DeZURIK

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U.S. BUILT VALVES FOR HYDRO APPLICATIONS

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Since 1976, when DeZURIK built its first jet flow gate for a Bureau of Reclamation dam in New Mexico, the company has served the hydro industry, primarily supplying valves for releasing water from dams through low-level outlets. The custom valve designer and fabricator is especially known among hydro industry owners, engineers, and consultants for its popular throttling knife gate valve. In this interview, Doug Hartsock, DeZURIK's hydro applications engineer, talks with Hydro Leader about the company's products, which are manufactured in the United States.

Hydro Leader: Please tell us about your background and how you came to be in your current position.

Doug Hartsock: I am a mechanical engineer by profession. I started out in the mining and mineral processing industry, designing copper and gold facilities around the world, and after a few years worked my way back to what had originally interested me in college: alternative energy, or what has today come to be known as renewable energy. For several years, I enjoyed designing biogas-to-energy plants powered by landfill methane. Following that, for 5 years I did something completely different and designed aerospace manufacturing facilities for Boeing. In 2001, I joined a small hydro consulting firm called Devine Tarbell & Associates, which has since been acquired by HDR. I then moved to an international hydro engineering and construction firm, Washington Group International, which eventually was acquired by AECOM, where I worked my way up to become the hydroelectric department manager.

I eventually realized that managing a group and the nontechnical and reporting responsibilities that go along with it wasn't my calling, so after 35 years of being a consulting engineer for a number of industries, I decided

The throttling knife gate valve is an economical outlet valve for many hydro applications.

to try my hand at something different: manufacturing. It occurred to me that Hilton Valve Company, whose valves I had specified over the years, was just 10 minutes down the road from where I live in the Puget Sound area. When I learned that the chief engineer at Hilton was planning to retire, I approached the company about helping expand its footprint in the hydro industry. In 2019, DeZURIK, which had acquired Hilton in 2012, hired me as a hydro applications engineer.

Hydro Leader: Please introduce DeZURIK.

Doug Hartsock: DeZURIK was founded in 1928 by a creative young engineer at a paper plant in Minnesota. One day, Matt DeZurik was asked to solve a problem that had been plaguing the pulp and paper industry: pine pitch–fouled valves. He designed the eccentric plug valve to solve the problem. That one solution led to the founding of DeZURIK, and 95 years later, DeZURIK has grown to approximately 700 employees. Along the way, it has acquired several large legacy valve companies: Willamette, Red Valve, APCO, and Hilton. Prior to the Hilton acquisition, the DeZURIK line was limited to cast-body valves with standard size and pressure ratings. Hilton gave DeZURIK the ability to custom design and fabricate larger valves from steel plate and standard steel shapes, such as angles and channels. Large valves are common throughout the hydro industry for handling the large volumes of water associated with reservoirs and dams. For example, Hilton can design a 9-foot-diameter knife gate valve rated at 40 pounds per square inch gauge (psig). It doesn't have to conform to higher conventional pressure ratings, such as 150 or 300 psig, which are often unnecessary at hydro facilities where the operating heads are often below 250 feet, or just over 100 psig. The ability to design a lower-pressure-rated valve can result in considerable cost savings.

Today, DeZURIK makes a wide variety of valves, from plug valves and butterfly valves to check valves and air release valves, not only for the pulp and paper industry, but also for the water and wastewater, mining, petrochemical, oil and gas, and hydro industries. We also supply valves that will be installed in carbon-capture facilities planned throughout North America.

Hydro Leader: Would you elaborate on your products and their applications for the hydropower industry?

Doug Hartsock: Hilton entered the hydro industry around 1976, when it supplied its first jet flow gate to Reclamation's Nambe Falls Project in New Mexico. Over the next 20 years, the company continued to occasionally build hydro valves. Around the year 2000, in response to interest in an outlet valve that would be less costly than the jet flow gate, George Stevenson, then Hilton Valves' chief engineer, conceived of the throttling knife gate valve with a friend of his, the renowned Reclamation engineer Lee Gerbig. Hilton supplied eight throttling knife gate valves to its inaugural customer, Pacific Gas & Electric Company (PG&E), in 2003. The throttling knife gate valve has since become our most popular hydro valve. It's an economical, low-head, controllable-outlet valve that can compete favorably against the jet flow gate or a fixed cone valve.

Hydro Leader: Who is your target clientele, and what markets do DeZURIK and Hilton serve in the hydro industry?

Doug Hartsock: We serve the owners and operators of hydro facilities and work closely with their engineers and contractors. Our larger customers include federal agencies, such as Reclamation and the U.S. Army Corps of Engineers, and state agencies, such as the New York Department of Environmental Protection and the San Francisco Public Utilities Commission. PG&E in California is a major public customer, as are a number of small water districts throughout California whose hundreds of reservoirs and miles of conduit, tunnels, and canals all need valves. Our hydro market target is primarily the low-level outlet valve, although we have also supplied valves for turbine bypasses and fish passage systems.

Hydro Leader: Where are the outlet valves used in a hydro facility?

Doug Hartsock: When dams were first built in the 1920s and 1930s, the designers predicted that the reservoirs would eventually fill with silt and debris. To anticipate this, they installed drains, or more specifically, sluice outlets, within the dams to pass the material downstream. The word sluice was first used in the California Gold Rush days, when sluicing sediment to reveal gold was a common practice. Unfortunately, sluice outlets didn't work as well as they were supposed to. Operators soon found that opening the sluice gates merely created a depression around the intake, while the rest of the reservoir remained full of sediment. They also discovered that debris could get stuck in the gate, something that kept them awake at night. As a result, sluice outlets were commonly abandoned and kept in a closed position. Years later, when regulatory agencies began to require the controlled release of water from reservoirs and dams to improve fish habitat and recreational activities, many owners retrofitted the sluice outlets to once again release water.

