Canadian Prairies Group

NEWSLETTER

of Chartered Engineers

Summer 2011

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Chairman‘s Notes

Welcome back to everyone – hope you had a good summer which included a relaxing and enjoyable break. The routine of fall and winter is about to begin, so your executive hopes you will include attending some, if not all of our meetings this year – the second Wednesday of each month at the Danish Canadian Club – details are posted on the CPGCE website (www.cpgce.org).

Before the summer break, we concluded last year's technical meeting series with a special presentation by Rene Godin on what had happened at the Fukushima Daiichi Nuclear Power Plant after the Tsunami in Japan. The factual explanation indicates that there are several things that can be learned and implemented to increase safety, but estimating what might happen during, and then designing against, what is thought to be a one-in-a-thousand year event is a difficult task.

We begin this year with a talk on what needs to be done to benefit from winter construction in the oil sands context, followed by a talk on water resources and their future. As before, I would urge you to contact an executive member if you would like a presentation organized on a topic of particular interest. Meanwhile we will continue to try to provide a programme of talks across the breadth of engineering which our various Institutions represent.

The Annual General Meeting of the organization will take place in January as usual, but not at Fort Calgary this time. We will have a new venue, so it will be nice to meet everyone in a different setting to the last few years.

We look forward to seeing you at our monthly technical meetings in September, October and November.

Nigel Shrive

2010 CPGCE Scholarship Award

The CPGCE Scholarship Award 2010 presented us with a great collection of essays; ten of those from students at the University of Alberta, two from the University of Calgary and one from the Lethbridge College. As is the case every year, University of Alberta holds the most applicants for the CPGCE Award.

The applicants are enrolled in the field of Chemical Engineering (3), Electrical Engineering (3), Mechanical Engineering (2), Material Engineering (2), General Engineering (2) and Engineering Physics (1). Eight of those applicants are senior students in their last years of their respective programme.

The Scholarship Committee – Adrian Dumbrava, Nigel Shrive and Alan Deazeley - were very pleased with the participants' essays. The students' fresh take on Engineering interests and Global Nature of Engineering topics show a very talented and hard working generation. Many of the applicants are enrolled in programmes outside of Canada (co-op, summer study programmes, volunteer work, research, symposiums, etc). This is a feature that indicates a continuous high level of participation in today's engineering profession.

It was a very tight race and the winner was finally selected after long debates. Matthew David Dyck was chosen from the University of Alberta. Matthew is enrolled in the Bachelor of Science course majoring in Engineering Physics - Nanoengineering Option (2007-2011). He is the holder of many awards and scholarships (Joseph and Edwina Charyk Scholarship in Engineering Physics, Pat Heron Commutative Bursary, Tom Chambers Leadership Award, Stantec Academic Excellence Scholarship in Engineering, Copp Family Leadership Award, Henry Kreisel Memorial Academic Scholarship, Louise McKinney Scholarship, Alberta Centennial Premier's Scholarship, Governor General's Medal and Salisbury Award of Excellence Gold, Rutherford Scholars Award, Golden Key International Honour Society lifetime membership), proofs of academic excellence, research efforts and achievements, outstanding skills, community leadership and service.

Below is an extract from Matthew's "credo" on engineer's role and the nature of engineering:

"Engineers can be catalysts for economic development in the holistic sense, not only contributing to the generation of wealth but also improving overall quality of life. Historically, engineers have been successful at developing technologies which have catalyzed economic prosperity by enhancing industrial productivity, harnessing new energy sources and developing high-speed global information and communication systems, but technological innovation can also serve to improve living standards, enhance education, offer improved healthcare and conserve the environment.

It is the opportunity to affect the society in such profound ways that makes the engineering profession both rewarding and humbling.

Today's global context challenges the engineer to not only be a good designer and technical expert, but also a thinker, creator and innovator that combines a broad technical understanding with creative approach to the development of new technologies. While the increasingly global nature of engineering brings many new challenges to the profession, it also offers opportunities to make a profound positive impact on the world in ways in which the world has yet to dream!"

