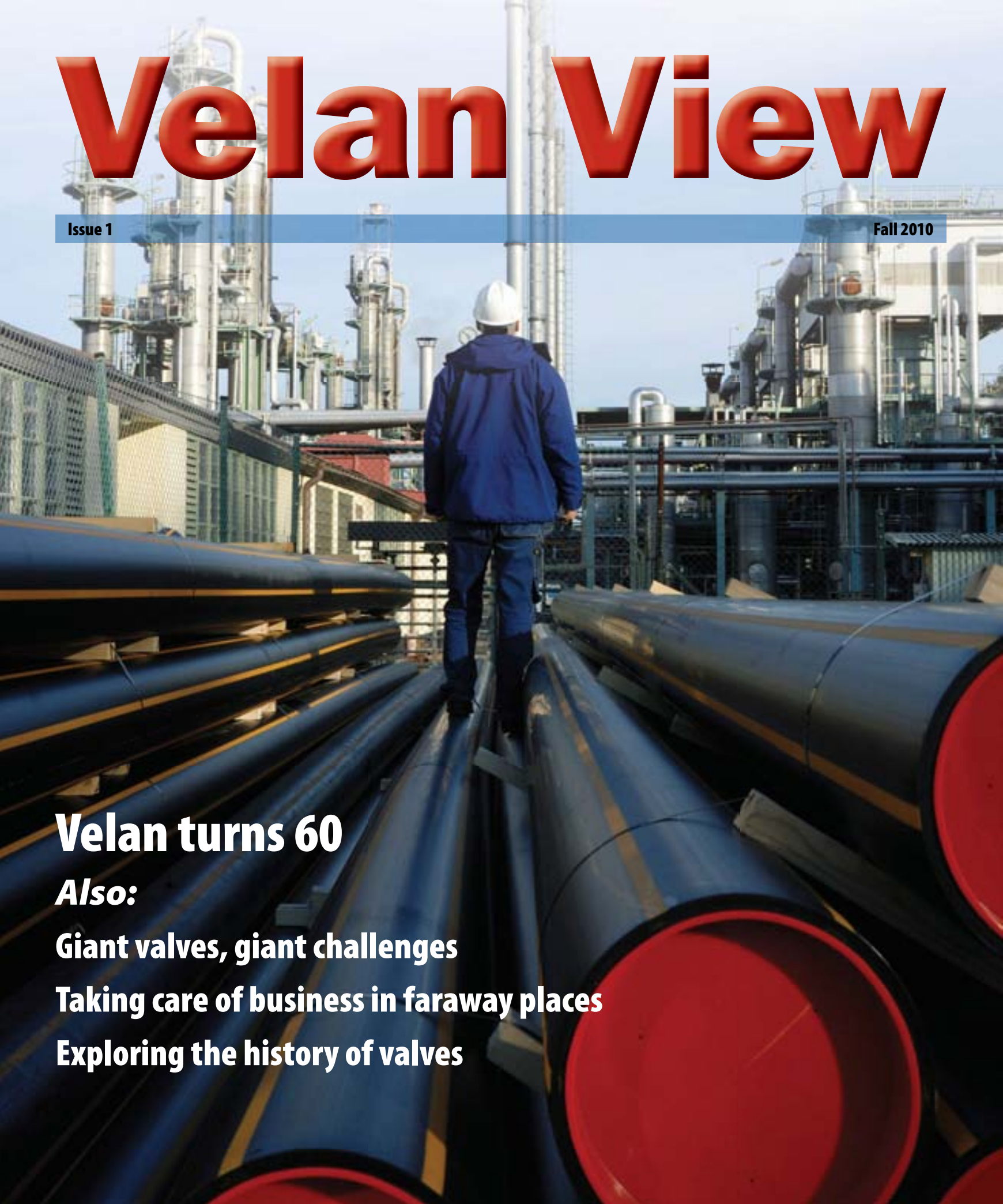
# Velan View

Issue 1 Fall 2010



## Velan turns 60

***Also:***

**Giant valves, giant challenges**

**Taking care of business in faraway places**

**Exploring the history of valves**



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# President's message:

## How far we've come in 60 years

This year we are proud to be celebrating our 60th anniversary. It was 1950 when my father founded the company shortly after arriving in Canada as a political refugee from communist Czechoslovakia. The company was named Velan Engineering, and the strong focus on engineering and innovation has continued to be a foundation for success. Now we are launching *Velan View* magazine, using the expertise of our people as well as the knowledge within our larger community of distributors and end users worldwide.

***What started out as one man's vision and hard work has grown to 1,690 people working together in a global company.***

Within these pages, we'll profile the wide range of industries we work in—starting in this issue with nuclear (page 6). We'll also feature articles by industry experts such as Greg Johnson, who takes us step-by-step through some of the most important valve innovations accomplished over the years (page 24). We'll share first-hand accounts of challenges faced in valve manufacturing. We'll celebrate the wealth of knowledge we have at Velan by talking to people like Ralph Sargent, Vice President of International Marketing, who's been part of our team for over 45 years (page 10). And we'll talk with innovators in the fields of design and R&D like Gil Perez, Vice President of Engineering, and Mirek Hubacek, Director of Design, Quarter-turn and Dual-Plate Check Valves (page 19). In our ongoing "Valves without borders" articles, we'll spotlight real-life adventure stories, tagging along with some of our field service people as they travel to exotic and hard-to-reach customer sites around the globe (page 12).

There is a proverb that "The more things change, the more they stay the same" and this has been true here at Velan over the past 60 years. We went from mailing letters to telex to faxes to emails but as the speed of communication accelerated, the business fundamentals didn't change so much. While we modernized our plants with the latest equipment to improve productivity and quality, it still takes hard work and attention to detail to turn out a consistently top quality product. The drawing boards have all been replaced by computers but this hasn't changed the need for talented designers and innovative ideas. Our customers have high expectations, and we are committed to offering the quality products, services, and long-term value that they are looking for.

What started out as one man's vision and hard work has grown to 1,690 people working together in a global company. I am very proud to be part of this company for the last 37 years. Our people have accomplished a lot during the past six decades and we still have a lot to do to continue to grow our company into the future.

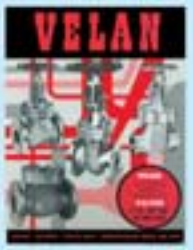
I wish you happy reading!

Tom Velan

# Velan celebrates

## 60 1950-2010







1950 1953 1958 1964 1970 1976

**1950**
- A.K. Velan founds Velan Engineering.

**1953**
- Patent for bimetallic steam traps.

**1954**
- First overseas manufacturing plant, Velan Engineering Co., Ltd., in U.K.

**1956**
- First U.S. plant in Plattsburgh, New York.

**1958**
- Supplied 8,500 new technology bellows seal valves to Oak Ridge National Lab's research reactor.

**1961**
- Velan GmbH started as sales office in Germany.

**1964**
- Launch of API 600 cast steel valve product line.

**1968**
- Second plant built in Montreal.

**1970**
- First valve company to receive ASME "N" stamp for nuclear valves.

**1972**
- Development of first "live-loaded" packing chamber.

**1974**
- Joint venture in France with Rateau (later bought by Alstom), to focus on nuclear industry.

**1976**
- Opening of fourth plant in North America, this one dedicated to cast steel production.

**1978**
- Opening of U.S. manufacturing plant in Williston, Vermont.

**1980**
- Velan expands distribution network in U.S. with Vinson appointment.

**1984**
- Velan receives patent for Y-pattern bonnetless valve.
- New plant in Montreal for large forged valves.
- Launch of Memoryseal® ball valves with patented seats.

**1986**
- Established metal-seated ball valve product line in partnership with Peter Kindersley.

**1988**
- Opening of first Korean manufacturing plant.

**1989**
- Start-up of Velan Portugal.

## History
**Founded in 1950**

## Sales
**Over $400 million**

## People
**1,690 employees**

## Global network
- **13 production facilities**
- **5 plants in North America**
- **4 plants in Europe**
- **4 plants in Asia**
- **4 stocking and distribution centers**
- **Hundreds of distributors worldwide**
- **Service shops worldwide**

**Photo credit: Velan**



**1984** **1999** **2000** **2004** **2008/09** **2010**

### 1990
- Introduction of Total Quality Management program.
- Velan named one of Canada's 50 best managed companies.

### 1991
- First North American valve manufacturer to obtain ISO 9001.
- New plant in Taiwan to produce small ball valves.

### 1996
- Velan goes public (TSX).
- Juwon Foundry established in South Korea.

### 1997
- Acquisition of Proquip™, a manufacturer of dual-plate check valves and Securamax™, a manufacturer of severe service metal-seated ball valves.
- Cast steel gate and ball valves qualified to TA LUFT emission standards.

### 1999
- Opening of new Head Office and Plant 5 in Montreal.
- Velan acquires 100% of French joint venture, strengthening its leadership in nuclear and cryogenic valves.

### 2000
- Velan celebrates its 50th anniversary. BP awards "Environmentally friendly valve" status to cast steel valves.
- Launch of Torqseal® triple-offset valves.
- Second plant opened in Ansan City, South Korea.

### 2003
- Tom Velan became President of Velan.

### 2004
- A.K. Velan named Pioneer in nuclear valve technology by *Valve World,* international magazine on valves.
- Launch of Total Process Improvement program (TPI).

