



Vicepresidencia Corporativa de Servicios Compartidos

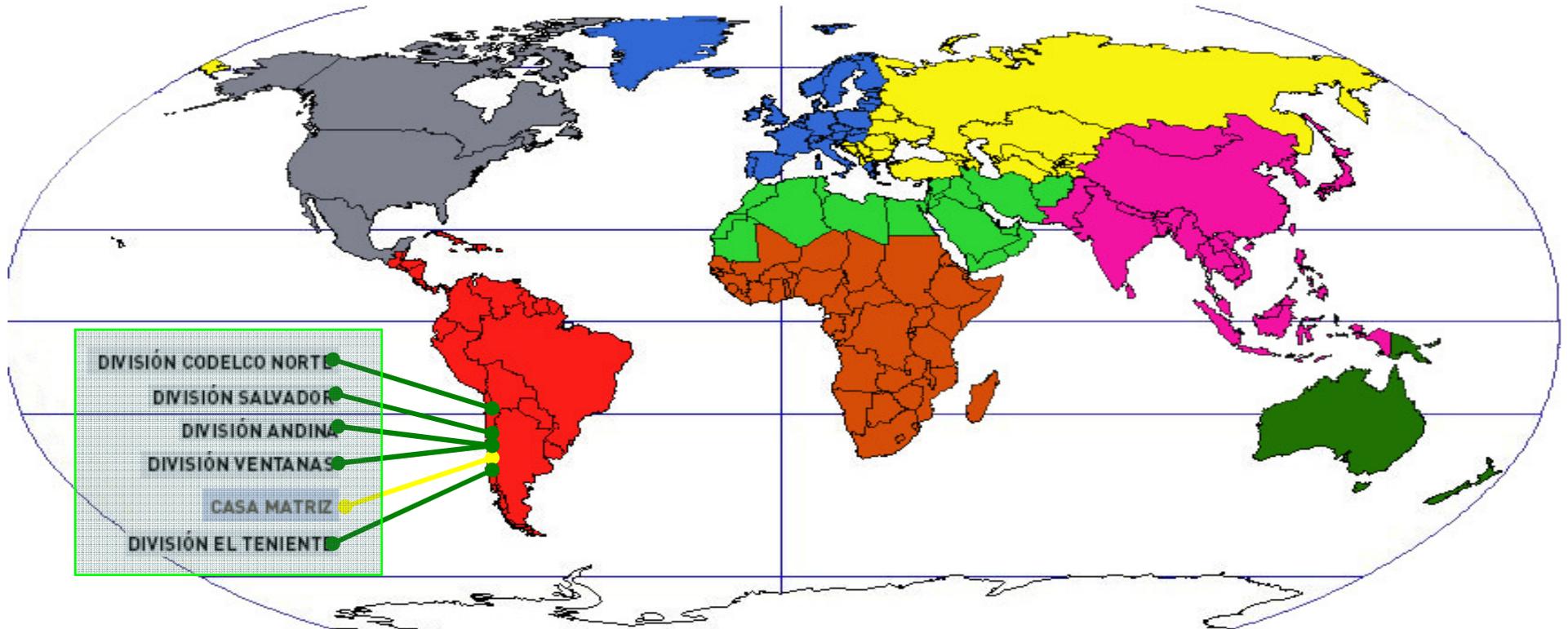


TECNOLOGIAS QUE AGREGAN VALOR AL NEGOCIO

PI SYSTEM EN CODELCO CHILE

Leonel Mundaca P
Codelco Chile

Fecha : Junio 04 , 2010



Codelco es el Primer Productor de Cobre en el Mundo, con una producción que en el año 2009 alcanzó 1.700.000 de Toneladas Métricas de Cobre Fino, correspondientes al 10,2% de la producción de Cobre en el Mundo. Sus reservas son las mayores que se conocen en la actualidad. Es la Mayor Compañía del Estado de Chile por lo que tiene una relevancia en el aporte al País.

Su producción esta basada principalmente en :

- Concentrado de Cobre
- Concentrado de Molibdeno
- Ánodos de Cobre
- Cátodos de Cobre
- Acido Sulfurico



