THE CONSULTANT

The Newsletter of the IEEE Consultants Network of Long Island

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

RFID (radio frequency identification) is showing up in more and more places and let me express an opinion: RFID is very scary.

I read how affixing RFID tags to warehouse merchandise makes inventory control much easier than it once was. The workmen need only pass by the fronts of storage shelves, scan the affixed RFID tags and account for all of the items there.

That's wonderful.

Then I read how RFID tags are now being included in credit cards and as with the warehouse example, by carrying no more equipment than can be stuffed into a duffel bag, a criminal can walk through a crowd and scan the RFID tags on the credit cards of passers by, thus stealing their credit card information.

That is not wonderful.

In connection with this, in the latest Consumer Reports (August 2006, page 11, "Your Letters"), the editor writes:

"Some data security experts have recommended using foil liners in wallets to block scanning of RFID-enabled payment cards that don't have to be swiped. But extending that type of protection to every item you carry could be cumbersome."

So which is worse, cumbersome or robbed?

Meetings

August 2006

7:00 PM, Wednesday, August 2, the first Wednesday of the month.
Briarcliffe College, 1055 Stewart Avenue, Bethpage, NY
See website for directions: www.consult-li.com

Topic: "Control or Conniptions - What's Good and What's Bad in Today's Professional PC"

This will be an open forum, moderated by Peter Buitenkant, to discuss the latest technology in home and small-business computers. The topics will be discussed from the viewpoint of someone currently looking to purchase a new computer; what features are desirable, and what options should be avoided. Both hardware and software will be discussed.

Be prepared to share your own experiences, opinions, and suggestions.

Admission is free (no charge). No pre-registration is required. For further information, contact the Chairman, John Dunn, by e-mail: ambertec@ieee.org, or by telephone: (516)378-2149. If John is not available, contact Vice Chairman Jerry Brown (contact info in officer list) or Moderator Peter Buitenkant (contact info in box, this page).

Some Humor—contributed by Jerry Brown

DRILL PRESS: A tall upright machine useful for suddenly snatching a piece of flat metal out of your hands so that it smacks you in the chest and flings your beer across the room, splattering it against that project part you are working on.

WIRE WHEEL: Cleans paint off bolts and then throws them somewhere under the workbench with the speed of light. Also removes fingerprint whorls and hard-earned guitar calluses in about the time it takes you to say, "Ouch..."

ELECTRIC HAND DRILL: Normally used for spinning pop rivets in their holes until you die of old age.

PLIERS: Used to round off bolt heads.

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HACKSAW: One of a family of cutting tools built on the O! Ouija Board principle. It transforms human energy into a crooked, unpredictable motion, and the more you attempt to influence its course, the more dismal your future becomes.

VISE-GRIPS: Used to round off bolt heads. If nothing else is available, they can also be used to transfer intense welding heat to the palm of your hand.

OXYACETYLENE TORCH: Used almost entirely for lighting various flammable objects in your shop on fire. Also handy for igniting the grease inside the wheel hub you want the bearing race out of.

WHITWORTH SOCKETS: Once used for working on older British cars and motorcycles, they are now used mainly for impersonating that 9/16 or 1/2 socket you've been searching for the last 15 minutes.

HYDRAULIC FLOOR JACK: Used for lowering an automobile to the ground after you have installed your new disk brake pads, trapping the jack handle firmly under the bumper.

EIGHT-FOOT LONG DOUGLAS FIR 2X4: Used for levering an automobile upward off a hydraulic jack handle.

TWEEZERS: A tool for removing wood splinters.

PHONE: Tool for calling your neighbor to see if he has another hydraulic floor jack.

SNAP-ON GASKET SCRAPER: Theoretically useful as a sandwich tool for spreading mayonnaise; used mainly for getting dog poop off your boot.

E-Z OUT BOLT AND STUD EXTRACTOR: A tool ten times harder than any known drill bit that snaps off in bolt holes you couldn't use anyway.

TWO-TON ENGINE HOIST: A tool for testing the tensile strength of everything you forgot to disconnect.

CRAFTSMAN 1/2 x 16-INCH SCREWDRIVER: A large pry bar that inexplicably has an accurately machined screwdriver tip on the end opposite the handle.

