Institute of Power Engineers

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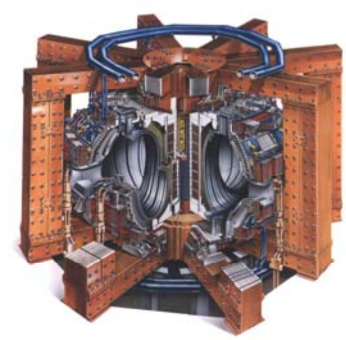

Tour Of The Edison Hydro Electric Generating Station

Throughout the years, numerous upgrades to the station have been made. All the generating units where rewound so that they could produce power at 60 cycles. In the late 1980's,

From the Editor

Welcome to another issue of the Institute of Power Engineers magazine. Something that you'll notice is the change in format of this issue. This change has come as a result of your feedback for; shorter and more issues; a different layout; and sharper graphics. As a result of these changes the file size has also been reduced hopefully to ease sending and downloading. Your input is valued and only with your input can the magazine better serve you.

As the world is changing organizations like ours need to find ways to increase involvement and membership. It's becoming harder for people to find time for involvement in organizations like ours due to increased work loads, business commitments, etc… I'm hoping that the magazine can provide something to our current members and future members to see a value in belonging to our organization.

I'd like to thank all the contributors for their articles and time to help deliver this issue. I'd especially like to thank the Sault Ste Marie branch for their involvement. If any branch would like to contribute articles on their branches activities, stories, special members and their involvement, or stories on new innovations your contribution is welcome.

Recently we were contacted by a cogeneration magazine from India , "Cane Cogen India" for Winrock International India (www.winrockindia.org) to reprint articles from our past issues of our magazine. Hopefully this is a sign of things to come, and we can build a global relationship with other like groups. The world is changing and becoming a smaller place, there is power in numbers!

Editor/publisher
George Reid
Windsor, Ontario Branch

The Benefits of Direct Mount Actuated Ball Valves

As a premier supplier and integrator of process control solutions, Setpoint Technologies continually strives to offer cost-effective reliable automated valves, pumps and instrumentation packages throughout Canada.

While onsite at different factories, we often find a customer spending too much money to maintain their ball valves. The ball valve in Figure 2.0 is one such example. It is a bracket and coupling technology that is expensive to maintain and prone to failures for various reasons which will be outlined in the chart below.

At Setpoint, we offer Direct Mount Technology ball valves as shown in Figure 1.0. They provide superior performance over bracket and coupling technology. Below is a comparison of the two technologies.

