



CODELCO NORTE

Superintendencia de Automatización
Codelco Norte

Leonel Mundaca P

OPERATIONAL MANAGMENT SYSTEM FOR DIVISION CODELCO NORTE





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THE CHUQUICAMATA MINING DEPOSIT IS LOCATED ON THE SECOND REGIÓN IN CHILE, 230 KM. NORTH-EAST ANTOFAGASTA CITY, AT 2.900 msnm OF MEDIUM ALTITUDE

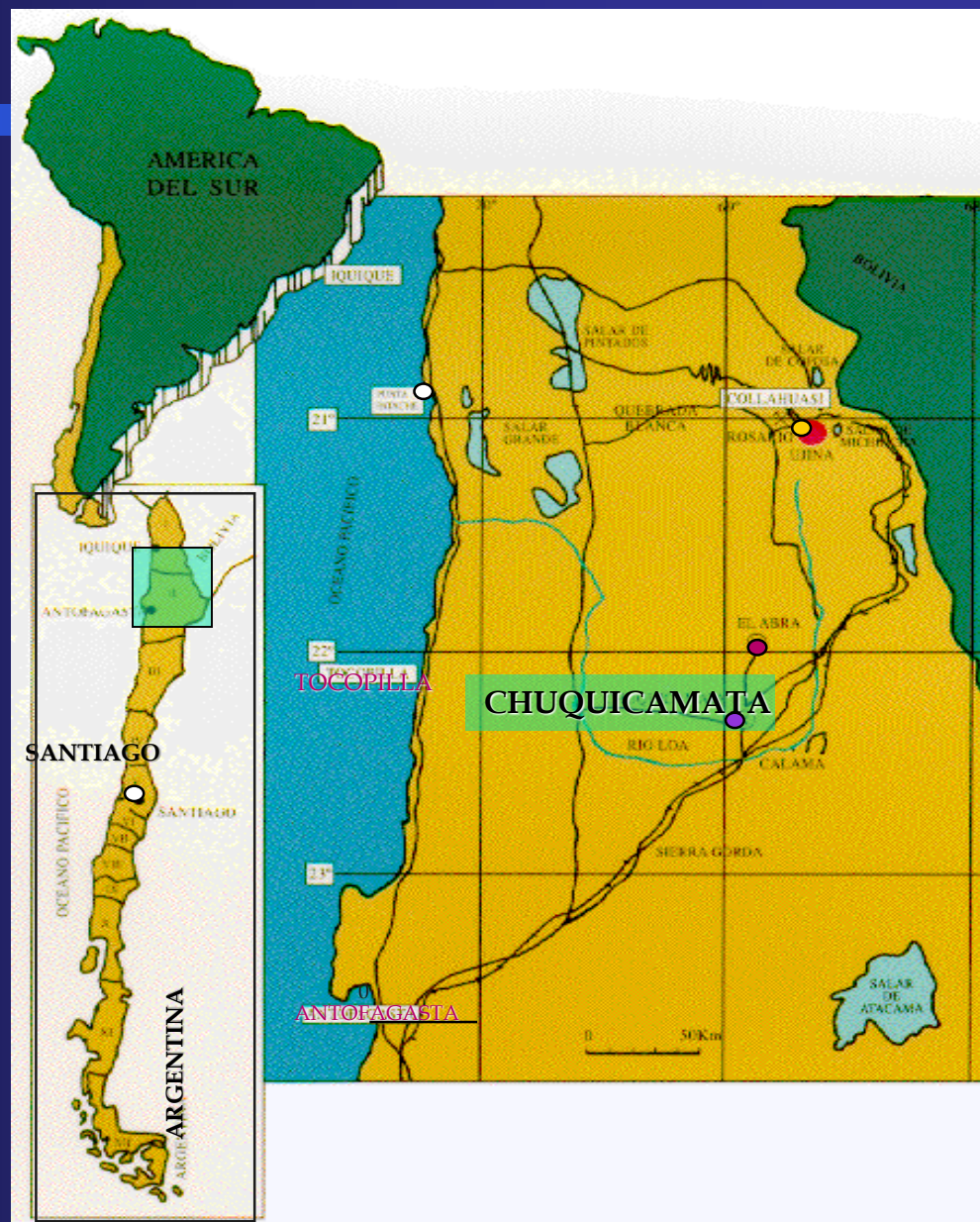
ITS MAIN PRODUCTION LINES ARE BASED IN :

SULFUR LINE

- Copper Concentrate.
- Molibden Concentrate
- Copper Anode
- Copper Cathode
- Acid Sulfuriv

OXIDE LINES

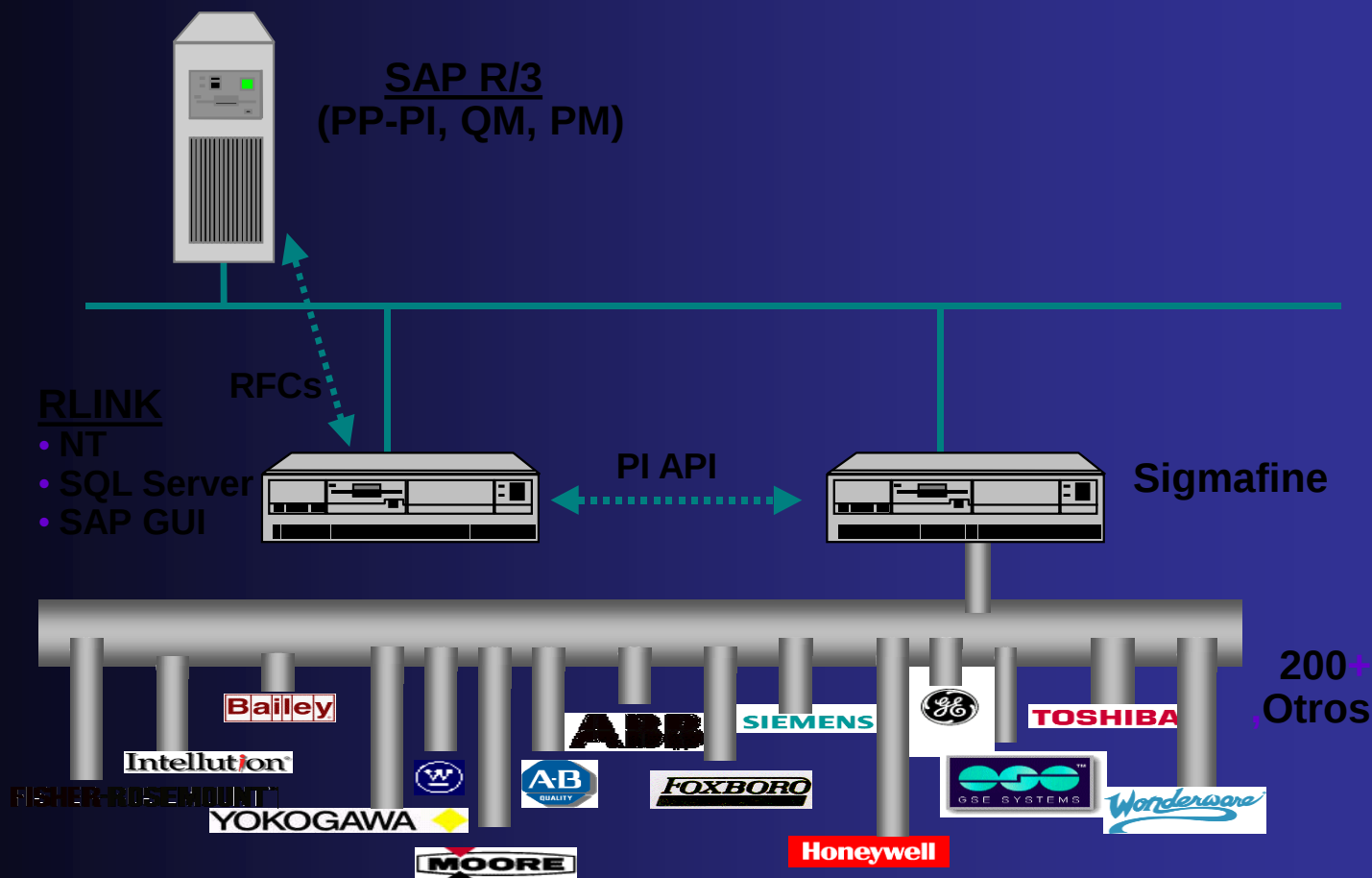
- Cathode Line





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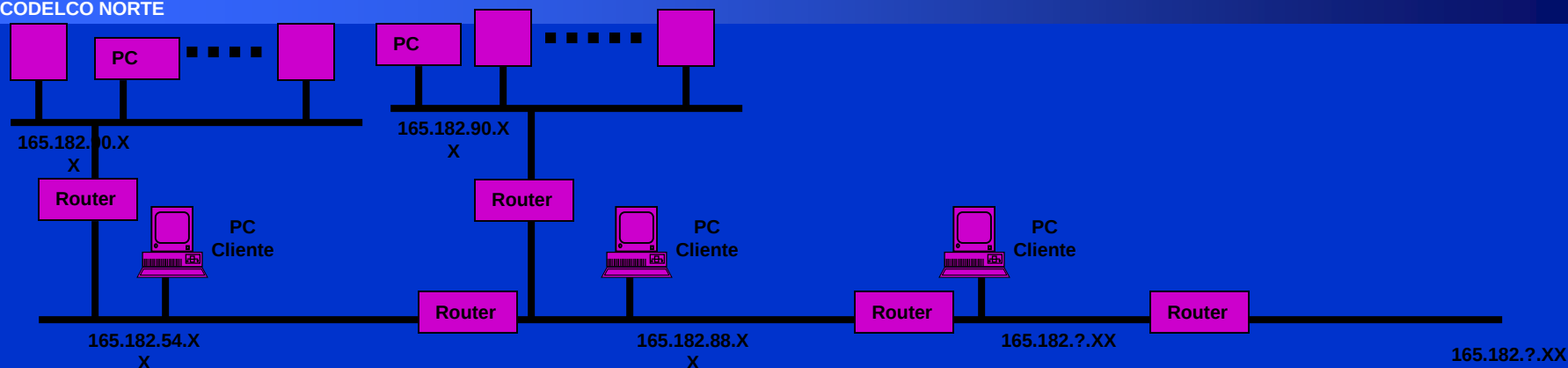
OPERATIONAL MANAGMENT SYSTEM FOR DIVISION CODELCO Part I