Vicepresidencia Corporativa de Servicios Compartidos

PLATAFORMAS PI EN CODELCO CHILE

Plataforma PI System Un poco de Historia

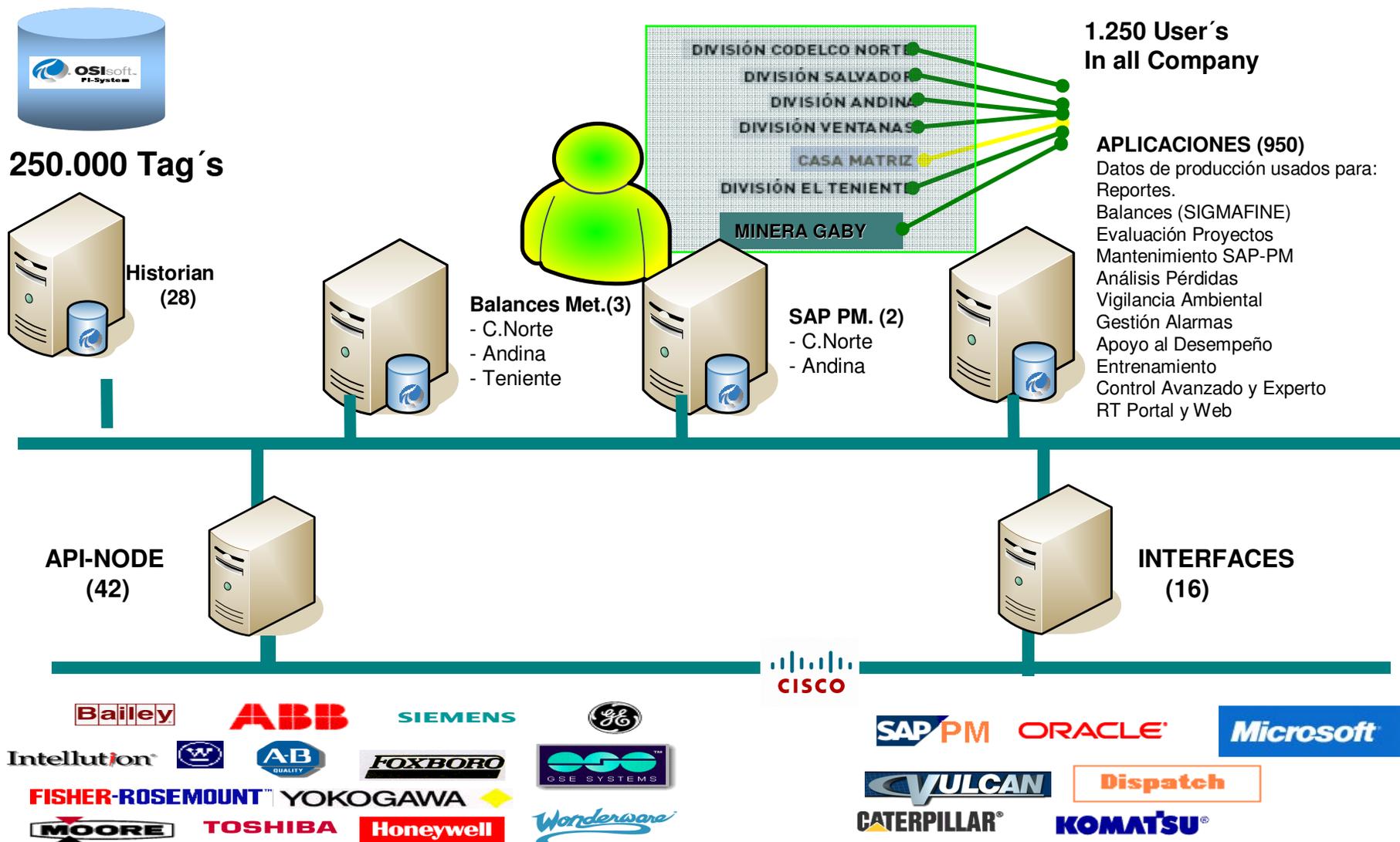
1998 – Flash Smelter Chuquicamata



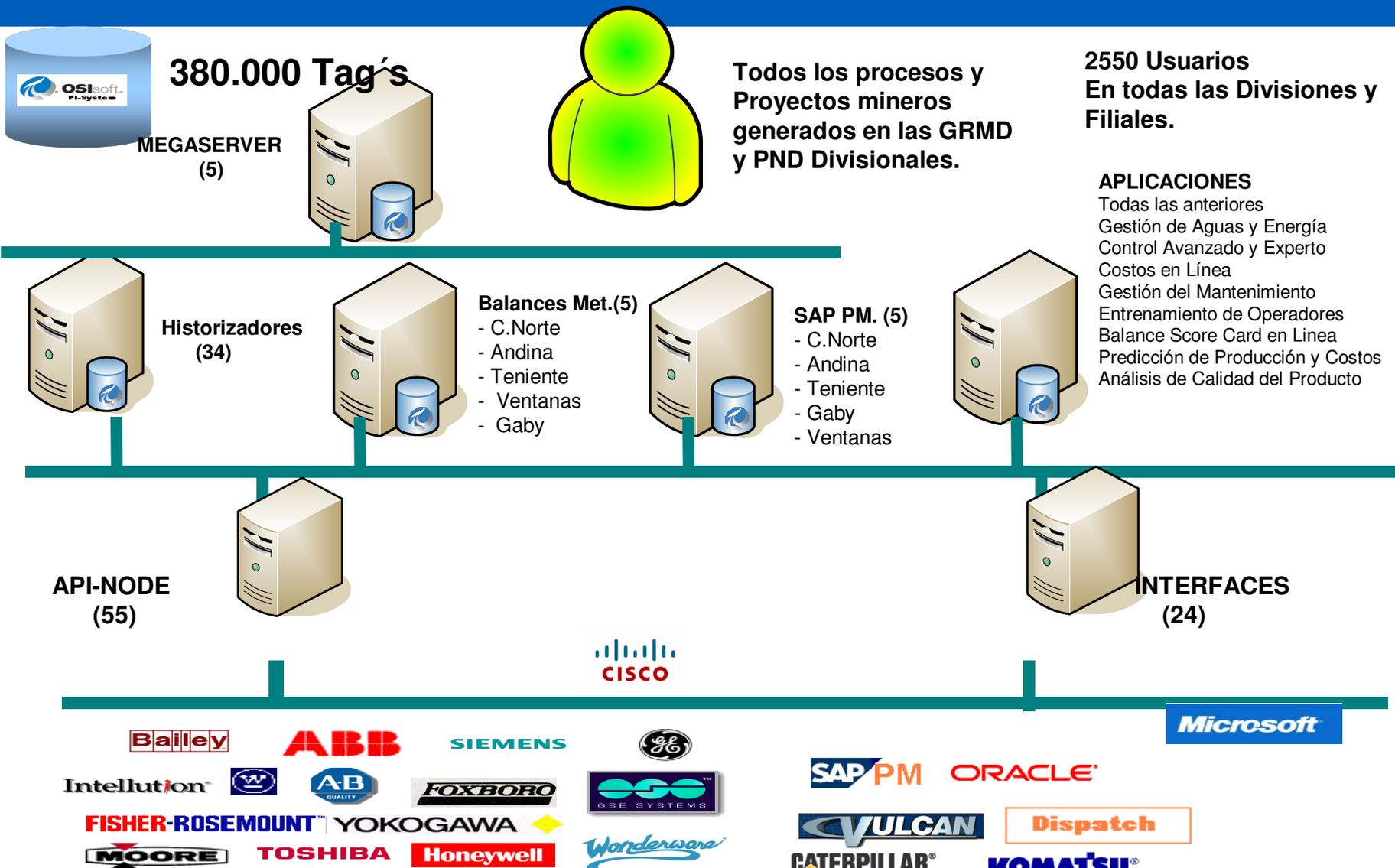
2010 – Concentrador - Andina



PI System Platform to May 2010



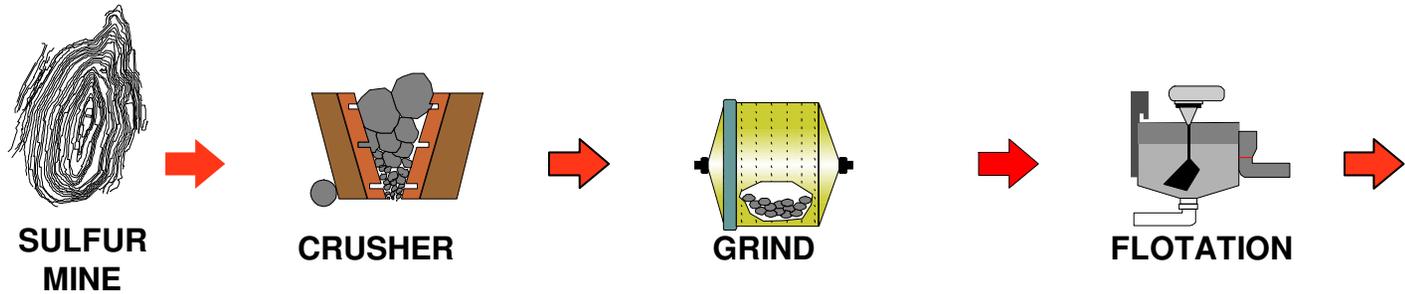
PI System Platform to April 2013

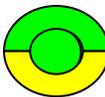
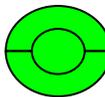
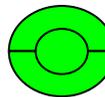
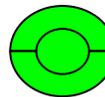
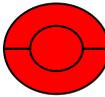
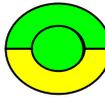
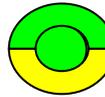
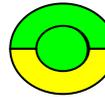
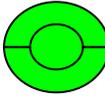
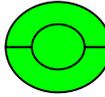
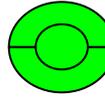
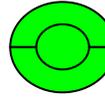
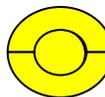
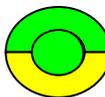
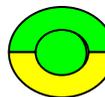
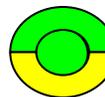