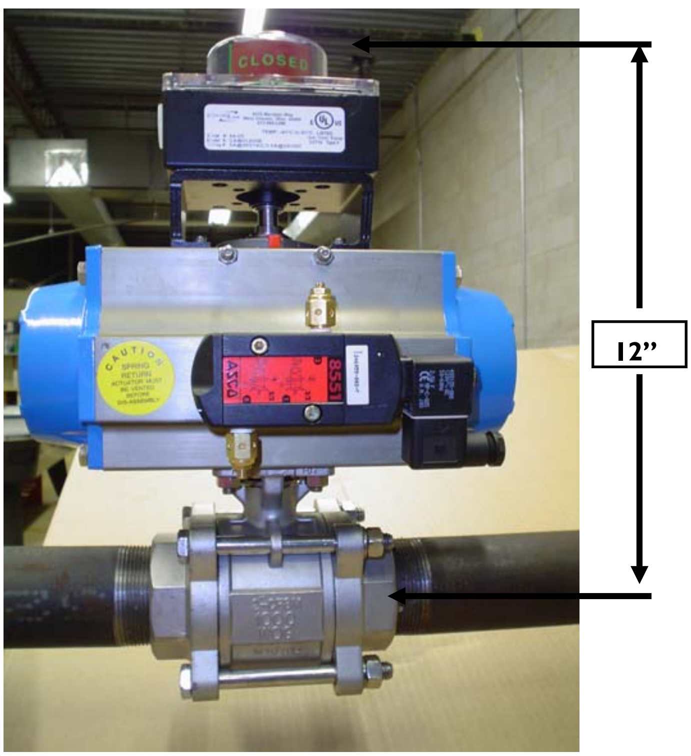

Figure 1.0 2” Direct Mount Technology

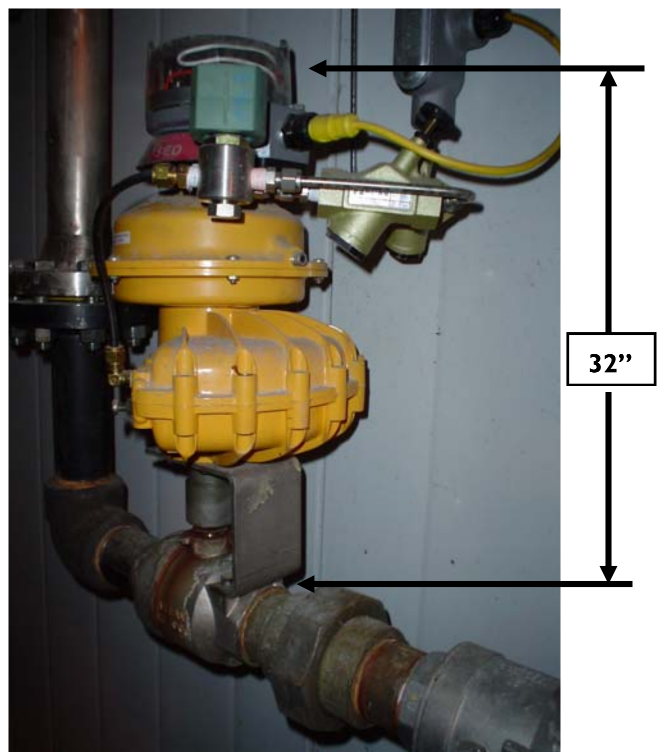

Figure 2.0 2” Bracket & Coupling Technology

Valve Design Comparison:

Direct Mount versus **Bracket & Coupling**

Direct Mount	Bracket & Coupling
Valve is designed for automation. Chevron live-loaded stem. Solid 4 bolt ISO flat pad for mounting actuators to valve. This offers a solid foundation for supporting all actuation hardware and accessories.	Valve designed for lever operation only. No chevron packing, no solid actuator mounting pad to support top-heavy accessory components. Valve is installed on water service – not a tough service to begin with – however, the valve still leaks through the stem area.
No cumbersome, expensive brackets required. Valve actuator pad is ISO mount so almost any actuator in the world can be mounted. The actuator in Figure 2.0 cannot be direct mounted. Valve assembly installation can be done by one maintenance technician. Overall height of the assembly is 12" making the valve easy to handle while most other valves are top-heavy and cumbersome to install.	Brackets and couplings are required. Changing to a larger, or smaller sized valve or Actuator requires an entire new bracket and coupling. With the L-bracket, there are only 2 bolt holes on the valve body to support the entire assembly. When the valve cycles, you can see slight movement of the entire assembly. This is primarily due to the fact the overall height of this assembly is 32"! Remember, this is only a 2" valve.
All accessories are NAMUR mount, a world standard. The switch box located at the top of the actuator has 2 conduit entry holes. One entering and one exiting out to the solenoid. This saves time as no external junction box is required. The direct mount solenoid valve is powered directly off the limit switch.	Does not accept NAMUR mount accessories. This assembly requires expensive external inline solenoid valves plus the cost of properly supporting the solenoid to the actuator. The solenoid alone requires a nipple, external air lines, fittings and labor to install. With external solenoid valves, there is an added cost to stock 2 solenoid models. One for double acting and one for spring return.
Large savings. Direct mount valves only take a Few minutes to automate and test. All components are CNC machined and fit together tightly for smoother control. This valve takes a maximum of 15 minutes to assemble and test.	Non-direct mount valves can take hours to assemble and test. The special bracket bending, machining and couplings required are expensive and labor intensive. At best, this valve would take 4 hours to automate and test.
3-piece design simplifies maintenance. Remove 4 bolts, swing the valve out of the line without disturbing the piping. The entire assembly can then be inspected and installed back into service.	To inspect this 2-piece valve, the piping on both sides needs to be removed. Once again, this would add an additional cost to this valve package.
Note of caution: direct mount valves need a bracket between the valve and actuator for all *high* temperature applications to keep the heat Away from the actuator. Failure to do so could damage the actuator seals.	

Direct mount ball valves will offer years of trouble-free performance and continue to deliver the lowest
cost of ownership.

Setpoint Technologies is a Canadian owned company with a large inventory of Marwin
ball valves and controls.

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From Windsor, Ontario to Washington State or How I ended up working in the US

By: Tim Wisdom
Plant Manager
Frederickson Power

My name is Tim and I am Canadian.

I was born and raised in southwestern Ontario, studied in Canada to obtain my 1st class Power Engineer's License and work for a Canadian company in the U.S.

So how is it I came to be working in the United States?

I never set out to work in the United States; it was one of those things that just kind of fell into place.

As an employee of EPCOR Utilities Inc (headquartered in Edmonton, Alberta); I manage Frederickson Power, which is located near Tacoma, Washington. It's a 250 MW combined cycle plant utilizing a GE 7FA combustion turbine in a 1 on 1 configuration. Tacoma is approximately 45 minutes south of Seattle depending on traffic. I also oversee a 300 MW simple cycle combustion turbine plant located in Brush, Colorado. That plant utilizes 2 Siemens V84.3 combustion turbines and is run by a contract operator.

I was born in London, Ontario and lived there for the first 24 years of my life. I worked at a number of commercial and light industrial facilities while writing exams and trying to amass the necessary steam time for my tickets. I left London and moved to Windsor in 1982 and took a 2nd class shift Engineer's job with the Canadian Salt Company. While at the salt plant I finished writing my 1st class ticket as well as well as a maintenance gas fitter's license. Through much of this time I was a member of the I.P.E. in both London and Windsor.