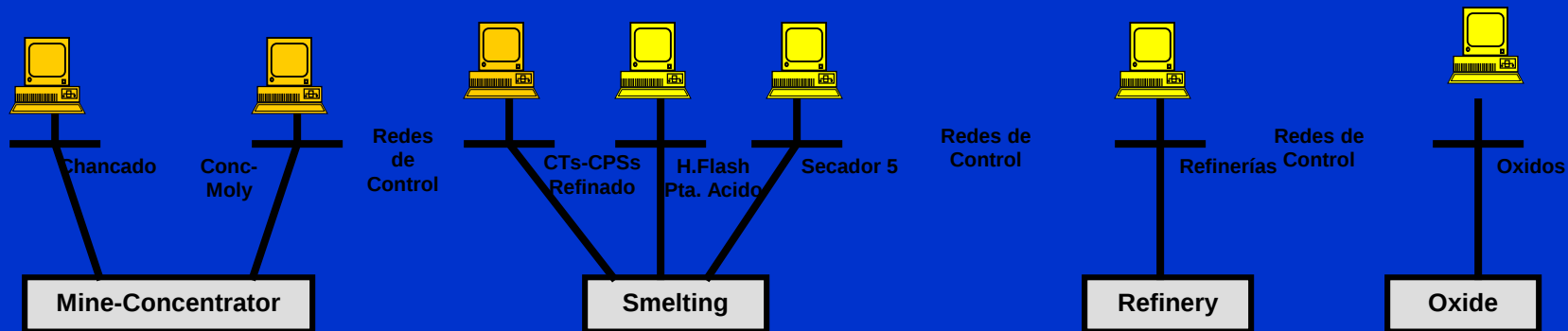
1994 SITUATION

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Information System

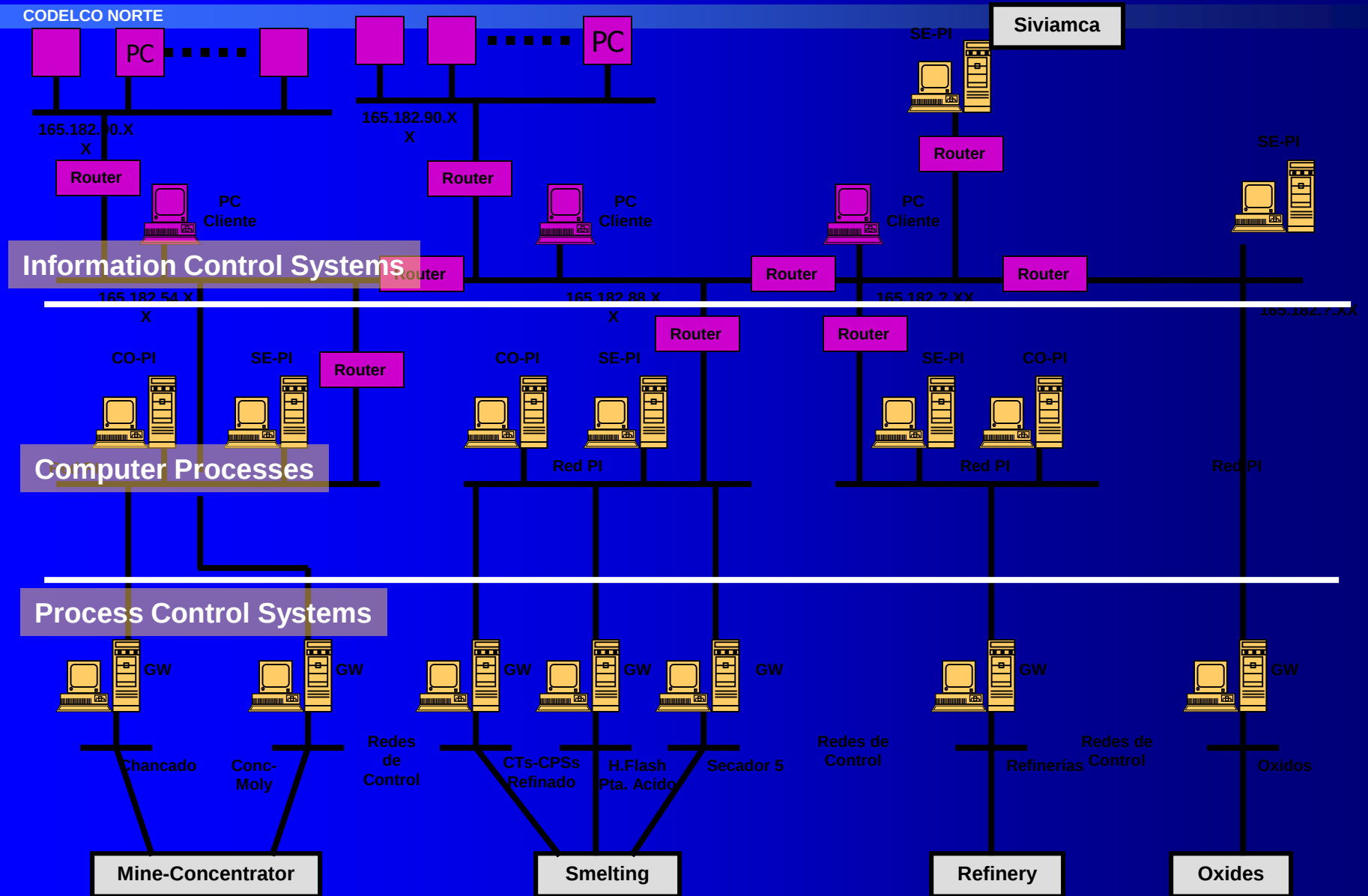
Control System



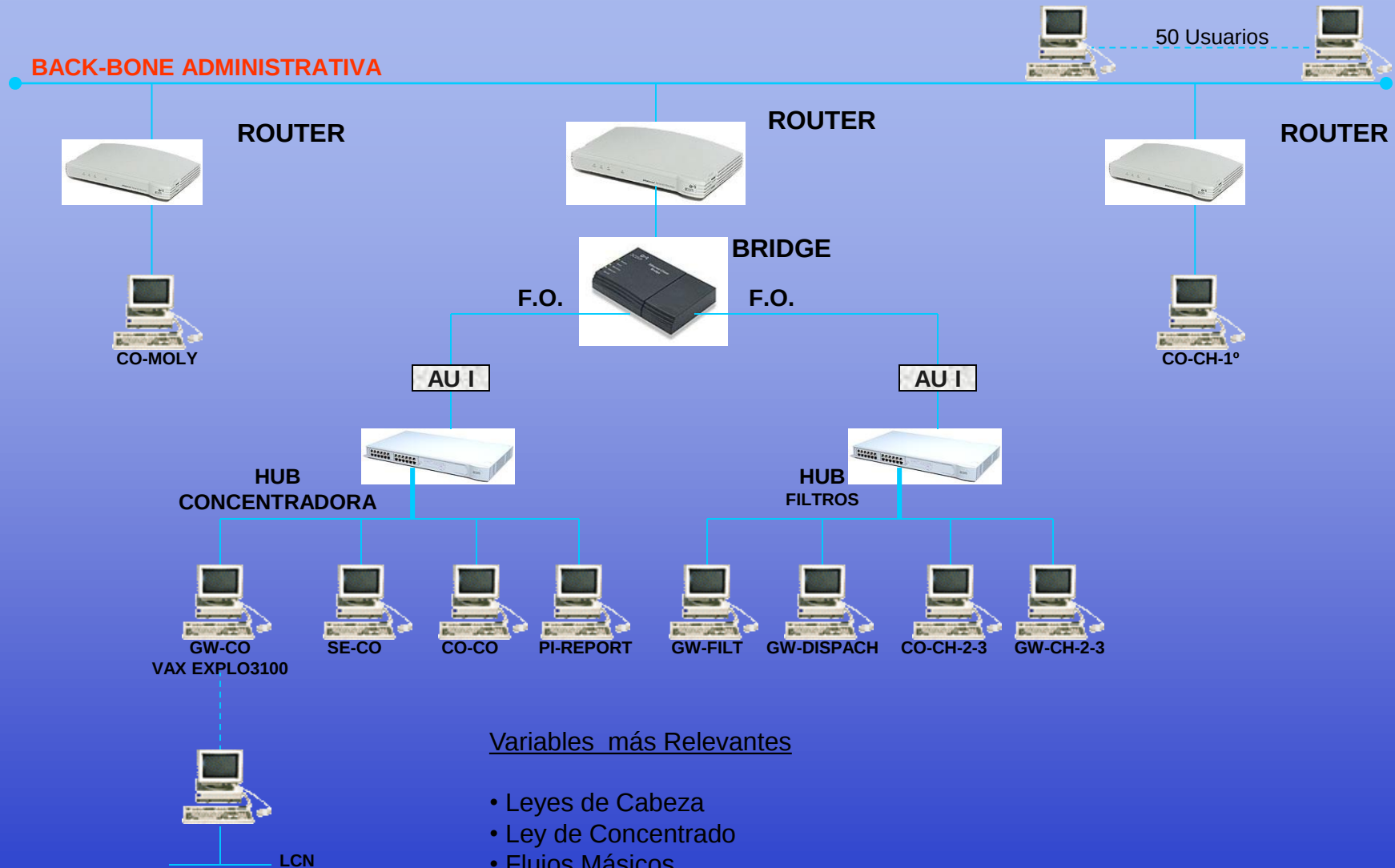


PRESENT SITUATION

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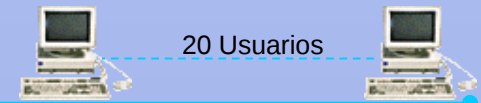
PI-SYSTEM MINA CONCENTRADORA



Variables más Relevantes

- Leyes de Cabeza
- Ley de Concentrado
- Flujos Músicos
- Concentrado entregado a Fundación
- Ley y Masa de las Colas

PI-SYSTEM FUNDICIÓN



BACK-BONE ADMINISTRATIVA

ROUTER



BRIDGE



F.O.

F.O.



AUI

AUI

AUI

AUI

F.O.

AUI

DAE



**HUB.
H-FLASH**

**HUB
CT1**

**HUB.
CT2-CPS**

**HUB
SEC-5**

GW-RM

GW-LAB

CO-ACI

BNC UTP



BNC AUI



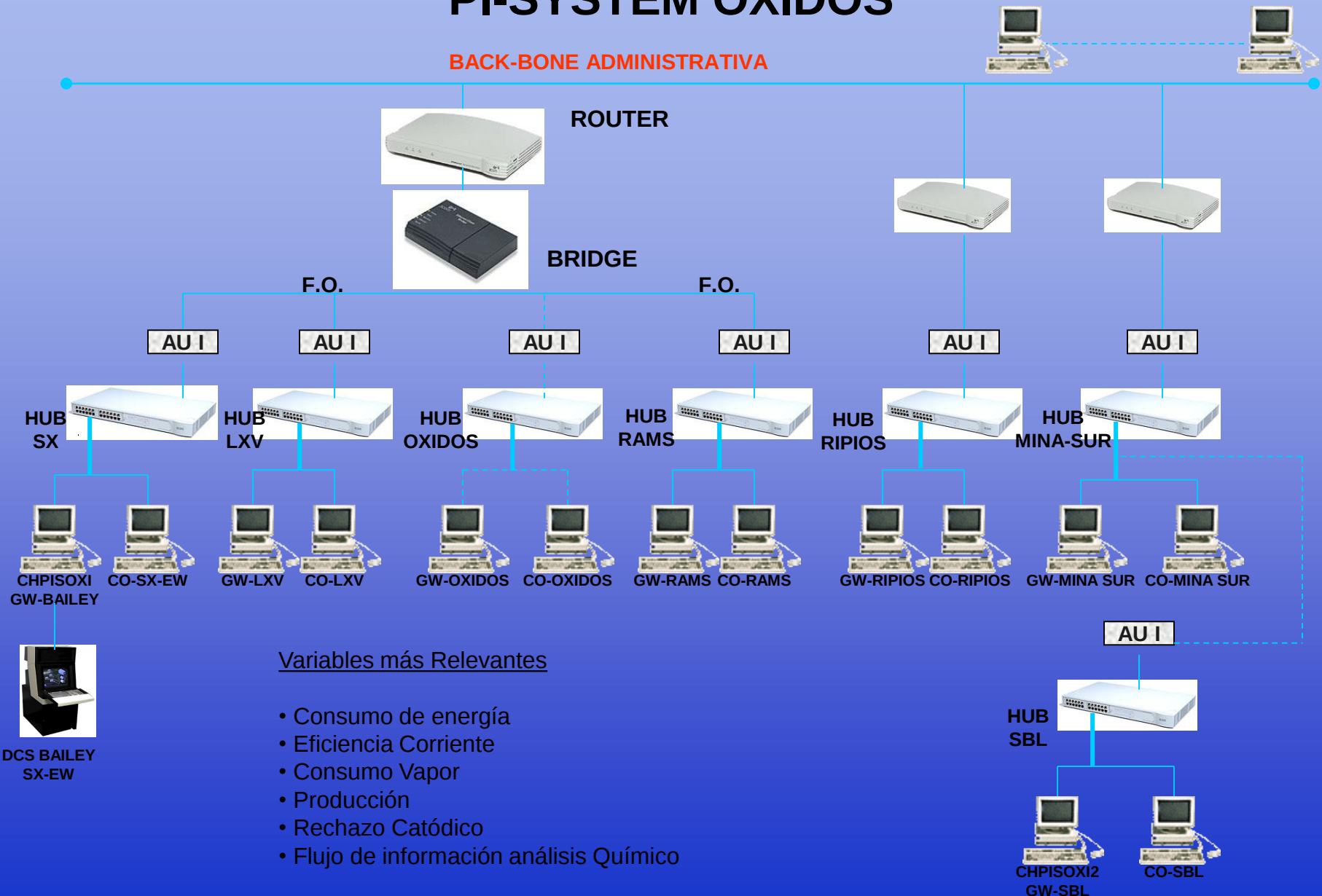
LCN

Variables más Relevantes por cada unidad de Fusión(Horno Flash, CT, CPS)

- Flujo de Concentrado
- Ley de Ejes
- Flujo de Gases
- Concentración de SO₂
- % de Cu en escoria
- % de Cu en el concentrado

PI-SYSTEM ÓXIDOS

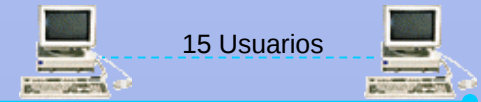
BACK-BONE ADMINISTRATIVA



Variables más Relevantes

- Consumo de energía
- Eficiencia Corriente
- Consumo Vapor
- Producción
- Rechazo Catódico
- Flujo de información análisis Químico

PI-SYSTEM REFINERÍAS



BACK-BONE ADMINISTRATIVA

ROUTER



**HUB
REFINERÍAS**



CHSIIR01
GW-BAILEY



GW-MAQUINAS



GW-FPO

**CIU
(Computer Interface Unit)**



DCS BAILEY
CO-REFINERÍA N°2

Variables más Relevantes

- Consumo de energía
- Eficiencia Corriente
- Consumo Vapor
- Producción
- Rechazo Catódico
- Flujo de información análisis Químico

