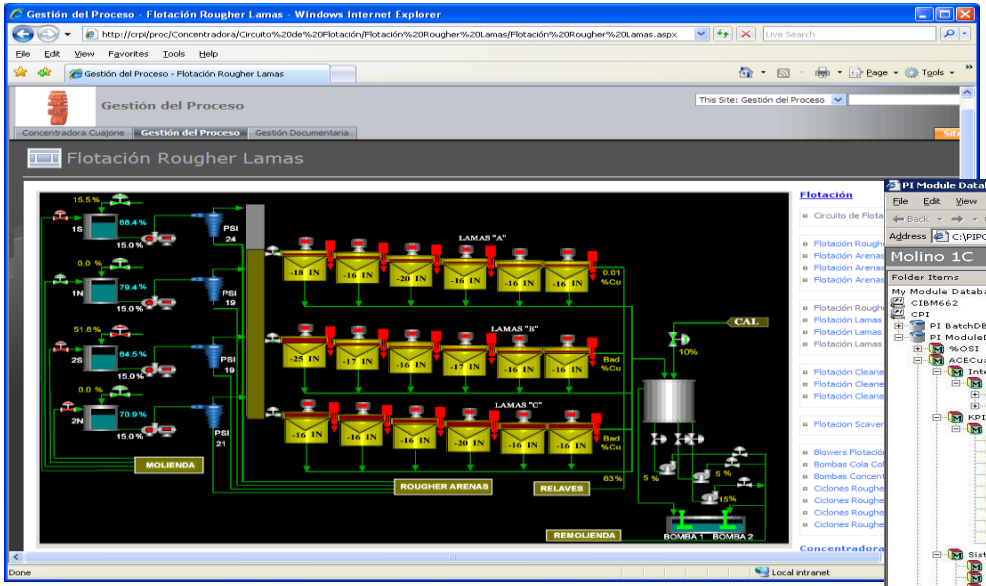


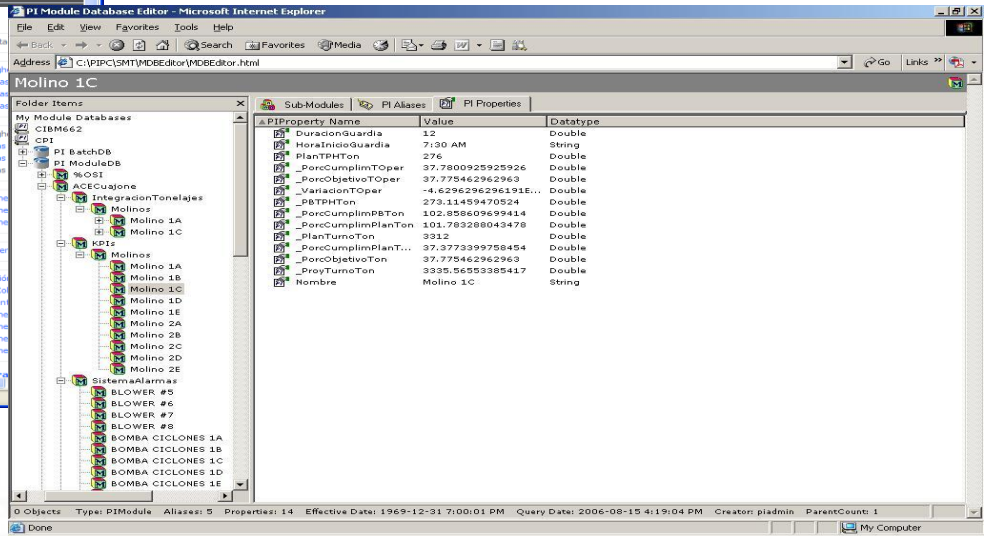
Visualization Architecture



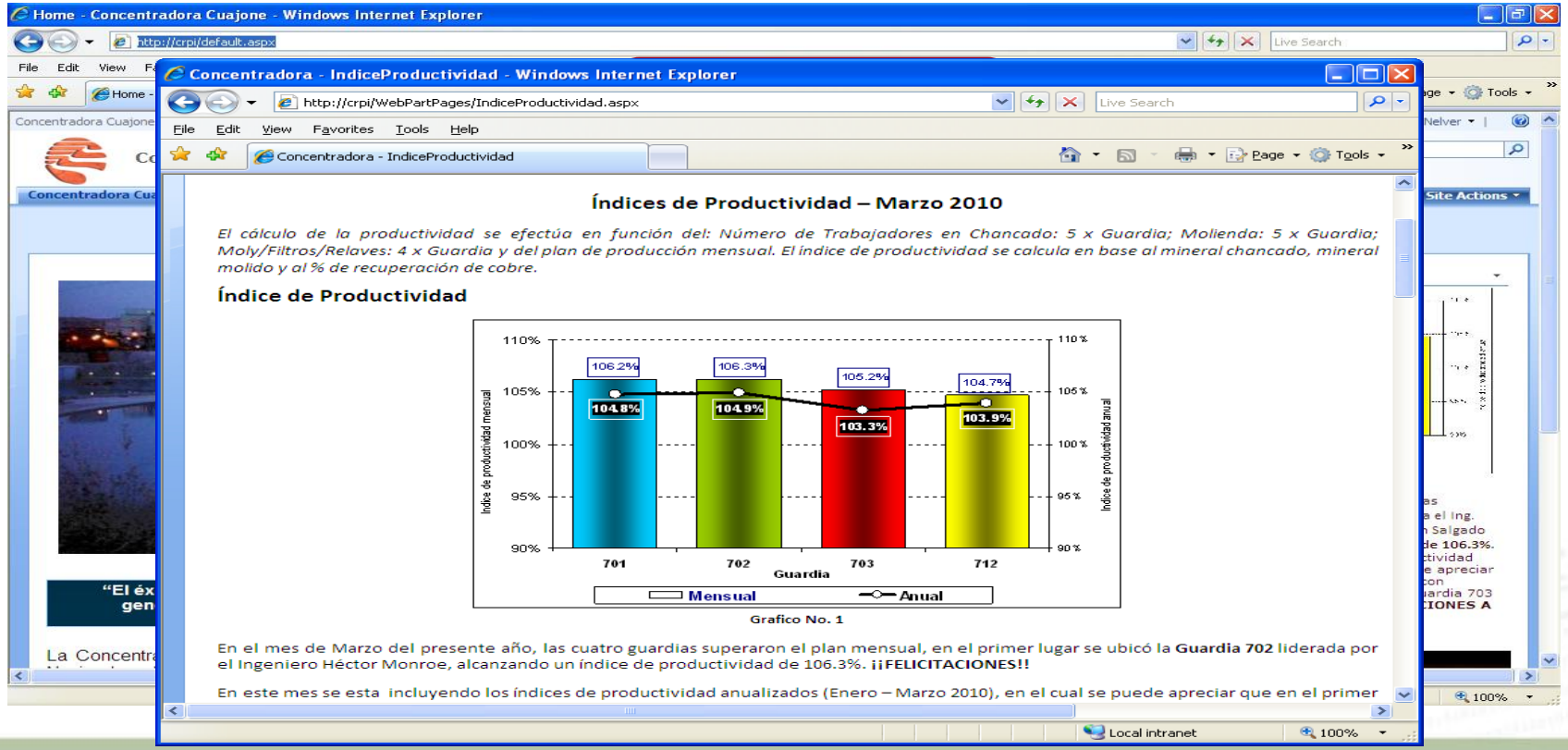
SOME APPLICATIONS