The years went by working and raising a young family and it wasn't until the advent of the West Windsor power plant and its ever encroaching steam line to the salt plant that I realized I needed to pay attention to what was then the relatively new technology of combustion turbines, HRSG's and everything else that went along with it. That insight caused me to leave Canadian Salt and start work for the H.J. Heinz Company in Leamington, Ont. Heinz had two Allison KB-5 gas turbines supplying two HRSG's which supplied steam to the factory process load. The power generated supplied the factory load during the off season with surplus power being sold to Ontario Hydro through a power purchase agreement (PPA). This was an excellent opportunity to break into the business for me and it was an extremely well run and maintained facility.

The early to mid 1990's were a period of change in Ontario as the NUG's were making headway in what had been a virtual monopoly by Ontario Hydro. PPA's were being signed, natural gas was cheap and the future looked very bright for the likes of TransAlta, TransCanada, Tractebel, Westcoast Energy and others. It was through Westcoast Energy that I started my migration west and then finally south.

In June of 1996 I was hired as the Plant Manager/Chief Engineer of the new Whitby Cogeneration facility. Whitby was a joint venture between Atlantic Packaging and Westcoast Power. The plant featured the first commercial installation of the Rolls Royce Industrial Trent combustion turbine rated at 57 MW. The plant also featured an IST once through steam generator. The facility was located east of Toronto near Lake Ontario between the Whitby and Oshawa border. It was designed to supply its electrical output to Ontario Hydro and steam to the newsprint mill owned by Atlantic Packaging. Due to teething pains associated with this new engine platform the site experienced numerous challenges bringing the plant to commercial operation. I cannot say enough about the tenacity of the people who worked there during that particular start up trying to get things straightened out.

After 3 years in Whitby I was offered a transfer by Westcoast Power to their new facility then under construction in Campbell River, BC. Island Cogen was the first Canadian installation of the ABB GT-24 gas turbine. The plant supplied its electrical output to BC Hydro and steam to the adjacent Elk Falls paper mill. I read with great interest the article that Curtis Mahoney submitted to the magazine regarding the plant. Curtis relocated to the west coast after a rather long job interview on the deck of Painter's Lodge in Campbell River from West Windsor Power. It was a pleasure to work with him during the start up and commissioning of the plant and work through some interesting issues. Prior to declaring commercial operation, we were commissioning the plant and selling everything we could to the Mid C hub during the spring of 2001. Around the same time Westcoast announced that they were selling off some of their NUG plants to refocus on their core pipeline operations. Both Island Cogen and Whitby were ultimately purchased by Calpine and ended up in their Canadian Income Trust.

At the time of the sale, I remained with Westcoast Power and was then asked to relocate to the US where they were restarting a stalled project originally undertaken by Tenaska Washington Partners in 1995. The restarted project was a partnership between EPCOR of Edmonton, AB and Westcoast Power. As this was a Brownfield site, it presented some significant engineering challenges mating new components with the existing equipment foundations.

As fate would have it, Westcoast Energy (parent of Westcoast Power) was bought outright by Duke Energy during construction and commissioning of the plant in the first quarter of 2002. To put this in context, this was an incredible period of growth and optimism in the industry. Duke had settled on a 2 on 1 reference plant design utilizing the GE 7F A technology and wasn't particularly interested in a half contracted (PPA for half the plant's output) 1 on 1 plant with a partner. Right after we achieved our commercial in service date in Aug 2002 Duke sold their 60% interest in Frederickson to EPCOR.

The sale to EPCOR produced some much needed stability. Here was an Owner who wanted to own and operate the facility for the long term. In April 2004 EPCOR sold down 49.85% of their interest in the plant to Puget Sound Energy (PSE) of Bellevue, WA along with the plant's merchant (non contracted) exposure. The sell down still gives EPCOR effective control while minimizing financial uncertainty associated with the merchant portion. In April of this year EPCOR Utilities Inc sold its remaining ownership stake to EPCOR Power L.P. (TSX:EP.UN). The acquisition is expected to close in summer 2006. EPCOR is still responsible for the day to day operation and maintenance of the facility on behalf of the owners. I report to the Senior VP of Generation Services Inc. in Edmonton and to the owner's committee. The plant has performed very well since its inception.

As for working in the U.S. and the differences between here and Canada there are a number of things that come to mind. The largest transition for me was learning about the different regulatory statutes and regulations. Whether it was wage and hour issues or state and federal environmental reporting there was a fairly significant learning curve initially. I am not using my ticket down here as it is not recognized or required in the state of Washington. That is not to say that it has not served me well as I have progressed in the power industry. The foundation that the Canadian Power Engineer's licensing system provides has opened all the doors I have personally encountered to date. The strong foundation that the S.A.I.T. based curriculum and exams instilled has allowed me to participate and thrive in an amazing industry. There is also another Canadian at our site. His name is Ric Chernesky and he is the O & M manager. Ric came to Frederickson from EPCOR after working in a variety of roles at all of the generation plants. Prior to that, he was with Sask Power for thirteen years. Ric has an interprovincial 1st class ticket.

