POLISH-AMERICAN ENGINEERS ASSOCIATION

FOUNDED IN 1934

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All members and friends of Polish-American Engineers Association are cordially invited to attend our May 2012 meeting.

DATE: **Friday, May 18th, 2012**

TIME: **7:30 p.m.**

PLACE: **Copernicus Center**
Kings Hall
5216 W. Lawrence Avenue
Chicago, Illinois

SPEAKER: **Dr. Kazimierz Jagiello, PhD, PE**

TOPIC: **Nuclear Power Plant, Reactor Control, What Can Go Wrong, Why We Are Safe**

Professional History

Dr. Jagiello received his Masters Degree at the Faculty of Electrical Engineering of the University of Mining and Metallurgy, in Cracow in Poland in 1972. Four years later he earned a PhD degree in Control Theory at the same faculty.

His professional career has always been associated with Control and Automation. He started as a Technical Assistant and became the Associate Professor at the University of Mining and Metallurgy in Poland specializing in Control Systems. In 1984 - 1987 he worked at Al-Tamim cement plant in Iraq, first as an Automation Engineer and then as the Manager of the Automation Department.

After he moved to Canada, he joined Ontario Hydro that was later transformed to Ontario Power Generation and have been working at Darlington Nuclear Power Station for the last 22 years, first as a System Engineer on Shut Down System Computers and for the last 12 years as the Senior Design Engineer in Plant Design, Instrumentation & Control. Dr. Jagiello has formal qualifications to design both, conventional and nuclear I&C control systems in the Province of Ontario including pressure boundary.
Dr. Jagiello is a Professional Engineer in Ontario. He is a past president Council of Polish Engineers in North America. In 2009 I was a Visiting Professor at the Faculty of Mechanical Engineering and Robotics at the University of Mining and Metallurgy in Cracow Poland. Dr. Jagiello joined PAEA in January 2012.

Abstract

The presentation will be based mainly on nuclear CANDU system, the design the author is most familiar with. It has many unique features like "On Line Fuelling" and also in case of the Darlington Nuclear Power Station the control including Special Safety Systems that is fully computerized.
Nuclear power station consists of two major sites; nuclear and conventional. Conventional site is similar to other conventional power plants like coal fuelled units. Nuclear site that includes reactor and its auxiliaries, boilers and supporting systems is physically separated from the conventional systems. There are barriers in place to prevent potential cross contamination between the two sides.
Reactor generates heat to produce steam that drives turbines and the generator. It sounds simple. In reality it is a very complicated system with advanced and precise control and many supporting subsystems. Independent, active Special Systems monitor key process parameters and shut down the reactor automatically if one of them exceeds safety limit.
Three elements are needed to maintain fission reaction in reactor core; adequate amount of fuel, reactor geometry and the moderator. Reactor power is controlled by absorbing thermal neutrons. This is being done by inserting negative reactivity inside the core. Moving Adjuster Rods in and out of the reactor applies "gross" control. Adjusting the water level in the Liquid Zone Control Units provides "fine" control. Reactor control is tied to conventional systems, ex; turbine trip activates alternative heat sink as well as reduces power of the reactor. The whole reactor control is done by computers with the exception of transients or raising or reducing the power, when some operational maneuvers are being done manually.

What can go wrong?
Different scenarios are possible. Process upset caused by turbine trip, equipment failure, human error. In any of these cases reactor power can raise rapidly in a matter of seconds.
The primary goal in controlling the reactor is to protect the core and there are different mechanisms in place. Starting from the control systems and going through the Shut Down Systems up to the worst case scenario when the Loss of Cooling Accident (LOCA) occurs and the Containment system is activated.
The LOCA usually follows the core meltdown. It happened in Chernobyl and Fukushima. The consequences can be limited if the Emergency Cooling Injection System (ECI) is operational. This system was taken out from service in Fukushima when tsunami disabled emergency power generators.

Why we are safe.
There are multiple barriers in place starting from a day to day business that ensures workers safety and preventing them and the public from being contaminated. This includes protective clothing, radiation and monitoring, zoning… Also ventilation is directed from the clean towards the potentially "contaminated" zone.
The Reactor Regulating System itself has built in a safety protocol that automatically reduces power or shuts down the reactor if the level of one of the monitoring parameters is exceeded.
There are two independent and always poised Shut Down Systems that monitor the reactor and Heat Transport System and each of them can shut down the reactor.
There is the Emergency Cooling Injection System that cools down the reactor to prevent fuel meltdown (if this stage is reached).
There is the Containment Building to contain the LOCA, if all other barriers failed.

I think we are safe, provided we treat the reactor core with respect.

Reminder to all members and sympathizers. **Ralph Modjeski scholarship** applications should be turned in by qualified students of engineering by June 15th. Three scholarships will be awarded.

As a part of our annual tradition **PAEA participated in the May 3rd Parade** will took place on Saturday May 5th. About 24 members and families marched along Columbus Drive. Afterwards the entire group feasted on Pizza and beer at Giordano's Restaurant. We offer special thanks to all those who participated, in spite of cool and misty weather.

One of our members, **Mr. Janusz Kulczuga organized a trip to University of Akron to meet with Professor Wieslaw Binienda**. Meeting took place on Sunday May 6th and Monday May 7th. Professor Binienda received a plaque commemorating his scientific achievements and efforts to enhance image of Polish community.