Operational Management Support

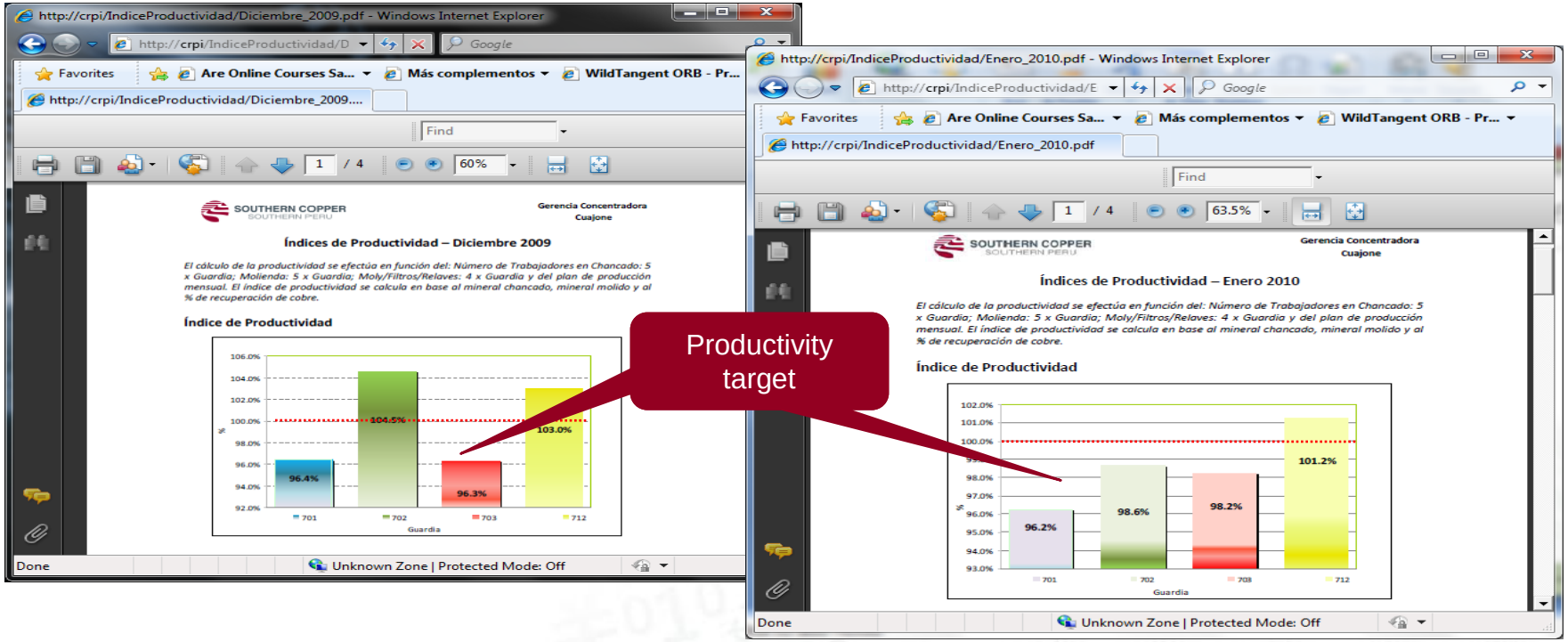




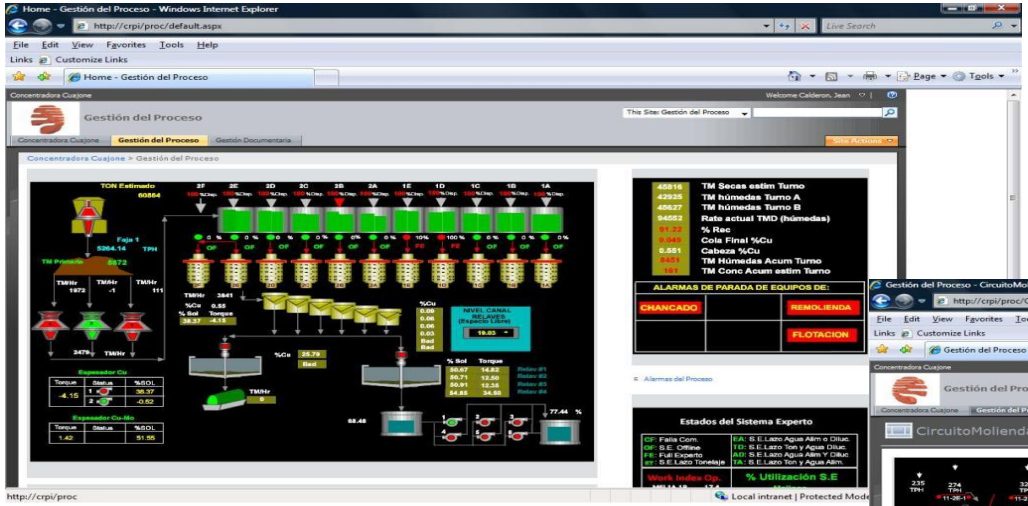
Concentrator Portal Applications

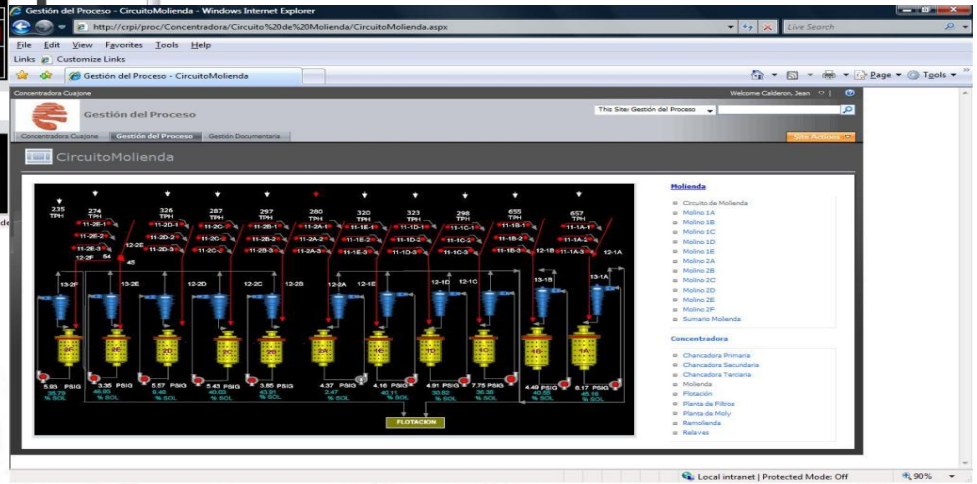