PI SYSTEM PLATTFORM IN CODELCO CHILE FOR METALLURGICAL PROCESS

SULFURE LINE – MINE CONCENTRATOR

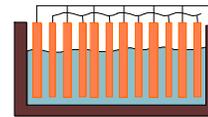
-  Not Implemented
-  Implemented
-  In Upgrade



| | SULFUR MINE | CRUSHER | GRIND | FLOTATION |
|-------------------------|---|---|---|---|
| Codelco Norte |  |  |  |  |
| Codelco Salvador |  |  |  |  |
| Codelco Andina |  |  |  |  |
| Codelco Teniente |  |  |  |  |

PI SYSTEM PLATFORM IN CODELCO CHILE FOR METALLURGICAL PROCESS

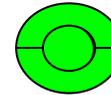
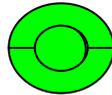
SULFURE LINE – SMELTER & REFINERY



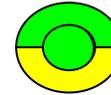
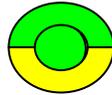
SMELTING

REFINERY

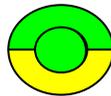
Codelco Norte



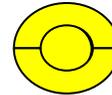
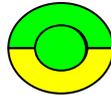
Codelco Salvador



Codelco Teniente

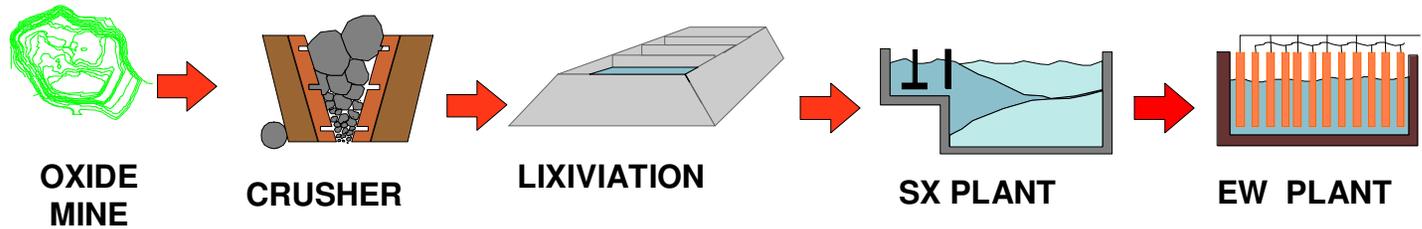


Codelco Ventanas

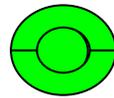
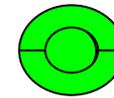
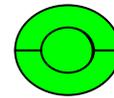
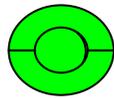
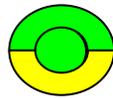


PI SYSTEM PLATFORM IN CODELCO CHILE FOR METALLURGICAL PROCESS

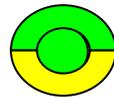
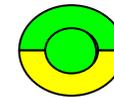
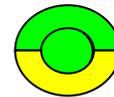
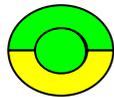
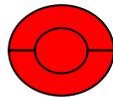
TRADITIONAL HIDROMETALLURGICAL LINE



Codelco Norte (HS)

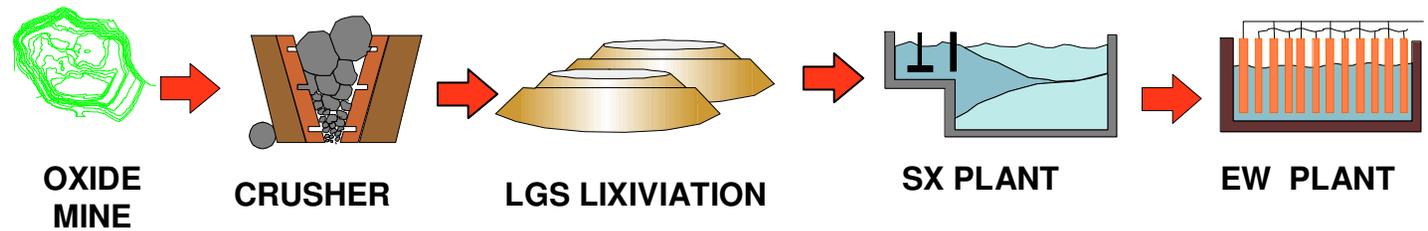


Codelco Salvador

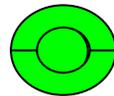
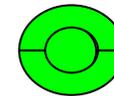
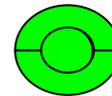
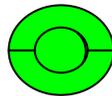
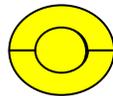


PI SYSTEM PLATTFORM IN CODELCO CHILE FOR METALLURGICAL PROCESS

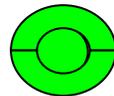
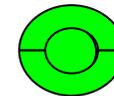
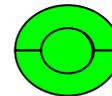
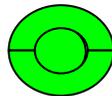
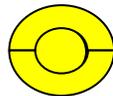
MODERN HIDROMETALLURGICAL LINE



Codelco Norte (HN)



Minera Gaby





Vicepresidencia Corporativa de Servicios Compartidos

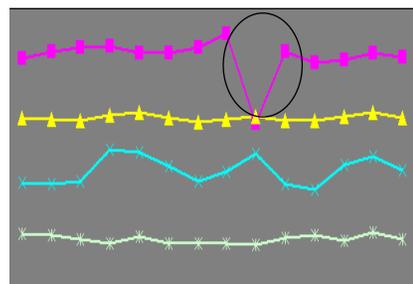
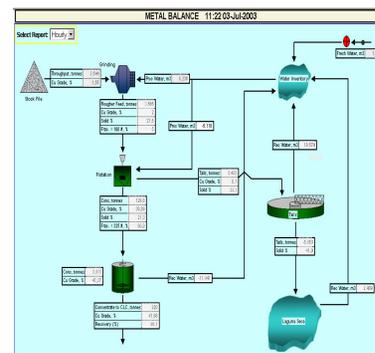
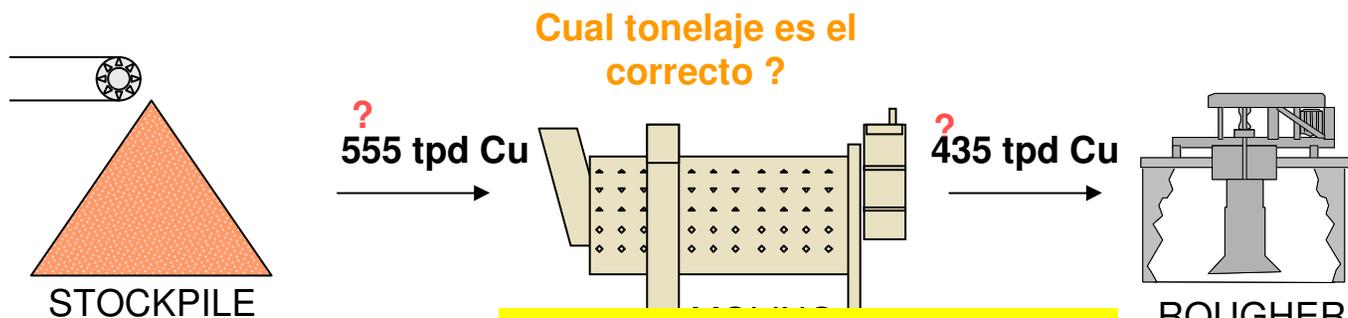
APLICACIONES DE GESTION EN CODELCO TENIENTE

Clientes:

Alfredo Wilke
Hugo Passalacqua

Balances de Producción y Reconciliación de Datos

Aplicación que realiza el Balance de Producción Metalúrgica de la División , basándose en la reconciliación de datos históricos.