### 2006
- A.K. Velan is awarded the first ever "Valve World Fellow" award by *Valve World.*

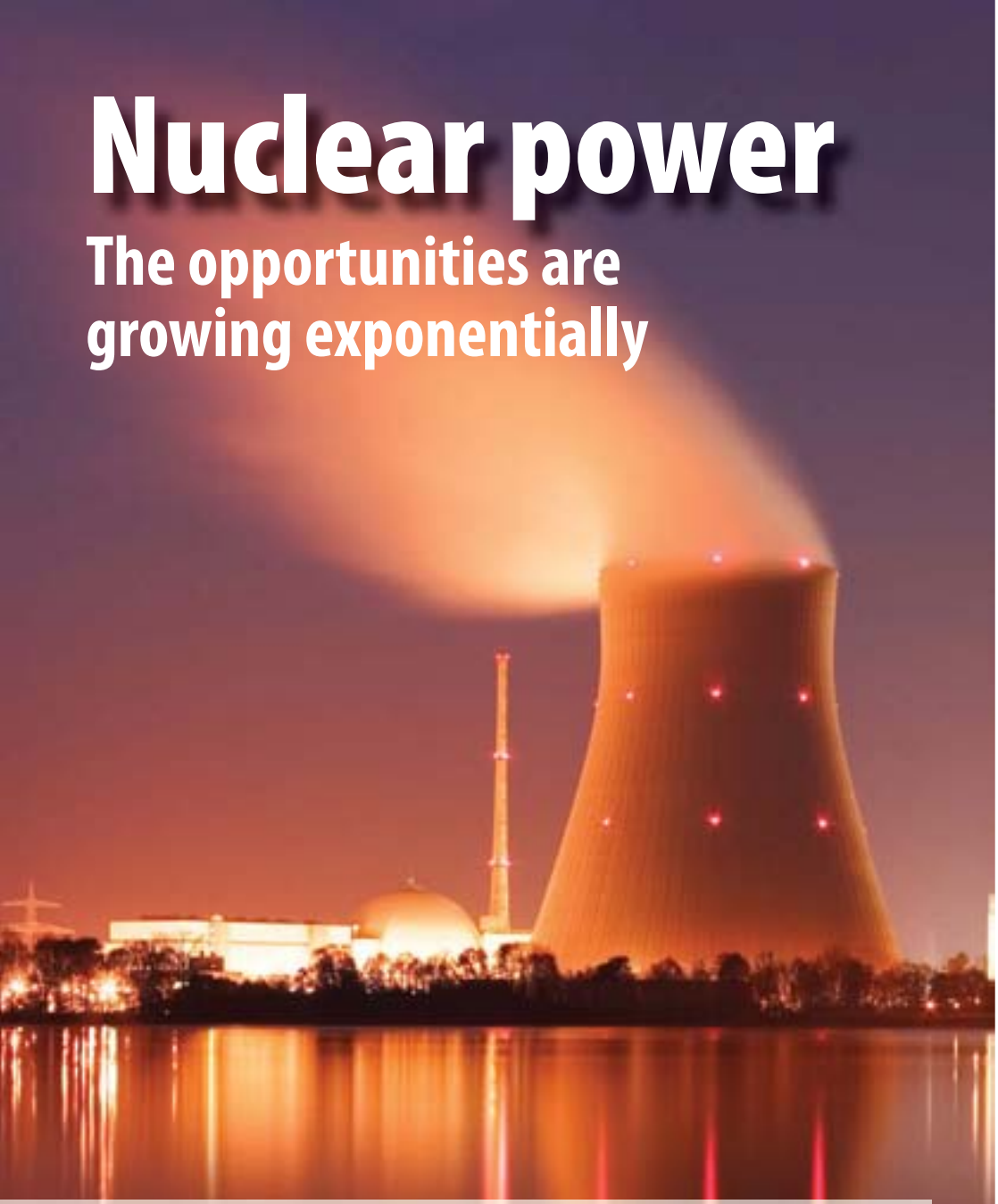
### 2007
- Acquisition of controlling share of Segault, a French manufacturer of valves for the nuclear and navy industries.

### 2008-2009
- Expansion in Montreal–Plant 5 extension: 45,000 ft². New plant: 78,000 ft².

### 2010
- Expansion in France–$5.6 million investment in plant and equipment.
- Launch of new *Velan View* magazine (Fall Issue).

# Nuclear power

## The opportunities are growing exponentially



**Most experts agree that there are forces at work today that are joining together to paint an ever-more attractive backdrop for the nuclear industry. Because of Velan's long and successful participation in this industry, the company and its distributors are well positioned to take advantage of abundant opportunities.**

Photo credit: iStock

Fueled by the combination of increasing concern over greenhouse gas emissions and growing acceptance of nuclear power by the general public as a viable means to generate electrical power, the nuclear renaissance is steadily gaining momentum worldwide.

"Global warming has forced the world to look for the cleanest source of energy, and right now that source is nuclear," says Ron Lippy, Senior Manager, Engineering Programs for True North Consulting, who has spent much of his career training on or talking about nuclear standards and safety.

Lippy's comment is backed up by the latest statistics. According to the Nuclear Energy Institute (NEI), nuclear power plants generate about 70% of all carbon-free electricity in America. Lippy adds that, "unlike the late '70s and subsequent decades when the media was largely negative about the nuclear industry, it's currently being embraced by both the media and the public as a 'green' alternative to less environmentally friendly energy sources."

At the same time, recent surveys also show that the general public "has a much higher acceptance value than they've ever had in the past because they have come to grips with the fact nuclear is the most abundant source of carbon-free energy," says Mark Gake, Engineering Manager in Black & Veatch's nuclear business. The NEI said in a June newsletter that three out of four Americans now favor nuclear energy, which is a rise from about half in 1983. Those who "strongly favor" nuclear energy now outnumber those who "strongly oppose" it by more than three to one.

Its importance is also served by the fact that the world's use of electricity is growing rapidly. The International Energy Agency reports that the use of consumer electronics such as flat screen televisions, MP3 players, mobile phones, and other tools will triple electricity consumption by 2030.

In some areas of the world, the acceptance and use of nuclear power is already well underway. In France, for example, three-quarters of the electricity the country uses is

*Velan supplied the first contract for nuclear bellows seal valves in 1958.*

generated by nuclear power. That compares to about 15% in Canada and about 20% in the U.S. Worldwide, the percentage stands at about 14%.

As of June 2010, 29 countries in the world were operating 438 nuclear reactors, and 58 new plants were under construction. According to "Emerging Nuclear Power Countries: Market Analysis and Forecast to 2020," by GlobalData, global installed nuclear capacity will increase by more than 35 gigawatts by the year 2030, and the majority of this added capacity will come from emerging nuclear power countries, which will add about 60 reactors by 2030.

## Velan's role in that global nuclear mix

Velan has been a major player in the nuclear markets almost since its inception. Because of the company's involvement with the U.S. Navy, it first started producing the type of tough, top-quality valves needed to run nuclear-powered submarines back in 1950. "We have an established relationship with the U.S. Navy we've developed over the years as we worked with them in many areas," says Velan founder and CEO, A.K. Velan. "We've pioneered many valve technology innovations that have later become standards in a wide range of industries. For example, the Navy was quick to standardize on forged valves up to 24 inches because of their greater strength and reliability. These forged valves have since found widespread preference in fossil power plants, commercial nuclear power plants, and in super-critical power plants in particular." Velan R&D also developed the first bellows seal valves in the 1950s to address the need for zero-leakage and the first live-loaded packing chambers in the early 1970s.

In 1970, Velan became the first valve company to receive the ASME's "N" stamp accreditation, and it is one of the very few valve companies to have maintained that North American nuclear standard for 40 years.

The company has been working with nuclear organizations and power companies since the early days, collaborating with the U.S. Navy, Atomic Energy of Canada, AREVA, Westinghouse, Duke Energy, Ontario Power Generation, and others in establishing new levels of safety and reliability. It collaborated with the U.S. Nuclear Regulatory Commission and the Electric Power Research Institute in developing qualification testing and, most recently, with major power companies to test special gate valves that can accommodate larger, heavier actuators to provide greater access for installation of thrust and torque sensors on the stem.

"We've gained a great deal of invaluable experience by working in the nuclear industry for so many years," says Tom Velan, president of the company. "Our R&D, design, and manufacturing processes were all defined by the stringent standards of the nuclear industry, and we have always tried to apply that experience to other markets, be it for power generation, chemical and petrochemical, oil and gas, coal liquefaction, pulp and paper, mining, cryogenic, or the ship-building industries. It's all about ensuring safe and reliable performance over time."

## What valves can do

Much of what valves do in the nuclear power industry has to do with the shut-off or control of water, steam, and coolant through critical points in nuclear plants, as well as nuclear submarines. To accomplish this, Velan manufactures gate, globe, check, ball, and Torqseal™ triple-offset valves to the exacting standards of the regulatory bodies that control nuclear industries throughout the world.

According to Christian Schweiger, Nuclear Program Manager and Export Compliance Manager for Velan, the biggest difference between the valves produced for nuclear and those produced for some other industries is the durability requirements. "Nuclear valves have to last up to 60 years. They are very high quality valves, and there are many extra steps in the manufacturing and quality control process to ascertain the nuclear-grade levels of quality."

Most of the plants operating today (about 85%) are second-generation plants. The difference between first-generation plants,

*A Velan bolted bonnet gate valve in a PHT transfer system in a CANDU nuclear reactor.*


*Velan SAS specializes in nuclear gate, globe, and check valves, as well as cryogenic butterfly valves for LNG terminals and carriers.*

which were built up until about the end of the 1990s, and second-generation plants are additional layers of protection and reliability that have given the industry an impressive safety record. (NEI says plants in the U.S. have operated at nearly 92% capacity rates since the year 2000, which compares to about 71% for coal and about 41% for natural gas plants.) Because Velan has been involved since the early days, part of what the company produces is for these legacy plants, and one area of opportunity going forward is in upgrades to existing plants.

**Schweiger comments that:**
***"At Velan, we serve our existing customers with aftermarket replacements and upgrades, and obviously also look to new plant construction going on worldwide as a potential market for the future."***

"Many plants were originally designed and built for 80 years, but the regulatory process (in the U.S.) limited that time to 40 years," Lippy comments. "What a lot of plants are doing now is going for extended intervals, as well as extended output capacities. That presents the same opportunities as building new plants and will result in more and more orders for new valves, as well as all the other parts that go into a nuclear plant," Lippy says. These non-nuclear-specific valves are known as "balance of plant" valves.

Schweiger comments that: "At Velan, we serve our existing customers with aftermarket replacements and upgrades, and obviously also look to new plant construction going on worldwide as a potential market for the future."

## Global opportunities, new areas

Velan has a head start over many other suppliers to the industry because of its already strong global presence (as well as its many years in nuclear). When the nuclear industry flourished in the 1970s, the company established a joint venture to manufacture valves in France, where nuclear power has been strong since the beginning. Velan-Rateau (later Alstom-Velan) was that joint venture, and the company took full ownership in 1999.

The company further strengthened its position in 2007 with the acquisition of a majority interest in Segault, which is a major supplier to plants as well as the French nuclear navy. The acquisitions added many new products to the Velan nuclear valve line, including main steam isolation valves, instrumentation valves, solenoid valves, and safety valves. But the company is also looking at other countries to expand its reach, as well as producing valves for the newest generation of nuclear plants.

According to Gake, the interest in nuclear power now stretches around the globe.