On February 22nd 2011, members of the CPGCE Executive Committee, including Bob Enever, Alan Deazeley and myself – welcomed the winner in Calgary for a presentation dinner and award of 3000 CAD cheque. (see picture). The winner also received a commemorative "Charles S. Dempsey" medal with the winner's name engraved to acknowledge the CPGCE

award. This is how Matthew recorded being awarded this distinction:

"This week's mail brought a wonderful medal with my name engraved as the 2010 winner of the Charles S. Dempsey Scholarship. What a thrill it was to receive this cherished memento commemorating the wonderful experiences I have had with the Canadian Prairies Group of Chartered Engineers! "

We congratulate Matthew Dyck on his achievement and wish him success in Master's Degree in Engineering programme.

The Scholarship Committee would like to extend to current and future scholarship applicants the opportunity to discuss their engineering careers and challenges. In recognition of the effort that every applicant showed in the submission of their Scholarship Award application, the CPGCE Executive Committee launched the invitation to a special session where an exchange of opinions with Committee members on engineering and technical education.

Finally, I reiterate the invitation to engineering students to submit their applications for 2011 CPGCE Award. Details on how to apply for the 2011 CPGCE Award are available on the following website :

http://www.cpgce.org/Award.htm

Dr. Adrian Dumbrava P.Eng
CPGCE Scholarship Committee

2011 FALL TECHNICAL PROGRAMME

Wednesday, 14th September 2011

Winter Construction – Yes or No?

Pieter Diedericks, M.Eng., MBA, P.Eng. Vice President, Major Projects, Synthetic Oil, Nexen Inc.

Winter is mostly seen as a bad part of construction in Alberta. It is however also an ally because it would have been more difficult to execute projects if we did not experience the winters. Planning should take both aspects into account and there are mitigation actions that can be done to reduce the impact of winter. The presentation will cover safety, productivity, transportation, advantages, heavy lifts, planning for winter and mitigation actions.

Wednesday, October 12, 2011

Safe Water for the Long Haul: An Engineering Perspective on the Global Water and Sanitation Crisis

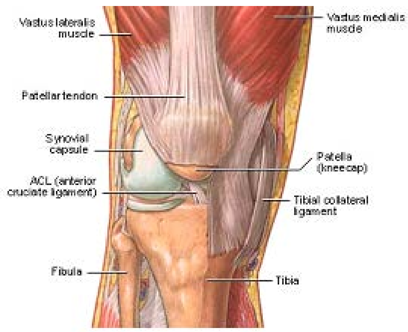
Laura Schuelert, P Eng, B Ed, M Sc Director, Education Program Development CAWST - Centre for Affordable Water and Sanitation Technology

Why do almost one billion people lack safe drinking water? Why does 40% of the world population lack basic sanitation? We will explore these international development and engineering issues together and discover how CAWST, a Calgary non-profit organization, has impacted 3.6 million people with better water and sanitation in less than a decade. We will also discuss what actions you can take to help address the global water and sanitation crisis.

Wednesday, 9th November 2011

The Engineering of Natural Human Body Joints

Dr Nigel Shrive, Killam Memorial Chair, Civil and Biomechanical Engineering, University of Calgary



The joints in your body are complex engineering systems involving four main types of tissue - bone, cartilage, ligament and Meniscus/ labra. In addition, joints are enclosed in a thin tissue called the synovium which supplies most of the cells and materials that are active in the joint. The tissues work in a synergistic fashion to allow normal, painless motion of one bone relative to another during daily activity. The basic engineering functions of joints are to transmit load in a stable fashion from one bone to another across the joint, with extremely low friction. The roles and functions of the tissues to accomplish this feat will be described. Many things can go wrong with the tissues and a common joint disease in the elderly is osteoarthritis. Possible causes of the initiation of this disease will be raised, and the consequences for joint function.

If you have suggestions for the Technical Programme please contact the Technical Meeting Coordinators identified on the back page.

Wednesday, February 9, 2011

Materials for Oil & Gas Projects – Traditional and Modern

Allan McIntyre, P Eng ,

Allan gave a very informative technical seminar on new materials for piping in the oil and gas industry that are under consideration to improve corrosion resistance. Allan started off by describing a Materials Engineers as one having a set of DDP skills**; D**entist, **D**etective and **P**harmacist.