AVIATION METAL SNIPS: See hacksaw.

TROUBLE LIGHT: The home mechanic's own tanning booth.

Sometimes called a drop light, it is a good source of vitamin D, "the sunshine vitamin," which is not otherwise found under cars at night. Health benefits aside, its main purpose is to consume 40-watt light bulbs at about the same rate that 105-mm howitzer shells might be used during, say, the first few hours of the Battle of the Bulge. More often dark than light, its name is somewhat misleading.

PHILLIPS SCREWDRIVER: Normally used to stab the lids of old-style paper-and-tin oil cans and splash oil on your shirt; but can also be used, as the name implies, to strip out Phillips screw heads.

AIR COMPRESSOR: A machine that takes energy produced in a coal-burning power plant 200 miles away and transforms it into compressed air that travels by hose to a Chicago Pneumatic impact wrench that grips rusty bolts last over-tightened 58 years ago by someone at ERCO, and neatly rounds off their heads.

PRY BAR: A tool used to crumple the metal surrounding that clip or bracket you needed to remove in order to replace a part.

HOSE CUTTER: A tool used to cut hoses too short for their intended purpose.

HAMMER: Originally employed as a weapon of war, the hammer nowadays is used as a kind of divining rod to locate the most expensive parts not far from the object we are trying to hit.

MECHANIC'S KNIFE: Used to open and slice through the contents of cardboard cartons delivered to your front door. Works particularly well on contents such as new racing seat pads, vinyl records, liquids in plastic bottles, collector magazines, refund checks, and rubber or plastic parts.

DAMMIT TOOL: Any handy tool that you grab and throw across the garage while yelling "DAMMIT" at the top of your lungs. It is also the next tool that you will need.

Help from SATOP — *Dr. Richard LaRosa, sealevelcontrol.com*

The Space Alliance Technology Outreach Program (SATOP) is funded by NASA and offers small businesses up to 40 hours of free technical assistance from NASA and its Alliance Partners. Typical of the people helped by this program is Nick Cancro, who manufactures a white LED array for boat cabin lighting. He sells it through his catalog business, "Sailor's Solutions." An Alliance Partner helped him with the design of the heat sink. His catalog has a photo of the heat sink with an array of six LED's emitting soft white light. The accompanying text, "Thermal Design Assisted by NASA Space Alliance Technology Outreach Program" should help to sell the product.

The program has been advertised in terms such as, "Rocket Scientists for Manufacturers," so I figured that I was excluded. But at the recent LISAT Conference, when I was speaking to the Regional Director, Larry Kalish, at the SATOP booth, I realized that I was a very small businessman trying to develop a very huge product, and I could surely use some help. Larry assured me that this was the case and I later submitted a request through www.SATOPNY.com. I was promptly contacted by a SATOP engineer, who worked with me to define a task that could be accomplished within the 40-hour limitation. He then put me in contact with Professor Vincent Choo of New Mexico State University, who wrote a short statement of work which amounted to verifying the calculations for the OTEC ammonia turbine cycle.

His final report was quite valuable to me. First, it referred to a thermodynamics textbook which I bought to supplement the one I was using before I was drafted in World War II. Exergy wasn't invented then. Second, I learned that in these low-efficiency thermal cycles, typical of OTEC, the vapor quality of the turbine exhaust is high enough without superheating the inlet vapor. Superheat requires lowering the inlet pressure, which lowers the turbine efficiency. Third, I realized that it would take a radical redesign of the condenser (and possibly the evaporator) in order to reduce the temperature drops in the heat exchangers and leave more temperature differential for the turbine. I had borrowed an OTEC design that was optimized for exporting electric power, where pumping power is considered to be a parasitic loss. But for sea-surface cooling, all of the turbine output is converted to electric power to drive pumps, so it may be possible to reduce the back pressure of the condenser and run all the cold bottom water through it.

Now, how can the SATOP program help LICN members? How about help with tools for mounting, testing, and removing fine-pitch surface mount components. Perhaps NASA or a SATOP Affiliate might know about some specialized software. Help with transducer design and fabrication would surely be available. Most consultants and their clients qualify for SATOP help, based on my experience. It's a way to extend your capabilities. They will work on only one of your problems at a time, but after that is satisfactorily closed out, you are free to ask for help on something else.