"There is a huge build out underway in China and India—even the United Arab Emirates recently signed a contract for new nuclear units, which is fairly remarkable given its history as an oil-producing country. And there are other countries such as Vietnam that have never had nuclear energy in the past that are currently exploring the building of new units," he says.

The other area of growth is the newer Generation III plants, which are already in operation in Japan and under construction

*Christian Schweiger, Nuclear Program Manager and Export Compliance Manager for Velan.*


Photo credit: Velan

*Velan forged bolted bonnet check valves in active nuclear plant drainage.*

or approved for construction in Europe, South Korea, and China. The new plants have features designed to be even more safe and reliable, as well as cost effective and efficient. The facilities have innovations such as improvements in fuel technologies, superior thermal efficiency, additional redundancy in active safety systems, and standardized designs that greatly bring down the costs for maintenance and initial capital investments.

These plants are where many new innovations in valve technologies are occurring, according to Schweiger.

"Today's most advanced nuclear power plants—Generation III+—require much stricter safety margins for motorized and actuated valves. This leads to the use of very high-strength materials such as Inconel for internal parts," he says.

Velan produces a wide range of these innovative new valves, including three-way globe valves in large sizes, high-pressure gate valves, and RADUR/RAMA bellows seal valves. Some of the newer valves must address new requirements to be cobalt-free to reduce dangers of radiation exposure. They are also designed to be even more durable with projected lifetimes of 60 years.

Velan also developed a full range of modular maintenance valves—valves with seat replaceable in-line in less than 15 minutes—to reduce the dose level of workers during outages.

"Europe and other parts of the world have already accepted the need for nuclear power and are ahead of North America in making it happen. But even in Canada and the U.S., the interest has increased tremendously as those countries look for cleaner fuels. That means nuclear will be a growing opportunity for Velan on both sides of the ocean," said Tom Velan. |V V|

## Velan's most recent nuclear contracts

Like the nuclear industry itself, Velan's reach in this field is global in expanse and growing year by year as the industry expands. Some of the more recent work is:

- **Velan SAS in Lyon, France,** received orders for nuclear valves for 24 stations in China for over $200 million and for two in France for over $30 million.

  The subsidiary was selected by the China Nuclear Power Engineering Company to supply high-pressure forged valves for six nuclear power plants in China, a country where a lot of action in this industry is occurring. The plants are in Hong Yang He, Ning De, and Yang Jiang, and the valves will be supplied this year and in 2011.

- Also, EDF in France awarded a contract to **Velan SAS** for additional valves for the European Pressurized Reactor Flammanville 3. This is on top of other maintenance and service orders for several French nuclear power plants.

- **Velan Inc. in Montreal** received a contract early this year for valves for a nuclear power project in Slovakia. The contracts were for nuclear gate, globe, check, and butterfly valves for the Mochovce nuclear power plant in Slovakia.

***Mr. A.K. Velan was presented with a framed illustration of this next-generation USS Gerald R. Ford-class nuclear aircraft carrier by Northrop Grumman Newport News in honor of "his dedication to supporting the construction of our nation's warships."***

Illustration credit: Northrop Grumman Newport News

# The challenge of making giants

**One of the ways a company gains the experience it needs to grow is by being handed a challenge that requires new ways of thinking and acting.**

*Ralph Sargent, Vice President, International Marketing, standing next to a 36-inch class 300 gate valve manufactured for the Chiyoda Corporation in Japan.*

Such was the case for Velan when it won the contract for producing big valves in large quantities for a liquefied natural gas (LNG) project for Chiyoda Corporation in Japan.

"We had never been asked to produce valves of this size and this quantity," says Syed Ahmed, Manager, Export Marketing for Velan, who was in charge of the Chiyoda project. "The largest 600 class valves we'd delivered before this were 24 inches."

The Chiyoda valves ranged in size from 14 to 40 inches and most were in class 600. Velan had about 16 months from the time the order was placed to deliver the valves.

"This order was close to $20 million, and it included not just one or two of these very large valves, but a great quantity in a short amount of time," says Joe Calabrese, Director of Marketing for Velan. Forty-six of the more than 740 valves delivered were of the largest dimension and size.

## Go big or go home

Chiyoda's valves were made for one of the largest LNG facilities in the world, a high profile project in Qatar that continues to expand in size. LNG is the process by which natural gas is extracted from the ground, then converted temporarily to liquid (through temperatures that go down to -162°C/-260°F). Converting it to liquid decreases its capacity by 600 times so it can be stored or transported to other places in the world. Once the liquid arrives by special cryogenic ships, it is brought up to the temperatures that turn it back into gas, and it's pumped through natural gas lines for uses such as residential and commercial energy. Many of the places the gas is shipped are areas of the world where natural gas resources are scarce while the need for the gas is high, such as Europe, Korea, and Japan.

The process of turning the gas into a liquid is done in what is referred to as a "train," which is a single unit for liquefaction. The valves that Velan manufactured for Chiyoda were for several of the largest trains in the world—Trains 6 and 7. When completed this year, they will have the capacity to produce 7.8 million tons of LNG per train per year.

Velan has a long, successful relationship with Chiyoda, a company that has been engineering and building energy facilities around the world since 1948. "This was a unique project and order and, because of our history with Chiyoda, they had full confidence we could do this special job," Calabrese says.

However, Ralph Sargent, Vice President, International Marketing, adds that: "To handle these huge valves for Chiyoda, we had to come up with ways not just to machine them, but to move them about, test them, and ship them out."

*Syed Ahmed, deep in a "sea of valves"—part of the Chiyoda shipment.*

### A new way of thinking

Producing the largest valves for the Chiyoda project fell onto the shoulders of Velan's Plant 2, where most of Velan North America's custom-built jobs are manufactured.

"Machining valves when the body itself weighs almost 23,000 pounds requires a different way of thinking. We had to start, of course, with a quality body, and we are fortunate in that our foundry (Juwon Specialty Steel, Korea), produces top-quality casting for us," says Yvon Castonguay, General Manager of Plant 2. The next step was "to come up with special tooling methods to handle the really large flanges and other parts, and we had to have a way to move the valves down the line," Castonguay adds.

When the valves were in the aisles, cranes could be used to move them about, but the cranes would not fit between the aisles so special dollies capable of carrying extremely heavy weights were used to move them from bay to bay.

Some of the largest valves weighed over 19 tons each. To test such large valves, they had to be laid on their sides using reinforced cranes. A special tank was built, then the cranes were used to hoist and lower the valves into the tank. The valves received temperature tests (they had to be tested at -46°C/-51°F); hydrostatic tests (in which the body cavity is filled with water, then pressurized to see if any portion of the valve would leak past the seat or through the body); and helium tests (injecting helium into the valve, then using "sniffing" sensors to detect if there is any leakage through the packing chambers).

To move the valves around the testing areas, into the painting area, and then into the shipping area, Velan invested in a special 80,000-pound lift truck (fondly called "The Beast" by those working with it in the plant).

Once the valves were machined, tested, and painted, they were loaded into special containers and transported onto cargo ships for delivery in Qatar.

Originally, Plant 2 thought that they'd have to build their own special shipping boxes around the valves, but when they went to push the giant valves into the containers "they fit with just a half inch or so on each side of the valve," Castonguay says. "Now that's a tight fit!"

The last valve for this particular shipment went out in 2008. But the testing tanks, reinforced cranes, special lift truck and the staff that gained experience from the challenges remain ready for action as Velan bids on the next trains for LNG production.

"LNG is a growing industry, and plants such as the one where Trains 6 and 7 are located keep adding capacity, which means piping and valves need to have greater capabilities, and more and more of them are needed," Ahmed says.

> ***"Although we cannot foresee what future jobs may bring, once you've successfully managed a project like this, the types of challenges you will face are definitely more predictable."***
> **— Ralph Sargent**

As Sargent explains, no two jobs are ever exactly the same, but: "We've already faced the issues of size, pressure class, and the logistical challenges of moving such huge and heavy valves from one work station to another, then maneuvering them around for testing. Although we cannot foresee what future jobs may bring, once you've successfully managed a project like this, the types of challenges you will face are definitely more predictable." |VV|

# Valves without borders

**In this and future issues of *Velan View*, we will be taking a look at the Velan team members who travel far and wide, doing whatever it takes to get the job done in an ever expanding business world.**

We start with people who have to be ready to go anywhere in the world on a moment's notice: the field service technicians. Acting as complements to Velan's large global network of authorized service shops, these intrepid explorers must be on call to support Velan products as needed once they're installed onsite.

## A truly diverse job

According to John Verners, who as Velan's Director of After Market oversees and hires Velan's field technicians, he tells people he's interviewing for the job how unique the position is. The uniqueness comes from the diversity of people with whom the potential technician will interact, as well as the day-to-day duties. That reality is both the excitement of the job and, ultimately, the biggest challenge.

"Our field service technicians are the liaison between customers who have any issues with a product once it's shipped from the factory and Velan. That can mean warranty claims or troubleshooting or anything related to how our product operates in the field," he says.

Since Velan's products are used in what are often very demanding applications across the globe, the job also means: "Our guys are on call to fly anywhere in the world at a moment's notice," Verners says.

To succeed at such a job requires a truly unique combination of personality type and technical knowledge. Technicians need a detailed and expansive knowledge of Velan's product line, and they have to be adept at working with people from cultures that usually are very different from their own. At the same time, "they are the face of this company, and what they do touches upon every aspect of the Velan operation," Verners says. For example, before traveling to the job site, the field service technician does extensive research collecting data throughout the company and talking to anyone who was involved with the job.

"We pull all supporting documentation—from how the valve was quoted, to what its specs are, to the machining drawings and the manufacturing order. The technician takes this data with him because he has to understand what he'll be faced with once he's in the field," Verners explains.

Even armed with all that information, a technician never knows exactly what he's going to encounter once he gets on site. "No matter how good your products are—and we have the best—no process runs perfectly all the time, and some of these products are operating under severe circumstances. That's the nature of our business. The key is to have people in place who can

Photo credit: iStockphoto

quickly solve a problem or issue should one arise," Verners says. That means having top-notch technicians on call and ensuring they have full access to engineering and other support staff back at the head office while they're out in the field.

"We tell our guys, you aren't there to make all the decisions. You're there to represent the company and walk a customer through a solution. We—Velan's staff at home—are here to back you up," Verners adds.

