

A sea change in the nuclear valve market

By Bob McIlwaine



In the next few years nuclear valves will represent only 4 percent of industrial valve purchases but will assume an important role in leading the industry through a sea change triggered by IIoT remote O&M, IIoW (Industrial Internet of Wisdom) and the creation of subject matter ultra-experts (SMUEs).⁽¹⁾

Nuclear power plants will spend \$2 billion for valves in 2018.⁽²⁾ Valve suppliers will also have an opportunity to carve out a slice of the guide, control and measure market which will be \$4.8 billion next year and will grow at 8 percent per annum over the next few years.⁽³⁾ The broader implementation of IIoT and remote O&M in the nuclear industry will allow suppliers of smart valves to increase revenues. Global nuclear power generation is now predicted to grow by 2.3 percent per annum out to 2035, mainly due to 11 percent annual growth in China. China's operating nuclear generating capacity will double over the next five years under the country's recently-published 13th Five-Year Plan. Worldwide valve investments will be ten times greater for existing plants than new ones. Service and remote monitoring will be 50 times greater for existing plants than new ones. Over 90 percent of the valve expenditures will be made by fewer than 50 companies. Thirty-nine percent will be made by just three operators and one supplier. Bechtel has completed more than 74,000 megawatts of new nuclear generation capacity, and has performed engineering and/or construction services on more than 80 percent of the nuclear plants in the United States and 150 worldwide. It employs 2,200 nuclear professionals, which include approximately 150 internationally recognized technical specialists who have been published widely, and have participated in developing

industry standards and guidelines. It is a major influence in ten percent of the combust, flow and treat decisions.

Decision makers

EDF has acquired Areva and then restructured the new nuclear plant reactor business to allow minority share purchases by Mitsubishi Heavy Industries and Assystem. In addition to operating 70,000 MW of nuclear power in France the company is negotiating the sale of nuclear power plants in China, India, South Africa and Saudi Arabia. It is responsible, therefore, for 20 percent of the nuclear valve purchasing decisions. Korea Electric Power (KEPCO) is a nuclear power operator with a capacity of 23,116 MW. It is operating 25 nuclear power units as of 2016 with five under construction. It will make five percent of the valve purchasing decisions in 2018. Exelon has consolidated nuclear power operations in the U.S. and is now operating plants with a capacity of over 19,000 MW. It will make four percent of the nuclear valve decisions. IIoT and remote O&M will create the equivalent of thousands of continuous total cost of ownership analyses. Nuclear valves are high performance products whose quality justifies a price above the minimum specification. These valves are sold based on perceived total cost of ownership. In the past it has been very difficult to analyse total cost of ownership of various high-

performance valves. As a result, high performance valves have been sold the same way as the general performance products. The sea change is the new ability of the nuclear plant to determine the lowest total cost of ownership (TCO). This will only come, however, if IIoT is empowered by IIoW. With this tool the corporate buyer will have the TCO for each of the alternatives and make his decisions accordingly. The main role of the sales group will be to make sure the buyer has an accurate TCO. IIoW utilizes the data analytics provided by IIoT and provides the interconnection between end users, suppliers, and subject matter experts to create the TCOs and more importantly create new products with lower TCOs. The interconnections need to be as prolific in IIoW as in IIoT. They include:

- Supplier personnel in each product group and geography interconnecting with peers around each of the top nuclear purchasers
- Owner-operator personnel in each plant and in each role interconnecting around processes and products used in more than one of the plants
- All players interconnecting with each other in new ways
- User controlled groups expanding scope to create decision systems and through digital technologies become international (suppliers with lowest TCO can support and sponsor this activity)
- Supplier controlled groups focused on total cost of ownership studies

Nuclear Power Plant Combust, Flow and Treat Purchases 2018 - \$ millions					
	World	EDF	Bechtel	KEPCO	Exelon
Percent	100	20	10	5	4
Guide	1400	280	140	70	56
Control	2200	440	220	110	88
Measure	1200	240	120	60	48
Valves	2000	400	200	100	80

- Associations expanding role to create decision systems and periodic webinars to integrate with annual meetings
- Individual User programs for suppliers expanding to create IloW (examples are AEP Bro Forum)
- Creation of Subject Matter Ultra Experts (SMUEs). Tomorrow's experts will master the massive TCO data generated from IloT. The SMUE will need to be very focused and to continually utilize and help create the decision systems around his speciality. The suppliers of the high-performance products with the lowest TCO products will benefit from the SMUE validation of their claims.

Group interaction

The interaction among groups now takes place without the support of organized support. For example, Velan's model of collaborative development began early in the 1950s and 60s. Over the years, the company has worked with a number of nuclear organizations including the US Navy, Atomic Energy of Canada, AREVA, and Westinghouse and utilities such as Duke Energy and Ontario Power Generation to establish new levels of safety, reliability, and maintainability of nuclear

valves, and electric actuators. Recently, Velan has been at the forefront of qualification testing to address safety issues raised by the Nuclear Regulatory Commission (NRC) and Electric Power Research Institute (EPRI). To ensure that critical motor-operated valves close during "worst case" scenarios, Velan worked closely with Duke Energy and others to design and rigorously test special gate valves that can accommodate larger and heavier actuators that provide greater access for installation of thrust and torque sensors on the stem.

The Motor-Operated Valve Users' Group (MUG) is a forum of member nuclear utility representatives formed for the exchange of technical information relating to the testing and maintenance of motor-operated valves (MOV) among the utilities and in coordination with other organizations within the nuclear industry for the increased reliability and safety of nuclear power.

The annual conference & expo of the MOV & AOV Users Groups takes place in January 2017 at the New Orleans Marriott. If this group were to expand its activities to include quarterly webinars and organized access to papers it could serve the international nuclear community. It could create decision guides similar to ones appearing on

the McIlvaine website.⁽³⁾ These could be continuously improved by subject matter ultra-experts who both take advantage of and improve the decision-making process. This segment of the valve market should be closely watched by all valve suppliers. The potential to greatly expand valve revenues with smart products and services applies in all applications needing high performance but the need and likely adoption is even greater in the nuclear industry due to the safety and environmental challenges.

References

- (1) Industrial Valves: World Markets published by the McIlvaine Company
- (2) Nuclear Valve Markets published by the McIlvaine Company
- (3) IloT & Remote O&M published by the McIlvaine Company

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