It was due to the initial investment by Westcoast Power and EPCOR in Frederickson that allowed for Ric and me to transfer to the US. Initially, we were granted L1-A work visas (Inter company executive transfer) prior to applying for and obtaining our green cards (Permanent Resident status). Our first task was to hire the plant operations and maintenance personnel for the facility. We were not sure how that would go given that there was no Power Engineer's license in the state of Washington. We weren't sure of how to find comparable skill sets in an unfamiliar market. We ended up using a naval recruiter to assist us with the plant staffing. There is a significant naval presence on the west coast of the US and we were able to interview people who had been working in gas turbine and nuclear powered ships and related process environments. These individuals possessed very strong technical educations along with a well developed culture of self reliance and good attitudes. This choice has worked out very well for us. After going through the plant commissioning, start up and associated vendor supplied training our staff has done a remarkable job in operating and maintaining the facility in a safe and efficient manner.

In summary, it's been a wonderful experience working in this business so far. It's taken me further than I ever expected. I've been able to meet and work with some incredible people, to travel, participate in the start up of some great projects and to push myself beyond anything I ever imagined. Thanks for giving me a chance to share it.

Sault Ste. Marie branch of the IPE toured the Edison Hydro Electric Generating Station
By Robert Cumming

Recently, members of the Sault Ste. Marie branch of the IPE toured the Edison Hydro Electric Generating Station in Sault Sainte. Marie, Michigan. This station is the largest, horizontal turbine Hydro Electric Station in the world. At full capacity, the plants 76 units can produce 300 to 550 kW each.

A/C generators which produced power at 25 cycles

Located on the banks of the St. Mary's river, construction on the Hydro Electric plant began in 1898. When completed in 1902, the station housed 80 turbines. Broken down into 4 electrical buses, each bus had 20 turbines, 19 A/C generators which produced power at 25 cycles and 1 D/C generator to provide excitation to the A/C units for the bus. Due to many structural design issues, the station could only operate at one quarter of maximum output. When operating at maximum load, the shear force of the water was causing the foundation of the station to shift. The station would operate at a reduced load until all the foundation problems where solved. In 1919, the station was ramped up to full load.

Original plant control room

Throughout the years, numerous upgrades to the station have been made. All the generating units where rewound so that they could produce power at 60 cycles. In the late 1980's, a survey was conducted on the station to determine the structural and operational condition of the plant. Although the structural end of the plant proved to be sound, the aging electrical systems where in need of an upgrade. The first of a 4 part upgrade to the plant began in 1987 with the replacement of the electrical transformers and switchgear on one of the four buses. The mechanical governors for each of the turbine units were replaced with electronic governors and the units where converted to self excitation. By the time the upgrades where completed in the early 1990's, the station had become fully modernized.

New plant control room

Although the station is now operated remotely from Iron Mountain Wisconsin, a crew of 2 station operators and a handful of maintenance employees keep the station operational. Most of the replacement parts for the turbines are produced onsite at the stations machine shop. Over the next few months, a new structural survey will be conducted at the station. If deemed structurally sound, the station could be in operation for another 50 years.

On behalf of the members of the Sault Ste. Marie branch of the Institute of Power Engineers, I would like to thank Mr. Ted Gauthier, the Station Superintendent for taking the time to tour us through the plant. Ted has been at the station since 1973 and will be retiring at the end of March. We wish you all the best in your retirement.

Fusion, The Jelly In The Donut

As the worlds thirst for crude oil increases, this limited resource's price will only skyrocket. With the emerging economies of the east placing even more strain on this situation how are we to quench this crude thirst? One answer to this dilemma was supposed to be nuclear power. Fission power has helped to alleviate some of the worlds energy needs however its capital and environmental cost haven't made it competitive enough to displace our need for petroleum. Nuclear fission power plants provide about 17 percent of the world's electricity. In the United States, nuclear power supplies about 15 percent of the electricity overall while in France, about 75 percent of the electricity is generated from 56 nuclear power plants.

Conditions for Nuclear Fusion

When hydrogen atoms fuse, the nuclei must come together. However, the protons in each nucleus will tend to repel each other because they have the same charge (positive). To achieve fusion, you need to create special conditions to overcome this tendency. The conditions that make fusion possible are high temperature and pressure.

The high temperature gives the hydrogen atoms enough energy to overcome the electrical repulsion between the protons. The temperature needed is about 100 million Kelvin, about six times the temperature of the sun. At these temperatures, hydrogen is a plasma, not a gas. Plasma is a high-energy state of matter in which all the electrons are stripped from atoms and move freely about. The sun achieves these temperatures through its immense gravity, on earth we must use microwaves, lasers, and ion particles. To obtain the pressures needed for fusion intense magnetic fields, lasers, or ion beams are used.