Productivity KPIs: Allows us to meet Targets



Applications PI WebParts





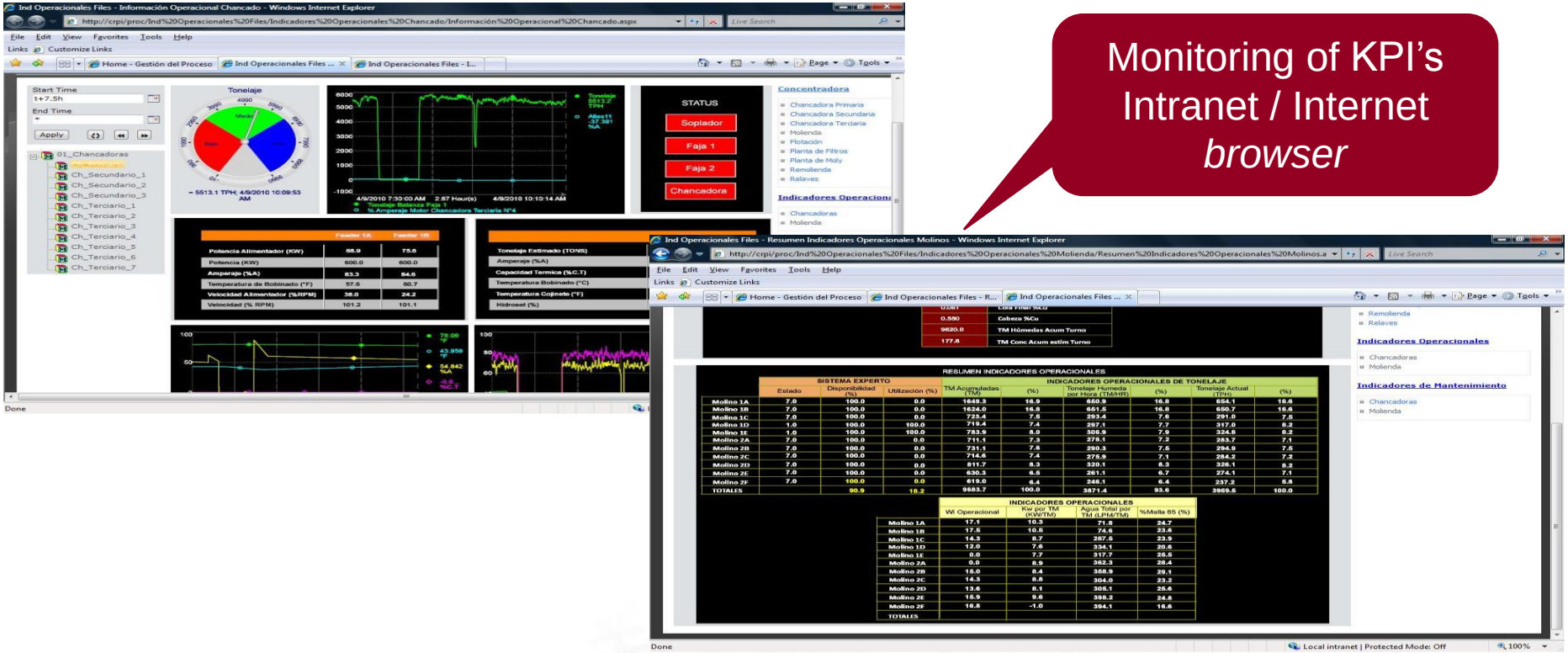
Process monitoring at an Intranet / Internet *browser* level