Foster Creek SAGD Plant

A case study for water treatment used for SAGD oil recovery method in Cenovus's Foster Creek project was presented. Different stages of treating brackish water were illustrated using a process flow chart. The original brackish water with 4000ppm chloride at 15°C was passed through filters, ion exchangers, heat exchangers and heat recovery condensers until the water is turned into steam. The materials originally selected for the piping system was carbon steel. The plant had suffered significant corrosion problems with the water treatment piping.

The water used for the SAGD process is produced from deep wells. Allan noted the pH level of the brackish water ranged from 8 to 10. The plant had severe corrosion at T-junctions of the pipes. The corrosive pitting was caused by the carbonic acid from dissolved CO_2 and bacteria and turbulent water flow at the T-junctions dislodged the corroded metal.

To resolve the corrosion problems Cenovus has decided to replace the carbon steel piping. The piping materials considered best suited to the process duty were reviewed. Pitting

Resistance Equivalence (PRE) and unit price of various alternative pipe materials were tabulated to compare to relative viability of the replacement materials for the corroded pipes.

Material	PRE	Relative Material Cost ($/kg)
Traditional Stainless Steel	23	8
Duplex SS 2205	34	10
Duplex SS 2507	38	13
Nickel Alloy 625	41	50
Nickel Alloy C276	46	70

PRE = (Cr % + 3.3x Mo % + 16x N %)

The evaluation started with a review of standard stainless steels and the more complex derivatives, the latter having a higher pitting resistance. Duplex SS is a commercially available material originally developed for North Sea oil production. Machineability of the alloy clad pipes is a key consideration in the evaluation of the material selection cost.

Duplex stainless steel is a difficult material to work with. Piping material cost constitutes about 30% of the overall project cost. Carbon steel clad with alloy for corrosion resistance was considered as a potential solution.

The corrosion resistance of carbon steel, galvanized steel, stainless steel and fibreglass was discussed. Fibreglass reinforced plastic pipe, FRP 411 is used in desalination plants in the Middle East and in chemical facilities in North America. The main concerns for fibreglass pipes in the Foster Creek water treatment plant include bruising and cold brittle fracture. Further studies using small scale tests on newer materials such as fibreglass need to be undertaken to ascertain reliability under service conditions.

In summary, Cenovus was proposing to proceed with the Duplex steels for the majority of the lower water temperature piping. For the higher temperature section on the water treatment system a final decision had still to be made.

Wednesday, March 9, 2011.

Common Misconceptions about Nuclear Energy

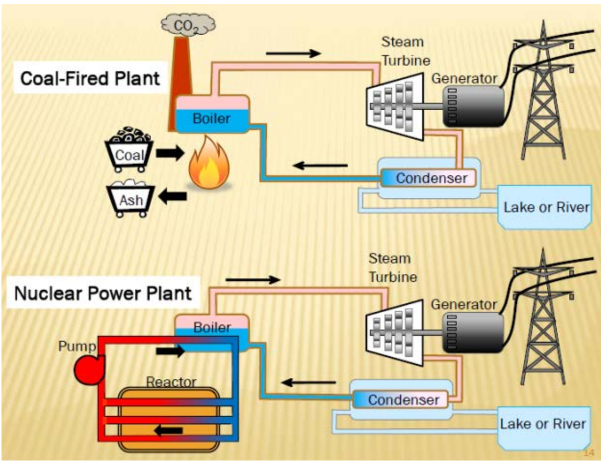
Rene Godin, P.Eng. Past CEO of Canatom

Rene Godin has been involved with the Canadian Nuclear Industry for most of his professional career. He presented a clear insight into the workings of a nuclear power plant.

Nuclear power provides 16.2% of the world's electrical power slightly less than renewable sources (hydro, wind, solar etc) 18.1% and natural gas at 18.6%. Canada has a much higher renewable sector 61.7% because of the large resource hydro-electric facilities and our nuclear capability is lower at 15.5%.

The presentation outlined the development of the nuclear power industry which arose from the Manhattan Project in WWII to build an atomic bomb. From this nuclear technology Admiral Rickover first developed the Pressurized Water Reactor (PWR) for submarines. In the US Westinghouse developed a commercial nuclear power station using a PWR which uses demineralised water. GEC developed the Boiling Water Reactor which is also a light water reactor. Both PWR and BWR use enriched uranium. The fuel of choice for the majority of nuclear reactors is uranium. In its common form uranium is composed of 99.27% U^{238} and 0.07% U^{235} plus smaller amounts of other isotopes. In enriched uranium the U^{235} isotope level is typically raised to 3%.