With current technology, we can only achieve the temperatures and pressures necessary to make deuterium-tritium fusion possible. Deuterium-deuterium fusion requires higher temperatures that may be possible in the future. Ultimately, deuterium-deuterium fusion will be better because it is easier to extract deuterium from seawater than to make tritium from lithium. Also, deuterium is not radioactive, and deuterium-deuterium reactions will yield more energy.

Fusion Reactors: Magnetic Confinement

There are two ways to achieve the temperatures and pressures necessary for hydrogen fusion to take place; **magnetic confinement** uses magnetic and electric fields to heat and squeeze the hydrogen plasma (The J.E.T. project is using this method) ;**Inertial confinement** uses laser beams or ion beams to squeeze and heat the hydrogen plasma. Scientists are studying this experimental approach in the United States.

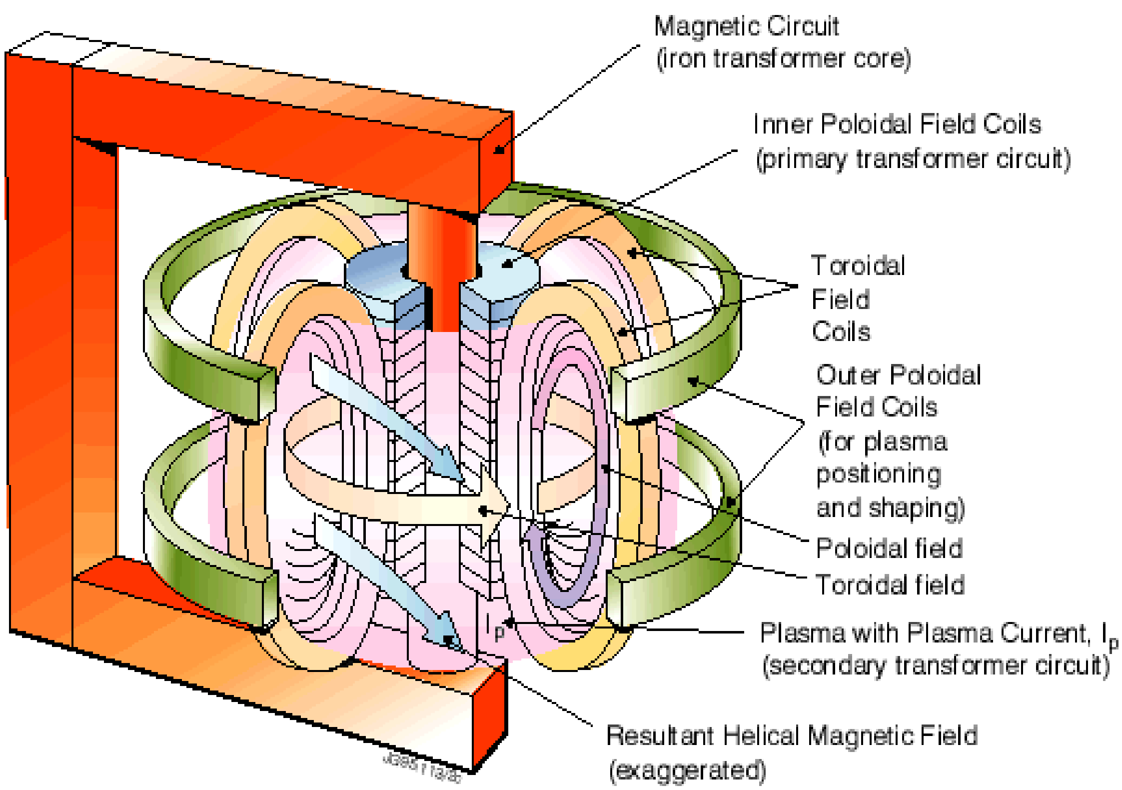
The world's largest fusion projects uses magnetic confinement is the Joint European Torus in Calham in the UK.

Microwaves, electricity and neutral particle beams from accelerators heat a stream of hydrogen gas. This heating turns the gas into plasma. This plasma gets squeezed by super-conducting magnets, thereby allowing fusion to occur. The most efficient shape for the magnetically confined plasma is a donut shape (toroid).

How Would All this Work

1. The fusion reactor will heat a stream of deuterium and tritium fuel to form high-temperature plasma. It will squeeze the plasma so that fusion can take place.
2. The power needed to start the fusion reaction will be about **70 megawatts**, but the power yield from the reaction will be about **500 megawatts**.
3. The fusion reaction will last from **300 to 500 seconds**. (Eventually, there will be a sustained fusion reaction.)
4. The lithium blankets outside the plasma reaction chamber will absorb high-energy neutrons from the fusion reaction to make more tritium fuel. The blankets will also get heated by the neutrons.
5. The heat will be transferred by a water-cooling loop to a heat exchanger to make steam.
6. The steam will drive electrical turbines to produce electricity.

