



Sliding gate valves excel in aluminium rolling mill



Reliable leak-tightness despite suspended particles and fast response times as cost factors

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The application of emulsions is an important factor when hot-rolling aluminium. Accordingly, the control of the specifically required quantities of rolling emulsion is crucial. Sliding gate valves have well proven their reliability, especially in applications where the cooling medium is enriched with abrasive aluminium oxide particles and a high rate of response cycles is required.

Hot-rolling of aluminium puts ultimate demands on the valve controlling the supply of the rolling emulsion. Novelis, a world leading manufacturer of rolled aluminium products and recycler of aluminium cans, uses in their plant in Sierre, Switzerland, an emulsion of 97% de-mineralised water and 3% oil. This rolling emulsion is recycled to support the safeguarding of resources, thus accumulating aluminium oxide particles in the process. The rolling emulsion is hence not only aggressive, but also abrasive. As the rolling plant requires the control of different flow rates for different product qualities, the requirements have been a challenge that many control valves could not meet in the past. Consequently, plant operators have had to cope with leakage caused by worn valve seats. Aluminium oxide particles found their way even into the frequently used PTFE seals, another cause for leakage. This resulted in a poor surface quality of all rolled products. As this cannot be tolerated, expensive maintenance work had to be carried out on the control valves on a weekly basis. Novelis was no longer prepared to accept these restrictions and achieved a noticeable performance improvement with sliding gate valves that also had a drastic costs-reducing effect.

The company which operates in 11 countries with a staff of approximately 12,500 supplies technologically advanced rolled aluminium products to Asia, Europe and the Americas. Novelis has been a subsidiary of the Indian company Hindalco Industries Limited since 2007 which is one of the global leaders in the aluminium manufacturing field and part of the multinational Aditya Birla Group with its headquarters in Mumbai.

The major part of the aluminium panels and foils goes to the automotive and transport industry, beverage and food packaging, and other industries such as the printing industry. A key factor for the

company's success is the surface quality of the rolled aluminium products.

Recently sliding gate valves have taken control of the flow of the rolling emulsion. Since the cooling of rolled products is performed at two different flow rates, the following process requirements apply:

- $p_1 = 10$ bar
- p_2 within the control range of 5 to 6 bar, hence:
- $\Delta p = 4$ to 5 bar
- $Q = 400$ to 800 l/min
- Opening time = 1 to 2 seconds
- Closing time = 3 to 5 seconds
- Cycling rate: 4 to 6 response cycles per minute

Completely insensitive to suspended particles

The unique feature about the operating principle of a sliding gate valve is the two slotted plates sliding and sealing against each other, forming the central function unit. Sliding gate valves are consequently leak-tight without using any metal valve seats. Thanks to the system design, the valve seats, traditionally a weak point of control devices, are eliminated completely. In addition, the central throttling unit, i.e. the slotted plates, is only subject to minimal wear. Sliding gate valves feature an exceptional leak-tightness even under highly demanding operating conditions, e.g. when controlling the emulsion application at Novelis, whilst providing a long service life thanks to their system design.

In addition to the long-term leak-tightness, the system design of the sliding gate valves provides another benefit which enhances sealing properties and economic, efficient service life: The maximum control lift of the sliding gate valve is only 9 mm. This short lift not only ensures short actuation travel and fast response times, but it also reduces the load on the packing and the actuation system. In a sliding gate valve, stress on both components is considerably lower, thus greatly reducing wear and significantly extending service life.

The leak-tightness owed to the system design in combination with the low stress on the actuation system result in ultimate long-term sealing properties. These sliding gate valves are an economically very efficient solution for a multitude of applications. Using different materials combined with any of the available actuation controllers, these valves can be used in the chemical, petrochemical, textile and pharmaceuticals industries, in steel mills and in many other areas of machine construction and plant engineering. Sliding gate valves are manufactured:

- in sizes DN 15 to DN 250
- for pressures up to PN 160 and
- for media temperatures between - 200 °C and + 530 °C.

The sliding gate valves in service at Novelis are equipped with sealing plates made of stellite alloy STN2. These have proven to be the ideal choice for this specific application. The control valves with these sliding plates are almost wear-free, even under the prevailing process conditions. The comprehensive long-term leak-tightness of the valves is hence ensured. Also, the two ball valves required until recently to control the two flow rates were replaced by one single sliding gate valve. The easy control of this sliding gate valve allows it to accurately adjust both required flow rates.

As far as the product quality is concerned, the very fast switching of the sliding gate valve provides a fundamental advantage. The maximum valve stroke of only 9 mm that is extremely short compared to other valve designs, the actuating time therefore is also very short. The sliding gate valve is able to regulate a different flow rate value or close fully in a matter of seconds. In addition, the sliding gate valves feature a high range of control flexibility and hence be adjusted to future process parameters. These control valves can easily be configured to control other flow rates by adjusting the actuation signals or by changing the K_{vs} value. The adjustment of the K_{vs} value only requires the function unit to be replaced by a unit to suit the revised conditions - which can be completed in minutes.



Sliding gate valves controlling the flow in an aluminium rolling plant: the aggressive and abrasive rolling emulsion is no problem for these valves which provide ultimate functional reliability by their two slotted plates sealing against each other. High-level leak-tightness despite suspended particles and a long service life create optimal conditions for economical production.

Excellent potential for savings opened up

The sliding gate valves eliminated one source of leakage - enhancing the quality of the surfaces. Novelis was also able to considerably reduce the operating costs incurred for the control valves. Since commencing with the use of these control valves, the operational failures and the maintenance expenditure have been reduced to a minimum whereas in the past, the process conditions necessitated the conducting of weekly maintenance and inspection work. To sum up, sliding gate valves offer the following benefits:

- enhanced product quality with a lower quantity of rejects,
- increased productivity,
- considerably reduced operating costs,
- minimisation of the spare parts and repair costs,
- reduced investment costs as one sliding gate valve is able to replace two ball valves that were installed previously.

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