The UK started with Magnox design which used gas rather than water as the heat transfer medium from the reactor. This was later developed into their Advanced Gas Cooled Reactor (AGR). Canada developed the Candu reactor which uses heavy water as the heat transfer medium. Heavy water has the same chemical structure as water (H_2O) but is formed from the second isotope of hydrogen called deuterium (D) and is represented by chemical symbol D_2O or ^2H_2O. A hydrogen atom, in its common form consists of one proton and one electron, deuterium has an additional neutron. Water consists of 99.98 % of H_2O and 0.02% D_2O. The heavy water is used because it has a lower rate of capture area of neutrons and enables the Candu reactor to be powered by unenriched uranium.



Nuclear and Thermal Power Generation Schematics

The application of nuclear reactors for power generation is similar to conventional thermal power plants where water is converted to steam and used to power steam turbines spinning electrical generators to create electrical power. In a conventional thermal power station, a fossil fuel such as coal, gas, oil, (or natural fuels peat or wood) are burnt with oxygen to generate heat and create large quantities of carbon monoxide, NOX gases and ash. In a nuclear reactor, a controlled conversion of uranium to other elements releases comparatively massive quantities of energy with virtually no emissions to the atmosphere of gases or ash.

Rene Godin argued that nuclear plants are safe and stressed the following key points:

- Nuclear power plants are the most regulated installations in the world
  - The Canadian Nuclear Safety Commission requires 5 licenses to build and operate a nuclear power plant
- Nuclear plants cannot explode like a bomb
  - Wrong fuel, wrong fuel configuration
- What about Three-Mile-Island and Chernobyl?
  - These were not nuclear explosions but loss of coolant accidents
- 45 years of operating nuclear power plants in the world have seen only 2 accidents

At the time of this presentation there had only been two catastrophic failures of nuclear plants. Three Mile Island in the USA had a failure of coolant in 1979. The radioactive gases were fully contained and there were no deaths or injuries.

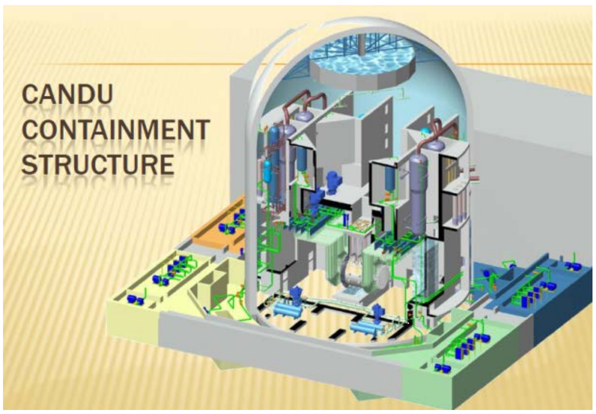
The most significant failure to date has been the Chernobyl RBMK USSR designed reactor in 1986. The plant was carrying out non standard procedures which resulted in a steam explosion and fire. The fallout required a 116,000 people to be evacuated and a 30 km exclusion zone to be established. The World Health Organization analysis of the catastrophe reported that 56 people died and 4,000 people (of 600,000 in the area) received higher than normal radiation with little adverse affects. The USSR design was an accident waiting to happen:

- It had no containment structure
- No failsafe system in operation
- Poorly trained operators

By contrast, conventional thermal power plants have significant issues. For example, about 6,000 die annually in coal mines coal (mainly in China) and it is estimated that 38,200 die annually from sulphur and nitrous oxides. Hydro-electric projects which were favoured because of low operating costs have caused massive damage to surrounding ecology. A prime example is China's Three Gorges dam which has resulted in forced relocation of 1.16 million residents. Over the last 25 years there have been several major hydro-electric dam failures resulting in several hundred deaths. The Sayano–Shushenskaya Hydro-electric power station failed in 2009 killing around 70 workers.

The presentation then went on to explain the Candu nuclear power plant which has had no major failures to date. Currently, there are 29 Candu reactors in operation (and 13 derivatives under construction in India). The Candu reactor does not require enriched uranium, which is the common material used for manufacturing nuclear weapons. This is considered a positive factor.