Because Velan's product line is so diverse and the issues and locations are so wide ranging, field technicians not only need to possess an extensive technical background, they also need the resourcefulness and creativity to adapt to each new situation, Verners says. "These guys are problem solvers and they have to be able to think on their feet. They may be facing a whole team of people who are stressed out because things are not going smoothly onsite, and they have to be able to ease any potential tensions. What's more, they might be going to a very remote location where the onsite team might not have the tools or expertise to help with the issue—and typically there's little possibility of finding the solution locally. To further complicate matters, the issue itself could be something really simple—or very complex.

"We advise our field service technicians to think of how they would deal with a worst-case scenario right upfront. If you can deal with the worst that could happen, you can deal with anything in between," he says.

For example, Verners cites a case in the Middle East where Velan had quoted a large service job with many parts, some drop shipped to the site directly from the suppliers, all of which had to be done very quickly.

"Everything was lined up, all parts were there, everything was prepared properly. Then, as we got into the work, we discovered one of the parts from the supplier was wrong. And unfortunately it wasn't something that we could have known about beforehand, because it had been shipped directly from that supplier to the site," Verners explains.

Faced with a scant 20-hour work window on a weekend, the technician had to locate a local shop with the expertise to modify the part to make it work.

"Even though you think you're prepared, somebody or something will inevitably throw a wrench into the gears. Consequently, you have to deal with every situation as a one-off," Verners says.

Photo credit: Velan

*This Velan 8-inch class 1500 metal-seated ball valve is installed in a pumping station 2,600 meters above sea level in a copper slurry environment.*

# Grace under fire: Speaking with François Martel

For François Martel, Field Engineering Service Technician, the term "pressures of the job" has a whole new level of meaning. In the past, for example, job stress has meant being escorted to the job site by machine-gun-armed guards, working with radiation levels so high he can only be on the site for brief periods, learning how to avoid poisonous snakes and spiders, and having his son meet his incoming plane at the airport to provide a fresh suitcase of clothes so he can get on yet another plane to travel halfway around the world.

Martel gained his own personal expertise through schooling and many years of experience, both with Velan for the past eight years and in his previous job traveling the globe to help set up new pulp and paper factories. He explains why being a field technician changes with every single job and why such a diverse background is needed.

*A rare moment of rest for François Martel.*

***"Two years ago we were working on a site where I had just two minutes to do what I had to do. Then we had to wait another six hours before we could work on the project again because of the radiation coming off the valve," Martel explains.***

"Nuclear power plants, refineries, chemical and petrochemical processes—each of these have their own specifications and situations," Martel explains. For example, "when we work with nuclear power plants, we always have a full day of safety training before we can get access to the sites," he says.

And with many of the processes in the field today, security protocols must be followed. For example, since the events of September 2001, North American nuclear power plants require a machine-gun escort to a site, a situation that François and his team members now take for granted. In some situations, such as working with oil companies in Saudi Arabia, he may be tested for drug and alcohol use. In some nuclear site visits, he has had to get radiation shots for protection against high levels of exposure. He tells this story as an example:

"Two years ago we were working on a site where I had just two minutes to do what I had to do. Then we had to wait another six hours before we could work on the project again because of the radiation coming off the valve," Martel explains.

In some locales, he's worked in extreme heat; in others, extreme cold. For example, in January of 2009 he was in New Brunswick, where the howling winds contributed to -31°C (-24°F) temperatures. This summer, he traveled to Qatar, where the thermometer hit 52°C (125°F). On one particular trip in May of 2009, he had to go from sunny southern California, where temperatures hit highs, to New Brunswick, where it was snowing. To ensure he had the right clothes, he arranged a stopover back at Montreal's airport long enough to have his son run a suitcase with new clothes out to the airport for the second leg of the trip.

Martel says he believes one of the most critical aspects to his job is to be able to stay calm under circumstances that can be trying at best.

"One of the most important rules in doing this is that if you show a customer an emotion such as stress—you lose control of the situation. You have to show that you are like a duck—you look pretty calm above the water but underneath the water your feet are paddling like mad…"

That requires the creativity John Verners mentioned because no two problems are the same, and it sometimes comes down to challenges as simple as lack of the right mechanical tools on site. At one point in his travels, Martel had to craft an open wrench from a steel plate and a sledge hammer from a log and strap.

"We have strong support back in the Velan home office and computers are vital to getting the job done, but we are often cut off from civilization," Martel explains.

And then there's the simple reality that job sites don't tend to be luxury places. "When you talk about traveling, some people see you in a comfortable hotel. That is not the case much of the time. In fact, I've been in places that are so dry the hotel staff checks to see how many water bottles you've drunk to make sure you won't get dehydrated," Martel says.

### Tricky circumstances

It can also place a person in sticky situations, though thankfully that doesn't happen very often. For example, Martel took a trip in December 2005 to Columbia during a period of political instability. On that trip the client had originally arranged for safe passage back


*François Martel (right) and a co-worker, Stéphane Charrier (left) from Velan SAS, visit a site for Canaport LNG in St. John, New Brunswick. The temperatures were extremely low that day and the wind so strong the facility was almost closed, but since his work took him inside the valve (see below) and out of the wind, the work went ahead. It was considered "work in a confined space" with oxygen being monitored for safety levels and the hardness of the valve being tested in case it needed to be pulled out of line in an emergency situation.*


to the airport, but the transportation fell through and a cab driver was called.

"When you see the sign for the airport clearly pointing in one direction, and the cab takes a sudden turn that you know is in the wrong direction, it's not a good sign. Even though my cell phone was getting no reception, I pretended it was and began talking rapidly. It must have made the taxi driver nervous because he made a quick U-turn and took me to the plane," Martel says. There, to add to the drama, he had to go through 13 levels of security just to get onboard because security at the time was so tight.

***"We have strong support back in the Velan home office and computers are vital to getting the job done, but we are often cut off from civilization," Martel explains.***

So with all the challenges, does Martel like what he does? "I can't say I always get a good night's sleep when I'm on the job—my mind is on whatever the problem is that I'm there to solve. However, when I come back from a job, I have no regrets about what I did. Every time I go out, I know I will be facing a different issue, so the job doesn't ever get boring or predictable.

"I also work for a company that stands behind its products so I can take pride in representing them in the field," he adds. |**V V**|

Velan View *will be talking to other field technicians in future issues, as well as the other departments that deal with global travel and its inherent challenges.*

# Unplanned shutdown?

## It's all in a day's work at the Jean-Gaulin refinery

**Located near Lévis, Quebec—approximately a three-hour drive north east of Montreal—the Jean-Gaulin refinery produces refined products from crude oil for the Canadian market and is run by Ultramar, a division of Valero Energy Corporation.**

Photo credit: Ultramar

A Fortune 500 company based in San Antonio, Texas, Valero is North America's largest independent petroleum refiner and marketer, supplying fuel and products through its 15 refineries and 10 ethanol plants stretching from California to Canada to the Caribbean.

Through key players in its distribution network, Velan has had a relationship with Ultramar for over 20 years, helping ensure that the refinery is kept well supplied with the valves they need to stay up and running. That supply/demand model was put to the test this past spring, when a broken pump resulted in a fire at the refinery.

The last word a refinery wants to hear is "fire," because the term "shutdown" is sure to follow closely behind, and whenever a shutdown occurs, the need to get valves and other equipment into place quickly becomes critical. This particular fire started in the middle of the night on February 2, 2010, and was extinguished by the morning of the same day. However, the temperature at the time was -25°C (-13°F), which meant major freezing of some areas (it took four days just to break the ice to make it safe for the workers). Although the fire affected only one unit, shutdown of that unit had a domino effect that paralyzed a good

portion of the refinery.

Velan's quotations department was put on alert immediately and went into high gear. They were told that all inquires about supplies to Ultramar were to be answered the same day and rush handling charges for valves in stock were waived, as were extra fees for rushing items through production.

## The dreaded shutdown

For Yves Lachance, Project Manager, and Michel Roberge, Procurement Coordinator for Major Projects at Ultramar, a shutdown means going into overdrive as they do everything they can to get the valves and other supply parts they need to get operations back to normal as soon as possible. "During a shutdown, we're buying bolts, nuts, and gaskets one minute, then someone says we have to replace a bundle on a heat exchanger or some special valves as priority one. We just keep jumping from one item to another, from small requisitions to big ones, from formal requests to calls for tender," Roberge explains. "Thankfully, unexpected shutdowns don't happen often."

Lachance adds that: "During regular operations, we have management meetings to keep track of daily activities and, of course, stay on top of transferring approved requisitions into purchase orders. We communicate with our key suppliers like Velan to make sure that they have received the orders and are acting on them—and especially that they understand the urgency of an order. We do a lot of expediting to make sure that everything is on track, and we coordinate transportation with the suppliers."

In other words: "All our days are very, very busy," he explains.

As far as shutdowns go: "I would say the main difference between a planned and an unplanned shutdown is that during a normal day we can obviously schedule our work better. We can plan what we will do in the morning and in the afternoon will tackle something else. During shutdown we operate on demand so it's more of a service department situation," Roberge explains.


*Michel Roberge, Procurement Coordinator for Major Projects (left), and Yves Lachance, Project Manager (right), at Ultramar.*

## The importance of being on the AML list

All suppliers that Roberge and Lachance rely upon are on an Approved Manufacturers List (AML). "This list," explains Roberge, "was put together by Valero at our head office in Texas. It contains references from each of the group's refineries and is the result of a rigorous audit of hundreds of regional and global manufacturers."

It's this simple, he says: "We have to make sure we have best-in-class products. This is our go-to list of suppliers and manufacturers in six key areas of operation, such as mechanical equipment, electrical equipment, and instrumentation. It's not a personal decision when it comes to selecting top-quality products. It's the result of a lot of audits and analysis."

Here's how the process works for Ultramar: "Each time we go to tender, the bidder's list is prepared by the buyer. It's then reviewed by our engineering group, inspectors, and project managers. When the prices come in, the bid is presented to all these people and once an agreement is made, a final recommendation goes to management. Only then is an order placed. The level of approval will vary depending on the value. For example, we would not disturb top management for an order of $25 but we sure would for an order of $500,000!" he adds.

> ***"It's not a personal decision when it comes to selecting top-quality products. It's the result of a lot of audits and analysis."***
> **— Michel Roberge**

"The big challenge for us is to find a supplier that can provide a turnaround as fast as we need to keep operating," Lachance says. "We need a company that has dedicated shop space, adequate manpower, and highly skilled resources for design and inspection. The company also needs to be able to work really closely with us so we know we have immediate access to a large inventory of products, like valves, etc. Good prices are one thing, but if the manufacturer only has a limited number or limited selection of items instead of 20, 30, or 50 of each, that won't work for us. That's why a manufacturer of custom-made equipment, such as Velan, is a good fit for us," he adds.