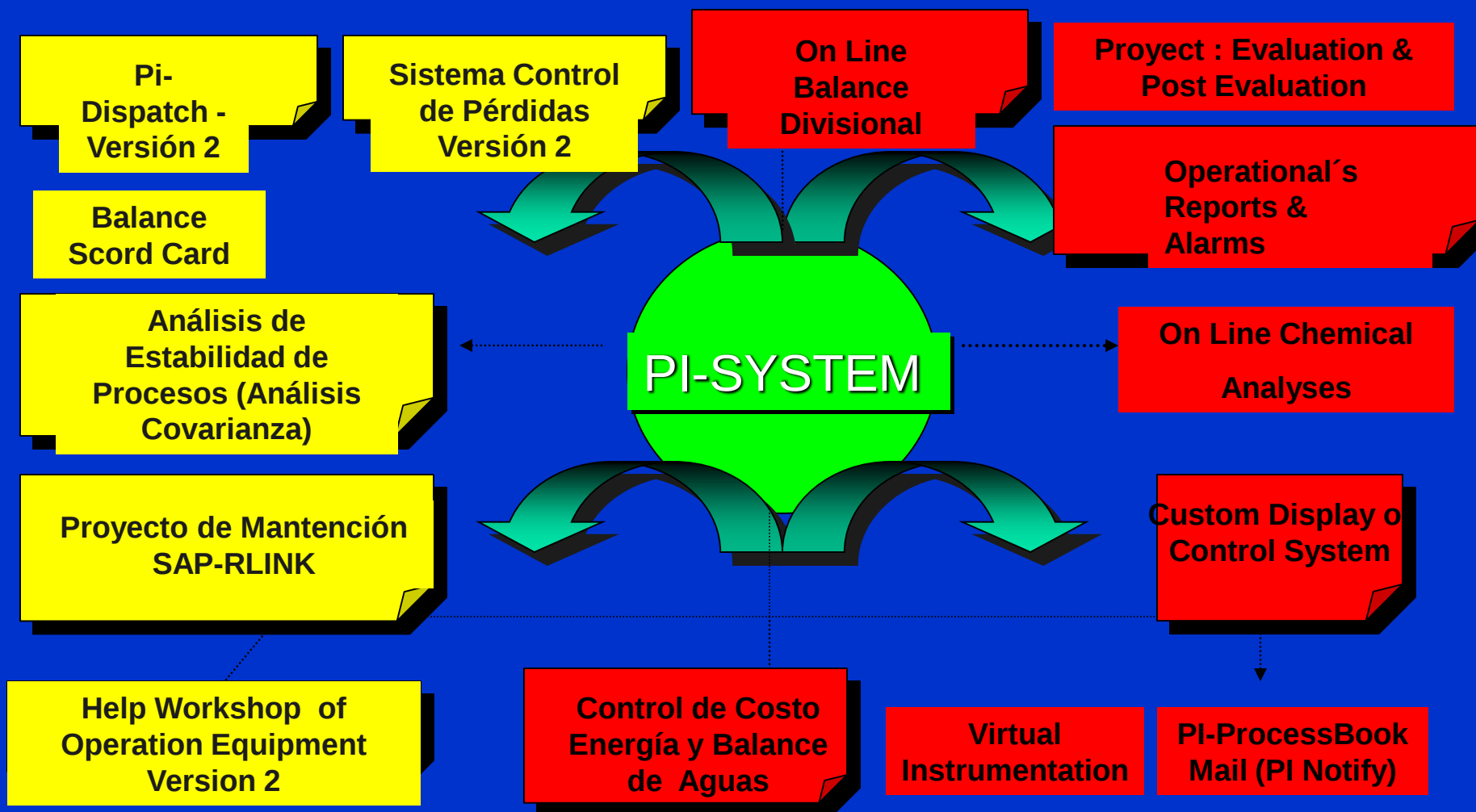


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Applications of the Operational Integration Platform