Hurricane Suppression——Loop Current Guide

— *Dr. Richard LaRosa, sealevelcontrol.com*

There is an old saying that an ounce of prevention is worth a pound of cure. In the case of protecting the Gulf Coast from hurricanes that gain energy from deep pools of warm water, the ounce of prevention may be a fence or screen that guides the Loop Current from the Yucatan Channel directly into the Florida Straits. This is a massive project, and the word "ounce" is appropriate only when compared to what it takes to remove the warm-water pools that accumulate if the Loop Current is allowed to intrude into the Gulf of Mexico. The accumulation of warm water is due to the Coriolis force which sweeps moving water to the right of the path with a force that is proportional to the velocity of the current. The velocity is near zero at 800 m depth, and increases to a maximum near the surface. The warmest water is also the least

dense. Hence, it is at the top, is the fastest, and therefore is preferentially collected in the interior of the Loop Current path.

Examination of the bathymetry in the neighborhood of the Yucatan Channel and the Florida Straits suggests that they can be connected together by a current whose center line is a circular arc whose radius is 248 km. The current exerts a centrifugal force which can be resisted by a fence or screen on the northwestern side of the path. After some approximations are made, the centrifugal force normal to the screen per meter of stream length is 2/R times the kinetic energy per meter of stream length. R is the radius of the center-line arc. The distribution of velocity over the cross section of the Loop Current should be about the same as the velocity distribution over the cross section of the Florida Current near Miami, where the kinetic energy is known to be about 11.68 GJ per meter of stream length. The centrifugal force is therefore 94.2 kN per meter of stream length.

Assume that mooring lines are attached to the screen at stations spaced 200 m along the path. The total horizontal force exerted by the mooring lines at each station is 200 times 94.2 kN, or 18.8 MN. It might be slightly less if the screen does not extend down to 800 m, and some of the slow-moving water in the current is allowed to slip into the interior of the Gulf. The lines slope downward to anchors on the sea floor, so there will also be a vertical component of force exerted by the lines on the screen. There will also be a vertical line to an anchor directly below the screen. This is needed to keep the screen stretched vertically so that its full height is effective in guiding the current. The combined vertical forces at each station are balanced by the buoyancy of a float attached to the top of the screen.

If dead-weight anchors are used, the vertical downward force of the anchor is its weight in air minus the buoyancy force of the water that it displaces. This force can be resolved into components perpendicular and parallel to the sloping bottom. The parallel component resists the sliding of the anchor if the bottom slopes downward going away from the screen. The perpendicular component times the coefficient of friction also resists the sliding. To simplify, assume the bottom is horizontal. The anchor directly under the screen has no sliding force, so a dead weight is suitable here. If the sloping lines have an angle of 45° and the coefficient of friction is 0.2, the air weight minus the buoyancy force must be six times 18.8 MN. (5 times to resist the horizontal force plus another 18.8 MN to resist the vertical pull) For concrete with a specific gravity of 2.0, the buoyancy force would be 6(18.8) = 113 MN, equivalent to a mass of 11.5 million kg, or 11,500 cubic meters of water, or a 22.6 m cube. The curved part of the screen is 370 km long and there would be the equivalent of 1850 of these cubes along the screen. The 0.2 coefficient of friction is only a guess, so it looks like it will be necessary to find some way to embed the anchors in the bottom.

Another problem is that the slanted mooring lines pass through the rapid current on their way to the anchors. This guarantees that there will be vortex-induced vibrations (VIV) of the lines. A web search yields much information on this subject because it is a serious problem for the offshore industry. Long pipelines to floating production platforms and long drill strings from drill ships must pass through ocean currents. When the pipe, drill, or cable is transverse to the current, vortices are shed alternately from opposite sides of the cylinder. This results in a vibration called strumming, and a phenomenon called lock-in. But it is time to get this newsletter out, so at this point, the loop current guide has some problems but it may be a viable protection from devastating hurricanes in the Gulf of Mexico.