## The law of constant improvements

Besides buying equipment for everyday operations and maintenance, and shutdown, Ultramar's procurement/projects staff is called upon to find the right equipment and products for major new or expansion projects. Between 1998 and 2008, Ultramar completed several such capital projects at the Jean-Gaulin refinery, including the expansion of the fluid catalytic cracking (FCC) unit, the addition of one crude unit—resulting in a significant increase in throughput capacity, the expansion of the capacity of the tank truck loading racks, and modernization of the wastewater treatment facilities. To reduce feedstock costs, the refinery was adapted to allow it to process a wider range of crudes. A significant part of the investment was intended to reduce the benzene content in gasoline and the sulfur content in main fuels (gasoline and diesel). These investments were made to meet government regulations, as well as the company's own high environmental standards.

For example, "In 2000/2001 we built a new crude unit here to treat Sahara crude from Algeria," Lachance explains. "Then in 2005, we decided to revamp this unit and double its capacity. I would say 75 to 80% of the original piping has since been replaced by bigger pipes and bigger valves with new pumps." The crude unit was built in anticipation of future oil crudes having a potential of high naphtalic acid. As Paul Dion, Velan's Vice President of Sales, Canada, says: "Crude's high naphtalic acid meant we had to do research into less conventional alloys. We eventually explored a CF3M alloy, which proved to be far more resistant in these aggressive services."

## Relationships matter

The relationship between Velan and the project and procurement engineers at Ultramar is critical to the success of both companies. As Lachance explains: "It is very important for a distributor and a manufacturer to work in unison and to know their client. For example, for a major project, we try to pre-purchase 70 to 80% of the bulk valves in the first order so at least we get a lot of material to get started and can then build on that strong base as needed. We also give a priority to longer delivery items like the less common alloys and more custom valves that are designed according to NACE (National Association of Corrosion Engineers) standards. We may store some valves for a year, then all of a sudden that urgent call comes through, and we're ready to get them working in the field."

For Roberge and Lachance, the secret to getting their refinery up and running fast and keeping it at peak performance is: "Instead of having 50 suppliers for one product and changing suppliers every second day, we try to deal with just a few good ones that will understand what we need and are prepared to work hard with us on inventory so there are no surprises," Roberge says. Lachance adds that, "It sounds obvious, but if you keep changing your suppliers all the time, you'll never build a good relationship with them. They won't trust you, you won't trust them, and chances are they might only keep an inventory of high orders from certified bodies so when you approach them with your special requirement they won't have it. And that's just plain bad for business," he concludes. |VV|


*Velan valve installations at the Jean-Gaulin refinery.*

## About the Jean-Gaulin refinery

**The Jean-Gaulin refinery in Quebec** is one of the most modern and efficient refineries in North America. The refinery relies on foreign crude oil for feedstock, which is received by ship at its deepwater dock on the St. Lawrence River. The refinery's location allows it to receive year-round shipments of crude oil from large crude oil tankers, including large, single cargoes up to one million barrels. Furthermore, the Jean-Gaulin refinery charters large crude oil tankers that are double-bottomed, ice-strengthened, and double-hulled so that they can safely navigate the St. Lawrence River in the winter.

The refinery's storage capacity is 8.7 million barrels for crude oil, intermediate, and refined products (such as gasoline, jet fuel, diesel, home heating oil, butane, and #6 fuel oil) and the plant can also accommodate liquefied petroleum gas in its pressurized storage vessels or tanks. The total throughput capacity recently reached 265,000 barrels per day.

Ultramar is a Canadian oil refining and marketing company formerly known as Golden Eagle or Aigle d'or. Its head office is in Montreal. It is a subsidiary of Valero Energy Corporation, which acquired Ultramar's former parent company, Ultramar Diamond Shamrock.

# The thinkers behind products and technology

## Velan's research and development team

*Marc Hébert, one of Velan's Non-destructive Examination Inspectors, performing magnetic particle testing to visually detect minor surface defects on a special stem.*

Velan's reputation for innovation can be traced to a commitment at the highest levels of management to provide the latest and best products using the most advanced technology available and to a dedicated team of engineers, designers, and technologists.

"We're constantly being challenged to solve tougher applications that involve higher temperatures and pressures, more difficult media, and longer service life," says Gil Perez, Velan's Vice President of Engineering.

That's because as the world evolves, new applications are created and existing ones are pushed to new limits. Velan's valves also must evolve, not just to keep up with needs, but to ensure that the new valves are safe and durable and that they perform as expected.

"Safety, qualified designs, and proven reliability are key concerns for all of our customers. At Velan, we combine our experience in proven designs with state-of-the-art techniques and technologies, and disciplined product qualification in meeting our innovation goals," Perez says.

### Velan's facilities and team

The company's primary R&D department is housed in a dedicated 6,000-square-foot facility in the company's largest plant in Montreal: Velan SAS also has extensive R&D facilities (more on that in the next issue of *Velan View*). In both facilities, the teams conduct a broad range of activities from researching the latest materials to testing Velan's products to certain limits and qualifying them for different applications. This is the evolutionary arm of R&D, the one that results in constantly improving Velan's products, as well as coming up with new ways to use them.

It's only part of the picture though. The R&D staff also conducts many project management activities that could involve outsourcing to other research facilities or working with other laboratories and universities with expertise in specific areas, which might be labeled the "revolutionary" arm of R&D.

"We often go outside our own four walls to get the expertise we need to answer some of the more complex challenges and draw knowledge from among research leaders," Perez explains.

Inside Velan's walls, Velan's dedicated research facility and the R&D staff is

managed by Vahe Najarian, Corporate Manager, R&D. And beyond that facility, "research and product development is part of the larger engineering team at Velan and works closely with all engineering disciplines, including analytical, design, and materials engineers, as well as our team of manufacturing process engineers," Najarian says.

***"Velan is very interested in cross-pollinating ideas because that's the best way to ensure we're always at the forefront of new technological advances," Perez says.***

## Sources and issues

A good portion of R&D projects and needs for Velan spring from the product management staff.

"Our people come to us with voice-of-customer concerns where a client has a new or challenging application and existing solutions either haven't been developed or haven't performed as well as required. We then have to develop something new for that particular need," Perez explains.

Another source within the company is field service technicians (see story on page 12), those people tasked with going out into the field to assess how valves are performing and answer customer concerns.

"We use their input and feedback from customers to find solutions to problems or challenges, and then those solutions are used for innovations and to fine-tune better ways of doing things," says Perez.

However, the company is also tasked with addressing some of the top recurrent issues in valve design, and they often work with other labs and experts to address those areas. Two good examples would be fugitive emissions and coating technologies.

In the area of fugitive emissions, "this is one of the hottest topics in our industry today, a perennial issue where the bar is constantly being raised. We are pushing steadily to meet and exceed industry demands," says Mirek Hubacek, Director of Design, Quarter-turn and Dual-Plate Check Valves.

Christan Beguian, Manager of Testing and Development, explains that: "We work with other facilities and with our own suppliers on this issue, trying to come up with better solutions to fugitive emission concerns."

As far as coating technology, "we have a comprehensive program to evaluate and develop multiple coating technologies from relatively conventional welding-type overlays to HVOF-applied coatings, state-of-the-art nano-coatings, and beyond," he explains.

Sometimes the development is not done in a physical laboratory, but rather on a computer with modeling.

"Our analytical engineering team is tasked with providing in-depth engineering support in areas such as finite element analysis for stress, thermal, and flow modeling," says Stan Isbitsky, Corporate Manager, Analytical Engineering.

And sometimes the research and development is not for the product itself, but rather the process of making the product.

"In production engineering, there are always innovations occurring on a routine basis in areas such as machining technology, new materials, welding technology, and much more," Perez explains.

## Testing, testing

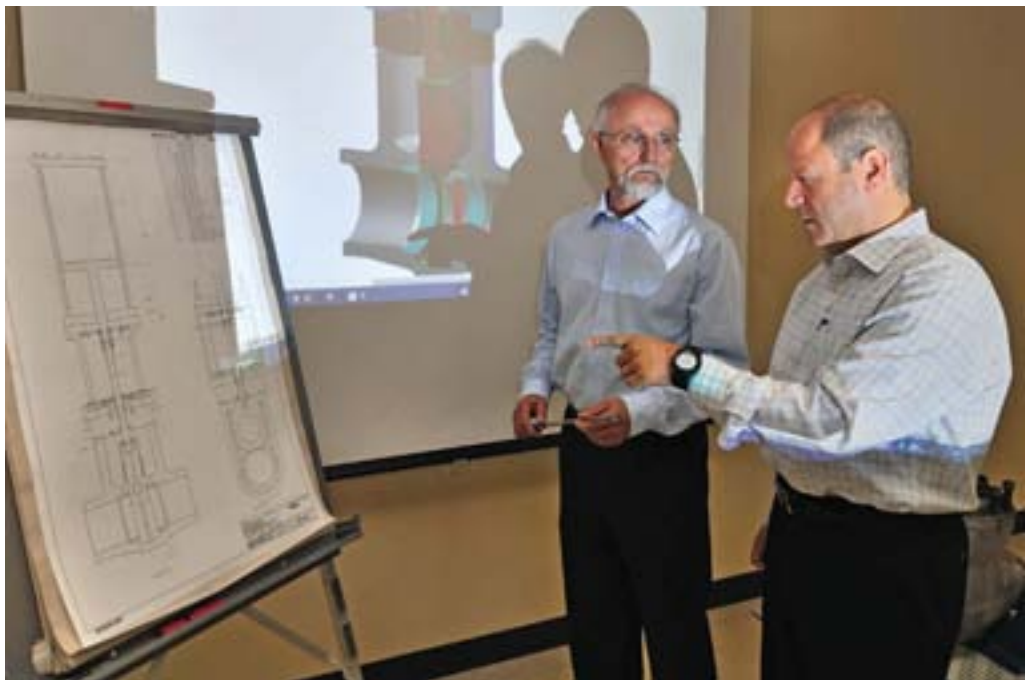
One of the areas where R&D staff spends a lot of its time is on testing products to determine how they will perform in the field. Testing capabilities range from individual tests in areas such as mechanical properties, fugitive emissions, material microstructure, and Cv to full life-cycle testing and qualification of new valve designs.

