Lake Mead, USA

Mucking System through Vertical Shaft

About the Project

The drought gripping the southwest U.S. has forced fast growing communities like Las Vegas to undertake new water-related construction projects. On March 20, 2008, the Southern Nevada Water Authority (SNWA) awarded a US$447-million design-build contract to Vegas Tunnel Constructors – a joint-venture of S.A. Healy Co., Lombard, Ill. and Impreglio S.p.A., Sesto San Giovanni, Italy. The JV will build a third raw water intake tunnel at Lake Mead, the Las Vegas Valley's water lifeline. The additional straw is needed since lake levels have dipped 110 ft since 2000. Lake Mead now operates at 1,117 ft. or about half of its capacity. One or both of the existing water inlets will be forced to shut down if the lake level drops another 70 ft. The new intake, SNWA’s largest project to date, will be able to draw water deeper than its counterparts at 860-ft. Construction entails a vertical 30-ft-dia., 600-ft-deep access shaft along Saddle Island’s western shore and a horizontal 20-ft-dia., 15,000-ft-long concrete segment reinforced tunnel under the lake bed. The horizontal tunnel will be built by using a TBM operating with two different muck removal systems. In certain conditions, the muck will be pumped out and separated at the shaft head. The other system will use a tunnel conveyor and a shaft mucking system which will lift the muck from the shaft bottom to the surface at the shaft head.

Project data

<table>
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<tr>
<th>Country</th>
<th>USA</th>
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<tbody>
<tr>
<td>Execution</td>
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<td>Project owner</td>
<td>SNWA Southern Nevada Water Authority</td>
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<tr>
<td>Customer</td>
<td>JV Vegas Tunnel Constructors</td>
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Structures

- Vertical access shaft: 182m deep, 9.7m diameter
- Horizontal TBM tunnel: 4.5km length, 6.1m inner diameter

Specialty

- Depth under Lake Mead: 170 m
- High water level: 17bar due to potential hydrostatic pressure caused by Lake Mead water level

Buffering silos, material switch and incline conveyor

Head Frame and muck discharge device

Project overview (source: SNWA)
Rowa’s Order
In January 09 Vegas Tunnel Constructors, short VTC, awarded Rowa Tunnelling Logistics AG, based in Wangen Switzerland, with a contract to design and supply a unique shaft mucking system to secure the removal of the continuous muck flow generated by the TBM heading.

Concept Mucking System
A tunnel conveyor hauls the muck from the TBM heading to the cavern at the shaft bottom. From there the shaft mucking system, using a double drum hoist located at the shaft head, transports the muck through the shaft and discharges it into a stacker conveyor at the shaft head. The mucking system is capable to handle a continuous muck flow.

Functions of mucking system:
- Receiving the continual muck flow from the tunnel conveyor at the shaft bottom
- Buffering the muck and loading it into special shaft buckets
- Vertical transport of 185m through the shaft using two buckets working in a reverse mode
- Feeding the stacker conveyor at the shaft head

The control of the mucking system takes place from the hoist control operation station positioned at the shaft head. The process can be run semi or fully automated observed by one operator who overviews the crucial application areas by means of video cameras and monitors.

Scope of delivery
Rowa’s scope of delivery was the design and delivery of a customized system which implemented the existing double drum hoist at the shaft head and included the equipment necessary to link the tunnel conveyor at the shaft bottom with the stacker conveyor at the shaft head.

Contained equipment:
- Head frame to be used with an existing double drum hoist
- Muck discharge devices
- Shaft buckets
- Design shaft guiding system
- Buffering silos and inclining conveyor
- Electrical control system to be integrated in the mucking chain from the hoist to the tunnel conveyor and TBM

Specialty
The mucking through this deep vertical shaft is a discontinuous process that involves several different equipments which run simultaneously. At the same time the input and output of the mucking system is a continuous muck flow. This condition puts a high demand on the shaft mucking equipment and on its control and supervision. Rowa supplied a system that can be controlled by the hoist control person located at the shaft head.