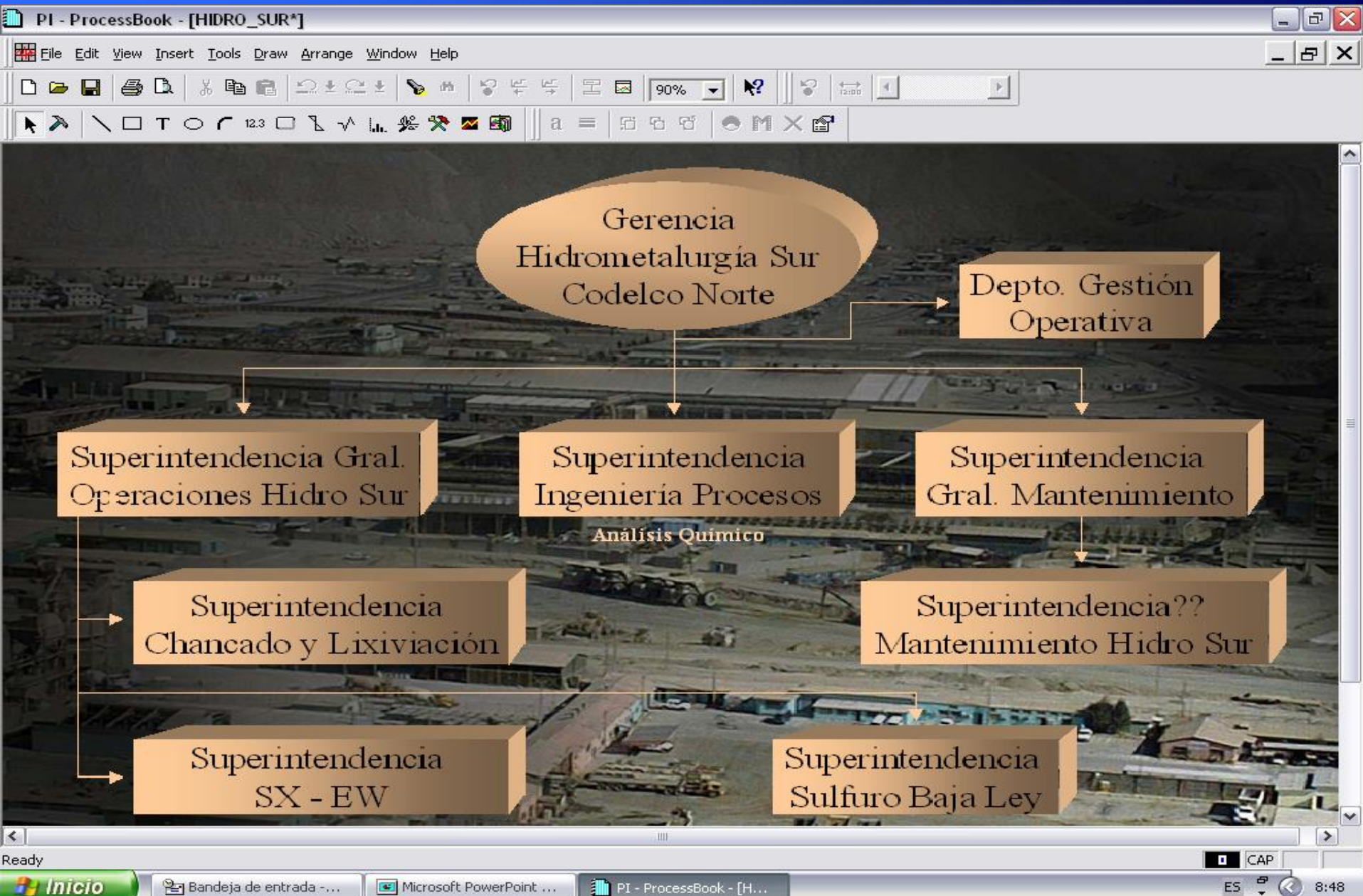
Present Vision

Future Vision



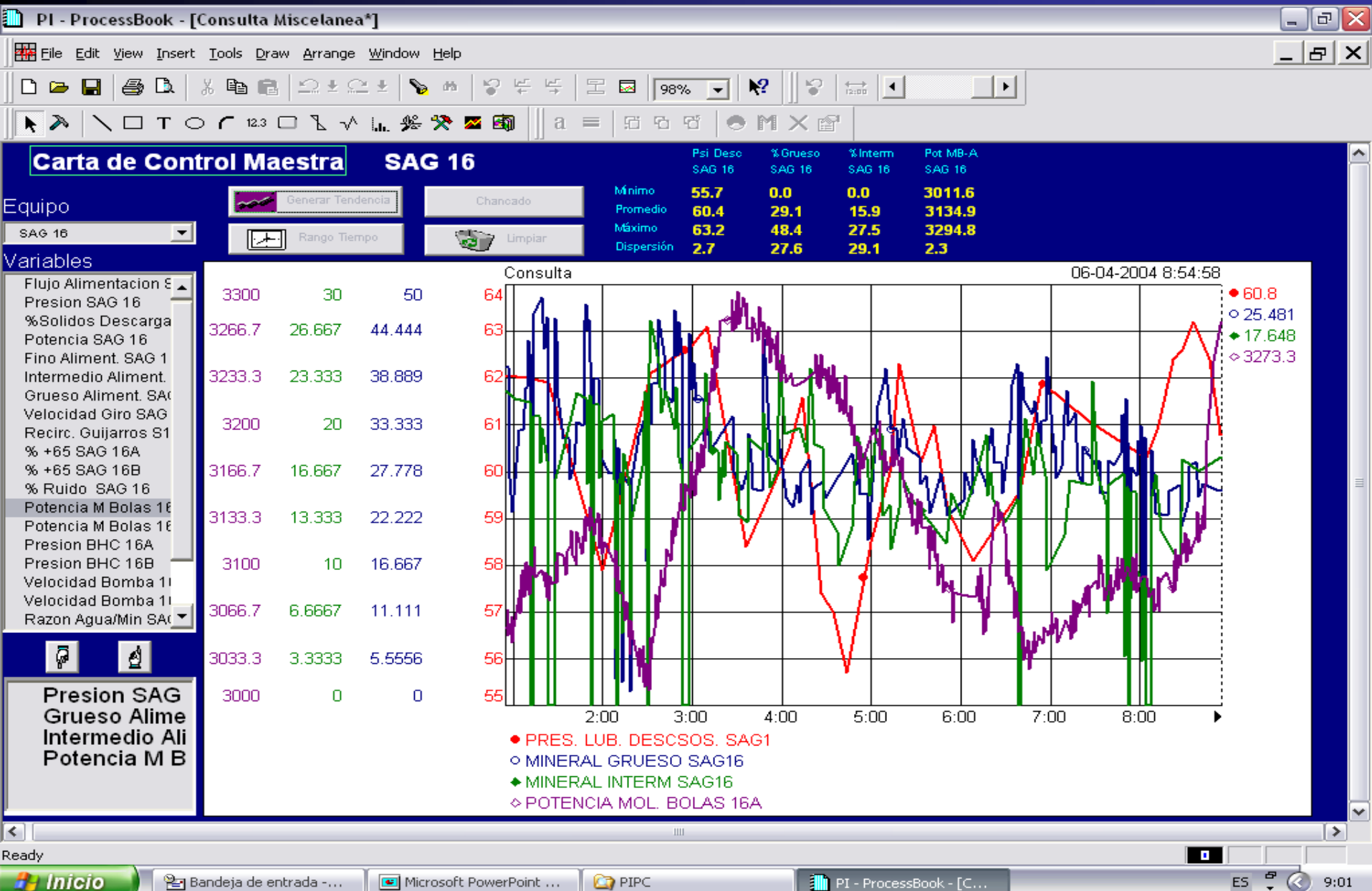


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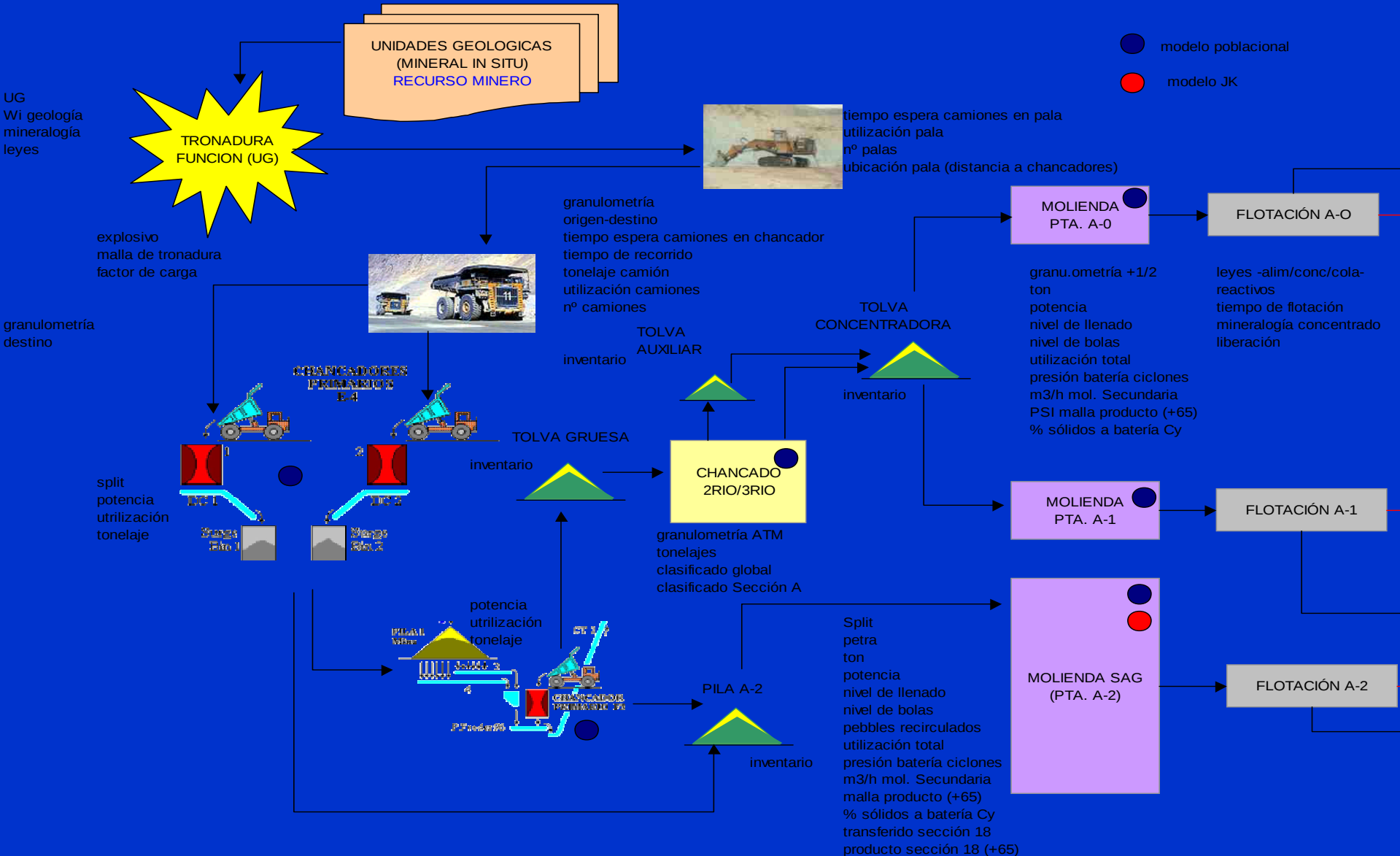
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Sistema de Coordinacion Mina-Planta





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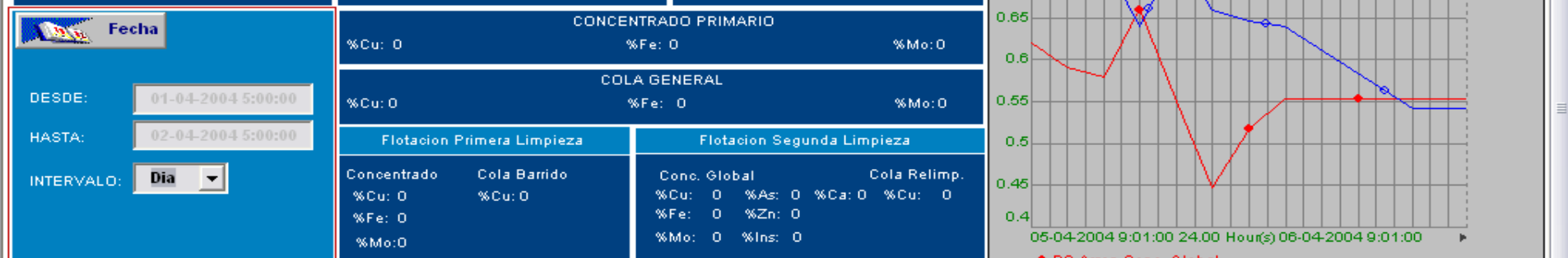
PI - ProcessBook - [Diagnostico Histórico (CO) [Read Only]*]

File Edit View Insert Tools Draw Arrange Window Help



Molienda A-0		Molienda A-1		Molienda A-2		Total Concentradoras	
Mineral Proces.(TMH):	72785	Mineral Proces.(TMH):	30176	Mineral Proces.(TMH):	75460	Tratamiento Total (TMS):	0
Agua(M3/TMH):	0.2	Agua(M3/TMH):	-657230	Agua(M3/TMH):	0.7	Agua(M3/TMH):	0
Medios de Molda.(Tao/TMH):	0	Medios de Molda.(Tao/TMH):	0	Medios de Molda.(Tao/TMH):	0	Medios de Molda.(Tao/TMH):	0
Energía Cons. (KW°H/TMH):	4.3	Energía Cons. (KW°H/TMH):	10.5	Energía Cons. (KW°H/TMH):	4.0	Energía Cons. (KW°H/TMH):	0
Flotacion A-0		Flotacion A-1		Flotacion A-2		Conc. Colectivo (TMS):	
Consumo Colector (Gr/TMH):	0	Consumo Colector (Gr/TMH):	0	Consumo Colector (Gr/TMH):	0		
Consumo Espumante (Gr/TMH):	0	Consumo Espumante (Gr/TMH):	0	Consumo Espumante (Gr/TMH):	0		
