

FROM SOUTH TO NORTH

China – China is facing the difficult situation of having to provide for 20% of the world's population with only just over 7% of global water resources. This situation is aggravated by the fact that 80% of its water sources are in the southern part of the country, but 64% of the agricultural land is in the northern part, where more than 50% of the population lives.

To solve this problem, China started a huge water supply project in 2002. From 2050, every year the South-North Water Transfer Project, based on three main routes – eastern, central, and western – will transport 44.8 billion m³ of water.

In addition to the Yangtze, the Yellow River plays a significant role in feeding these planned canals. Named from the yellow mud and sediments that it picks up in the Shaanxi Loess plateau, this river supplies water to 155 million people and irrigates 18 million ha of the agricultural land in China.

As part of a sub-project of the central route, water from the Yellow River will be transported to a subsurface pumping station through a 6 km-long tunnel. The Shanxi Xiaolangdi Yellow River Diversion Project is based on two reservoirs, several tunnels, subsurface channels, pumping stations,

pipelines, and aqueducts and is designed to divert 247 million m³ of water annually. Irrigation will account for 116 million m³, industrial and urban water demand for another 116 million m³, and 15 million m³ will be used for ecological purposes. The pumping station is equipped with four machines that pump the water over a distance of 60 km to an artificial lake in Shanxi Province.

THE INFRASTRUCTURE EXPERTS

ANDRITZ was awarded the contract to deliver the pumps for the subsurface station having already assisted in other parts of the South-North Water Transfer Project. For instance, the Hui Nan Zhuang station features eight ANDRITZ horizontal, double-suction split-case pumps to supply drinking water to the capital Beijing, 60 km away.

The four two-stage vertical volute pumps for the Shanxi Xiaolangdi Yellow River Diversion Project will be customized to meet the project requirements. Each achieves a flow rate of 5 m³/s over a head of 236 m at an output of 13 MW. The appeal lies in their more than 91% efficiency. As the Yellow River conveys large quantities of sand, the pumps will be provided with a special abrasion-resistant coating.



The four two-stage vertical volute pumps for the Shanxi Xiaolangdi Yellow River Diversion Project will be perfectly customized to meet the project requirements.

The pumps, with an efficiency of more than 91%, achieve a flow rate of 5 m³/s over a head of 236 m at an output of 13 MW.

The hydraulic design of the volute casing depends on the specific output characteristics. Optimum flow in the volute is achieved due to its individual shaping, which also guarantees a high level of efficiency. By varying the trailing edge, high-precision adjustments can be made to the desired duty points. The volute casing is designed as a welded structure consisting of several segments that may be embedded in concrete. However, the Shanxi Xiaolangdi Yellow River Diversion Project uses a solution without concrete because higher delivery heads are necessary. Due to the strength requirements, this application cannot be handled with a concrete volute.

The guide vanes are individually connected to the operating ring by means of articulated levers. This ring is actuated via hydraulic cylinders and rotates the guide vanes into the desired position. A guide vane mechanism is an emergency closing element in case of difficulties with the electric power supply, but it can also be closed to minimize the power required if synchronous motors are used during start-up. By closing the guide vane mechanism, it is possible to start up the pump when the pressure pipe is full. This guarantees a short start-up time with minimum power input.

Delivery, installation, and start-up of the ANDRITZ pumps is scheduled to take place in 2022. This will be another successful step towards a sustainable water supply for the north of the country.

AUTHOR

Vera Mueller
hydronews@andritz.com

TECHNICAL DETAILS

Shanxi Xiaolangdi Yellow River Diversion Project:

Scope: four two-stage vertical volute pumps

Head: 236 m

Flow rate: 5 m³/s

Efficiency: more than 91%

