Operational Management System and Mining Systems Integrations
Caserones is a green field owned by Lumina Copper an international corporation dedicated to base metals with headquarters in Japan.

Caserones is a $ 3 Billions project located in the north of Chile at 13,000 feet altitude and around 800 kms from Santiago.

This project is now in the construction phase with start up scheduled November 2012 for the oxide plant and December 2013 for the sulphide plant.

After several months of work in a business case with Lumina Copper and based on the unique capabilities of Kairos Mining (Honeywell Company in Chile) and successful implementation track record in other mining company in Chile, the customer agreed to establish a 3 years Master Agreement to develop Advanced Control Applications, Information and management systems for integrated operations from Mine, Oxide Plant and Sulphide Plant, water and energy monitoring systems, Personnel Training based on Simulators plus the associated life cycle services for two additional years.
To date, Caserones is one of the most challenging mining projects carried out in Chile.

- Complex location 4,000 to 4,600 (meters above sea level), low temperatures and strong winds
- **Short Life of Mine** (LOM)
- Reservoir with **lower grade** mined in Chile
- **Only one access road**, with permanent risk conditions
- **Water shortage** area
- **Limited availability of Human Resources**
OPERATIONS MANAGEMENT
AND SYSTEMS INTEGRATION
Customer and Honeywell Roadmap

Caserones Roadmap
- Mine Startup 2012
- Production Core Platforms
  - Integrated
- Other platforms integrated
- Plant Startup 2013
- Reduce Variability
- Knowledge Base Growing
- Stability 2014
- Improve Productivity

Honeywell Roadmap
- Consulting and Engineer Services
- Platform Implementations Services
- Life Cycle Services
  - Local Delivery
  - Remote Delivery
## Alignment to Business Model

### Value Model

**Strategic Focus**
- Management performance indicators relevant to detail
- Permanent search for mining base to maximize capacity and optimize the mine plan
- Assurance skilled labor both internally and externally
- High productivity by ensuring internal and external production budgeted
- Ensuring access to water resources
- Securing the license to operate for the life of the mine

### Strategic Guidelines
- Excellence and thoroughness in the control and analysis of costs and losses
- Search mining base that could exploit the installed capacity
- Recruitment and retention to ensure productivity and operational continuity
- Standardization of the threads and equipment
- Maximizing asset utilization without compromising production
- Generation of internal and external options to maintain water resource availability
- Proactive management of stakeholders

### Operational Excellence

- Generation of internal and external options to maintain water resource availability
- Contracts with Providers aligned to the objectives of business productivity
- Continuous monitoring of the design parameters in the consumption of water resources
- Specialization in every part of the production process
- Recruitment of experienced staff, targeted and rigorous to capture key positions
- Generation of flexibility to allow adaptation of the mining plan in the medium term
- Technology platforms that provide integrated control of processes
- Management of the maintenance reliability to ensure continuous operation
- Management depth of mine planning scenarios both ST, MT and LT
- Excellence and thoroughness in the control and analysis of costs and losses

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### Business Model

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## Alignment to Business Model

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### Strategic Guidelines

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</table>
What is the task?
What is the task?

How to measure my performance?

What technology will support us?

What processes manage?

Initial Scope of Work for Honeywell

How we interact?

How to organize the work?

How government?

What methods and procedures?
Technology Scope

Operational Management Systems
- Mine
- Oxide Plant
- Sulphide Plant (Concentrator)
- Auxiliary units (power, water, etc)

Simulation and Training Development
- Oxide Plant
- Sulphide Plant (Concentrator)

Services
- Remote monitoring and applications support
- Process operation manuals for the Sulphide plant (Concentrator)
Operational Management System (OMS)

OMS is a platform for operations management that integrates different types of information such as: Production, Costs, Planning, Mining inputs Consumption and Safety; allowing proactive management of operational processes.

The main features are:

⚠️ Operational KPIs deviation alerts and recommendations to eliminate them.

♻️ Integrate processes KPIs in order to improve global production performance.

📝 Operational incident logbook.

💻 Monitoring processes and theirs equipments state.

🔍 Manual data entry.

📝 Report for operational closures.
Integrated operation implementation stages

1. **OPERATIONAL PROCESS MANAGEMENT**
   - Planning
   - Mine Operations
   - Plant Operations
   - Dispatch

2. **CORPORATIVE APPLICATION INTEGRATION**
   - INTEGRATED SERVICES BUS
   - OPERATIONAL INFORMATION APPLICATIONS (DASHBOARDS, BUSINESS INTELLIGENCE, PORTALS)
   - PROCESS INFORMATION APPLICATIONS
   - MESSAGES ROUTING
     - SECURITY
     - QoS
   - SYSTEMS
     - INTEGRATION/TECHNOLOGICAL IMPLEMENTATION

3. **PLANNING**
   - SERVICES DEFINITION
   - PROCESSES DEFINITION
Centralized operations with integrated Systems/Data

- Improved response time
- Updated information
- Just one data
- Timely decisions
- Cost efficient
OMS Overview

OMS Scope of Work
OMS Overview: Dashboard Module

Mine Area
OMS Overview: Dashboard Module

Hydrometallurgical Process
OMS Overview: Dashboard Module

Concentrator / Water Process
OMS Overview: State Process Management Module

Monitoring KPI
Waste
Dump
Mill
Crusher
Dump
Leach
Stock

Monitoring KPI

Monitoring KPI

Monitoring KPI

Monitoring KPI

Monitoring KPI
OMS Overview: State Process Management Module

Recomendation & Actions

- Waste Dump
- Mill Crusher
- Dump Leach
- Stock

Recomendation & Actions

Operaciones

Perforación
- Costos
- Util
- Rend.

Tronadura

Carguido
- Costos
- Util
- Rend.

Transporte

Chancado
- Sin KPIs

Servicios
- Util

Mantenimiento

Transversales
OMS Overview: State Process Management Module

Knowledge Base of Recommendations and Operational Actions
This module charts the most important KPI’s operational areas
OMS Overview: Detentions Module

This module shows the equipment detained and the reasons of detentions.

<table>
<thead>
<tr>
<th>Flota</th>
<th>Equipo</th>
<th>Estado</th>
<th>Inicio</th>
<th>Fin</th>
<th>Duración</th>
<th>Razón</th>
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<td>14-03-2013 11:00:00</td>
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This module allows input of typical incidents that have occurred during the shift, either by production problems, environmental problems, weather or equipment failures.
This module allows manual data entry for no automatic information system.

- Safety
- Excel
- Operational parameters
This module allows to acquire relevant and reliable knowledge of: KPI, Production, Safety, Cost and status of each process and the different areas.

Avoid overwork during the consolidation process information during the shift, week and month.