VSC / Nombre de Gerencia

Additional (redundant) data

0.95 % Cu

5.8 tpd Mo

0.01 % Mo

58,000 tpd

0.75 % Cu

5.8 tpd Mo

0.01 % Mo

58,000 tpd

Production Balance

Private - DEMO

Overall Balance Summary

| Input Units (BBL) | | Inventory | | | | Flows | | | Inbalance | | Case: Demo | |
|----------------------|--------------------|------------|------------|-----------|-----------|-----------|-----------|---------|-----------|-------------------------|--------------------------------------|--|
| Raw Balance | Reconciled Balance | Open | Close | Inputs | Outputs | Inputs | Outputs | Inputs | Outputs | Balance | Accounting Period | |
| 800559.26 | 360356.26 | 4010146.40 | 4022079.06 | 548854.16 | 133647.46 | 548854.16 | 133647.46 | 8616.57 | -3316.10 | Start: 03/10/2000 00:00 | | |
| | Adjustment | 0.00 | 11932.66 | 0.00 | 0.00 | | | | | End: 04/10/2000 23:59 | | |
| Balance Units (MLBS) | | Inventory | | | | Flows | | | Inbalance | | Objective Function: 8381105472 | |
| Raw Balance | Reconciled Balance | Open | Close | Inputs | Outputs | Inputs | Outputs | Inputs | Outputs | Balance | Critical Objective Function: 31.4104 | |
| 1065767.15 | 1065767.15 | 1191263.32 | 1194511.61 | 164527.94 | 35783.48 | 164527.94 | 35783.48 | 3248.29 | 0.00 | Redundancy: | | |
| | Adjustment | 0.00 | 3248.29 | 0.00 | 0.00 | | | | | Message Log Ids: | | |
| | | | | | | | | | | Interface 1 | | |
| | | | | | | | | | | Wakeup 0 | | |

Ready Balance Group: Demo Accounting Date: 03/10/2000 Critical Objective Function: 31.410

