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The Evolution of Containerized Bulk Handling

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ENGINEERING AND PROGRAM MANAGEMENT
COMPANY PROVIDING SERVICES ACROSS THE
ENERGY AND RESOURCES SECTORS.





OUR GLOBAL PRESENCE

21 Locations. 14 Countries.

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Apia, Samoa
Brisbane, Australia
Honiara, Solomon Islands
Nuk'alofa, Tonga
Perth, Australia
Port Moresby, PNG
Port Vila, Vanuatu
Sunshine Coast, Australia
Suva, Fiji

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Concord, USA
Montreal, Canada
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OUR SERVICE OFFERINGS

What we do

Environmental Solutions	Minerals Processing	Oil & Gas	Power	Transportation Systems	Ports & Terminals	Pipeline Systems	Asset Management & Optimisation	Infrastructure	Mining Consulting	Specialist Advisory
Mining engineering	Concentrators	Refining	Power generation	Heavy haul rail and transportation	Arctic engineering	Slurry pipelines	Contract operations	Structural seismic	Exploration	OH&S technical consulting
Geotechnical and civil solutions	Hydrometallurgy	Maintenance capital	Renewable power	Simulation	Bulk materials handling	Tailings, water and oil & gas pipelines	Continuous improvement and reliability engineering	Bridges	Geological modelling	Simulation & Business Intelligence
Water management	Smelting	Well pads	Alternative energy	Bulk materials handling	Offshore structures	Pipeline operations software	Operational readiness	Light rail	Resource and reserve estimation	
Tailings and mine waste management	Heap leach facility design	SAGD	Energy transport		Coastal engineering	Pipeline control systems	Asset management	Mine and industrial	Geotechnics & numerical modelling	
Environmental and social solutions	Comminution	Arctic engineering			Marine structures	Integrity management	Asset optimisation by Ausenco Rylson	Control systems	Mine design, planning & economic evaluation	
Sustainability solutions		Offshore structures					R8 by Ausenco Rylson		Mine permitting, environmental and closure	

- +** **SERVICES:** Program management, engineering, global procurement, construction management, commissioning, EPC/EPCM, studies and technical solutions, control systems, asset optimisation, simulation and business intelligence.
- +** **COMMODITIES:** Biomass, coal, copper, CSG/CBM, gas, graphite, industrial minerals, iron ore, lithium, LNG, mineral sands, oil sands, precious metals, uranium & zinc.
- +** **PROJECT LIFECYCLE:** Evaluate, Innovate, Create, Optimise.

What is containerized bulk handling?

Historically this has meant using conventional ISO containers and either loading them with conveyors with baffles or tipping them on end. While it makes use of underutilized empty container movement, it is still not a very efficient operation.



What is modern containerized bulk handling ?

Specialty containers with removable top lids to move bulk cargo from source to destination in a safe and economic manner, and rotary spreaders to load containers directly into ships.



Typical sequence of modern containerized logistics

Modern containerized bulk systems have been used in Australia for years and we have seen a growing interest in South America and Africa using a simple application method.

- Direct loading & sealing of the container at the loading facility (mine, grain terminal,...)
- Movement of the containers – loading facility to port by truck or by train (or both)
- Offloading of the containers at the port facility
- Using containers instead of bulk cargo storage
- Direct unloading of container into ship's hold or on conveying system to holding stockpile with rotary spreader unit

Typical containerized bulk equipment

Customized containers being transported by highway truck or rail



Direct discharge of cargo into ship's hold



The evolution of containerized bulk

Containerized bulk handling is not a “one size fits all” solution, and just buying the equipment is not enough. This needs to be integrated into a holistic logistics system.

- Make use of existing infrastructure where possible
- Maximize payload of containers to match cargo and transport rules
- Bi-modal transfer of containers at a Transfer Station (truck from the product source - transfer to rail) for movement to the port
- Offloading of containers at port, and dumping into conventional bulk storage facility for storage, reclaim and ship loading
- Retain capacity for container storage on site and direct loading of containers into ships if the bulk system is out of service
- Optimize the overall logistics network with simulation modelling

Options for an integrated container system



Benefits of containerized logistics

- Cargo is sealed in the container until it arrives at port
 - Minimizes potential for cargo loss through spillage or theft
 - Maintains quality of cargo with no contamination, added moisture, etc.
 - Avoids re-handling of bulk cargo at intermodal facilities (truck - rail)
 - Minimizes risks of environmental impact on route or from bulk handling
- Containers can be used as temporary covered storage
- Direct unloading of containers into a ship with rotary spreader unit allows for utilization of general cargo berths as an alternative to permanent bulk storage and ship loading facilities
- Assets are fully mobile and transferrable to other sites
- The system is easily expandable
- Multiple types/qualities of bulk cargo can be handled