The design of containment structure was reviewed along with the storage of spent fuel. The presenter passed around a sample of typical Candu fuel bundle to the audience.



The presentation ended with a quote from Patrick Moore who was a co-founder of Greenpeace: “Nuclear Energy is the only large-scale, cost-effective energy source that can reduce these emissions while continuing to satisfy a growing demand for power. And these days it can do so safely.” Washington Post April 16, 2009.

Rene Godin made his presentation to the CPGCE on March 9, 2011. Two days later on March 11, the massive Tōhoku earthquake occurred followed by an equally destructive Tsunami. One major catastrophe from this natural disaster was the consequential Level 7 meltdown at the TEPCO Fukushima Daiichi Nuclear Power Plant. Renee Godin was requested to give a follow up presentation on the causes and consequences of the Fukushima Power Plant failure.

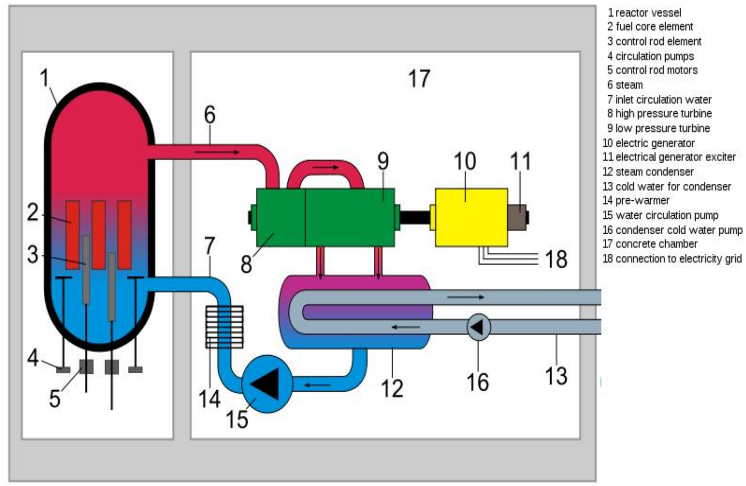
Wednesday, June 29, 2011.

Nuclear Disaster in Japan caused by Earthquake and Tsunami

Rene Godin, P.Eng.

The TEPCO Fukushima Daiichi Nuclear Power Plant has six reactors. All are based on the General Electric Boiling Water Reactor design which uses enriched uranium, see schematic. The reactor design capacity and construction dates are listed as follows:

Unit 1	460MW	in Operation 1971
Unit 2	784MW	in Operation 1974
Unit 3	784MW	in Operation 1976
Unit 4	784MW	in Operation 1978
Unit 5	784MW	in Operation 1978
Unit 6	1100MW	in Operation 1979



Nuclear BWR Schematic

At the time of the earthquake three reactors units 4, 5 and 6 had been shutdown for planned maintenance. Units 1, 2 and 3 were in operation but shutdown automatically and safely during the earthquake. When the Tsunami hit, the tidal waves of 14 m height breached the sea walls which were only designed for 6 m and flooded the emergency electrical generators which run the backup cooling water pumps. When the reactors shutdown they have a residual heat load of around 7% of the reactor maximum capacity . For Unit 1 this is 40MW and Units 2 and 3 50MW. This is a significant heat load. There were two emergency back up systems. One is a battery based system which operated for several hours. The second system is an emergency diesel generator system which failed when it was flooded by the Tsunami and was not put back into operation for many days if not weeks. The entire electrical infrastructure at the site was inoperable for weeks as a result of the Tsunami flooding.

Although it has not been disclosed officially, it is believed Units 1, 2 and 3 all suffered overheating as soon as the battery powered pumps failed. With no cooling water circulation, the top of the reactor core was exposed above the cooling water level causing the core to overheat and melt. When the zirconium fuel rods that make up the reactor core rise above the maximum design temperature, they react with water to create hydrogen. This has to be released from the reactor vessel or it will overpressurize and the vessel will fail. The hydrogen was released from the reactor and gradually built up in the reactor building. The hydrogen subsequently detonated damaging the buildings. TEPCO attempted to cool the reactors by spraying water on the building and reactor and when power was available sea water was pumped into the reactor building. This was an act of desperation and was apparently not effective. The reactor cores of Units 1, 2 and 3 were permanently damaged.