Características de la Aplicación

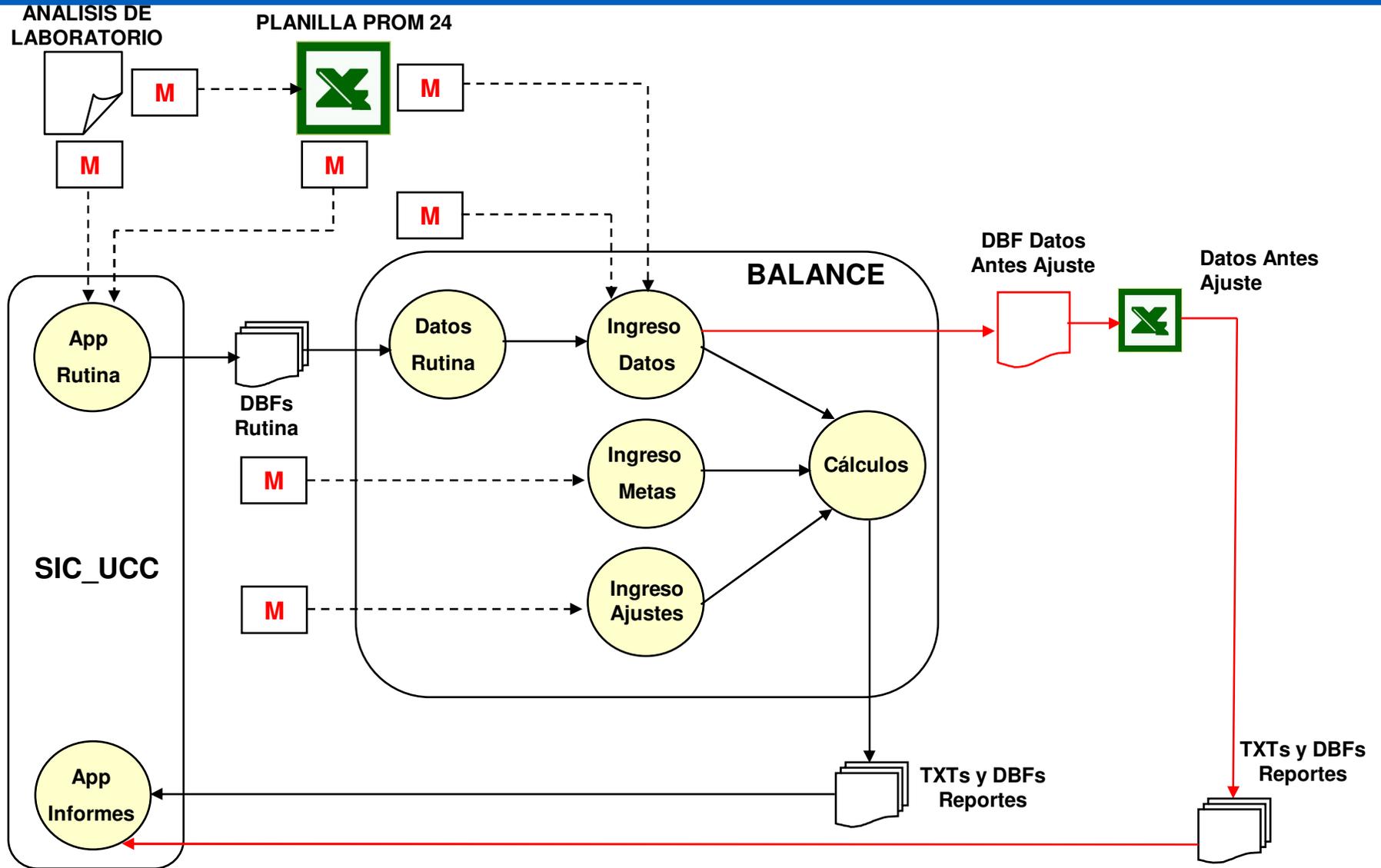
Es Auditable

Usa siempre los mismos conceptos

Usa sólo Información Validada

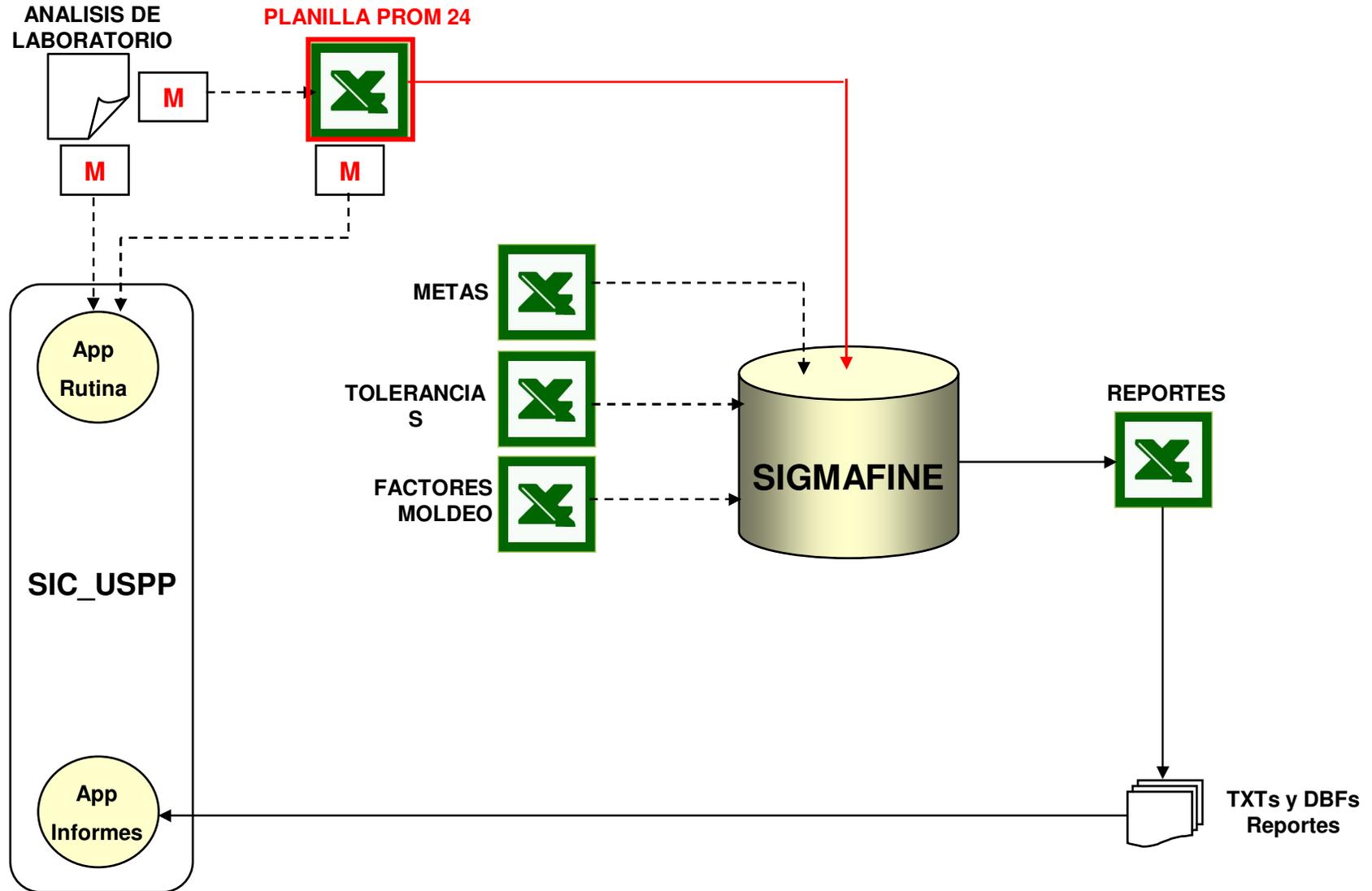
Resultados Coherentes con la Metalurgia

Arquitectura Anterior



Arquitectura Implementada

ESTRUCTURA Y REGISTRO DE FLUJOS DE INFORMACION IMPLEMENTADA





Vicepresidencia Corporativa de Servicios Compartidos

•
APLICACIONES DE GESTION EN
CODELCO ANDINA

Clientes:

Guillermo Grandón
Juan Larson

Aprovechando las Plataformas Corporativas

- Horómetros
- Usómetros Inteligentes
- Trigger Equipos On/Off
- Variables Energéticas
- If – And – Else
- Cercanía a PLC's