Constitution and By-Laws committee which consists of Dr. Ron Wolosewicz, Tad Hofkin, Miroslaw Noyszewski and Roman Korczak completed their effort and the final draft of both documents was submitted to the Administration for review; prior to presentation to the Membership for approval.

Dr.Plachta suggested a multi day bus trip to visit and **explore Bridges of Ralph Modjeski**. Trip could be scheduled in the fall of 2012. Original itinerary, attractions and cost are provided below.

MOSTY RUDOLFA MODRZEJEWSKIEGO

Dzień 1 - Wyjazd z Chicago o godz 9 rano, około godziny 1 pm docieramy do Rock Island (170 mil od Chicago), gdzie przez godzinępodziwiamy historyczny Government Bridge (2). Przejazd do następnego, pobliskiego mostu pomiędzy Bettendorf a Moline (3), gdzie spędzamy dodatkowy czas do godziny 4-5 pm. Posiłek, przejazd na nocleg (100 mil) do Keokuk.

Dzień 2 - Wyjazd z hotelu po śniadaniu ok. godz. 8:30, krótki podjazd do mostu Keokuk (4), gdzie spędzimy około półtorej godziny. Około 10 wyjazd w kierunku odległego o 130 mil Saint Louis, gdzie dotrzemy ok. godz. 12:30 w południe. Do godziny 2 po południu oglądamy most McKinley Bridge (5), po czym jedziemy 110 mil do Thebes gdzie znajduje się kolejny most kolejowy (6) Rudolfa. W Thebes będziemy do godz. ok. 3:30 pm, a następnie przejedziemy (70 mil) oglądać most w Metropolis (7). Wyjazd z Metropolis ok. godz. 7:30 pm, przejazd (120 mil) na nocleg do Evansville KY, gdzie dotrzemy ok. godz. 10 pm. Nocleg w Evansville.

Dzień 3 - Wyjazd z motelu o godz. 8 rano, na most w Evansville (8) przeznaczamy czas do godz. 9 rano, po czym jedziemy oglądać most w Louisville (9) w godz. 10:30-11:30. Po lunchu długi przejazd (450 mil) do Memphis TN na nocleg.
Dzień 4 - Po śniadaniu, w godz. 8:30 - 9:30 oglądamy most kolejowy w Memphis (10). Dla zainteresowanych bylaby mozliwosc zwiedzenia museum Elvisa Preseleya, tzw. Graceland Mansion. Przejazd 400 mil do Nowego Orleanu, gdzie dojedziemy ok. godz. 5 po południu. Most drogowo- kolejowy Huey P Long (10) (5-6:30). O moscie tym prasa Nowego Orleanu pisala, ze byl "Cudem Techniki, Dzielem Sztuki". Reszte dnia poswiecimy na spacer, relaks i kolacje w zabytkowym Starym Mieście, nocleg w Slidell.
Dzień 5 - Cały dzień przeznaczamy na przejazd do Greensboro/Raleigh w Karolinie Północnej.
Dzień 6 - Po śniadaniu przejazd 300 mil do Waszyngtonu, zwiedzanie miasta w godz. 1- 4 pm, przejazd (140 mil) na nocleg do Filadelfii.
Dzień 7 - Od rana podziwiamy most Benjamin Franklin (12) w Filadelfii, ukończony w 1926 roku w 150. rocznicę Stanów Zjednoczonych. Przejedziemy rowniez przez most Tacony-Palmyra (13), oraz ciekawy lukowy most kamienny poprzez Henry Avenue (14). O 10-tej ruszamy w stronę Nowego Jorku, a następnie wzdłuż rzeki Hudson, gdzie (2-3 pm) oglądamy most Poughkeepsie (15). Nocleg w okolicach Niagary.
Dzień 8 - Przejazd (600 mil) do Chicago.

Proponowany termin wycieczki: druga polowa Maja 2012
Cena wycieczki: $1050 .
Cena obejmuje transport wg. programu mikrobusem (van) 15-osobowym, 7 noclegów w motelach standardu Super 8 i opiekę przewodnika. Cena nie obejmuje ubezpieczeń, posiłków ani biletów wstępu.

UWAGA: możliwe jest 2-dniowe przedłużenie wycieczki (jej cena wzrośnie do $1350), połączone z dodatkowym zwiedzaniem Quebec City, Montrealu, Niagary i mostu Modrzejewskiego w Detroit.
Dzień 8 - Przejazd z noclegu w okolicach jeziora Champlain/Adirondac Upper NY do Quebec City, zwiedzanie mostu (16) Dolcia, o którym, pisano, że jest ósmym cudem świata. Nocleg w okolicy Trois Rivieres.
Dzień 9 - Zwiedzanie Montrealu, przejazd w okolice wodospadow Niagary, wieczorna panorama oświetlonych wodospadów, nocleg.
Dzień 10 - Całodniowy przejazd do Chicago połączony z podziwianiem ostatniego już na naszej trasie mostu Modjeskiego (17) w Detroit/Windsor.

All those interested **please contact Dr. Jan Plachta** at 773-775-7599 or jsplachta@sbcglobal.net

All members who are current with their dues received very attractive and colorful **membership cards.**

P.A.E.A. MEMBERSHIP DUES. If you are late with your dues please remember to send us your check. Dues are $50 per year, senior citizens and students $25 per year. Questions? 2012 membership cards will be provided to all those who paid their dues. You may send an email to: paea.info@gmail.com