Hydro Leader: What drives the current demand for your valves?

Doug Hartsock: The requirement to release water for fish and recreation and to restore water habitats is the main driver. For owners, this requirement is often built into the relicensing process. When the owner of a regulated hydro facility in the United States applies for a new operating license every 50 years or so, the Federal Energy Regulatory Commission often mandates new water release requirements as a condition for receiving the license. The water releases are often very prescriptive, specifying that

the water has to be released in specific amounts during certain times of year. This renders the existing valves on many outlets obsolete, because they can only be operated fully open or fully closed—they can't be throttled. That's where the throttling knife gate valve excels.

Seismic regulations are also driving a demand for new outlet valves. In light of new, more stringent seismic requirements, hydro facilities in California in particular are being reevaluated to assess their survivability in an earthquake. Dam outlet works are being upgraded so that they can release water more rapidly if the dam is compromised by a seismic event. Then there's climate change, which seems to touch many things these days. In hydro, changing precipitation patterns can increase the probable maximum flood volumes that a reservoir sees and create the risk of overtopping. This requires them to be able to release larger volumes of water, which often means they need new or bigger outlet valves. More recently, climate change has also seen the advent of a new outlet design called multiple-level intakes. In warm climates, such as those of Arizona and California, the water impounded in a reservoir can thermally stratify so that the top level is warm and the bottom level is cold. Releasing only warm water from a reservoir can be detrimental to fish downstream. To mitigate this, regulators have required some owners to modify their outlet works by installing outlet valves at multiple elevations within the reservoir, providing the ability to blend water from cold and hot regions of the reservoir to optimize the temperature of the water released downstream. We're seeing an increased interest in this application, for which the throttling knife gate valve is the perfect solution.

Hydro Leader: What types of outlet valves do you make?

Doug Hartsock: The throttling knife gate valve is our most common valve, not just for the outlet but for what's referred to in the hydro industry as a guard valve, which is installed directly upstream of the outlet valve. The guard valve allows you to isolate, or dewater, the outlet valve for maintenance or repair. In an extreme case, if the downstream outlet valve fails, the guard valve can temporarily serve as the outlet valve. We also manufacture the jet flow gate, which was designed by Reclamation in the 1950s. It is a robust valve that is installed at several Reclamation facilities; the first ones were installed at Shasta Dam in California. Hoover Dam also has several large ones. We're currently designing what we believe to be the largest jet flow gates in the United States, at 90 inches in diameter, for Palisades Dam in southeastern Idaho. The fixed-cone valve, also known as the Howell-Bunger valve, is the least common valve that we supply. The fixed cone valve was originally designed to discharge freely in a large, expanding, radial pattern. In practice, you rarely see them operated this way because it creates a large discharge field. Not all hydro facilities have enough real estate downstream of the dam to receive the discharge without something getting very wet. To manage the discharge, Hilton worked with Utah State University's hydraulics laboratory to develop the baffled hood, which dissipates the discharge energy of a fixed-cone valve while greatly reducing the area of discharge.

Hydro Leader: How does an owner select a specific valve?

Doug Hartsock: The biggest factor is whether they want an energy-dissipating or a non-energy-dissipating valve. Releasing water from a dam is a powerful process, and when you dissipate that energy within the valve, the forces acting on the valve are tremendous. It's much easier on the valve if the energy is released downstream instead, absorbed by the tailrace or released into the air, a technique referred to as free discharge. However, there will always be instances in which the downstream conditions are too sensitive for free discharge. In this case, the energy must be dissipated either within the valve or by using a device such as the baffled hood I described earlier. Obviously, cost is also a factor. Of the valves I've described, the throttling knife gate valve is the most economical. Another important consideration is that owners might be more familiar with operating one type of valve rather than another.

Hydro Leader: What sets you apart in the industry?

Doug Hartsock: We're a custom designer and fabricator. We make valves out of standard plate as opposed to using castings, which often results in a more cost-effective design, particularly for large valves or when high alloys are required. We're also a U.S.-based company. At a time when manufacturing has largely moved overseas, we've found that many hydro owners prefer to buy valves manufactured in the United States. The federal government has even mandated this in recent legislation. A few other things that set us apart are our existing relationships with owners, engineers, and contractors within the hydro industry and the fact that we've been active in the industry since 1976. We're committed to hydro, which we believe is a key component of our energy and water future.

Hydro Leader: Is there anything you'd like to add?

Doug Hartsock: Sometimes, I sense that the hydro industry—not unlike a lot of industries—is becoming somewhat siloed. Owners, consulting engineers, regulators, and suppliers rarely leave the fields they entered after college. More by accident than design, I have had the benefit of working in a number of diverse industries during my career, exposing me to a variety of ways to approach or solve a problem. Something that I picked up early in my career designing a copper solvent extraction facility, for example, might have benefitted me when designing a landfill gas system. Therefore, for an industry like hydro to grow and solve the problems facing it, I believe we should encourage movement between the various silos. A consultant, for example, might cross over to work for a regulator or a manufacturer, and vice versa. I was on a call with a federal customer who was lamenting that one of the agency's more experienced employees recently transferred to another federal agency. I pointed out that it might be a good thing, because the individual is going to share what they learned at the previous agency with the new agency, and maybe someday an individual from another agency will come to the first agency and impart their knowledge.