Plataforma Corporativa Gestión del Negocio

RLINK



Ingreso Manual de Datos

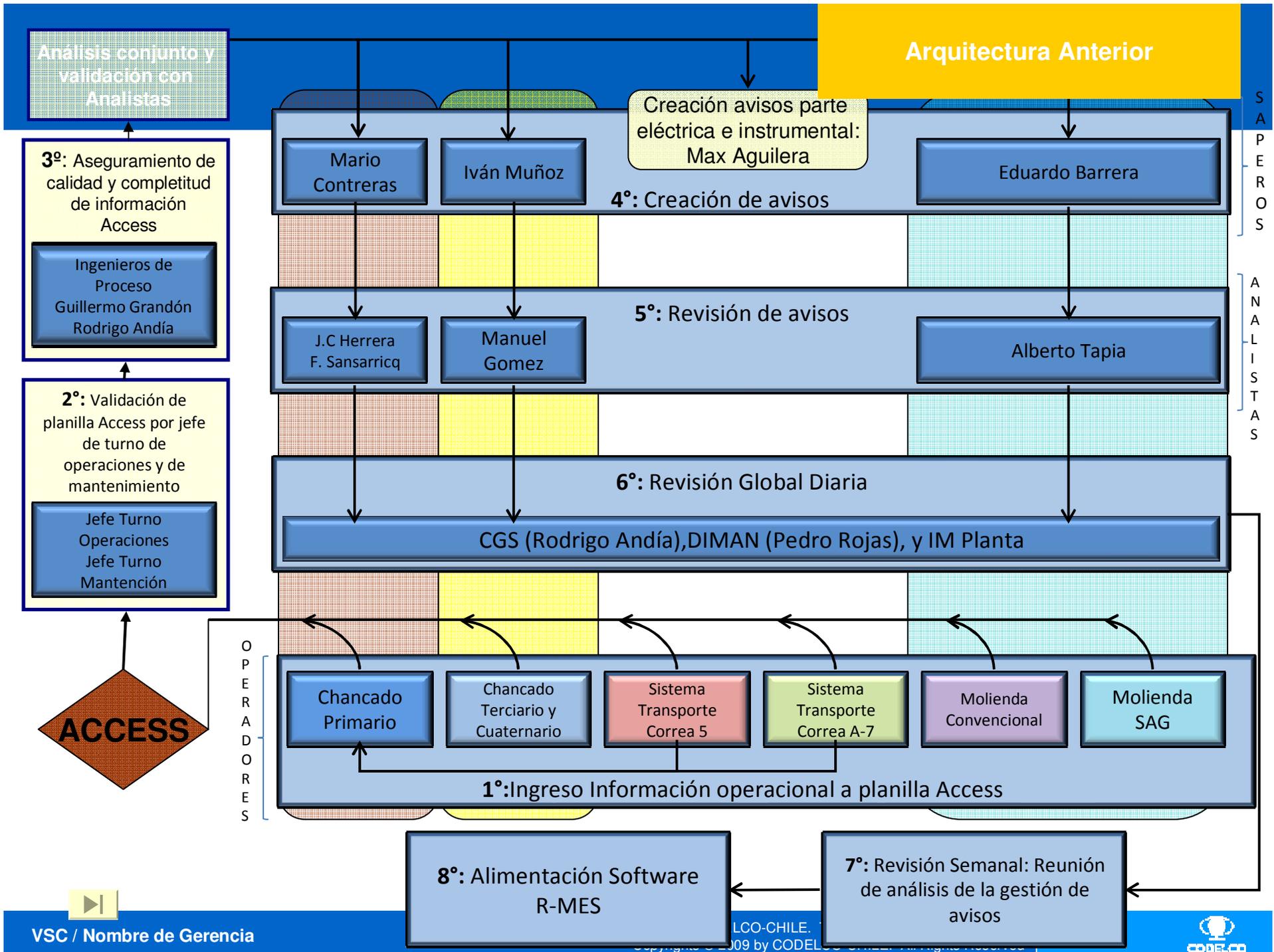
Procesos de Carga de Datos Batch

Información en Tiempo Real

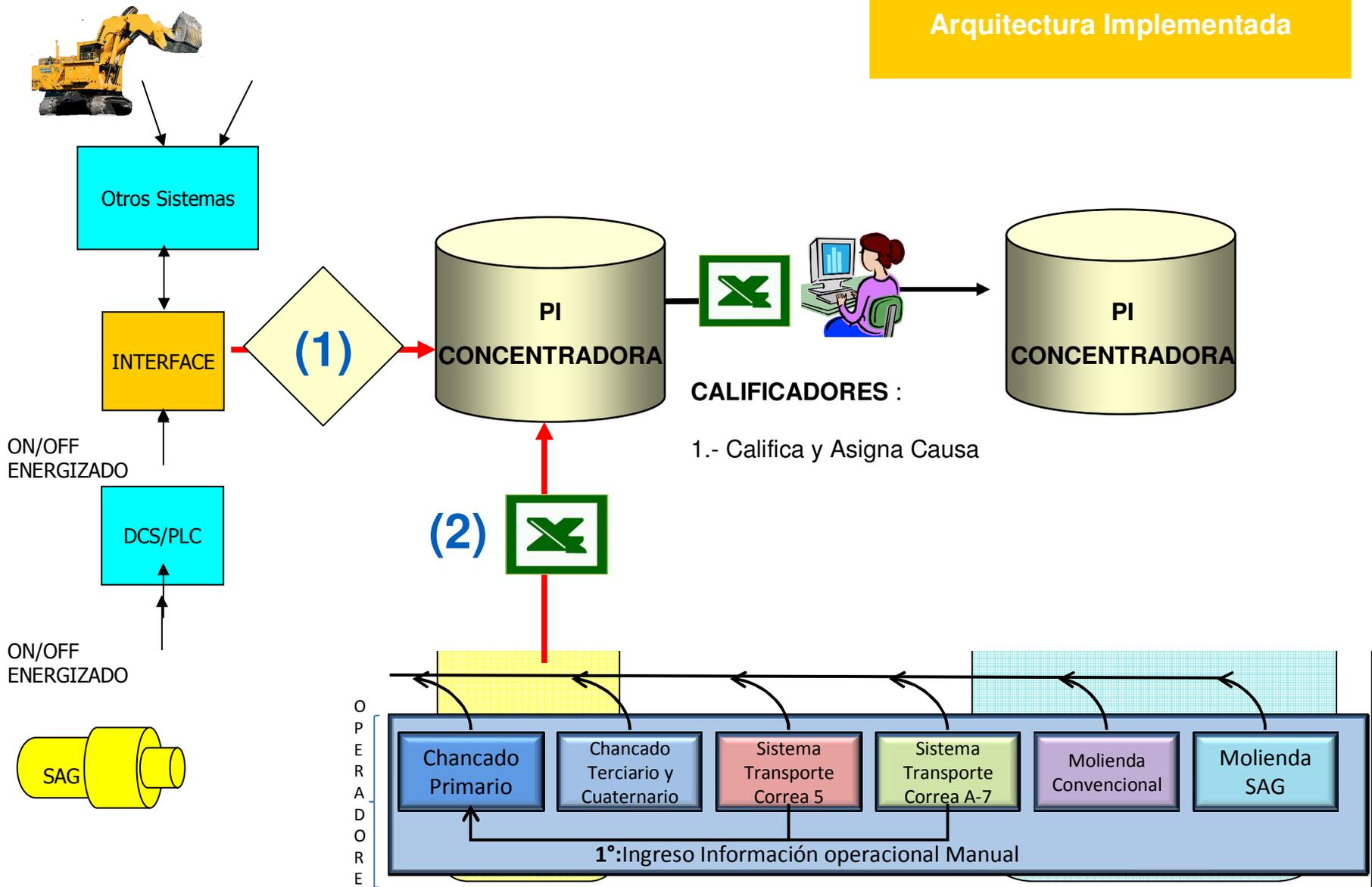
Información Tradicional

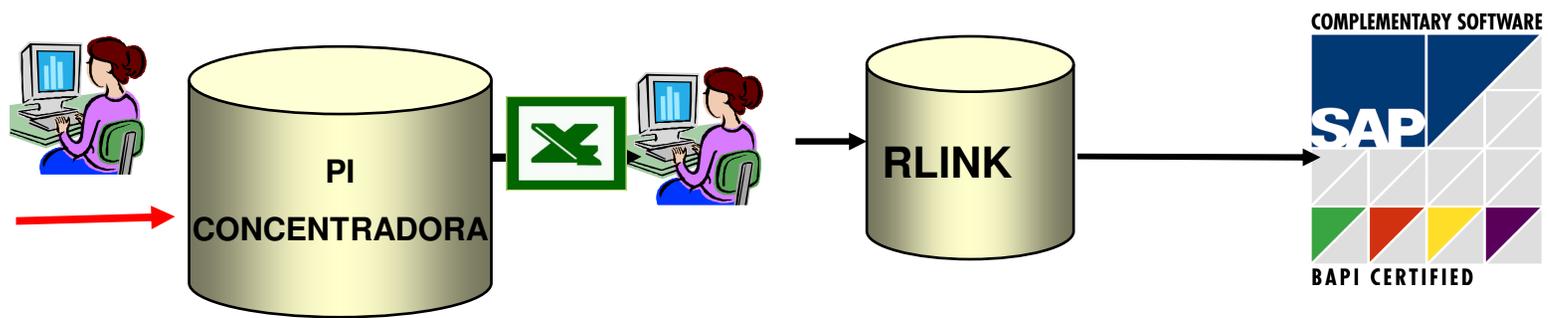


Plataforma Corporativa Gestión de Tiempo Real



Arquitectura Implementada





CALIFICADORES :

- 1.- Califica y Asigna Causa

VALIDADORES :

