

International Bulk Journal Awards 2016

Category: Innovative Technology Award

Article: Intermodal Containerized Bulk Handling

Date: June 2016



MMG's Las Bambas mine, at 4,000 meters above sea level, is the largest copper mining project in Peru and will be producing 1.4 million tons of copper concentrate annually. A mine this size is a major revenue generator for Peru but the elevated and remote location posed problems to transport concentrate to market. The team had to find some innovative solutions to achieve a safe and effective method for transporting product to market.

The Problem

MMG had to work with Matarani Port, the nearest existing port to Las Bambas, some 710 km by road from Las Bambas. The closest rail connection to Las Bambas was approximately 440 km away, but it offered a safer and more economical method of transporting concentrate on part of the route to Matarani Port.

Road safety, environmental compliance and existing road congestion through major towns and cities were the major risks to be addressed with the logistics and materials handling solution. Added to this, the existing port operated by Tisur, had recently commenced construction of a new port facility, which was only partially suited to the containerized transport system, so the port operator had to be engaged to effect essential design changes. A traditional bulk handling solution would have resulted in environmental exposure at multiple transfer points and double handling using tipper trucks, bulk rail wagons and expensive rotary rail car dumpers.

The standard traditional approach

Transporting bulk on rail wagons involves the use of a fixed rotary railcar dumper (*figure 1*) to offload the bulk material at the final destination. This method is commonly used as a way to offload the commodity but needs high capital investment, long set-up lead times with limited flexibility as it is fixed in place.

An innovative solution to the rotary rail car dumper

Following a fast-tracked project study, MMG chose an enclosed containerized bulk solution known as Containerized Bulk Handling to transport and offload the concentrate

What makes this an innovative solution for MMG is that it removed the need for expensive fixed rail car dumpers, was quick to set up and being an enclosed type system, protects and secures the commodity between the mine and port. By successfully implementing the truck-rail bimodal transport solution by MMG makes it **the first of its kind in the world**.

The MMG CBH system comprises of a bespoke bulk container used with a truck and rail bimodal transport solution from the mine to the port and a rotating spreader called the RAM Revolver® that lifts and tips the container's contents into hoppers at the rail transfer station, completing the export process. MMG awarded the trucking services to Transaltisa and the rail service to Peru Rail, both Peruvian companies.



figure 1: traditional rotary rail car dumper



figure 2: Front end loader filling containers before sealing



figure 3: Truck leaving port of Las Bambas heading to the Truck-to-Rail transfer station



figure 4: Containers loaded off truck onto railcars heading for the port of Matarani

Overcoming the road and rail weight restrictions

With Peru having gross weight restrictions on road transport of 52.8 tonnes and 80 tonnes on rail, MMG designed 4 meter long ISO type container with approximately 17.5 tonnes concentrate payload in order to meet these limitations. The result was two containers per truck and three per railcar, which optimized the truck and rail wagon gross weights to 52.8 and 76 tonnes respectively. Containers on trucks over conventional bulk transport achieve an 8% higher payload capacity, and the containers are easier to transfer from truck to railcar.

At the port, the containers can also be stacked and handled with existing terminal equipment. The use of *bimodal hauling* avoids the environmental risks that are apparent from conventional bulk trucks and bulk material handling at intermediate transfer points.

The process

Trucks arrive at Las Bambas mine with empty containers. The lids of the containers are then removed and the trucks with the open top container move into the storage shed. The containers are filled with concentrate using front-end loaders (*figure 2*) on top of weighbridges to maximize the payload to 35 tonnes per truck. The trucks move out of the storage shed where the container rims are vacuumed and the wheels washed, followed by refitting of the container lids. The trucks are marshaled into convoys (*figure 3*) and leave on the first leg of the bimodal journey, 443 kilometers by road to a Truck-to-Rail Transfer Station equipped with reach stackers for loading/offloading containers.

The second part of the bimodal transport is by rail (*figure 4*), 286 kilometers to Matarani Port. The train carries 54 containers with 17.5 tonnes of concentrate payload per container. Las Bambas will be able to ship four to five full trains daily which will allow 1.4 million tonnes to be transported annually.

Dedicated Rail Transfer Building

The next challenge was to perform direct loading from the railcar to a rail off-loading hopper at the port, without any intermediate re-handling or losses. To overcome this challenge the railcars, with full containers are maneuvered through the rail transfer building which is equipped with two bridge cranes fitted with revolving spreaders called RAM Revolver® (*see figures 5&6*).

The crane and RAM Revolver® system is used to offload the containers from the railcars. As each container is lifted with the revolver, the lid is automatically removed and the crane moves the container semi-automatically to the unloading position above the hopper. When in the correct unloading position, the revolver rotates the container 360 degrees allowing the concentrate to tip gently into the hopper (*see figure 6*).

Initially, while the dedicated rail transfer building was being constructed, MMG was able to start operations ahead of schedule by deploying a RAM Revolver® on a reach stacker, to feed the stockpile inside the main concentrate storage building in Matarani.

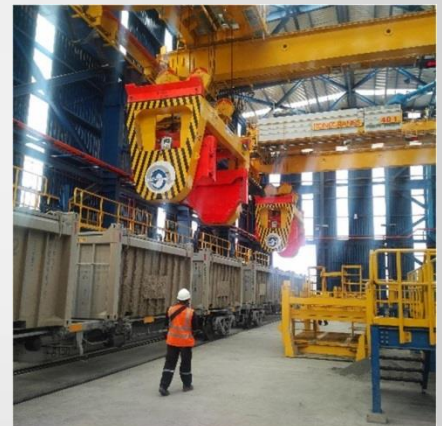


figure 5: RAM Revolver approaches container filled with concentrate in rail transfer building



figure 6: Semi-automatic crane moves RAM revolver over to the hopper, lid is removed and container rotates 360 degrees

The end result is that MMG was successful at implementing an innovative truck-rail bimodal transport solution, with direct loading from rail at the port with no need to re-handle containers or build additional infrastructure; the first of its kind in the world.

MMG has indeed set the benchmark for containerized intermodal bulk logistics in South America with fully integrating its new copper concentrate loading requirements into an existing port infrastructure; it is only a matter of time when this innovative solution becomes common place.

Why is this Innovative?

- Concentrate sealed in container for bi modal journey with no material loss in dumping and materials handling.
- System uses standard containerized equipment without the need for expensive specialist bulk equipment like wagons and rotary dumpers.
- Environmental best practice-zero material loss.



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