Where containerized bulk should be applied

- Use for high value or environmentally sensitive bulk cargo
- Logistics routes where single mode transport is not possible
- Small throughput volume cargos that can't support the construction of a dedicated bulk export facility
- Where existing container facilities exist and are underutilized
- A logical replacement for open top bulk trucking to reduce costs and provide a more environmentally sensitive solution
- Can be applied to greenfield installations or retrofit to existing logistics
- Integrate into a multi user export facility to simplify product integrity and segregation of inventories

Where containerized bulk should be applied... ... @ Abidjan's Ore Terminal



- Abidjan's Ore Terminal before : restricted to 10m draft
- New Abidjan's Ore Terminal : 13.5m draft + warehouse facilities
- Containerised bulk facility can be modified to suit

Case Study: Las Bambas Logistics



Project details

Offering
Transport Logistics

Commodities
Copper Concentrate

Location
Peru

Client
MMG

Timeframe
2014 - 2016

Solution phase
Create (EPCM)

Project value
US\$100M

Services
Consulting - EP

Complete logistics system design from the Mine load-out to Matarani Port, for a project located near Cusco at 4,300 m above sea level.

The system was totally integrated with the Client's requirements.

The system includes a 420 km truck haul, a Transfer Station, and a 310 km rail haul to Port.

Las Bambas logistics – scope of work

The Las Bambas logistics required an integrated solution for containerized bulk handling of 1.5 Mt/y of copper concentrate from the mine site to a third party export facility in Matarani.

- Definition, selection and optimization of the transport system logistics
- Design of container loading and lid handling facility at the mine
- Procurement of bulk containers and rotary spreader unit
- Procurement of truck tractors and trailers for contractor use
- Optimization of logistics, storage and handling systems at Pillones transfer station (transfer from trucks to trains)
- Procurement of locomotives and wagons for Peru Rail
- Optimization of container receiving and unloading system at Matarani including conveying to conventional bulk handling system

Optimization of the entire supply chain



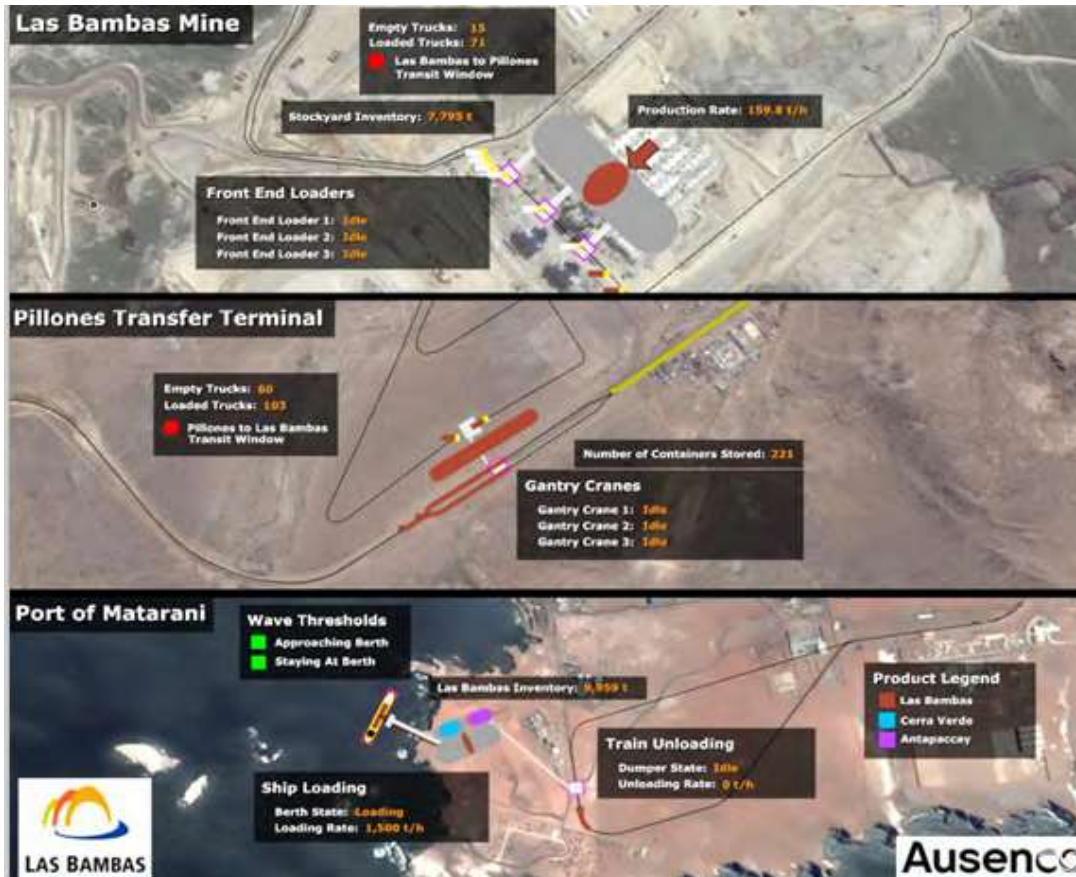
Included each component & the transport network from the mine to the port.