Consumo Cal (Gr/TMH):	0	Consumo Cal (Gr/TMH):	0	Consumo Cal (Gr/TMH):	0		
Alim. Prim. Cola Prim.		Alim. Prim. Cola Prim.		Alim. Prim. Cola Prim.			
%Cu: 1.0 %Cu: 0.1		%Cu: 0.9 %Cu: 0.1		%Cu: 0.8 %Cu: 0.1			
%Fe: 1.1		%Fe: 1.06		%Fe: 1.1			
%As: 0.03		%As: 0.0		%As: 0.02			

Flotacion A-0		Flotacion A-1		Flotacion A-2	
Consumo Colector (Gr/TMH):	0	Consumo Colector (Gr/TMH):	0	Consumo Colector (Gr/TMH):	0
Consumo Espumante (Gr/TMH):	0	Consumo Espumante (Gr/TMH):	0	Consumo Espumante (Gr/TMH):	0
Consumo Cal (Gr/TMH):	0	Consumo Cal (Gr/TMH):	0	Consumo Cal (Gr/TMH):	0
Alim. Prim. Cola Prim.		Alim. Prim. Cola Prim.		Alim. Prim. Cola Prim.	
%Cu: 1.0 %Cu: 0.1		%Cu: 0.9 %Cu: 0.1		%Cu: 0.8 %Cu: 0.1	
%Fe: 1.1		%Fe: 1.06		%Fe: 1.1	
%As: 0.03		%As: 0.0		%As: 0.02	



Planta de Molibdeno		Espesadores de Colas		Planta Tratamiento de Escoria		Planta de Filtros	
Alim. Planta (T):	12916	Floculante (L/T):	225534	Flujo(T)	Energ.(KW°H/T)	Agua(M3/T)	Conc. Filt (Ton):
NaHS (L/T):	8413.7			0	0.0	0.0	Conc. Env. Pozo (Ton):
Acido (Kg/T):	0			Medios de Molienda(Tao/Ton):	0		
NaCN (Kg/T):	0			Alimentacion	Conc. Final	Cola Final	Conc. Filtrado
Alim. Prim. Cola 1ª Limp				%Cu: 0	%Cu: 0	%Cu: 0	%Cu: 0 %S: 0
%Mo: 0 %Mo: 0				%Fe: 0	%Fe: 0		%Fe: 0
Prod. Mo Sulf (T):	0			%Mo: 0	%Mo: 0		%As: 0
Prod. Mo Ox (T):	0						



