THE CONSULTANT

The Newsletter of the IEEE Consultants Network of Long Island

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Chairman's Corner — *John Dunn, President, Ambertec, Inc.*

I attended a seminar earlier today, Sunday. It was about medical issues, not electronics. What struck me about it all was how poorly many people, including some of the speakers, seem to be at handling communications.

There were several microphones set up, but one of them went dead. The man to whom that microphone had been provided kept trying to use it. Why?? I have no idea. It didn't work, yet he seemed certain that if he kept the thing near his face, his words would somehow carry across that room which must have held several hundred listeners. Mind you, this person was a doctor, an intelligent man whom you would think would know better.

At the end of the spoken presentations, the floor was opened up for questions and answers. A man was sent out into the crowd carrying a wireless microphone, but not everyone whom the moderator recognized was given that thing in order to be heard.

It was such a thrill when a question would be posed by someone near the front of the audience with no microphone, a question that could not possibly be heard by most of the people in the room, and then to have the speaker offer a reply without first repeating the question so that everyone could understand.

One person who *was* given the microphone held it maybe twelve inches away when speaking. That question couldn't be heard by most of the audience either. Although a reply was provided, I'm not entirely convinced that the speaker had properly heard the question either.

More examples?

How about when a page on a PA system is spoken only once. "Was that page for me?", you're left to wonder.

How about when a voice mail message has a phone number spoken only once and at machine-gun speed and you can't make it out?

Elocution and attention to communication skills is what was lacking today. The seminar's presentation materials were actually worth while, but such an unnecessary struggle to get through.

Done any public speaking lately?

Meetings

February 2007

Topic: "Mohr on Receiver Sensitivity"
Speaker: Mr. Richard J. Mohr of R.J. Mohr Associates, Inc., Northport, NY.

March 2007

7:00 PM, Wednesday, March 7, the first Wednesday of the month.
Briarcliffe College, 1055 Stewart Avenue, Bethpage, NY
See website for directions: www.consult-li.com

Topic: "A Brief Historical Perspective of Our Profession - Part 2"
Speaker: Jerry Brown, Essex Systems, Huntington, NY.
See page 3 for speaker biography.

In December, Part 1 of this topic got us to 1900. Part 2 will start with the discovery of the electron and end with the invention of the transistor. It will include a lot of things that left landmarks in our geographic area, such as Nicola Tesla's Long Island Laboratory and Edwin Armstrong's first FM transmitter tower.

Light refreshments will be served? No confirmation yet.
Admission is free (no charge),
and no pre-registration is required. For more information, contact Chairman John Dunn at (516)378-2149 or e-mail ambertec@ieee.org.

Other Meetings

Consult the Events Calendars on the Section website: www.ieee.li and the LICN site: www.consult-li.com.

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Speaker Jerry Brown's Biography

Jerry Brown graduated from Oklahoma State University in 1962 with a BS in Physics and Mathematics,

His first position was with an Oklahoma company that manufactured industrial control systems for roll-to-roll processing of sheet materials (web processing) where he developed optical sensors, signal processors and electrical actuators for a wide range of applications. These were parts of closed-loop systems that controlled the lateral registration of sheet materials in industries such as paper, plastics, metals and textiles.

In 1973 he became engineering manager for a new division involved in nuclear thickness gauging and oversaw development of the world's first microprocessor-based nuclear thickness gauging system for web processes.

He came to Long Island in 1986 to join a division of Kollmorgen as engineering manager where he directed development of several new electromechanical systems used in the manufacture of Multiwire circuit boards. These machines involved many complex technologies such as ultrasonic wire embedding, precision electromechanical subsystems to unspool, feed and cut fine gauge wire, microprocessor controls and high-resolution motion platforms.

In 1998 he left corporate employment to become an independent R&D engineering consultant.

Show Me the Money! — *Richard LaRosa, sealevelcontrol.com*

Sir Richard Branson has just offered a $25,000,000 prize for doing what I think the ocean-powered pump for global cooling and increased food production will do. Previous articles in this series have traced the evolution of an ocean thermal energy conversion (OTEC) system that pumps cold water up from 1000-m depth and distributes it on the surface. The pumps will be mounted on submerged tension-leg platforms in tropical ocean waters where the surface temperature is at least 27°C all year. So far this year, the Caribbean Sea just south of the Yucatan Passage is meeting this requirement. Although the surface water is cooled, the overlying atmosphere transfers heat to the water, so the temperature drop appears in the atmosphere, where it is dispersed by the air currents. A general circulation model must be used to predict how much a given rate of pumping might slow down the destruction of the Greenland ice sheet - obviously not much for a single pump bringing up 10 m^3/s. Think 100,000 pumps and it becomes obvious that the cold water had better have greater value than just the cooling effect. That's where the nutrients might rescue the idea.