Although the Fukushima reactor design was compliant with the design requirements at the time of construction, it did not appear to have kept pace with current safety requirements. Example of design improvements are the modern BWR design has better containment building and has built in head tank as a back up emergency cooling water system.

Reactors 1, 2 and 3 will never be operated again and that is probably true for Reactor 4 which was not in use. TEPCO's challenge is to get the nuclear reactors back to a stable situation, remove all the radioactive material, decommission the reactors and mothball them such they will never cause a problem in the future. This is a major challenge for TEPCO, Japan and the nuclear industry and is expected to take many years to complete.

Until there is a full enquiry and the exact sequence of events is published, the timing and detailed failures of the design systems will not be known. The nuclear reactors were never in danger of causing a nuclear explosion. The current design of the BWR addresses some of the identified shortcomings of this specific design and detailed analysis of the Fukushima failures will produce recommendations which will improve the design of future reactors. It is believed that the operator, TEPCO, of the Fukushima nuclear power plants had not kept the design and operation of the reactors to current standards. Rene completed his presentation with a brief overview of the current Candu design and how it addresses the design weaknesses of the Fukushima power plant.

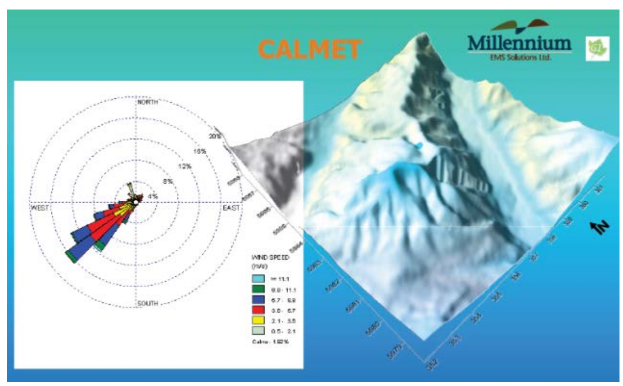
Wednesday, April 13, 2011.

Plume Modeling for Oil & Gas Facilities

Poitr Staniaszek, Ph.D. and Kurt Hansen, P.Eng.

Poitr works as a Senior Environmental Scientists with Millennium EMS Solutions Ltd and Kurt as President of Green Inc.

Poitr described several computer models for air contaminant dispersion study. He then defined odour and attempts to model odour emissions from oil sands facilities.



Air Dispersant Model Output

Dispersion modeling estimates the concentration of pollutants utilizing emission data, meteorological conditions, terrain and properties of the land cover such as Albedo Effect and Bowen Ratio. Models such is SCREEN3 have limited use since they have preset meteorological conditions which are rarely occur. SCREEN3 also produces very conservative results.

AERMOD is recommended by EPA for near source predictions in simple terrain. For large area with complex terrain such as for oil sands, CALPUFF dispersion model may be used in conjunction with 3D meteorological field generated by CALMET.

Meteorological data in Alberta is obtained from the following sources: MM5 which is a 12km spaced multi-layer observation; surface stations and upper air stations. An example of dust dispersion from a mine using was presented. In closing out the first part of the presentation, a simulation of the gas and particle dispersion from the recent Fukushima nuclear disaster in Japan was reviewed. The observation was the studies predicted radiation levels would be very low outside the immediate area of the power plant and not a significant concern.

The presentation continued on the associated topic of odours which are annoying and in some cases toxic. The European Odour Unit, ($OU_{E)}$ is used to quantify odour concentrations and is defined as the dilution factor necessary to reach odour threshold. Olfactometer is used by panellists to determine odour dilution.

Current odour dispersion modeling is considered still at its infant stage because of the difficulties in measuring numerous contributing odour emission; the chemical and physical transformation of odorous substance during transport is not being simulated; and the much shorter modelling period (e.g. 10 minutes) compared to the hourly wind data commonly used in meteorology.