"We have some pretty advanced technology available to us today for testing products and their designs," Najarian says.

"We do air and water flow loop testing, mechanical cycling, cryogenic testing down to -196°C (385°F), thermal testing up to 2,000°C (3,632°F) and autoclave high-pressure testing at temperatures up to 250°C (482°F)," he explains.

Sometimes the same methodologies that are used for conventional testing are used on an issue that's more complex, but at a deeper level.

For example, "with coatings, we might



*Mirek Hubacek (left), Director of Design, Quarter-turn and Dual-Plate Check Valves, with Gil Perez (right), Velan's Vice President of Engineering.*


*Velan's David Jones is hydrotesting a motor-operated coker ball valve. First, all electrical connections to the motor must be verified, and then the shell and back seating of the stem are tested. Finally, gasket pressure tightness tests are performed.*

get down to evaluating the microstructure, which is not typical production testing," Najarian says. In such a case, Velan might work in tandem or lead a project that involves outside laboratories, research facilities, or universities.

In addition, "We hold all major industry certifications, including ASME Section III, ISO 9001:2000, PED, and API 6D," Hubacek adds.

The final piece of the R&D picture—qualification of the products—gains in importance as the industries Velan serves evolve and expand.

"Qualification is the last stage of the design and development process where you must prove to everyone that you've achieved the design requirements and specifications. This runs a pretty broad gamut from analytical work such as computational analyses to proof testing the product under extreme conditions," Perez explains.

For example, a valve that must meet certain seismic requirements might just be analyzed by having the data on it run through computer models, or it may be statically tested in Velan's facilities or dynamically tested at an outside laboratory," Perez says.

"Some industries are quick to embrace new technologies, others tend to be more conservative," Perez adds. "The companies we work with have so many mission-critical processes going that they can't risk implementing anything that isn't tried-and-true. There's simply too much at stake. In the nuclear industry, for example, there's tremendous concern about safety, and so proven performance comes first. That's why our product testing and qualification are so rigorous," he says.

Whether the valves must handle liquid helium at near absolute zero -272°C (-458°F) in the world's largest particle accelerator at CERN, Geneva, Switzerland (where many Velan valves are used); are four-way coker switch ball valves that must handle one of the refining industry's toughest services; or are valves for main steam isolation service in operating nuclear power plants, Velan has the capability to deliver because of its continued commitment to R&D, innovation and reliability.

### Strength in partnerships

The Velan R&D department's heavy involvement with outside experts accomplishes several goals for the company.

Outside labs and testing facilities are often used when research within Velan's current facilities wouldn't be cost effective or where specialized equipment, resources and expertise are required.

"Velan is very interested in cross-pollinating ideas because that's the best way to ensure we're always at the forefront of new technological advances. As much as this industry focuses on stability and safety, it also demands continual advances in design and materials to ensure valves offer enhanced performance in increasingly severe applications," Perez says. |VV|

## Sharing the process of development

Velan representatives frequently are called upon to share technical knowledge with outside experts as part of general research. But recently, they were asked to share information on the process of research itself and how it fits into decisions on developing products.

Several groups of visitors came to Velan to ask about Stage-Gate, a process of managing the innovation pipeline, analyzing opportunities, and pushing new technologies with the best potential forward. At each Stage in the process, the technological and business issues are evaluated and developed in increasing detail. Each Stage is then followed by a Go/No-Go Gate to decide whether further effort and investment are justified. Successful projects become fully commercialized.

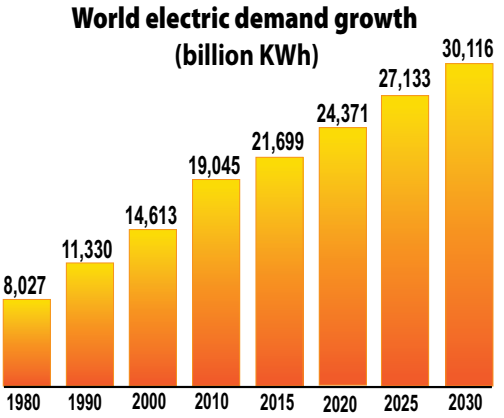
Stage-Gate is an important tool in helping to set priorities for corporate resources in the pursuit of product development objectives.

The two groups that visited Velan to learn about the company's Stage-Gate process included: 1) executives from a major paper company and 2) senior-level business people participating in an executive MBA program at several universities.

"These visits gave us a chance to exchange ideas on how such processes work—what works for us and what needs to be improved. Because we have a process already in place, it allowed both our visitors and Velan to study product development from a real-life standpoint," says Luc Vernhes, Design Manager, Securaseal™ Ball Valves.

# Out of the recession.....

**The Valve Manufacturers Association of America holds a Market Outlook Workshop each year to take a look at the economic health of a broad spectrum of industrial sectors. Speakers also gaze into their crystal balls to predict where each segment might be headed in the short and long terms. Given the economic woes of the last couple of years, the outlook presenters, who gathered in San Francisco, California in mid-August, were more challenged than ever by trying to forecast what's to come. However, they generally agreed this recession's end started in 2009 and will likely be over by 2011 or 2012, and a double-dip recession is not likely to occur. They also cautioned that, because of a wide spectrum of factors such as lack of progress on creating new jobs, the year 2011 may not be nearly as bright as some had hoped.**



*Source: NEI*

## Here are a few highlights from the industries Velan serves:

### Power

**Current:** Power generally lags behind other end-user industries when it comes to recovery, according to Michael Halloran, Vice President of Robert W. Baird and Company. But there are many long-term trends that point toward tremendous need. He predicted world energy consumption will have grown 49% between 2007 and 2035. Branko Terzic, PhD, Regulatory Policy Leader, Energy & Resources, Deloitte Services, LLP, said that almost 70% of electricity still comes from fossil fuel. At the same time, he said two-thirds of the world's scientists believe global warming is caused by human action. This means nuclear and renewable energy sources will become a reality, but that the world will need power from all sources, a notion supported by several speakers.

**Outlook:** While electricity consumption in North America has actually fallen in recent years because of the economy and the weather, forecasters believe it will increase going forward. Terzic said it will be up 4% for 2010 and about 0.4% for 2011 in the U.S., for example. Developed regions of the world will focus on replacing infrastructure, modernizing facilities and changing needs brought on by regulatory changes, including more nuclear.

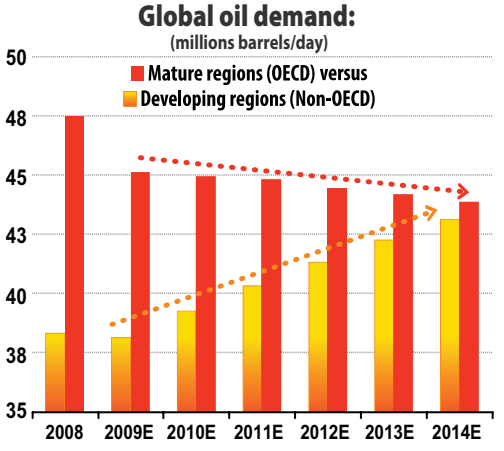
### Nuclear

**Current:** The nuclear industry is one of the brighter spots in industry today, pushed along by its growing acceptance as a way to meet the increasing need for electricity so that it doesn't contribute to greenhouse gas emissions. Keith Porter, Director of New Construction for Nuclear at Curtiss-Wright Flow Control, said that nuclear energy, at 1.72 cents per Kilowatt/hour (KWh) (1.84 cents Canadian), is now cheaper than coal, at 2.37 cents (2.53 cents CAD) per KWh, and it was already cheaper than gas (6.75 cents or 7.20 cents CAD per KWh) and petroleum (9.63 or 10.27 cents CAD per KWh). At the same time, governments are putting into place new rules and procedural changes that make it easier and faster to build new facilities.

**Outlook:** The need for valves for nuclear going forward is great. No worldwide figures were given at the workshop, but it's projected that in the U.S. alone, the first eight nuclear plants slated to be completed could require as many as 24,000 valves.

### Oil and gas

**Current:** The industry saw some growth this year—rising about 1 to 2% per year—but most of the growth is coming from emerging markets, said John Spears, President of Spears and Associates. Horizontal wells, which drill across instead of up/down and directional wells, which go down for awhile, then drill at a slant, are changing the face of the industry in North America, he said, but they require fewer wells and therefore, fewer valves, he added. During this year, oil prices held higher than expected, while gas prices fell, and the disparity has meant drilling efforts are more regional than they used to be (oil in certain areas, natural gas in others).



*Source: IEA*

# ..slowly

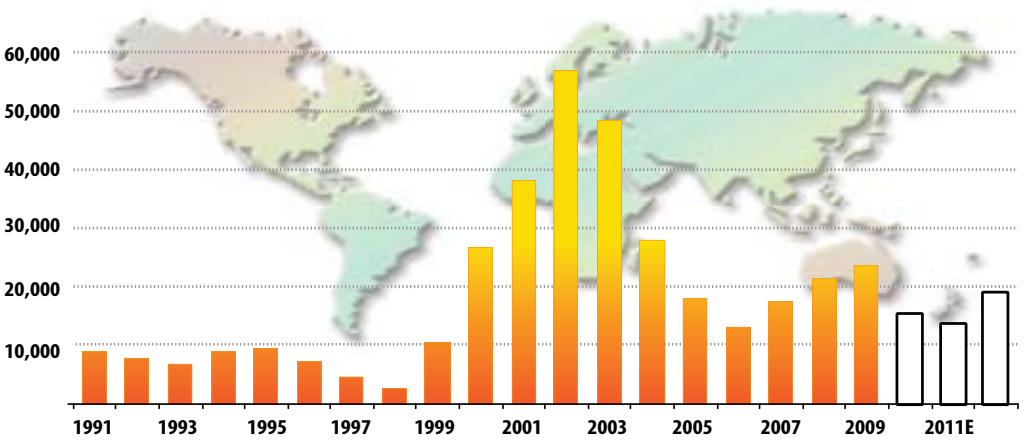
**Outlook:** Oil and gas prices will remain steady through the end of 2011. Gas drilling will decrease 20% while oil drilling will grow 50% through 2011.