Management KPI's

Alarm system and start/stop equipment, sub-standard conditions of processes and operations, etc. (PI – ACE)

PDA &
Tablet PC's

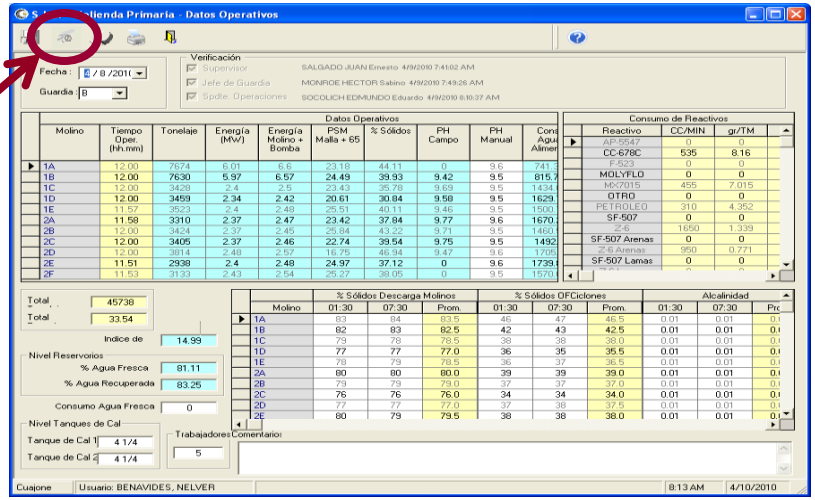
Applications PI WebParts

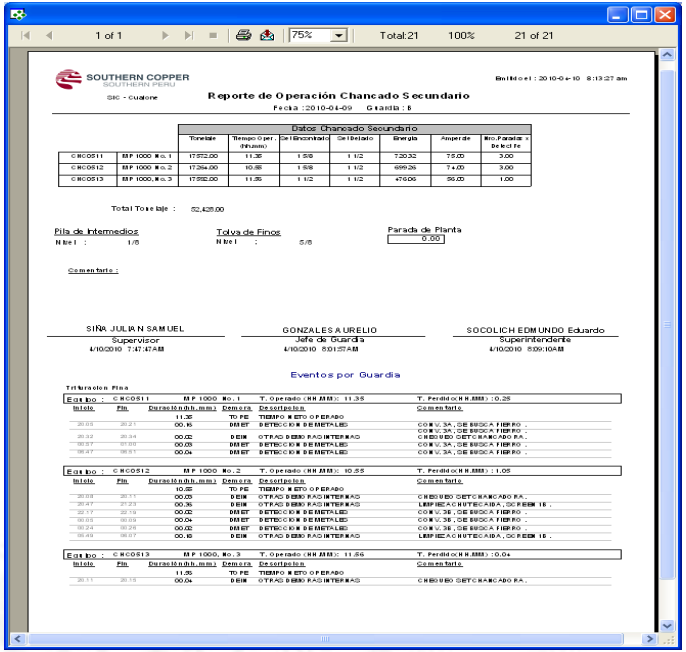


General Management Support

Concentrator Information System (SIC)