Ready



Codelco Norte

OPERATIONAL MANAGMENT SYSTEM FOR DIVISIONAL BALANCE

Part II



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AGENDA

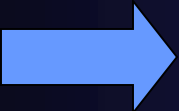
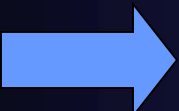
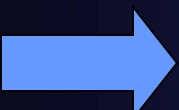
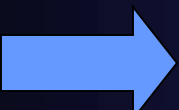
- **PROJECT OBJECTIVES**
- **PROJECT IMPLEMENTATION**
- **SYSTEM STRUCTURE**
- **ADVANCE OF THE PROJECT**
- **FUTURE ACTIVITIES**



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PROJECT OBJECTIVE

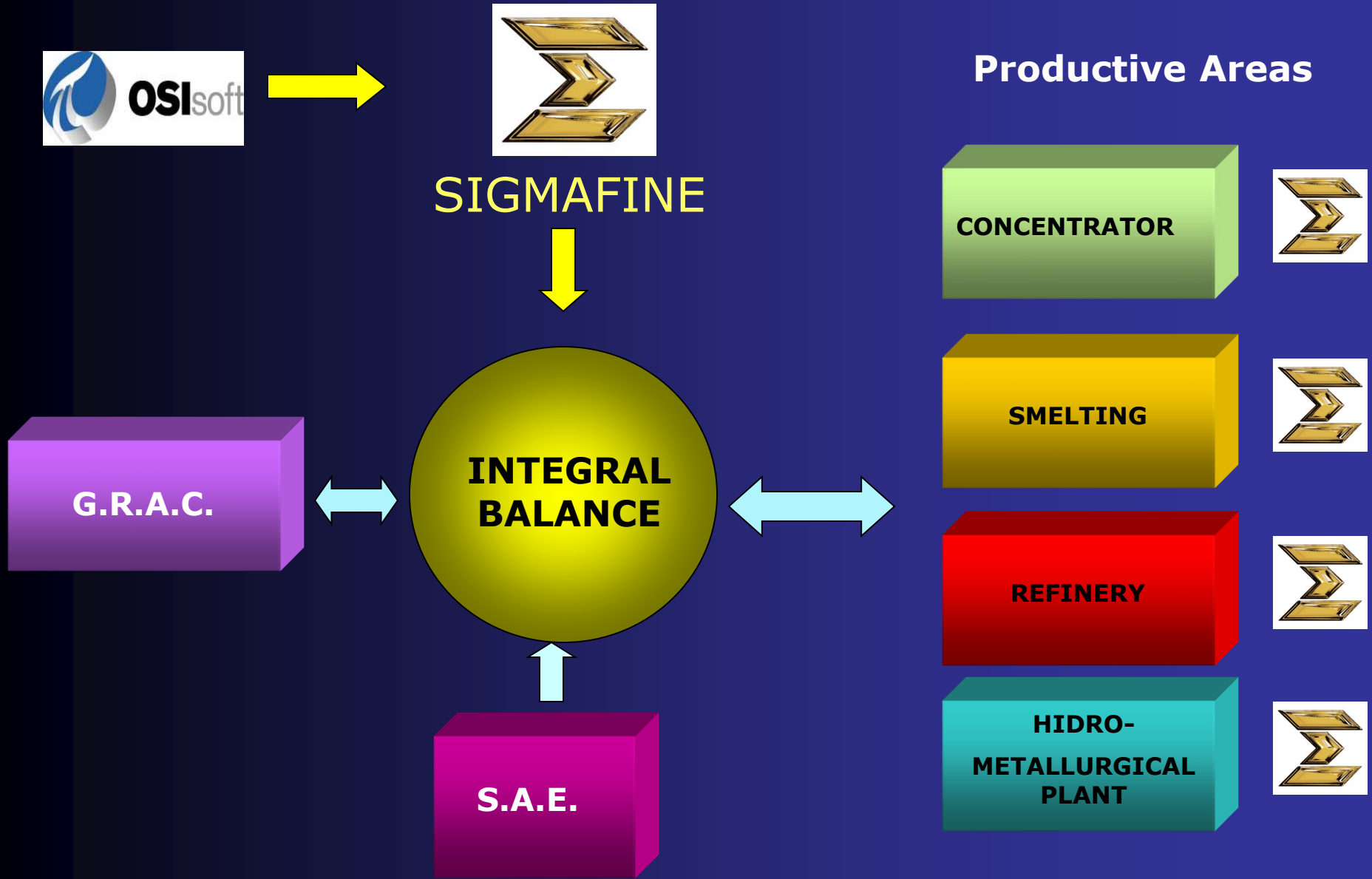
- To implement the Integral Balance of the Division, and of the Productive Areas, with a tool of standard and compatible programming with the rest of the divisional systems of information

-  * **Uniformity and dependability of the Balance Data**
-  * **Flexibility in the development and implementation of each one of the balances**
-  * **Internal Development Facility of the balances**
-  * **Allows audits on the generation processes of the different balances**



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IMPLEMENTATION (Actors)





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IMPLEMENTATION (Stages)

STAGES OF THE PROJECT :

**I.- Integral Balance (Present Structure of Data),
Octubre-2002**

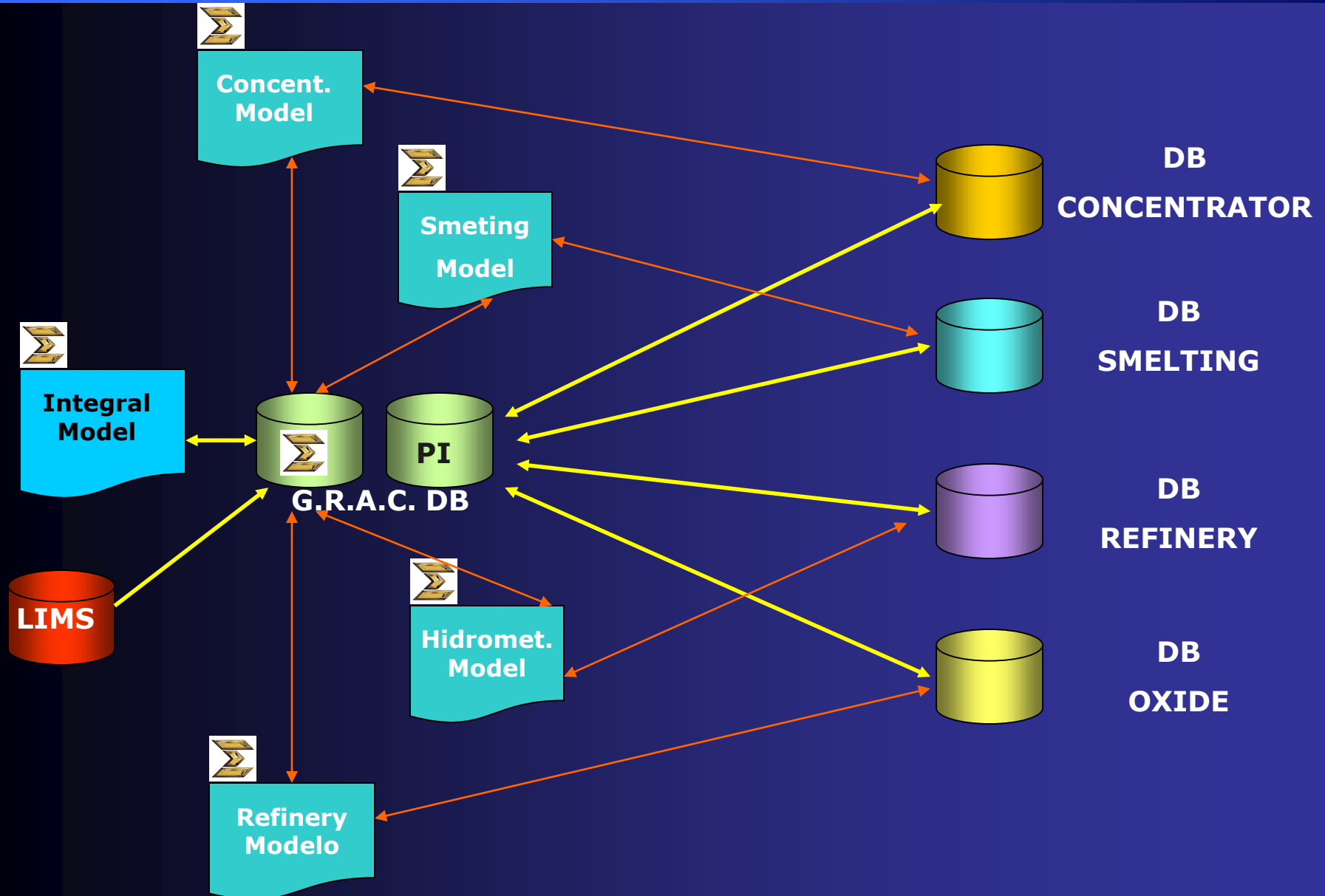
**II.- Integral Balance (Automated Data),
Diciembre-2002**