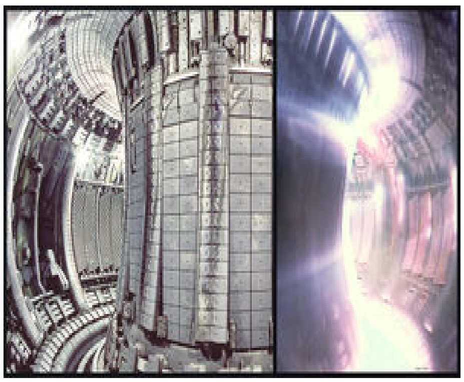
The steam will be condensed back into water to absorb more heat from the reactor in the heat exchanger.



Problems

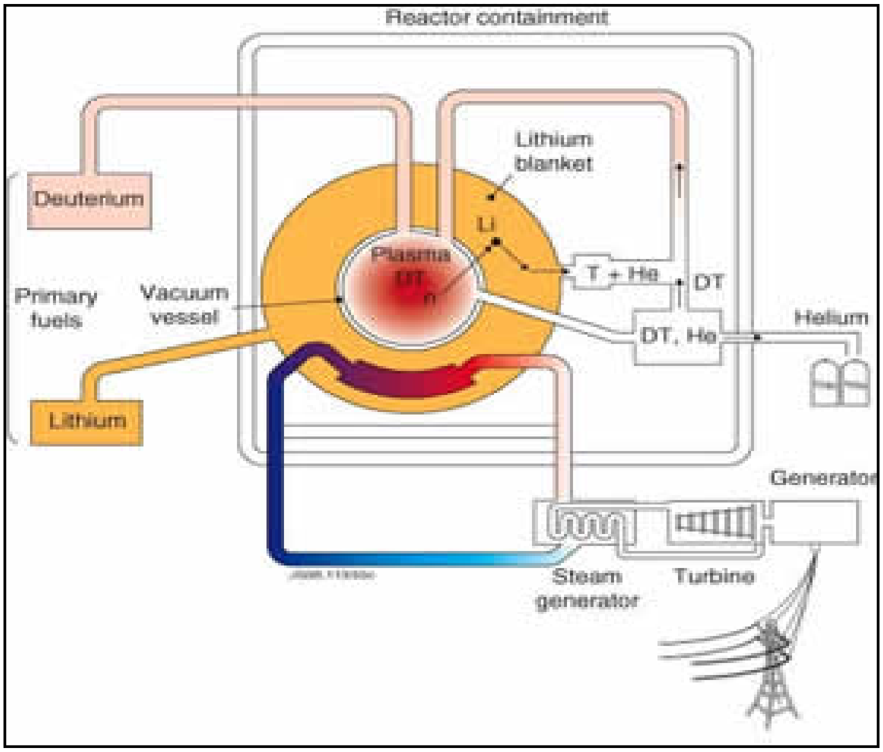
Developing materials for fusion reactors has long been recognized as a problem nearly as difficult and important as that of plasma confinement, but it has received only a fraction of the attention. The neutron flux in a fusion reactor is expected to be about 100 times that in existing pressurized water reactors (PWR).

Each atom in the blanket of a fusion reactor is expected to be hit by a neutron and displaced about a hundred times before the material is replaced. Furthermore the high-energy neutrons will produce hydrogen and helium in various nuclear reactions that tends to form bubbles at grain boundaries and result in swelling, blistering or embrittlement. One also wishes to choose materials whose primary components and impurities do not result in long-lived radioactive wastes. Finally, the mechanical forces and temperatures are large, and there may be frequent cycling of both.



Inside JET from non-operation to plasma firing

The possible layout of a future fusion power station



As the price of crude hits $75 a barrel and higher, and the effects of global warming become better understood we need to look to other energy sources to power our economy. The experts are predicting that a fusion reactor will be putting power into the grid in 30years. With the advances in super conductors, better and stronger alloys, and better computer modeling the future for fusion is looking bright. Its possible that the hot jelly in donut will alleviate our addiction to Jed Clampett’s Texas tea.

Nitrogen Sparging and Blanketing of Condensate, Makeup, and other Water Tanks

Background

Scale and Corrosion

Currently, after outages, many boiler and pre-boiler systems are filled with aerated water, sometimes containing high ppm concentrations of ammonia and hydrazine. This water, which is exposed to air in vented storage tanks, contains high concentrations of carbon dioxide, carbonates, and oxygen. The practice of dosing the tanks with ammonia and hydrazine may reduce the oxygen concentration, but it increases, by about 10 times, the concentration of carbonate due to the formation of ammonium carbonate.

While this water is being pumped into the system and heated during startups, the ammonium carbonate breaks down, elevating the concentration of carbonic acid and reducing the pH in the feedwater and boiler. In room-temperature laboratory samples, an alkaline pH is misleading because it does not represent the actual pH at the temperatures in the boiler.

Filling the boiler and preboiler with aerated water results in large variations of pH and oxygen concentrations. These variations influence the solubility of iron and copper oxides; solubility is high at low pHt (pH at temperature) and low at higher pHt. During startup and normal operation, CO2 is driven out and the oxides which dissolved after boiler fill and warm-up then precipitate and form deposits. A high concentration of oxygen and low pH during the startup period enhances corrosion of the economizer and other components, generating additional corrosion products, which later deposit.