Information from the PI System

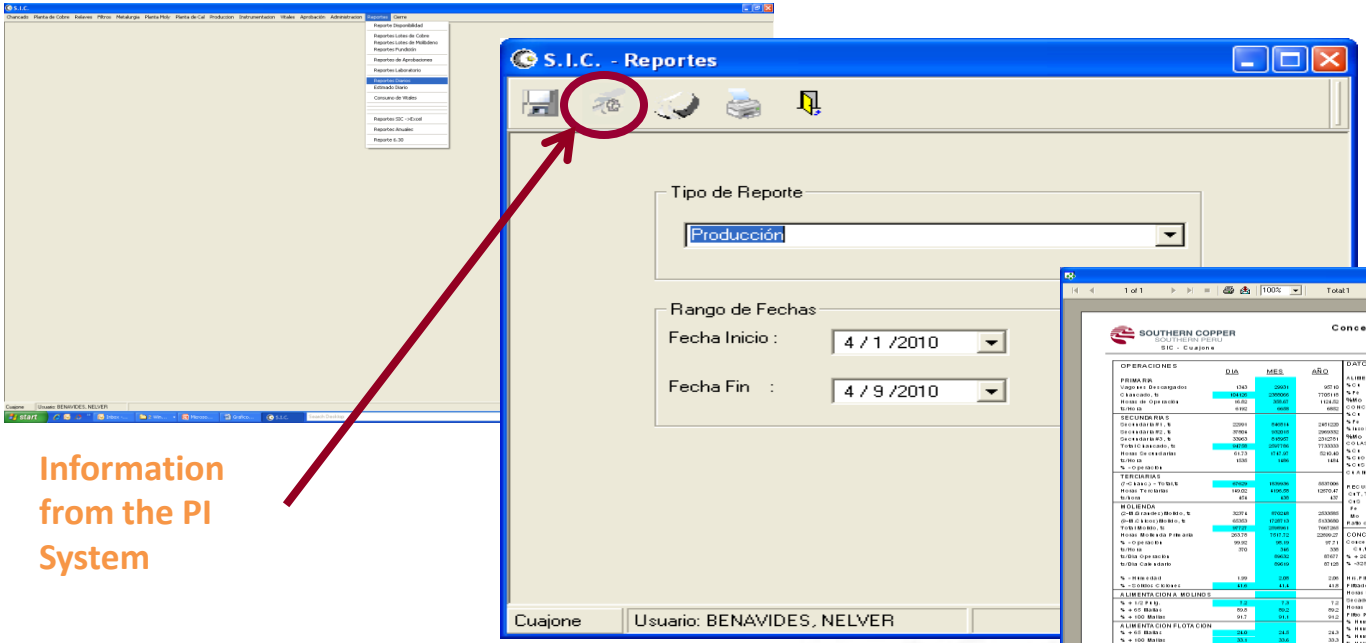




The SIC obtains its information from the PI System (PI - ACE)

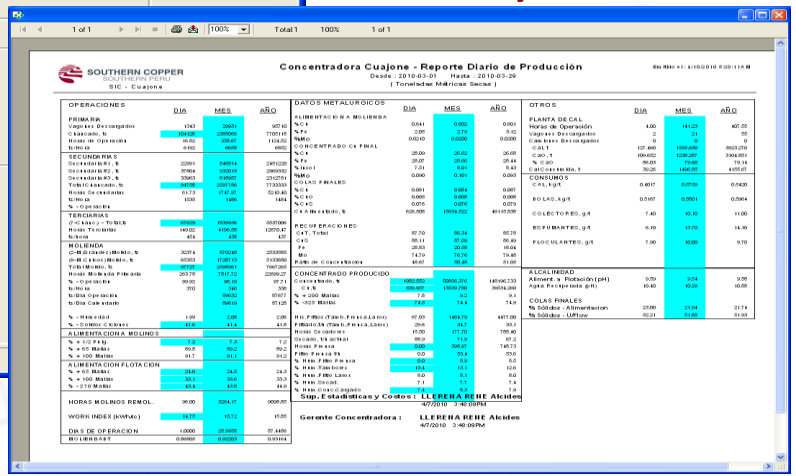
General Management Support

Concentrator Information System (SIC)



Information from the PI System

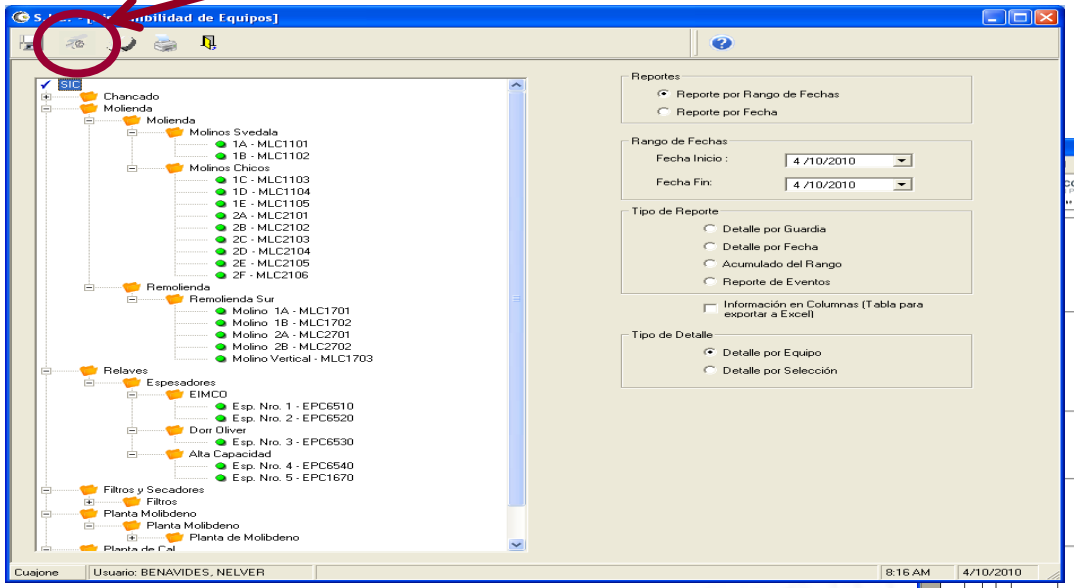
Official Production Reports obtained from the SIC system