Odour from oil sands generally comes from hydrogen sulphide and to a lesser extent to the TRS (Total Reduced Sulphur) compounds. The significant releases occur from equipment leaks on upgrading facilities, followed by mining projects, then by SAGD and in-situ projects. Odour problems may be mitigated using engineering design measures such as vapour recovery systems, flaring of emissions, increased vigilance and detection of fugitive emissions.

Kurt Hansen demonstrated that models do not always work. Field observation of odour from a pig barn conducted over 11 days in 2003 did not correlate well with those predicted by the results of ISCST3 modelling approach.

During the Q&A, Kurt explained that different odours are not additive in terms of strength of smell. Other key observation was that the models are only as good as the data and the skill of interpreting the simulations.

Wednesday, May 12, 2011.

Innovation in Shell and Tube Heat Exchanger

Murray Rundle, P.Eng.

Murray, the Canada Manager of EMbaffle Inc, presented a proprietary design of Shell and Tube heat exchanger which claims to reduce both capital and operating costs.

Shell and tube heat exchangers are the most common type used for oil & gas and chemical processes for following reasons:

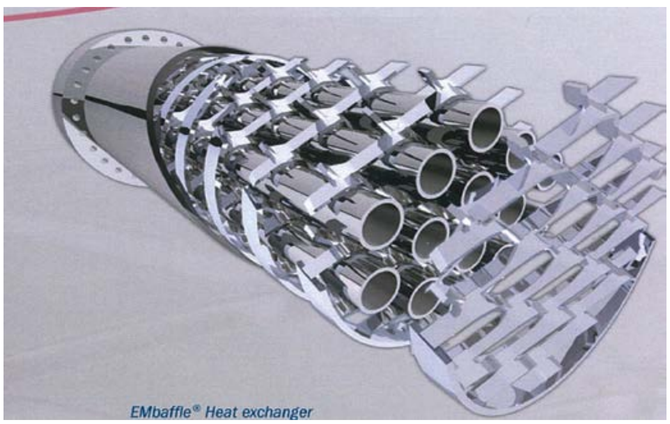
- Robustness
- Applicable to wide range of temperatures and pressure
- Applicable to different processes; boiling or condensing using either clean or fouling process fluids.

Conventional segmental baffles are currently the most common form of heat exchangers. Flow is basically directed back and forth across the tube bundle in cross flow. Its advantages include:

- Non-proprietary technology
- Simple fabrication
- Good heat transfer due to cross flow
- Performance is well studied and understood
- Can be thermally and hydraulically designed using commercially available software with no proprietary plug-ins required

However, disadvantages also abound, the cross flow requires a sizeable pressure drop and there are an inherent momentum losses which waste available pressure drop. Further they are prone to fouling, especially in stagnant zones and susceptible to vibration. Innovations had been developed over the past twenty five years ago to overcome these disadvantages. These include the developments of twisted tubes, helical and rod baffles.

However common problems were still encountered which include high fouling rates, fast decreasing performance and frequent clean-out requirements To address these problems, EMbaffle technology was developed and launched in 2004 as a patented system. The compact heat exchanger design uses expanded metal baffles to support tubes.



Component Graphic of EMbaffle Exchanger

The open structure results in low hydraulic resistance and enhanced heat transfer. This occurs from the break up of the boundary layer flow which occurs repeatedly at each expanded metal baffle along the length of the heat exchanger. The longitudinal flow pattern also reduces tube vibration. EMbaffle claim stagnant or ‘dead zones’ found in traditional segmental baffle heat exchangers tend to foul rapidly. These stagnant zones do not occur in their design.

The talk concluded with a comparison between EMbaffle and single segmental shell & tube exchanger. EMbaffle claim to generate about 24% higher thermal performance with their patented design

Wednesday, June 8, 2011.

Engineering Management - A Profession in a Worldwide Crisis and Challenges for Oil Sands Projects

Dr Max Wang

Max Wang gave a thought provoking presentation about the failings of engineering management from a personal perspective.