Phytoplankton floating in the surface layer that is illuminated by the Sun require the macro-nutrients phosphorus and nitrogen in the form of phosphate and nitrate ions dissolved in the up-welled water. Normally, the phytoplankton deplete the tropical surface waters of nitrogen and are prevented from receiving replacements because of stratification. The warm, lighter water is on top, and the colder, heavier water is below, and there is little vertical circulation to bring up more ions. The nitrate ions at 1000-m depth contain 0.4 mg of nitrogen atoms per kg of water. The organic matter produced by photosynthesis contains carbon, nitrogen, and phosphorus atoms in the ratios 106: 16: 1. These are the Redfield ratios. The atomic weights of carbon and nitrogen are 12 and 14, respectively. Therefore the ratio of carbon mass (supplied by dissolved CO_2) to nitrogen mass (supplied by the pumped-up water) is (12)(106)/(14)(16) = 5.68.

Previous articles in this series have assumed a pumping rate of 10 m^3/s, which brings up 10275 kg/s. This supplies (0.4)(10275) mg/s of nitrogen = 4.11 g/s, which produces (5.68)(4.11) = 23.3 g/s of carbon, or 735 metric tons (MT) of carbon per year (735 MT C/yr). This is primary production, the carbon in the organic matter synthesized from inorganic matter. It includes the organic matter that the phytoplankton use for their own respiration. The primary production of the World Ocean is $37.3 \cdot 10^9$ MT C/yr. 100,000 pumps would supply $73.5 \cdot 10^6$ MT C/yr, about 1/500 of the World Ocean production. How much is this worth? Maybe a lot, if it puts food where the large predatory fish must cruise many miles searching for prey. A lot more study will be needed to make the best case for ocean-powered pumps.

This series of articles has described a significant step forward in the implementation of OTEC, although to many it will seem like a step backward. That step is the recognition that OTEC plants should export cold water and nutrients rather than electric power or some other product (like ammonia or fresh water) that requires power to be provided by the plant. The plant must pump up cold water to condense the working fluid. If all the power produced is used to pump cold and warm water, and if all this water flows through the condenser and evaporator heat exchangers, the respective water temperature changes are minimized and the maximum differential between the condensation and evaporation temperatures of the working fluid is achieved. This maximizes the efficiency of the engine thermal cycle, which in the latest design iteration, is a colossal 3.67 %. If you think that's low, just see what happens if you try to sneak some power out to sell it on the market. You run less water through the heat exchangers, resulting in larger water temperature changes. The efficiency drops, the heat exchangers become too large and expensive, and the result is failure, as proved by 126 years of history.

Arsene D'Arsonval wrote a paper in 1881 describing the OTEC concept. Around 1930, Georges Claude demonstrated the idea in a plant that produced power from a turbine. The output was less than the power required to run the plant. Similar attempts have been made until the present time. A 1-MW gross-power demonstration in India appears to be stalled because their 1-km-long cold-water pipe was lost at sea in the attempt to up-end it. A 1-MW plant is supposed to be demonstrated in Hawaii next year. Success is always "just around the corner."

There have been some ingenious innovations that attempt to improve the thermal efficiency of OTEC plants that allow large water temperature changes in order to export power. The Kalina and the Uehara cycles use a mixture of water and ammonia whose composition changes as it goes through the heat exchangers. This allows the working fluid evaporation and condensation temperatures to track the water temperatures more closely. There have been successful demonstrations, but there are no working plants in operation.

During all this time of OTEC development our problems have shifted from fuel shortages and fuel costs to global warming, glacier loss, and sea level rise. It may be time to recognize that OTEC can help to solve our current problems by supplying cold water and nutrients. Accept the history lesson that tells us that OTEC plants cannot export power, manufactured chemicals, or desalinated water.

A second contribution of this series of articles is a method of on-site assembly of sections of cold-water pipe. A work boat with dynamic-positioning thrusters carries pipe sections with flanges at both ends to the site and lowers one section vertically into the water. Another vertically-oriented section is placed on top of the first one and sections of a grooved ring are placed over the flanges to couple the pipe sections together. A clamping band is tightened around the ring sections to keep them in place. Then the assembly is lowered and the next pipe section is positioned and attached. The process is repeated about 100 times if the pipe sections are 10 m long. There have been many unsuccessful attempts to tow a horizontal 1000-m-long pipe to the site and up-end it. The on-site assembly of vertical pipe sections avoids this pitfall.