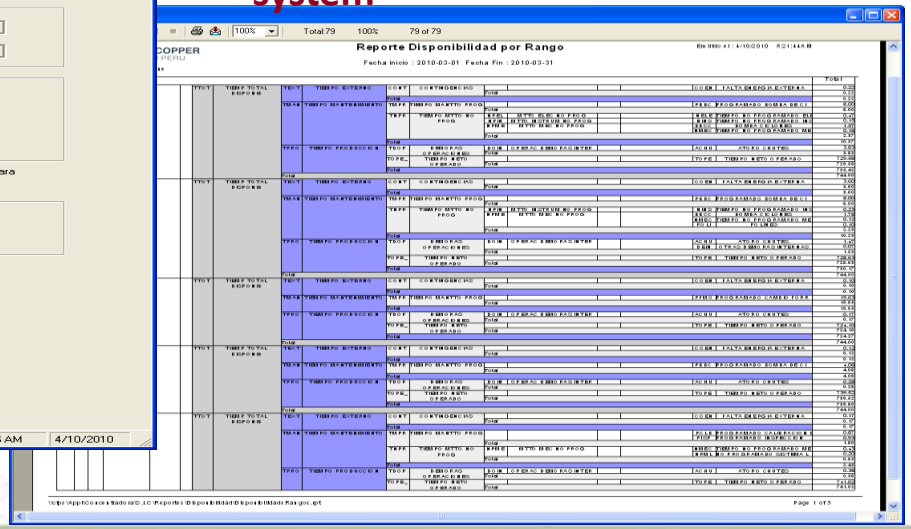
General Management Support

Concentrator Information System (SIC)

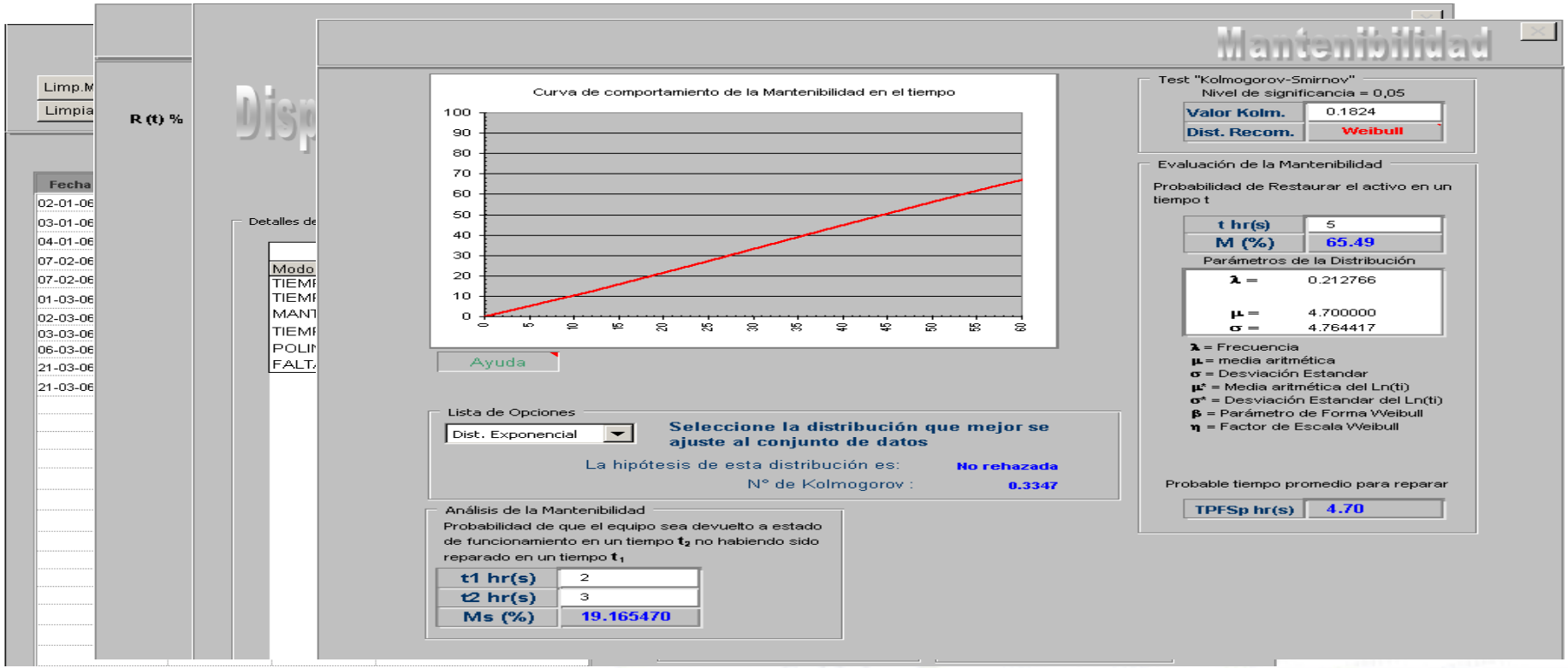
Information obtained from PI System



Availability reports & information for maintenance management from the SIC system