- Review of the 420 km heavy haul road geometry, design speeds & speed limits
- Social and community factors along the route
- Environmental / weather impacts on year round truck operations
- 310 km rail network infrastructure and capacity
- Proposed a rail operating plan and defined operating factors, limits & restrictions

KEY OUTPUTS:

- Required truck, container, and railcar fleet sizes
- Identification of system limits, potential bottlenecks and then optimization of logistics

Simulation at each critical location



- Identified limitations and removed bottlenecks at all operations on the logistics chain including the mine, transfer station & port
- Covered all equipment & infrastructure
- Modelled up to 130 loaded and empty trucks per day through the facilities
- Included location limits, maintenance restrictions, random breakdowns & weather delays

Container specifications

A total of 1,200 containers were required for the complete logistics system

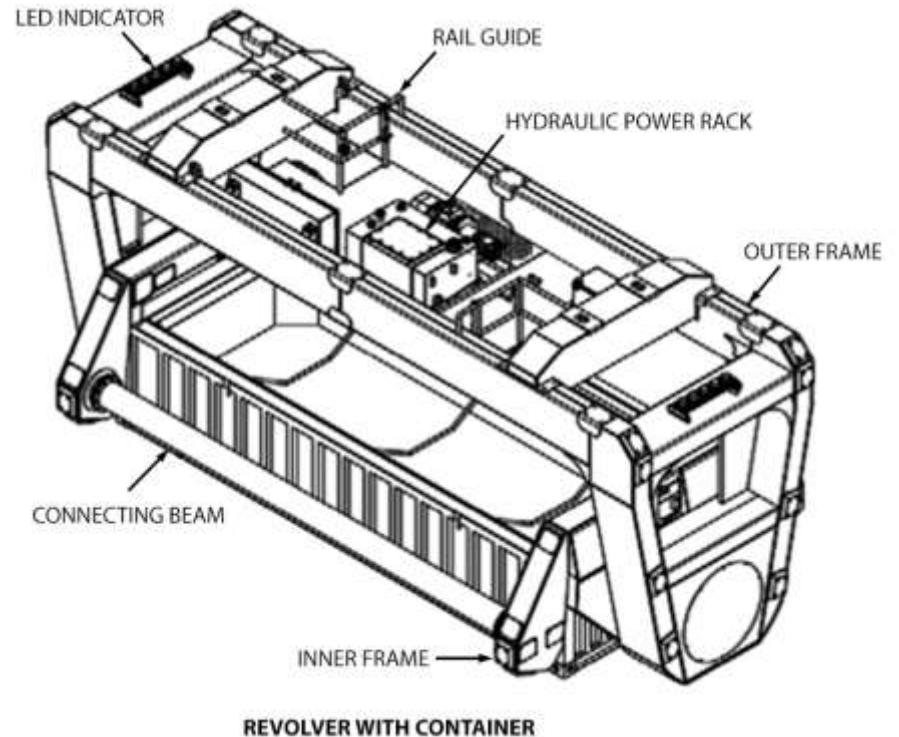
- Custom container design to maximize net payload / truck
- Non-ISO dimensions (4.0m x 2.4m x 1.85m)
- Gross payload of 17.5t
- Fully removable lid with 4 corner lock system
- BK2 – compliant rating
- Interior coating for release of concentrate when dumped



Rotary spreader specifications

The rotary spreader for the container discharge system needed to be compatible for use in direct-loading of ships as a back-up contingency system.

- Custom design to suit the non-ISO containers
- Integrated lid lifter
- Flexible mounting for use by cranes and forklifts
- Back-up diesel power supply to enable use by harbor and/or ship's cranes



Truck tractor and trailer specifications

Tractor trailer units were purchased by Las Bambas and provided to local contract hire trucking companies to ensure consistency in the service.

- Custom trailer unit to transport two containers
- Tri-axle trailer design
- Off road suspension due to poor road conditions
- Tractor and trailer equipped with “super single” tyres to maximize allowable axle loads and achieve 52.8 t GVW
- Tractor required to be light as possible to maximize load



Locomotive and wagon specifications

New locomotives and rolling stock required for the project were purchased by Las Bambas with operations contracted to Peru Rail.