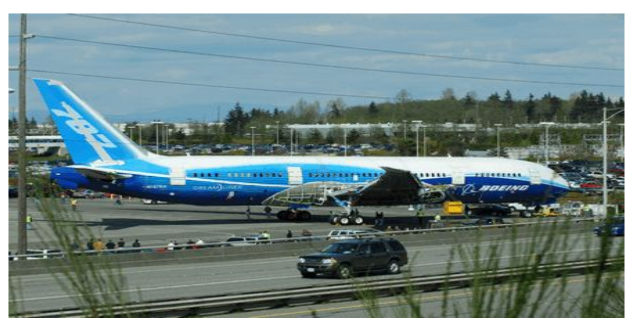
.The theme of his presentation was the litany of engineering projects that have resulted in long delays and large cost overruns. The examples given were:

- Boeing 787 Dreamliner/Airbus A380
- Space programmes
- Channel Tunnel/ Boston Big Dig
- Nuclear and thermal power plants
- Petro-chemical plants
- Canadian oil sands projects

to name a few.

Airbus A380

What happened, the companies Airbus Boeing that developed their respective airliners are not amateurs. These projects are extremely



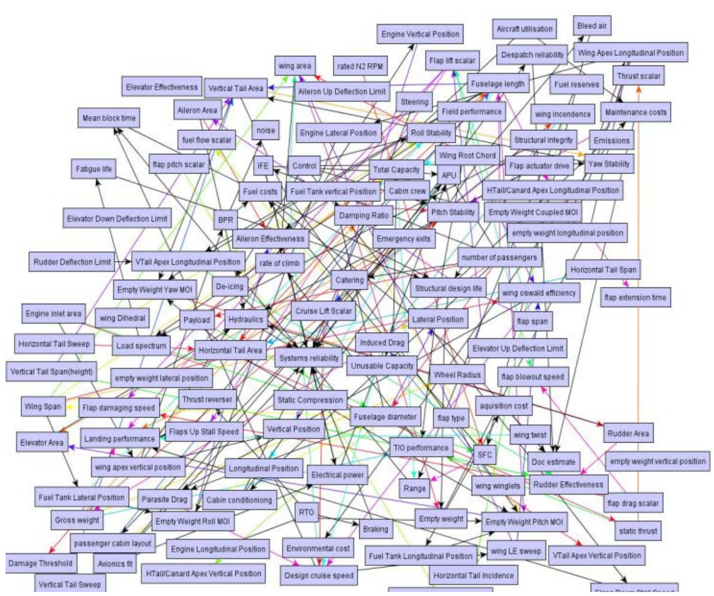
Boeing 787

complex; it is very difficult to manage the designs of large industrial projects, globalization and modern tools have added new challenges and there is a severe shortage of engineering management expertise.

The question was posed: “What is engineering management?” For these extremely large technical projects, it is the requirement to manage thousands of engineers and designers in a multitude of disciplines at multiple locations around the world. The design teams are all interdependent and yet have never met. Further these teams design and specify thousands of systems with millions of components. Miraculously, these projects do come together and work (most of the time). The key elements in engineering management are:

- Technical Integrity including functionality, safety, regulatory compliance, reliability, maintainability and constructability
- Cost effective designs
- Timely release of properly documented design information for procurement, manufacturing and construction/assembly

These translate into the myriad of activities that are needed to manage the engineering in terms of changes, cost, schedule, quality, interfaces and communication, safety, modern design tools and systems. One key issue in all these activities is that it is not possible for any one person to comprehend the complete design, see typical interaction diagram.



Aerospace project network interaction diagram

In the search for more cost effective design and manufacturing, all major projects have gone global. This means a project is being worked on twenty fours hours a day, utilizing engineering design and manufacturing resources available around the world.

If engineering management is so critical to the execution of a project, one would expect that it would be a prominent profession. This is not the case.

The shocking reality in research and teaching management is:

- Almost unlimited resources applied to business management
- Some effort applied to Construction and project management
- Virtually nothing on engineering

Max Wang’s assessment is:

- Very complex work
- Huge responsibility that is inadequately rewarded (no Wall Street bonuses)
- Lack of expertise
  - Academia lack interdisciplinary skills and/or hands-on experience
  - Experienced practitioners (very few) too busy or unwilling to share

The consequences are; a lack of engineering management training, a lack of respect for the function, a severe shortage of the necessary expertise and an industry that continues to pay a high cost often unknowingly.

The presentation concluded with the question of whether the oil sands industry was ready for the next boom and whether the owners had contingency plans for the eroded talent base arising from the 2008/9 layoffs and recent retirements.

The CPGCE Executive as of January 2011

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