THE CONSULTANT

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

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The new era in television is coming. It's called HDTV. Since in approximately two years, all NTSC broadcasts will cease, we decided to take a look at what particular television we might buy and so we went down to the store. What an experience. I can safely say from direct personal observation that HDTV is at best a work in progress.

The pictures on many of the sets being demonstrated were horrid. No two sets had the same color rendition, but I'm told that can be adjusted. If so, then why was almost every set visibly different from every other? I suppose there's some kind of logical explanation for that.

What was really bad though was seeing how on every LCD based screen, images of any object were surrounded by some kind of halo that shimmered and pulsated. It looked as bad as ghosts used to look when using a rabbit ears antenna on a black-and-white portable in the middle of Queens as I was growing up.

Also, along every image edge like someone's dark sleeve against a bright sunny sky, there was a visible serration like little saw teeth that would swing up/down as the image moved.

Ugh!

Giving up on the LCDs, we moved on to the rear projection sets. To me, they looked very, very dark. To my wife, they weren't so bad. Why? I discovered that if I bent down and looked at them, the image brightened. In short, visibility from off-angle was very poor.

On we went to the plasma screen sets. They looked somewhat better, even with some evidence of the above effects. However, I noticed that some plasma sets seemed more likely to show flicker on moving objects than others did.

Those that seemed to have the poorer performance in this regard had a dark cross hatching that very strongly separated the individual pixels from each other. In the better sets, the pixels seemed to fuzz into each other with no dark grid overlay. It was the fuzzier pixeled sets that showed less flickering, not zero, but noticeably less.

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Meetings

January 2007

Topic: "Beware of Loop Gain!"
Speaker: Mr. John Dunn, Ambertec, Inc., Merrick, NY.

John did his usual great job, and Ye Editor would like to take up some space with the following comment: Despite almost 60 years in this business, I don't think I realized that you could measure the open loop gain without physically opening the loop. In the example of the talk, he had to keep the loop closed so that the sneak non-linear path around the loop was not interrupted, and he was able to detect its presence.

February 2007

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

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

Light refreshments will be served. 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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Chairman's Corner — continued from page 1

We finally went on to look at DLP sets and there we saw pretty much the best image quality, but at $3000..........

Also, I've read that DLP sets use a back-light bulb that has to be periodically replaced, so as Onslow used to say in the Britcom 'Keeping Up Appearances', "Nawwyce!"

We didn't buy anything.

I had noted that the LCD sets that looked so bad use 1080i scanning whereas the very costly DLP sets we saw used the better 1080p scanning method. I have also read that the LCD folks are going for 1080p capability as well, so I decided it's best to just wait and see what happens next.

Still, if you're in the market for one of these things, caveat emptor!

Ocean-Powered Pumps for Global Cooling and Increased Ocean Productivity — *Richard LaRosa, sealevelcontrol.com*

The title of this article is different from that in the November 2006 newsletter. First, the plural form of pumps concedes that it might take 100,000 pumps, each bringing up 10 m3/sec of cold water to adequately cool the sea surface and the overlying atmosphere. This amounts to a total flow of one million m3/sec, referred to as 1 Sverdrup (1 Sv) in honor of the famous oceanographer Harald Sverdrup. This is a cooling rate sufficient to lower the surface temperature of the Caribbean Current or the Gulf of Mexico Loop Current by 3 deg C. The surface temperature of the current is not actually reduced by 3 deg C because the heat transfer from atmosphere to water is increased. There is cooling, but it is spread out over a large and vaguely-defined area by the atmosphere. Computer modeling is needed to predict how much effect this pumping will have in reducing the rate of ice sheet destruction. To visualize the magnitude of 1 Sv, note that the transport of the Florida Current in the vicinity of Miami is about 25 Sv.