- 1.- Valida Información
- 2.- Solicita Modificaciones
- 3.- Escoge Mantenibles



Vicepresidencia Corporativa de Servicios Compartidos

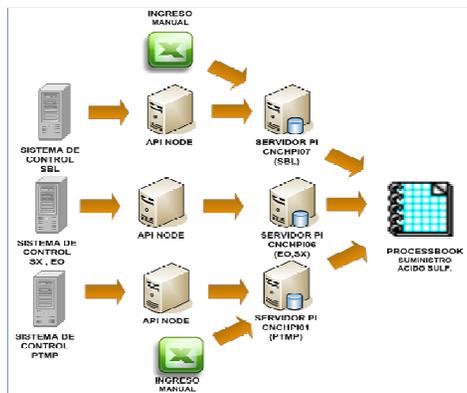
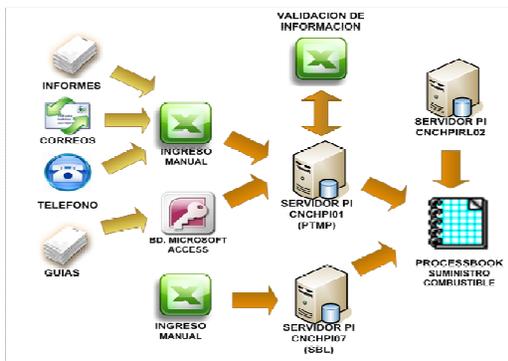
APLICACIONES DE GESTION EN CODELCO NORTE

Clientes :

Oscar Jiménez
Angel López

Tecnologías para Control de Suministros e información Movil

Aplicación que permite a la Gerencia GELS llevar el control en línea de los insumos más relevantes permitiendo revisar Costos , mejorar eficiencia , e incrementar la productividad de las personas al colocar información en aparatos móviles



G.E.L.S. Welcome Oliva Perez Cristian Pablo (Cont... | My Site | My Links |

G.E.L.S. Despliegues en Línea Suministros en Línea

View All Site Content

Proceso

- Tonelaje Apilado Día
- Flujo PLS a POZO 2
- Alimentación Tren A
- Alimentación Tren B
- Cobre en PLS a SX
- Refino Tren A - B
- Eficiencia Tren A - B

Reportes

- S.I.M.P.

G.E.L.S.

GERENCIA DE EXTRACCIÓN Y LIXIVIACIÓN SUR

CODELCO Norte

Sitios Corporativos

- Portal Codelco
- S.I.G.A.I
- Personalístico
- Vitrina Documental GELS
- Sistema Control Tiempo
- JOSSAW Control Despacho de Camiones EIMS
- Detalle de Despliegues
- SAP
- G.E.L.S.

Descargas

- Convertir Excel 2007 a 2003
- Adobe SVG Viewer 3.0
- Manual de Usuario

Sitios de Interés

- Cachico
- Traductor en Línea
- Diario Estrategia
- Email
- Mercurio Calama
- Google
- Sitios.cl

| Descripción | Fecha/Hora | Valor Actual | Unidad de Ing. | Tendencia |
|-----------------------|---------------------|--------------|----------------|------------------------------|
| Tonelaje Apilado Día | 30-03-2010 15:47:00 | 2172,30 | TON | \\lancho011200w\QITOTAL_DIA |
| FLUJO BOOSTER POZO SX | 30-03-2010 15:47:07 | 1351,20 | M3-H | \\lancho06\SX-LX-FIT-688B |
| FLUJO SOLUCION TREN A | 30-03-2010 15:47:07 | 1049,68 | M3-H | \\lancho06\SX-TA-E1A-FI-3705 |
| FLUJO SOLUCION TREN B | 30-03-2010 15:47:07 | 1050,62 | M3-H | \\lancho06\SX-TB-FIK-1710 |
| Cu ALIMENTACION SX | 30-03-2010 11:00:00 | 8,43 | G/L | \\lancho06\SX-TB-CU-719_M |
| Cu REFINO TREN A | 30-03-2010 11:00:00 | 0,59 | G/L | \\lancho06\SX-TB-CU-719_M |
| Cu REFINO TREN B | 30-03-2010 11:00:00 | 0,61 | G/L | \\lancho06\SX-TB-CU-721_M |
| PROMEDIO EFIC EXT TA | 30-03-2010 15:40:47 | 93,00 | % | \\lancho06\SX-EF-EX-730_C |
| PROMEDIO EFIC EXT TB | 30-03-2010 15:41:47 | 93,48 | % | \\lancho06\SX-EF-EX-731_C |



G.E.L.S.

All Sites

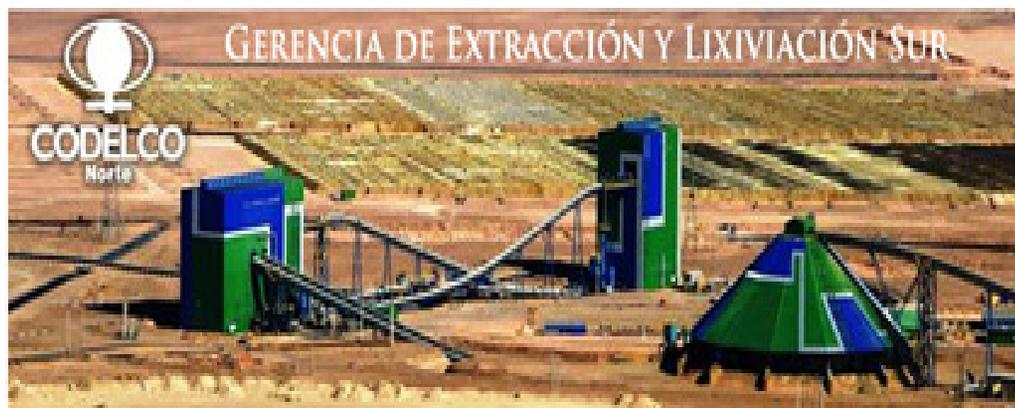
Advanced Search G.E.L.S. [Despliegues en Línea](#) [Suministros en Línea](#)[View All Site Content](#)**Proceso**

- [Tonelaje Apilado Día](#)
- [Flujo PLS a FONDO 2](#)
- [Alimentación Tren A](#)
- [Alimentación Tren B](#)
- [Cobre en PLS a SX](#)
- [Refino Tren A - B](#)
- [Eficiencia Tren A - B](#)

Reportes

- [S.I.M.P.](#)

G.E.L.S.