Management & Maintenance Planning: Reliability, Availability & Maintenance

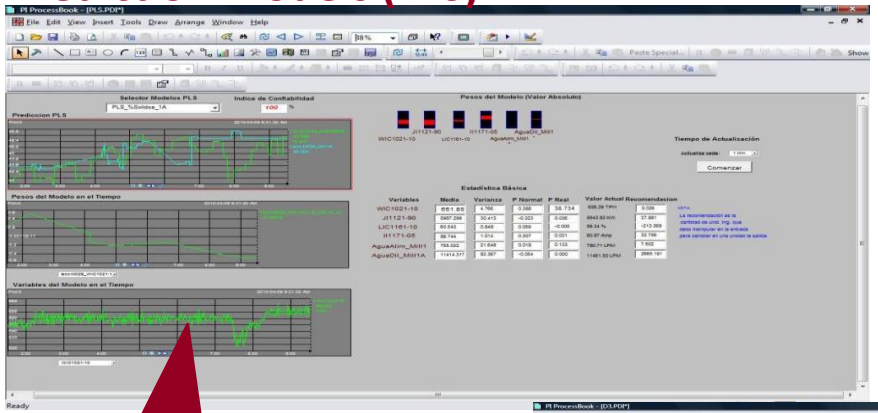


PI System Support for Process Optimization

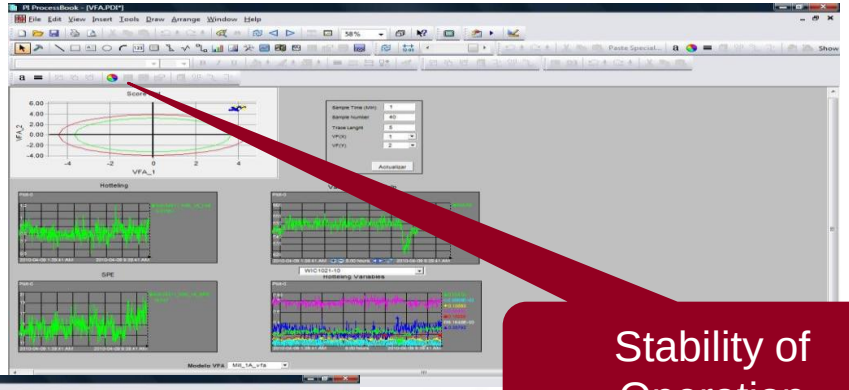
Development of Virtual/Soft Sensor as inputs to the Milling Advanced Control System, supported with PI System tools

Multivariable Statistical Analysis: SCAN

Prediction Models (PLS)

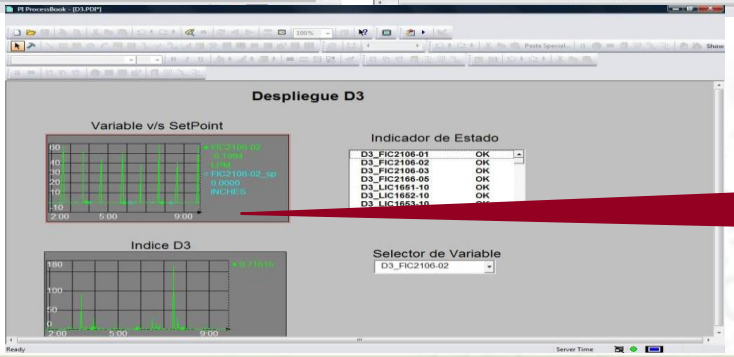


Statistical Variability Models (VFA)



Stability of Operation

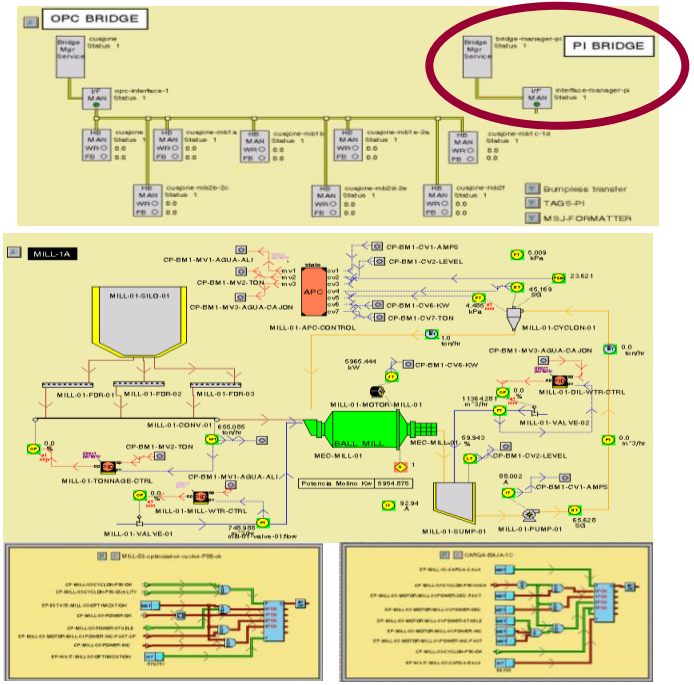
Virtual Sensors of % Solid and P80 Overflow Cyclones



Performance of control loops

Evaluation Models for Tuning Control loops (D3)