## Refining

**Current:** Forecasting what will happen in all phases of oil and gas—from upstream to midstream and downstream—is hard given the industries multi-faceted pressures and fluctuating prices. However, speaker Mark Peters, Vice President, Group Publisher, PennWell Corporation, brought up one long-term trend the world is watching: the development of national oil companies (government-controlled oil companies). These NOCs now control 77% of the world's reserves, and some of the countries are using that fact as a diplomatic tool (Venezuela, Iran, and China). Many of them also control refining, and in the Middle East, there is movement toward turning the Persian Gulf area into another Gulf of Mexico, where much of the world's refining has occurred. For international oil companies, such as Shell and Exxon, one of the great game changers going forward will be unconventional sources of oil and gas, including the heavy oil found in the sands of Canada, Peters added. The refining industry in North America will see significant declines in new building (down by about 10% in the U.S. next year, for example), he said. However, biofuels will play a bigger role.

**Outlook:** New energy legislation in North America, driven by the Deepwater Horizon disaster, may decrease capital spending on this side of the ocean even further, so most new spending will take place in developing areas of the world. Ethanol, however, is rising worldwide in demand. For example, it will increase to become about 20% of the marketplace for transportation fuel in the U.S. by 2020 (compared to about 12% today).

**Global power capacity additions**




*Source: EIA*

In the long term, global demands for oil will grow 30% by 2025.

## Mining

**Current:** Just before the economic crash, new investors who were not miners by trade had started getting into the industry, said Steve Ralbovsky, Partner, PricewaterhouseCoopers. As the crash was happening, commodity prices started falling also, and between those two events, stocks in mining fell even deeper than in other industrial areas. Commodities have started to rise back from their lows, but the industry now faces a number of political challenges, including the mentality that mining should pay hefty taxes. In Australia, for example, mining faces a possible "Resource Super Profits Tax" of 30 to 40%.

**Outlook:** Companies in mining will continue to divest some of their operations to keep profits up. However, the industry offers opportunities for emerging nations that need infrastructure construction (mining companies often must put in the roads and facilities that go to remote areas). Also, Ralbovsky said uranium mining is about to pick up.

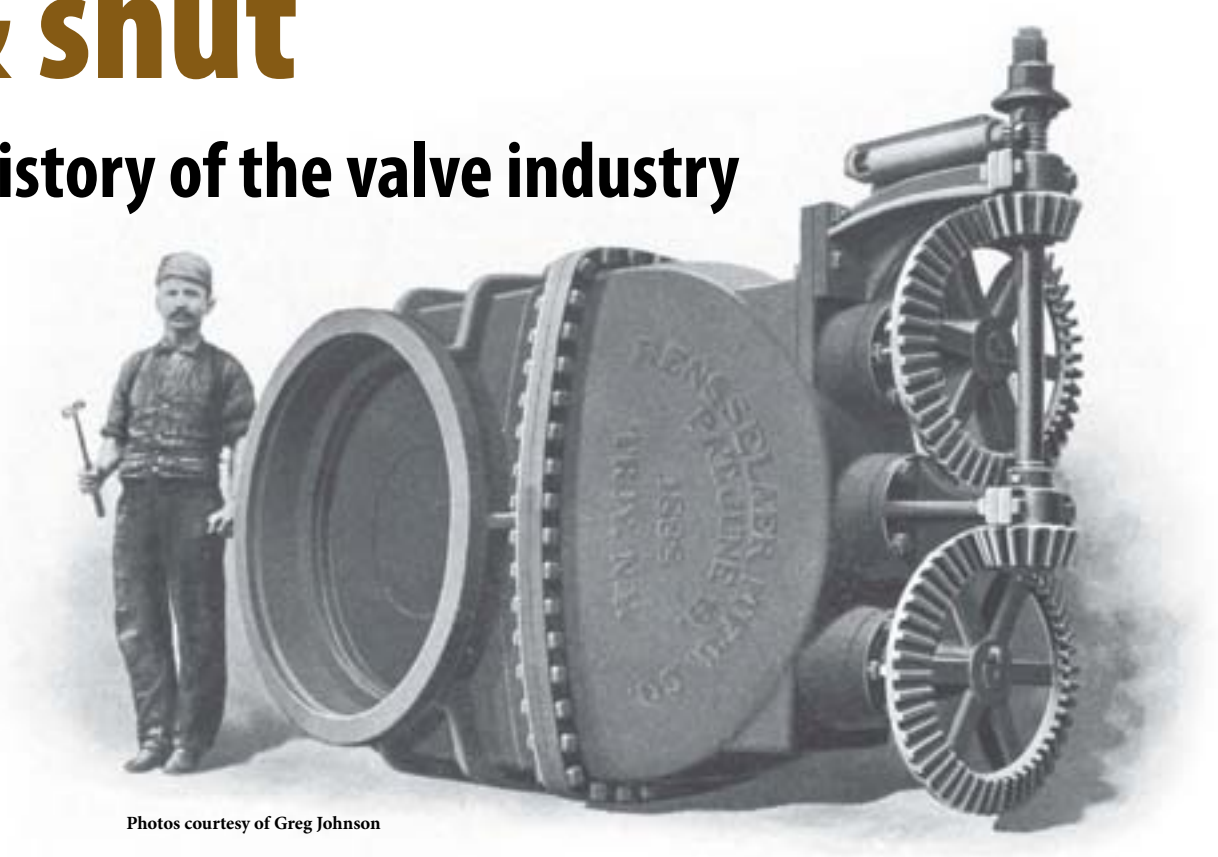
## Pulp and paper

**Current:** The U.S., Canada, and Europe are well-positioned as producers of pulp because of the raw materials they have, said Michael Armstrong, Vice President of Advisory Services, PricewaterhouseCoopers. China, on the other hand, must import a good portion of its pulp. The paper industry itself has become a vertical industry with certain companies producing certain types of paper and some smaller companies experiencing success by specialization and by locating their companies close to where the trees and pulp mills are found. However, the paper industry all over the world is suffering some realities, such as the fact newsprint and paper for printing books is giving way to electronic communications, including the new electronic books. Still, in developing areas such as China, consumer needs have increased for goods such as tissues and containerboard.

**Outlook:** Pulp demand will grow steadily over the coming years as downstream paper demands recover. |VV|

# Open & shut

## The evolving history of the valve industry



**The industrial revolution and the American valve industry have marched side by side since steam engines were first built in the 1830s.**

***By Greg Johnson***

Photos courtesy of Greg Johnson

Many factors have affected the industry during these years, such as world wars, the discovery of new energy sources, and the invention of new alloys and materials.

What's more, even though most valve designs were conceived during the late 19th century and early 20th century, the very first valves as we know them can be traced even further back than 2,000 years.

Today, valve engineers may think they are breaking new ground when they boot up AutoCAD and draw up a new valve design. But oftentimes that new design was actually unveiled decades or even centuries before.

Take the plug valve for example. During the early 1900s, numerous patents for plug valves were launched, most notably by Sven Johan Nordstrom. But examples of bronze plug valves were unearthed in digs of many early Roman Empire archeological sites. These plug valves were of a bronze alloy that amazingly is nearly identical to the ASTM B62 bronze chemistry still in use today. An interesting tidbit about early Roman valves and piping is that unlike in modern times, where the builder or manufacturer of the valve cast its name upon the valve, back then the property owner's name was cast in raised bronze letters on the valves and piping.

Like many advanced-for-their-day Roman inventions, valve technology got lost in the fog of the dark ages and was not resurrected until steam needed controlling around the end of the 18th century. The steam-powered industrial revolution then rapidly accelerated the need for quality piping products, particularly valves.

The coming deluge of valve patents began with a trickle in the United States in 1839.

*Early Roman plug valve.*

That was the year the first valve designs were registered with the U.S. Patent Office. The official first valve patent was a very simple open-system hydraulic sluice gate. However, later that same year, a few plug valve patents were also granted. The first real gate valve patent was issued in 1840, and surprisingly the early valve doesn't look all that different from some of today's gate valves.

Valve design between 1850 and 1875 was dominated by globe-type valves. The biggest fluid control need of the period was controlling and regulating steam flow, and the globe valve was the best design for the job. The period from 1850 to 1900 also saw the birth of many of the major iconic companies in the valve industry. Powell, Crane, Lunkenheimer, Jenkins, and Grinnell all started their empires in the second half of the 19th century, and all with patents for globe valve designs!

### The influence of steam

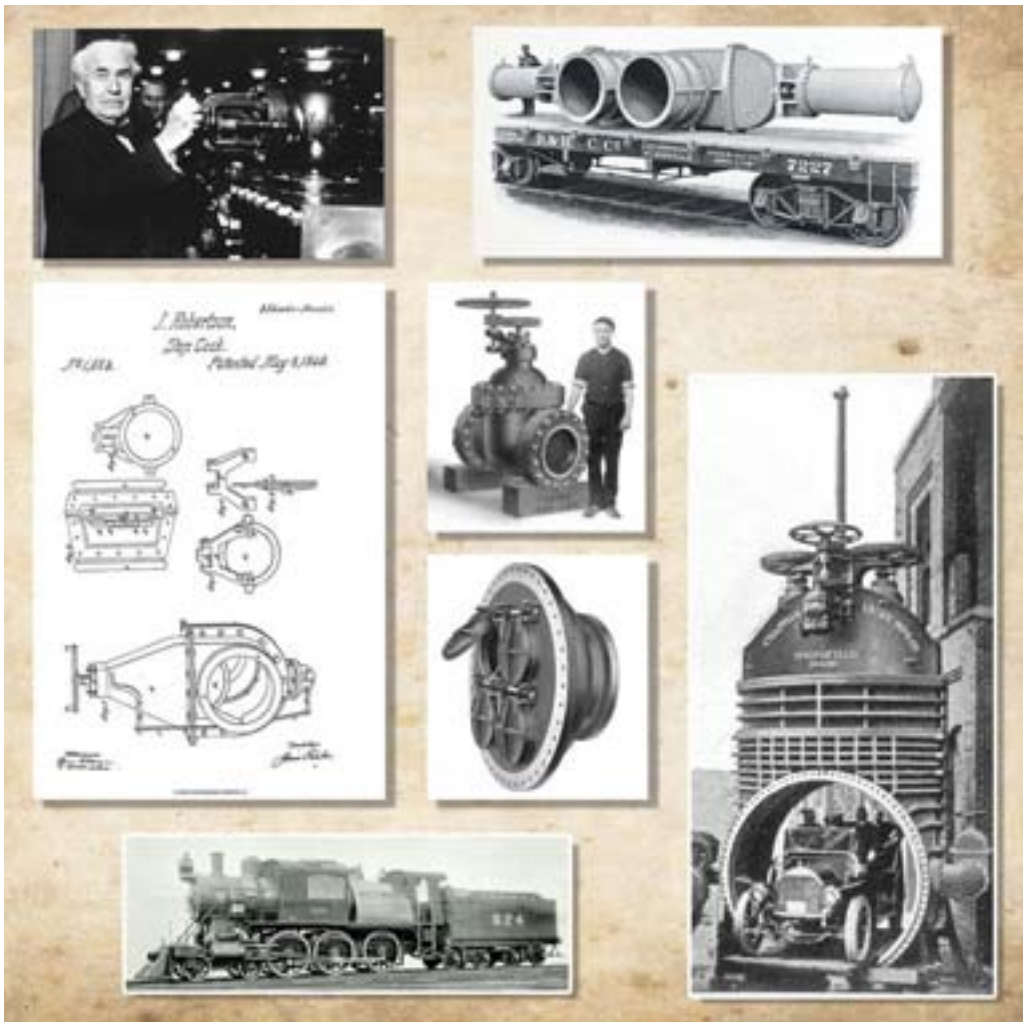
As the end of the 19th century approached, the steam-powered valve industry grew as did the steam industry itself. Unfortunately,

the dangerous side of steam power was not recognized during this time, and tragic boiler explosions were killing and maiming hundreds of persons each year. The fledgling American Society of Mechanical Engineers (ASME) focused on this problem and by 1912 had a solution in place in the creation of the Boiler and Pressure Vessel Code. "The Code," as it is referred to today, helped solidify safety relief valve design and performance.