The thermal engines that power these pumps use the small temperature difference between the surface water and the bottom water. This might be 27 deg C for the surface water in winter minus 5 deg C for the bottom water all year round. The maximum efficiency possible is the Carnot efficiency, which is (27 - 5)/(27 + 273), or 7.33%. Much of the 22 deg C temperature differential is wasted in water temperature drops through the evaporator and condenser heat exchangers, and temperature drops across fluid films and the walls that separate water from the ammonia or other working fluid. There is also the inefficiency of the turbine, so the actual efficiency is much lower than 7%. Each drop in efficiency makes the machinery larger, more expensive, and more unwieldy. For adequate return on the investment, the machinery must be run continuously throughout the year. This means that the pumps must be stationed south of the Gulf of Mexico in order to have warm enough winter temperatures. The November 2006 article indicated that the water flow through the evaporator and condenser heat exchangers had to be maximized in order to reduce the heat exchanger temperature drops. This means that all of the cold water pumped up from the bottom must go through the condenser and a similar amount of warm surface water must flow through the evaporator. The result is that almost all of the power produced by the heat engine is used to run the pumps and other on-board equipment. There is nothing to export and sell, except for the cold water pumped up from the bottom and distributed over the surface.

Fortunately for the economics of this project, the cold water from the bottom is rich in nitrate and phosphate ions, as well as dissolved iron. These are used by phytoplankton in the upper layer of the ocean which is illuminated by sunlight. The phytoplankton contain chlorophyll, so they can produce organic matter through photosynthesis. The phytoplankton also need vitamins B1 and B12 to stimulate their growth. The B vitamins are produced by bacteria and there is a dependence on iron availability. Various forms of zooplankton eat the growing phytoplankton and the krill eat the zooplankton. Whale sharks feed on krill and they have been observed in the Caribbean, so we have at least one link to large fish. However, many fish dwell on or near the bottom in water much shallower than the 1000-m depth required to supply the 5 deg C water, so it is necessary to establish the connection between these fish species and the increased food production at the surface of the deep water where the pumps are located. This can be done by examining the photosynthesis process. Photosynthesis involves very complicated interactions of photons, chlorophyll, and raw materials, using small steps that build up to a chemical change. Leaving out all these small steps, the process is described superficially by Eq.1.

$$106\ CO_2 + PO_4^{3-} + 16\ NO_3^- + 122\ H_2O + 19\ H^+ \longrightarrow (CH_2O)_{106}\ (NH_3)_{16}\ H_3PO_4 + 138\ O_2 \qquad (1)$$

Eq.1 shows a process in which many carbon dioxide and water molecules are converted into an organic compound and oxygen molecules. Some of the carbon dioxide emitted by various natural and human activities is dissolved in the ocean and some of this is converted into organic material. This eventually dies if it is not consumed by another creature further up the food chain. The dead organic material sinks to the bottom of the ocean where it decays or is buried in sediment. This photosynthesis, death, and sinking is referred to as the biological pump. It is a way of removing dissolved carbon dioxide from the water and depositing it as dissolved organic carbon. But it is not a permanent carbon sink. When the organic material decays, methane and carbon dioxide are released. We must keep the ocean productivity at a high level to keep removing the carbon dioxide.

There is another way in which the pumping benefits ocean food production. Phytoplankton, zooplankton, krill, and other sea creatures use calcium carbonate to form their shells. Coral skeletons are also made of calcium carbonate, although it is a different form. The ocean absorbs large quantities of carbon dioxide, which dissolves mostly as un-dissociated molecules. These react with water to form a large concentration of bicarbonate ions. The essentials of this process are shown in Eq.2.

$$CO_2 + CO_3^{2-} + H_2O \leftrightarrow 2HCO_3^- \qquad (2)$$

The concentration of bicarbonate ions is so great that it is hardly affected by this reaction. This means that the product of the carbon dioxide and carbonate ion concentration is constant. Therefore an increase in carbon dioxide results in a decrease of carbonate ion concentration. This means that to form calcium carbonate shells and skeletons at the required rate, an increase in calcium ions is required. But a major source of calcium ions is from the dissolving shells and skeletons of creatures, hopefully dead ones. However, there are predictions that increasing CO_2 will retard the formation of and might even dissolve the shells and skeletons of live creatures. The pumping of cold water from the bottom supplies macronutrients (phosphate and nitrate ions) plus iron and other required ingredients, thus removing the CO_2 by converting it to organic matter. The pumping also tends to overcome the ocean stratification, putting the top layer in better communication with the greater depths.

Since the sinking organic matter is moved around by the bottom currents, the continental slopes and shelves can be supplied with nutrients from the deep waters. The lower life forms on the bottom use these nutrients, which work their way up the food chain to feed the larger fish and other marine animals. Many details must be filled in and clarified, but it appears that there is a high-value and necessary use for the cold seawater that is pumped up to cool the ocean surface and overlying atmosphere. This might justify the construction and deployment of a large fleet of pumps.