Virtual Sensors & Optimization of Milling Process

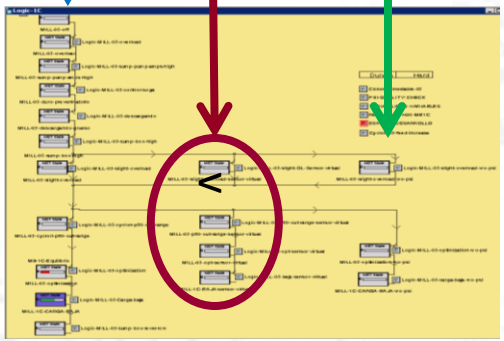


PI – OPC

PSI / P80

PI-ACE P80
Virtual Sensor

No PSI



Advanced Control System

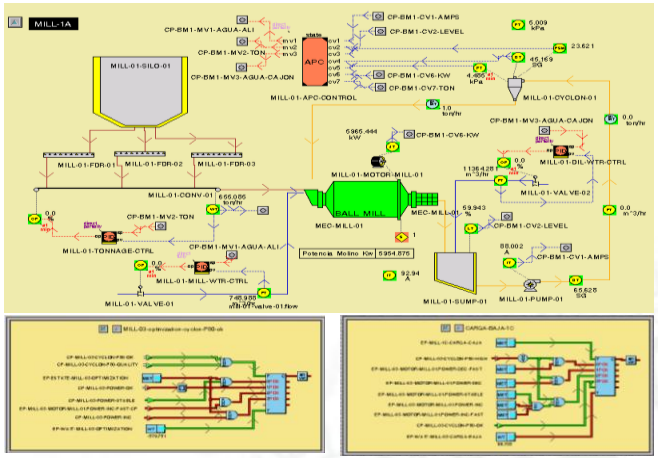
Logical Status

Virtual Sensors & Optimization of Milling Process

+ 65 Mesh

% Sólids

PSI Virtual Sensor Selection Logic



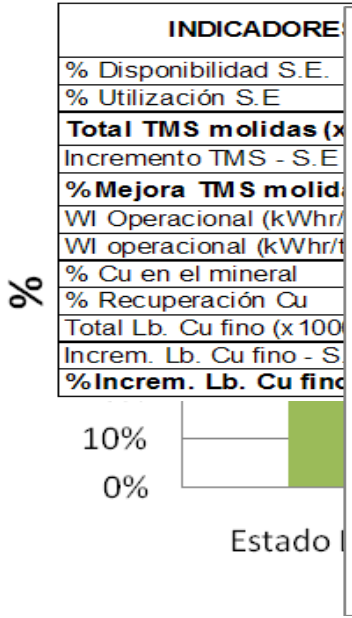
Advanced Control System

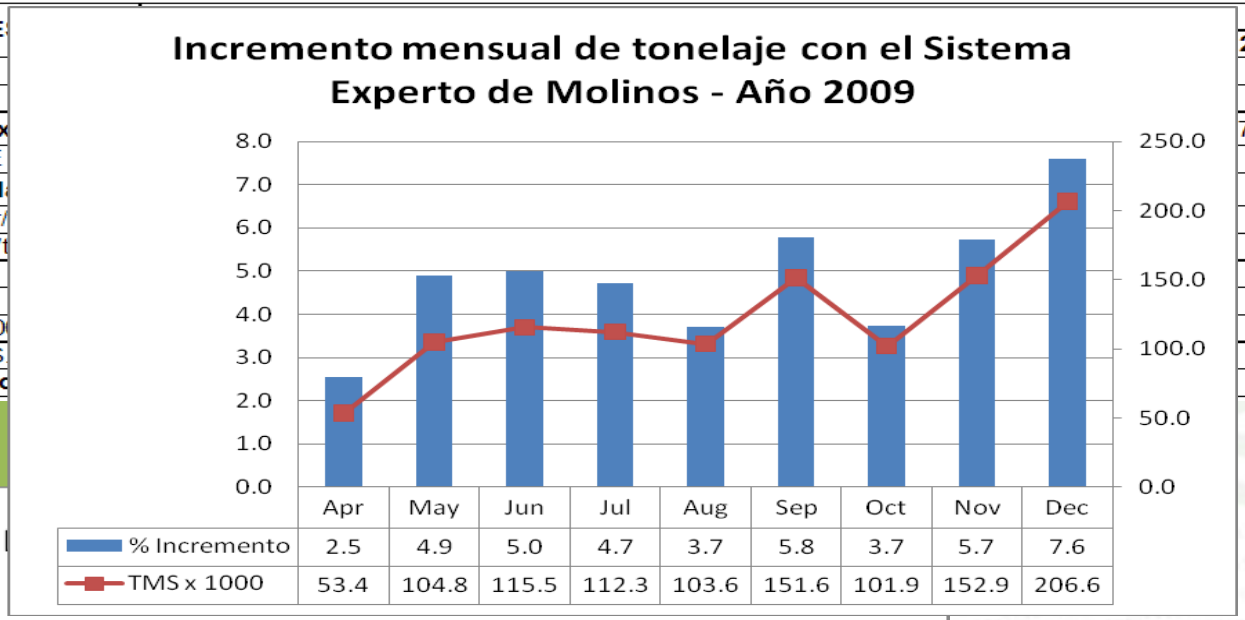
Virtual Sensors and Optimization of the Milling Process

Evaluación del Sistema Experto en los circuitos de molienda primaria

Periodo de evaluación: 4/4/2009 al 31/12/2009

INDICADORE	2F	TOTAL
% Disponibilidad S.E.	94.4	94.7
% Utilización S.E	71.6	73.4
Total TMS molidas (x	727.6	23926
Incremento TMS - S.E	71.4	1102.7
%Mejora TMS molid	4.1	4.6
WI Operacional (kWhr/	15.1	14.7
WI operacional (kWhr/t		
% Cu en el mineral		
% Recuperación Cu		
Total Lb. Cu fino (x 100	7830	198522
Increm. Lb. Cu fino - S	522	9920
%Increm. Lb. Cu finc	6.66	5.00





Benefits of the Milling Process Advanced Control System

Production Benefits:

- Increase in production: 4.6%
- Decrease power consumption: 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

Requirements for Success

- Requires resources that will efficiently and proactively manage the PI System and associated applications.
- Assign as many human resources to develop and enhance specialized applications.
- Invest in development and training of your staff.

Benefits

- A single database.
- Unified view of information.
- Increased availability of information.
- Detailed insight into the process.
- Easy integration with the rest of the systems.
- Ability to analyze the process and identify new control strategies.
- Improve the Predictive Maintenance.
- Identify best practices for operations.
- Real impact in decreasing operating costs.

Final Conclusion

PI System provides a natural and flexible infrastructure that enables and supports continuous innovation and improvement.

Thank you