| Descripción | Fecha/Hora | Valor Actual | Unidad de Ing. | Tendencia |
|-----------------------|---------------------|--------------|----------------|------------------------------|
| Tonelaje Apilado Día | 30-03-2010 15:47:00 | 2172,30 | TON | \\cnchpi01\200WQITOTAL_DIA |
| FLUJO BOOSTER POZO SX | 30-03-2010 15:47:07 | 1351,20 | M3-H | \\cnchpi06\SX-LX-FIT-688B |
| FLUJO SOLUCION TREN A | 30-03-2010 15:47:07 | 1049,68 | M3-H | \\cnchpi06\SX-TA-E1A-FI-3705 |
| FLUJO SOLUCION TREN B | 30-03-2010 15:47:07 | 1050,62 | M3-H | \\cnchpi06\SX-TB-FIX-1710 |
| Cu ALIMENTACION SX | 30-03-2010 11:00:00 | 8,43 | G/L | \\cnchpi06\SX-TB-CU-716_M |
| Cu REFINO TREN A | 30-03-2010 11:00:00 | 0,59 | G/L | \\cnchpi06\SX-TB-CU-719_M |
| Cu REFINO TREN B | 30-03-2010 11:00:00 | 0,61 | G/L | \\cnchpi06\SX-TB-CU-721_M |
| PROMEDIO EFIC EXT TA | 30-03-2010 15:40:47 | 93,00 | % | \\cnchpi06\SX-EF-EX-730_C |
| PROMEDIO EFIC EXT TB | 30-03-2010 15:41:47 | 93,48 | % | \\cnchpi06\SX-EF-EX-731_C |

Sitios Corporativos

-  [Portal Codelco](#)
-  [S.I.G.R.I](#)
-  [Personático](#)
-  [Vitrina Documental GELS](#)
-  [Sistema Control Tiempo](#)
-  [JIGSAW Control Despacho de Camiones EIMS](#)
-  [Detalle de Despliegues](#)
-  [SAP](#)
-  [G.E.L.S.](#)

Descargas

-  [Convertir Excel 2007 a 2003](#)
-  [Adobe SVG Viewer 3.0](#)
-  [Manual de Usuario](#)

Sitios de Interés

-  [Cochilco](#)
-  [Traductor en Línea](#)
-  [Diario Estrategia](#)
-  [Email](#)
-  [Mercurio Calama](#)
-  [Google](#)
-  [Sitios.d](#)

Suministros en Línea

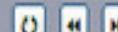
- Despliegues Suministros - RtPortal
- 1.- Acido Sulfúrico
- 2.- Aguas
- 3.- Combustibles
- 4.- Energía Eléctrica
- 5.- Vapor
- 6.- Scaid
- 7.- PLS

Ingrese Fecha

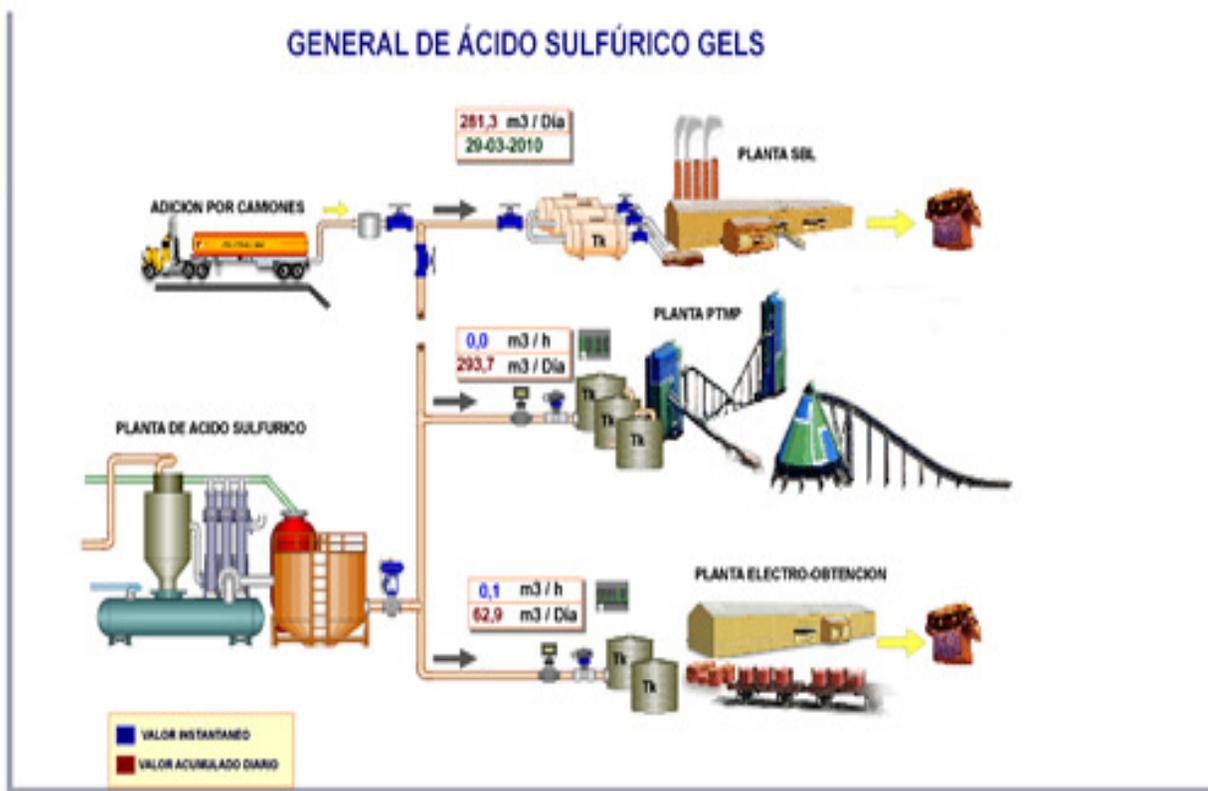
Start Time = -1d

End Time =

Apply



GENERAL DE ÁCIDO SULFÚRICO GELS



Ad hoc SVG - Diálogo de página web

OSIsoft Start End Apply () << >> Ad hoc Trend

CONSUMO RELEVANTE DE COMBUSTIBLE EN ENMS



| CAMIONES DE EXTRACCION | |
|------------------------|--------------|
| CARGA DE COMB. | Valor |
| TOTAL DIA | 41,515 Lts |
| TOTAL MES | 0,000 Lts |
| Por MATERIAL TRANSP. | 3,90 Ton/Lts |
| Por DIST. RECORRIDA | 0,13 Km/Lts |



| CAMIONES REGADORES | |
|---------------------|--------------|
| CARGA DE COMB. | Valor |
| TOTAL DIA | 0,000 Lts |
| TOTAL MES | 0,000 Lts |
| Por DIST. RECORRIDA | 0,000 Lts/Km |



| CARGADORES FRONTALES | |
|----------------------|---------------|
| CARGA DE COMB. | Valor |
| TOTAL DIA | 1,423 Lts |
| TOTAL MES | 0,000 Lts |
| Por MATERIAL CARGADO | 34,57 Ton/Lts |
| Por DIST. RECORRIDA | 0,00 Lts/Km |



| PALAS | |
|----------------------|---------------|
| CARGA DE COMB. | Valor |
| TOTAL DIA | 0,000 Lts |
| TOTAL MES | 0,000 Lts |
| Por MATERIAL CARGADO | 0,000 Lts/Ton |



| RETROEXCAVADORAS | |
|------------------|-----------|
| CARGA DE COMB. | Valor |
| TOTAL DIA | 0,000 Lts |
| TOTAL MES | 0,000 Lts |