**III.- Balances of Productive Areas,
2003 →**



SYSTEM STRUCTURE

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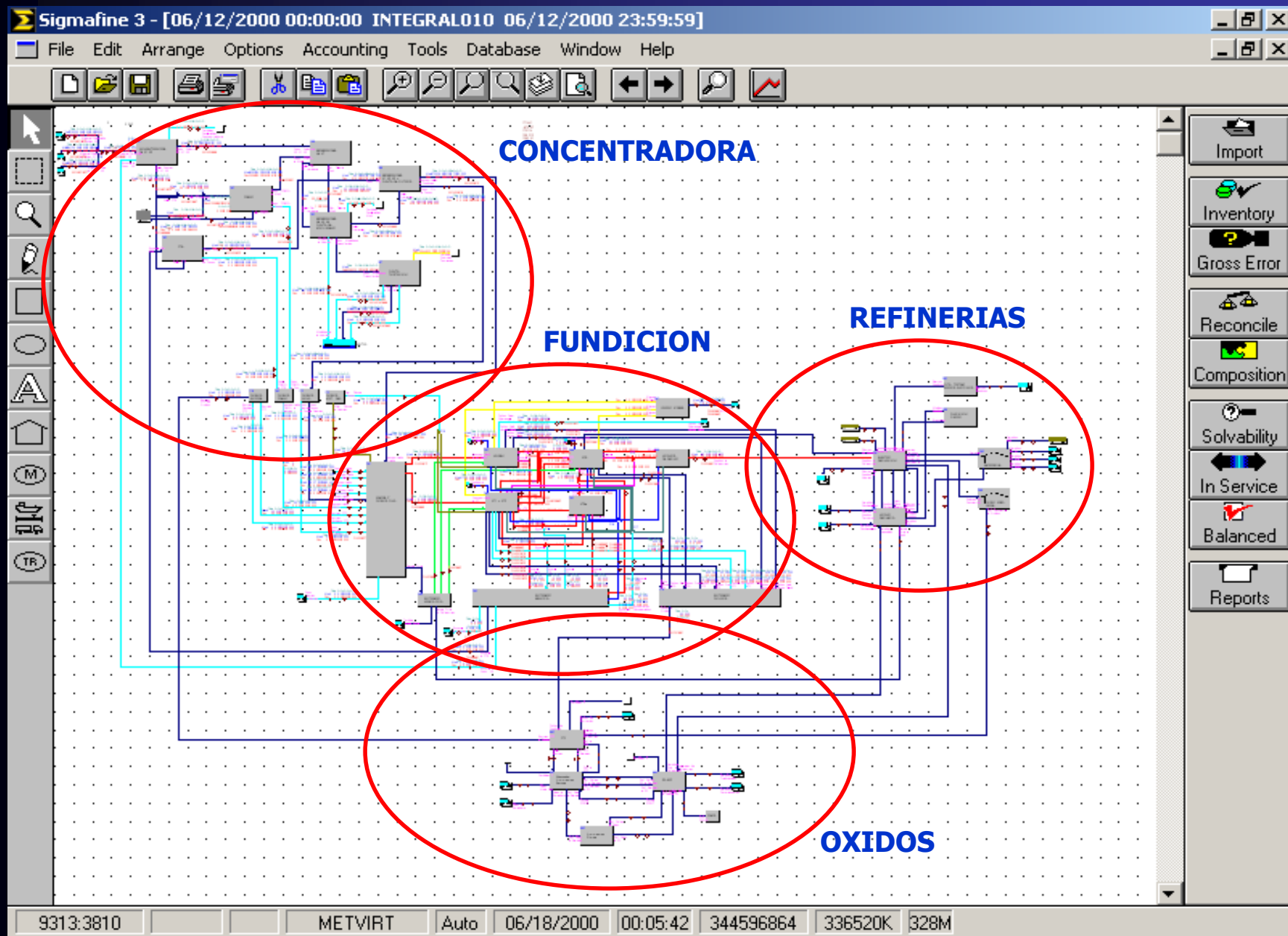
ADVANCE of the PROJECT (achived)

- Collection of Flow Diagrams**
- Identification of involved variables per area**
- Rising of variables**
- Study and Development of the Integral Model**
- Rising the Structure of SigmaFine DB**
- Incorporation of tolerances**
- Testing of models**



ADVANCE OF THE PROJECT (achived)

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ADVANCE OF THE PROJECT

- Incorporation of Inventories**
- Load of Data (January-September)**
- Calculation of the Integral Balance in daily base for the year 2002**
- Evaluation of results**



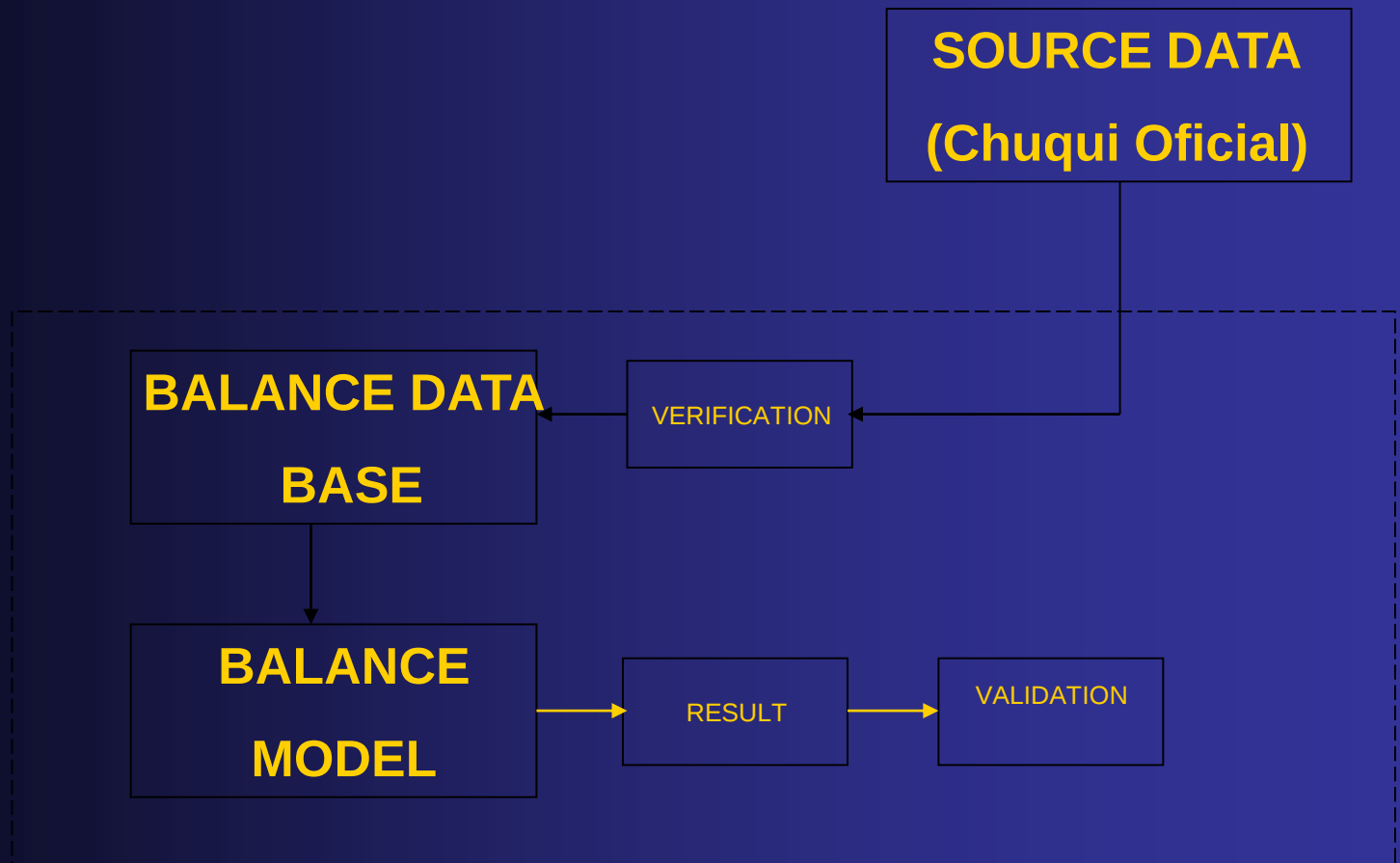
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ACTIAL ACTIVITIES

- Integral Balance Start up**
- Training**
- Automated transfer of data**
- Development of Balances per Areas**