- Peruvian standards for supply of all locomotives & rolling stock
- Custom wagon design to maximize payload per wagon & per train
- Utilized proven wagon manufacturers in China to reduce total costs



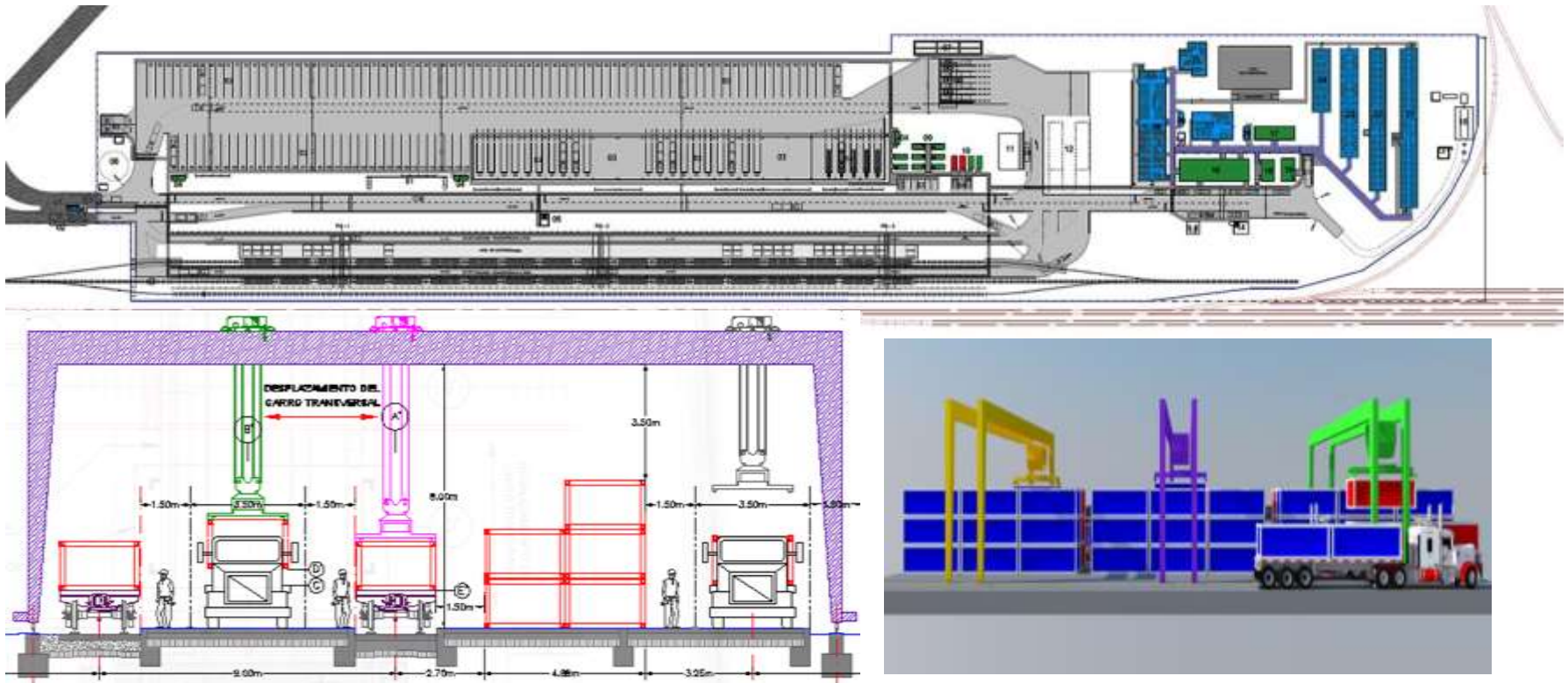
Container loading facility at mine site

The new system integrated container loading and a means of handling the container lids with a loadout facility that was under construction.



Transfer facility at Pillos

The Peru Rail facility was optimized to provide enough space to receive, unload and store trucks overnight, store containers, and additional rail tracks added for storage and loading of trains with gantry style cranes.



Train receiving & container discharge at port

Matarani Port “Berth F” facilities have recently been developed and commissioned for rail receipt of Las Bambas concentrate. The system was modified on a “fast-track” basis to accommodate container handling and unloading, bulk storage and ship loading.



Options for container receiving & discharge at port

The new system is versatile and allows the handling of containers received by rail and/or truck.

Containers can be dumped and stockpiled in existing sheds with mobile equipment.

This versatility allowed early export shipping prior to completion of the new berth facilities.

Containers can also be stored on-site for direct unloading into a ship's hold.



Benefits of the containerized system

Ausenco proved that a customized logistics solution was a benefit to the Las Bambas project.

Key benefits included:

- Reduced capital and operating costs for truck fleet
- Reduced rail operating costs compared to conventional bulk
- Elimination of a bulk transfer at Pillones with associated costs and concerns
- Reduction in port charges and increased port versatility with options for:
 - Storing cargo in bulk or in containers
 - Direct unloading to vessel using available cranes at container dock
- Reduced trucking risks on the haul road and through local communities
- Reduced environmental risk due to spills & losses during handling, transfer and transport.

Questions?

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