Exhaustion of Condensate Polishers

Adding aerated makeup during startups and operation causes exhaustion of condensate polishers by carbonates and elution of already exchanged impurities. This is especially a problem in steam cycles with high makeup requirements, such as in cogeneration cycles.

Advantages of Nitrogen Sparging and Blanketing

*Filling the boiler, deaerator, and feedwater system with deaerated water with low concentrations of oxygen and carbon dioxide leads to minimization of iron and copper oxide scale and corrosion, faster startups (less iron and copper holds), and lower frequency of chemical cleaning.

*Using deaerated makeup reduces exhaustion of condensate polishers by carbonates.

*No need for auxiliary steam for deaerators - energy saving.

Reduction in use of oxygen scavengers - less environmental impact, less organic breakdown products (organic acids, CO2), lower costs.

*Elimination of storage tank contamination by dust, no organic growth, no cleaning.

Description

The nitrogen system design is shown in Figure 1. It is a schematic diagram of a tank with the Bottom Sparger (A), Inlet Pipe Sparger (B), Nitrogen Supply and Controls (D), Oxygen or Conductivity Analyzer (F), Tank Pressure Control (C), and an Overflow Pipe (E)). The sparging itself is through sintered stainless steel Sparging Elements. The pressure to the sprayers is controlled by two pressure regulators; one for the Bottom Sparger and one for the Inlet Pipe Sparger, followed by a passive critical orifice flow element which guarantees that the nitrogen flow will never exceed the capacity of the tank pressure control siphon, which vents the excess pressure. The length of the sparging time is based on oxygen concentration at the bottom of the tank or conductivity (mostly elevated due to carbon dioxide).

Anticipated Performance

The Nitrogen Sparging and Blanketing System will maintain oxygen concentration in storage tanks at less than 300 ppb and conductivity less than 1 uS/cm. These parameters are maintained during pumping in, pumping out, and water storage without pumping, even when the tank capacity is exceeded and a larger volume is required.

