

Rur Dam Schwammenauel, Germany

VAG Hollow Jet Discharge Valves
replace 60-year-old Ring Valves

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The Rur dam Schwammenauel in the North Eifel mountains has a capacity of 203 million m³, making it one of Germany's largest dams. It catches the rainfall in the headwaters of the Rur. The Schwammenauel power station uses the hydropower station to generate electricity.

Project overview

- Rur Dam Schwammenauel (North Eifel)
- Valves:
 - VAG EKN® Butterfly Valves DN 2000 with brake-and-lift cylinder and dismantling joint DN 1800
 - VAG EKN® Butterfly Valves DN 2300 with brake-and-lift cylinder and dismantling joint DN 2300
 - VAG Hollow Jet Discharge Valve DN 1800 with ventilation system with a diameter of 3200 mm and hood pipe with a diameter of 3600 mm
- Features: Hollow Jet Discharge Valve in DN 1800, output capacity of 50m³/s for each bottom outlet
- Period: Summer 2005
- Contractor: Heinrich Scheven Anlagen- und Leitungsbau GmbH, Erkrath
- Awarding Authority: WVER (Wasserverband Eifel-Ruhr)

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Situation on site

Steel pipes and bifurcations were built into the last 50 metres of the tunnel to the dam's bottom outlet. A total of three pipes (2 x DN 2000 and 1 x DN 2300) ran through the valve house, which is on the downstream toe of the dam. The two smaller pipes served as bottom outlets and flowed into the adjacent stilling basin. The biggest of the three pipes, which was used as a spillway, ran above ground for 80m to the power station.

The two Ring Valves that regulated the water flow from the bottom outlet pipes and all of the pipes' pipe burst safety systems that were installed in the valve house had the same nominal dimensions. The over 60-year-old valves were showing increasing signs of wear and were becoming increasingly fragile. Mid-2002, the bottom outlet operations had to be cut back. Inspections and tests followed. The ensuing market analysis and feasibility study were presented at the beginning of 2004. The result: the valves in both bottom outlets and the spillway had to be replaced.

Planning and tender

The construction was planned to take place during the less flood-prone months of May to October. The awarding authority, Wasserverband Eifel-Rur (Water Board Eifel-Rur (WVER)), immediately issued a limited invitation to tender, because the custom-made

valves had a delivery time of up to ten months.

Decision for VAG-Armaturen GmbH's Hollow Jet Discharge Valves

Two criteria determined the selection of the Control Valves: on the one hand, the new valves had to have the same nominal dimensions as the old ones and no structural changes were allowed to be made around the stilling basin. On the other hand, the new DIN 19700 standards, which were to become effective in July 2004, called for an output capacity of at least 50m³/s per bottom outlet pipe. It was decided to replace the old Ring Valves with Hollow Jet Discharge Valves because they met the output capacity requirements and also close better and more reliably during emergency shut-offs.

Guide pipes were used to bundle the output jet. Capacity calculations resulted in a Hollow Jet Discharge Valve with a nominal dimension of DN 1800 and venting system with a diameter of 3200 mm. To rule out all vibrations, the wall thickness of the valves and adapters was dimensioned at a pressure rating of PN 25 and the flange at a pressure rating of PN 16.

The operator commissioned these tasks to VAG-Armaturen GmbH. VAG had been in contact with the engineering firm and WVER since 2003, and was hence able to get involved in the project and the feasibility study at an



early stage. The technical requirements were discussed in detail during several on-site visits: the dimensions, the material for each of the components, the coating system for the inside and outside of each of the valves and the actuation requirements.

The contractor, Heinrich Scheven, visited the VAG plant in Mannheim to evaluate the quality of the valves and their function at first-hand.

The inside of the new pipe section was reduced to connect the Hollow Jet Discharge Valve to the pipe burst safety system, which was connected directly to the existing pipeline with a short DN 2000 to DN 1800 transition adaptor. Due to the space constraints in the valve house, VAG produced a short, welded, DN 2000 Butterfly Valve as a pipe burst safety device.

New type of valve with modified dimensions

The Ring Valve is at its widest in the middle, and gets smaller towards the outlet and the water side of the valve house wall. The diameter of the Hollow Jet Discharge Valve, on the other hand, steadily increases up to 3.6m. These new dimensions meant that work needed to be carried out on the water side of the valve house wall and the bridge crane's runway girders. Old pictures showed that the old valves had been transported and fitted in the skeleton valve house. The current gate was too small and the crane system too low,

which meant that structural changes were necessary.

Construction of the hydraulic steel structure begins

The construction of the hydraulic steel structure started on 13 June 2005. The work was carried out by Heinrich Scheven Anlagen- und Leitungsbau in Erkrath. VAG delivered all of the required valves.

The delivery and construction schedules were part of the contract and were drawn up in agreement with WVER's project management.

Initially, all of the new pipeline and valve parts were supposed to be delivered before construction on the hydraulic steel structure began. But because the storage space was limited, different delivery dates were agreed and observed.

Delivery of the 23-ton heavy VAG valves

Heavy-duty vehicles transported the 23-ton heavy and up to 3.6m wide valves to a car park near the dam, where they were transferred onto a short flatbed trailer with separately steerable rear axle that could take the turn to the valve house. So that the construction could start on the hydraulic steel structure, the downstream bottom outlet tunnel was closed with a Roller Gate and sealed off from the dam. The 7,000m³ of water that remained in the

tunnels were drained through the old bottom outlet valves and the tunnels physically inspected. The old valves were then removed.

Installation of the new Hollow Jet Discharge Valves

In order to dispense water from the dam at short notice, the bottom outlet valves and the power station pipelines were removed at different times. Because of the space constraints, the two new VAG Hollow Jet Discharge Valves were placed in front of the end of the two pipe sections.

Only then could the remaining pipe segments and valves for the bottom outlet pipes and the ventilation pipes for the Hollow Jet Discharge Valves be lined up and installed.

The abutment wall for the Hollow Jet Discharge Valve was repaired before the work started on the power station pipe. This guaranteed that a pipe would always be available to dispense water during the construction work.

The two guide pipes were flanged onto the Hollow Jet Discharge Valves from the outside and the actuators installed.

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The old DN 2300 pipe burst safety valve was removed from the power station pipe. To install the new valve and the additional dismantling joint, the pipeline was separated on both sides with a cutting torch and prepared for the welding of two DIN flanges. The welding joints were X-rayed and the installation successfully completed.

Trial run: the capacity of VAG's valves was higher than expected

The bottom outlet tunnel was flooded and the Roller Gate removed. The pipes and valves were again submitted to a leak and function test at the beginning of September so that the serviceability and the higher capacity of the Hollow Jet Discharge Valves could be verified against the calculations.

Quality of the valves and collaboration with VAG was positive

The water board had a clear preference for VAG's valves during the planning and tender phase. 'All of the valves and pipe fittings that were delivered are flawless and meet the technical specifications in the tender,' confirms Herbert Polczyk, head of the dam division

at the Eifel-Rur water board, after the dam was put back into operation and emphasizes: 'We believe that choosing VAG will enable us to continue guaranteeing the reliable operation of our dam.'

And Klaus Küsel, Managing Director of the contractor, Heinrich Scheven, adds: 'All of the valves were delivered to the construction site on time and we didn't have any problems installing them. The collaboration with VAG's staff was exemplary and enabled us to complete the project on time.'