By 1900, the valve industry was very healthy and gaining maturity rapidly; however, virtually every manufacturer was doing things its own way to its own standards and specifications. This situation created a dilemma for the equipment owner: Brand X didn't match up with either brand Y or brand Z. It was clear that if the valve industry was to take the next step in its growth cycle, standardization was badly needed. Also, pressure standards were virtually non-existent at the time. The three pressure ratings of the times were: standard (up to 125 psi steam), medium (up to 175 psi steam), and extra heavy (up to 250 psi steam). Although cases of higher pressure piping and valves in hydraulic service could be found, these three standards were common.

The first flange standard was published by a group of industry leaders in 1911 and titled "Extra Heavy Flanges." These dimensions would later become the class 300 dimensions we still use today. The oldest North American valve standards-making body, the Manufacturers Standardization Society (MSS), created its first standard on flanges in 1914. Although this was progress on flange dimensions, the end-to-end dimensions of valves was another matter. By the end of World War I, some effort was made on end-to-end standardization, but nothing reached publication stage. Meetings on these and other issues would ensue, but end-to-end was not resolved until 1939.

The first decade of the 20th century saw the advent of steel castings for use in valve construction. Steel offered a great improvement in strength over the two prominent valve materials of the day, bronze and iron, and it would take nearly 50 more years for cast iron to fade from the top of the acceptable valve materials list. Still, iron would have one more chance at greatness in the form of ductile iron. Because ductile was stronger than cast iron, and most importantly not brittle, it would become popular in water works applications for the rest of the century.



## Pressure classes developed

In 1927, pressure classes as we know them today were developed. They included ratings for classes 250, 400, 600, 900, and 1350. All of these classes were based upon an operating temperature of 399°C (750°F). Later, classes 250 and 1350 would be replaced by class 300 and 1500 respectively, and even later, a class 150, rated at 260°C (500°F), would be added.

As World War I gave way to the Roaring Twenties, the driving force of steam control and containment was still preeminent, but other influences on valve design were just over the horizon. During The Great War, for example, an emerging giant of an industry, navy shipbuilding, developed in a big way. These steel warships of various sizes were crammed with valves of all types. Because of the confined nature of ships, combined with a harsh saltwater environment, many unique valve designs and materials were created.

War would again carve a new face on the valve industry in the 1940s—one of greater size, productivity, and creativity as American ingenuity worked overtime on many industrial and manufacturing fronts. The airplane became a primary weapon of war, and new designs were racing from the draftsman's table to the shop floor of companies such as Boeing, Lockheed, Curtiss, Republic, and others as designers sought to increase aircraft performance.

But one of the most important things that advanced aircraft performance was 100 octane fuel, which valves would soon help to flow. The American refinery and process plant designers came up with new cracking processes that ensured the U.S. would have a virtually unlimited supply of this powerful aircraft elixir.

***The World War II period saw the birth of two inventions that would radically shape the valve industry in years to come.***

Also, the 100 octane fuel supplied to Great Britain by the U.S. is credited with helping the British Royal Air Force achieve air superiority over the German Luftwaffe. As these 100 octane plants were designed and built, they created the need for special valve designs and alloys to conquer the often harsh media and temperatures encountered in the fluidic cracking process, which was the key to production of this vital new fuel. Another wartime need was met by the petrochemical industry in the form of butadiene and synthetic rubber. All these new plants and processes pushed valve manufacturers down design paths they had never before conquered.

## New developments in valves

The World War II period also saw two inventions born that would radically shape the valve industry in years to come. The first was the pressure seal bonnet. This invention allowed drastically reduced weights for large, high-pressure valves because the huge bulky flanged body/bonnet joints previously required on these valves could be reduced. Several companies developed this technology at about the same time, and infighting and lawsuits ensued, some of which were not settled until the 1970s.

The second important invention would have more impact but its creation was a fluke. In 1938, chemists in pursuit of better refrigerants at Kinetic Chemicals Inc., a joint venture between DuPont and General Motors, created a solid waxy substance. This material was extremely slick and nothing would stick to it. This innocent material was Teflon®, a substance that would make the floating ball valve possible. DuPont was granted a patent for Teflon in 1946, and within 15 years, the ball valve industry would start rolling at an ever-increasing rate.

Aside from developing new technologies and designs, the valve industry as a whole grew tremendously during the war, just by meeting the demand for gate, globe, and check valves. The U.S. Navy alone built hundreds of primary ships during this time, and each contained 500 to 5,000 valves. All this industrial output meant that the major valve manufacturers' facilities greatly expanded. The largest was the giant fully-integrated Crane valve plant in Chicago, which covered over 160 acres of land interlaced with foundries, furnaces, machine shops, and warehouses.


*A 1936 Mobilgas ad promoting the first catalytic cracking unit by Houdry.*

By mid-20th century, temperatures of some working operations had begun to exceed the capability of the plain carbon steels such as WCC, WCB, and A105. Therefore, Cr/Mo alloys, with their greater high-temperature strength, began to be used for pressure-containing materials in valves. These steels, with chrome contents up to 9%, proved up to the task and are still used today. Along with advances in Cr/Mo alloys, welding technology and quality also improved immensely. This led to a huge increase in the number of buttweld end valves manufactured.

The industrial boom that carried over into the 1950s also resulted in many new materials being accepted in valve manufacturing. For example, earlier in the century, the only material available for wear or erosion resistance in valves was a Cu/Ni alloy similar to Monel™. Advances in heat treating and metallurgy in later times resulted in the development of the hard 400 series, martensitic stainless steels. This material worked well, but the demands of superheated steam pressures of 2000 psi or more were too much for the martensitic materials. A cobalt hardfacing alloy, Stellite®, was soon applied to valve trim for erosion resistance; and today, it is still the first choice when those material characteristics are required.

As the '50s faded into the '60s, North America clearly lead in valve production, technology, and standards. Most of the major domestic manufacturers were nearing their peak production wise, with employment at its highest levels to date. There was no outsourcing, and everything was "made in America."

On the technology front, one of the biggest influences of the period was the advent of nuclear power, first on navy ships and then for land-based power plants. The nuclear navy, headed up by Admiral Hyman Rickover, fostered major leaps in valve technology, manufacturing, and most of all, quality assurance. Nuclear service valves demanded excellence in manufacturing. In fact, it was often said that the weight of the paperwork for a nuclear valve exceeded the weight of the valve itself! These quality assurance programs and procedures would be broadened in scope and expanded to other types of valves as the age of ISO certification came into fruition in the 1990s.

*Valve assembly circa 1950.*

### Standards revisited

The nuclear valve industry also focused more attention on the general valve standards in use at the time. As a result, many specifications were drastically altered, and many new ones were created. Probably the most influential of these new standards was the ASME B16.34, first published in 1974. This document was (and remains) the keystone to American industrial valve design standards. The pressure-temperature tables contained within are tools used every day by piping engineers and valve designers. Also, the first comprehensive valve testing standard, American Petroleum Institute (API), API 598, "Valve Pressure Test and Inspection" was initially published in 1968.

As the 1970s discoed into the 1980s, the North American valve industry began to struggle with too many foreign orders and not enough productive capability. The result was that for the first time, American valve manufacturers began to outsource valves and components from overseas. This situation also opened the door for foreign manufacturers to gain a foothold on the highly desirable North American domestic valve market.

When the air cleared (following the recession of the mid '80s), the domestic valve manufacturing landscape was totally different. Most long-time North American manufacturers had shifted manufacturing to the Far East, India, and Eastern Europe. An increase in overall business resulted in an influx of relatively unproven commodity valves from both familiar and unfamiliar manufacturers. This, in turn, resulted in extra scrutiny of imported valves, and creation of new standards to assess their quality. The API RP591, "User Acceptance of Refinery Valves," was first published in 1990. This document required that, before a manufacturer's products were accepted by an end-user, the valve manufacturer had to supply a block of valves to be completely examined and tested by a third-party inspection agency.

Now, as the 21st century is well under way, the valve industry is still evolving. Low-cost-country manufacturing is constantly balanced with product quality. This type of commitment to providing a high-quality product at a fair price will be the mantra of the next generation of successful valve manufacturers. However, one factor is constant: the valve industry, along with technology, is not standing still—they continue the race forward side by side. The state-of-the-art valves we see today may not be the industry champions of the future. Who knows, the next big thing could be gate valves based upon nanotechnology or control valves built from carbon fiber composites. |VV|

## About the author

**Greg Johnson** is the president and CEO of United Valve, a valve service company located in Houston, Texas. Greg is active in valve standards development activities with API, ISO, and MSS. He is a past chairman of the Valve Repair Council (VRC) and a long-time board member of that organization, as well as a current member of the Board of Directors for MSS. He is chairman of the Valve Manufacturers Association (VMA) Education and Training Committee and vice chairman of the VMA Communications Committee.


*The first nuclear submarine, "Nautilus," featuring early Velan valves, is now a floating museum in Groton, CT.*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