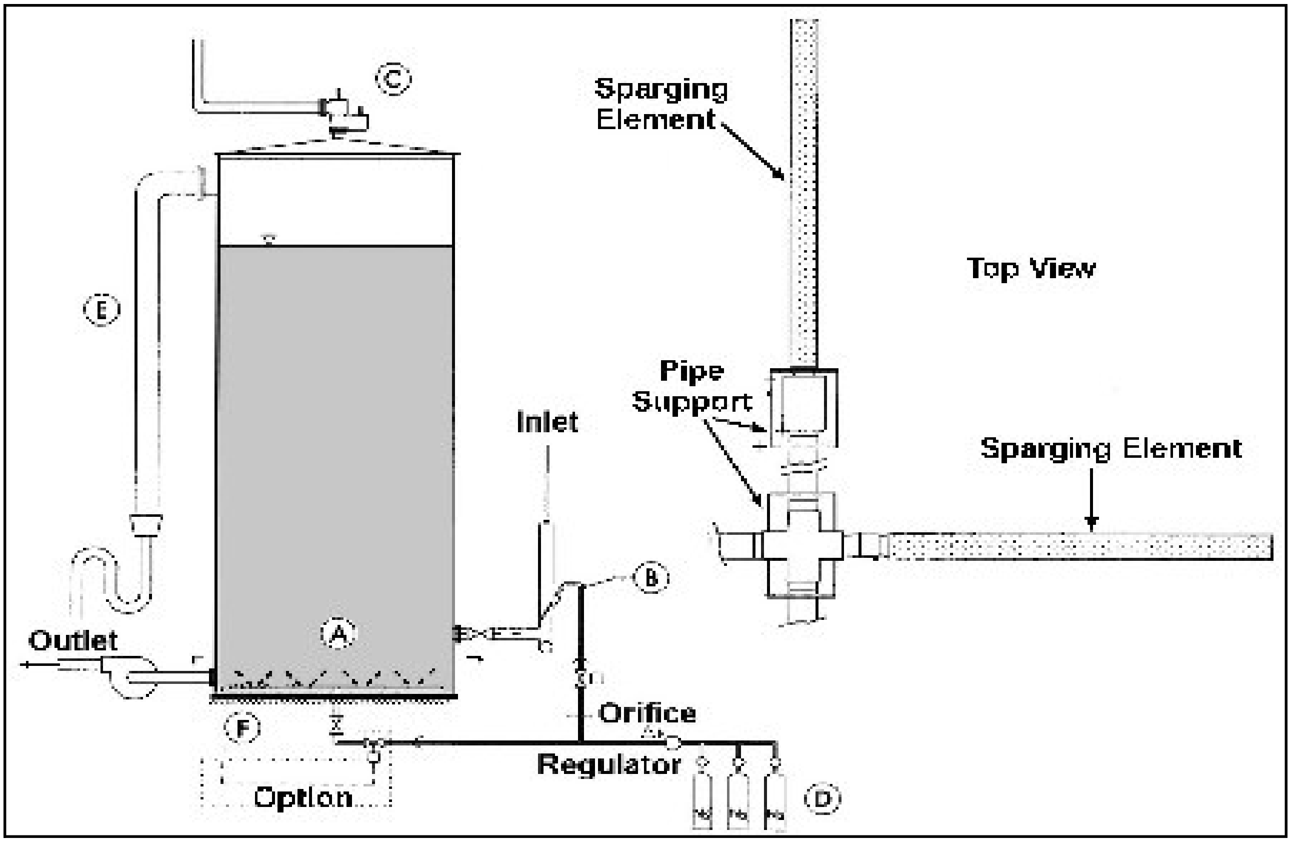


Figure 1. A Storage Tank Nitrogen System and Sparging Elements

Jonas, Inc., 1113 Faun Road, Wilmington, DE 19803, USA
Email: jonasinc@steamcycle.com, Web: www.steamcycle.com

So, You Want to Be a Power Engineer

We should all be proud of what we do and also be concerned about the future of skilled trades in general and ours specifically! This trade has been good to me and to my many co-workers and I feel that any effort to promote it to future generations is a very worthwhile endeavor.

This column is going to be an ongoing discussion concerning; job duties; training; exams; reference materials; and encompassing anything that could have an impact on our trade. My goal is to keep this trade active and to open up enthusiasms for the duties so that people will seek this as a positive career choice.

All skilled trades are currently in the same position. As the workforce ages there are fewer young people entering the skilled trades in general and therefore as we retire there are becoming fewer qualified replacements. This is not unique, it's happening in every trade (think about it, how old is your mechanic). So part of my goal is in some small way to try and to stem this rising tide.

In closing, thank you and happy reading as we continue. I'm especially interested in your thoughts of what might benefit newcomers to our trade. I would like to hear from anyone with thoughts, concerns, or ideas please drop me a line.

My e-mail is: drosey@jet2.net

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MEMBERSHIP APPLICATION FORM

(PLEASE DOWNLOAD, TYPE/PRINT IN INFORMATION, THEN FORWARD VIA EMAIL OR POSTAL)
(IF APPLICATION IS FILLED IN ELECTRONICALLY, EMAIL A COPY TO YOUR BRANCH)

Date :

1) ARE YOU APPLYING FOR (Check one only):

- [ ] New Membership (full Member)
- [ ] Associate Membership

2) IDENTIFICATION:

First Name: Surname:

Credentials: Date of Birth ((DD/MM/YY):

Address: P.O. Box # (if applicable):

Bldg #: Street: Apt. #:

City: Province: Postal Code:

Country: Canada or:

Home Phone #: Fax # :

E-Mail Address Prim:

Sec :

3) EMPLOYMENT:

Company Name:

Position or Title:

Address: P.O. Box # (if applicable):

Bldg #: Street:

City: Province: Postal Code:

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Work Phone #: Fax # :

4) POWER ENGINEERING STATUS

a) Are you a Power Engineer? Yes ☐ No ☐

b) If yes, do you currently hold a valid Certificate of Competency? Yes ☐ No ☐

c) If so, issued in what jurisdiction? ____________

d) Is your Certificate interprovincially recognized? Yes ☐ No ☐

e) Provincial Jurisdiction File Number: ____________

f) If not, then to what allied trade or profession do you belong? ____________

5) BRANCH SELECTION

Please select which Branch you would like to be affiliated with. If you are unsure which Branch is closest to you, then you may check the website "AREA MAP" for Branch locations. Applicants from remote areas, or from outside of Canada, may select the Branch of their choice. If you have no preference for a specific branch, you are invited to select the York Branch. French-speaking applicants may select the Montreal Branch for French language service, or the Ottawa Branch for bilingual service.

Note : All membership applications are subject to Branch approval.

☐ Calgary	☐ Edmonton
☐ Hamilton	☐ London
☐ Montreal	☐ Newfoundland/Labrador
☐ NovaScotia	☐ Ottawa
☐ Sarnia	☐ Sault Ste-Marie
☐ Sudbury	☐ Toronto
☐ Vancouver	☐ Victoria
☐ Windsor	☐ Winnipeg
☐ York	

6) DUES PAYMENT

Please note that dues payment in the form of a cheque or money order payable to the INSTITUTE OF POWER ENGINEERS must accompany this application which is to be mailed to the National Office.

The dues amount is $105.00, including a one-time initiation fee of $10.00. Future annual dues of $95.00 will be invoiced annually on the anniversary date of your membership acceptance, and are subject to a $5.00 discount if paid within 30 days.

The mailing address is:

Institute of Power Engineers
PO Box 878
Burlington, Ontario, L7R 3Y7
Forward to : ipenat@nipe.ca

Please also note that the dues constitute an Income Tax deduction if you live in Canada.

For further information : Website: www.nipe.ca