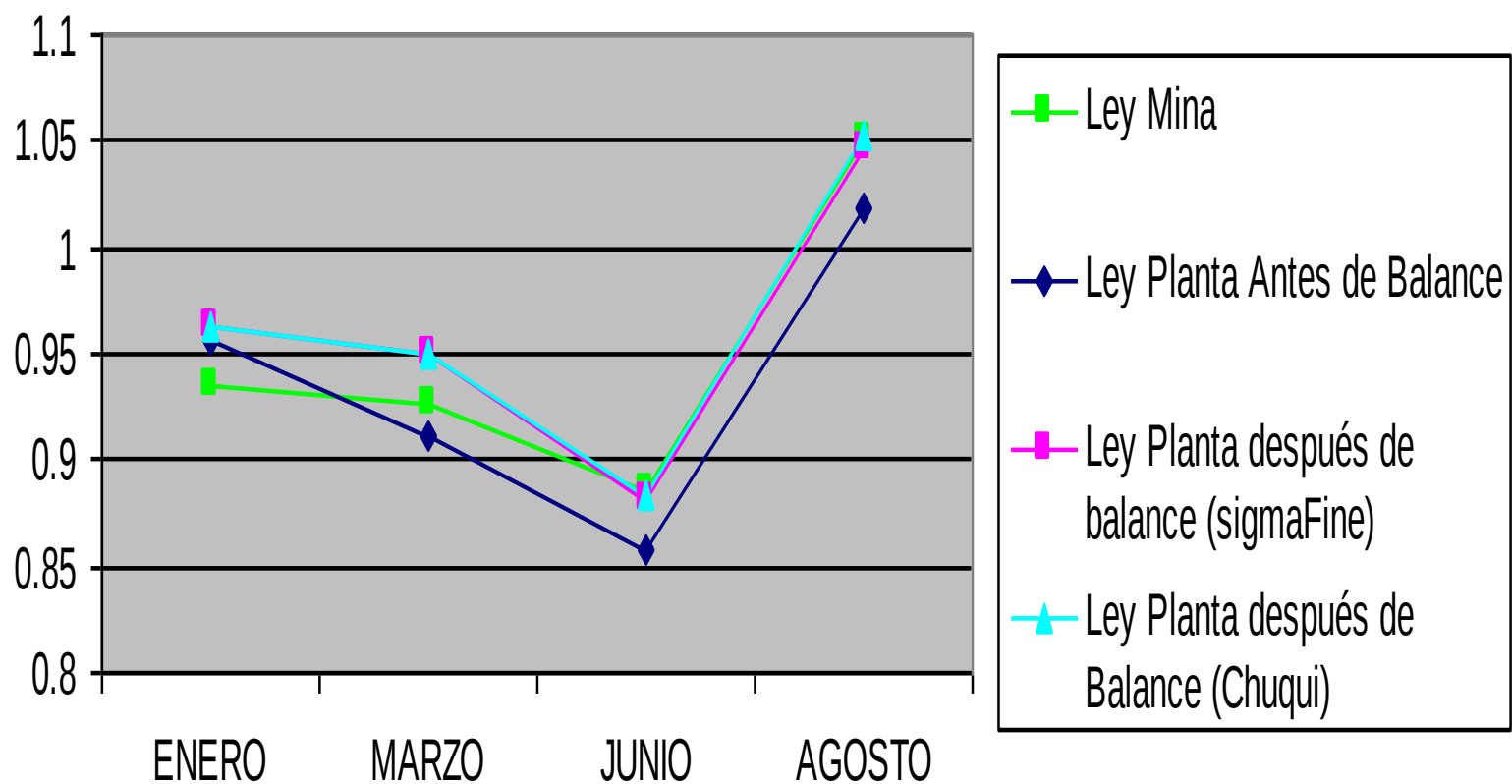
VALIDATION MODEL





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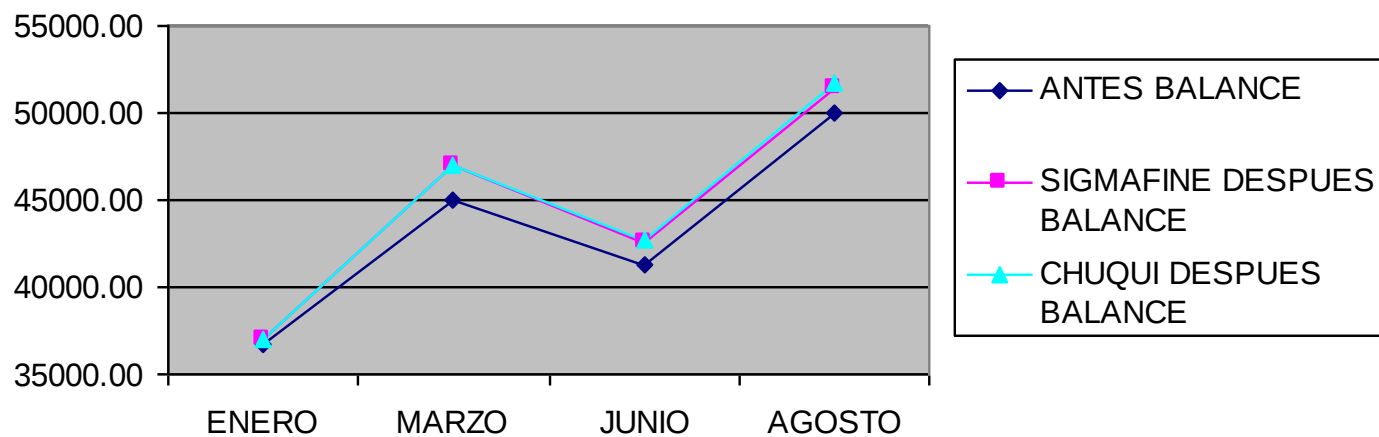
Leyes Alimentación



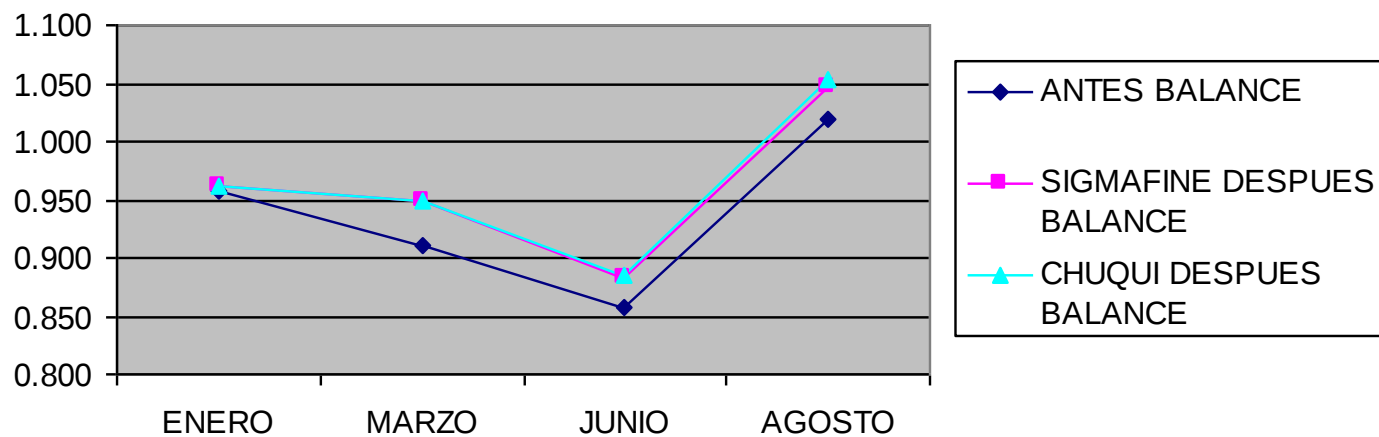


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Finos Cobre Alimentación Concentradora



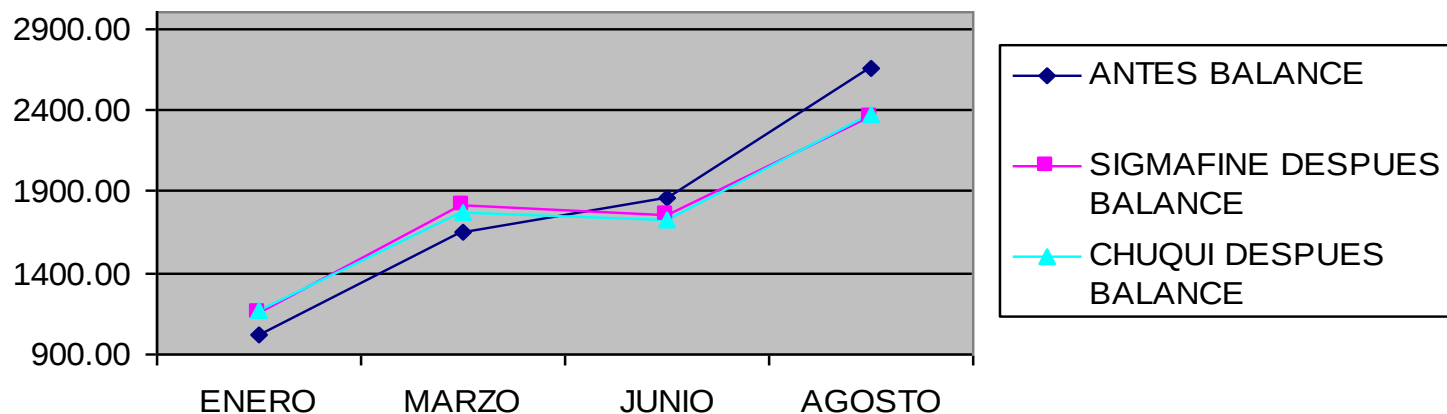
Leyes Cobre Alimentación Concentradora





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Finos Molibdeno Alimentación Concentradora



Leyes Molibdeno Alimentación Concentradora

