THE CONSULTANT

The Newsletter of the IEEE Consultants Network of Long Island

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Chairman's Corner

—Murray Kleiner, Chairman

We are always talking about how to promote our network so that more people know that we exist. This is true whether we are trying to get companies to call us for consulting services or trying to attract new members. Although we should continue investigating different means for advertising, we have in fact two proven solutions that will attract guests and give us the necessary exposure. One solution is to continue to have joint meetings with other organizations. We did this at our March meeting with the Electromagnetic Compatibility Society, and we had a very nice turnout. We also had a nice turnout at last month's meeting when our guest speaker was Andrew Haimes. His topic *Engineering and the Law* allowed attendees to qualify for PDH credits. By continuing to offer these kinds of courses at our regular meetings, we should attract more guests.

A reminder that because of the Jewish holidays, our October meeting will be held on Tuesday, October 11th, at 7:00 PM at our regular meeting place. It will be hosted by Peter Buitenkant and we will have an exchange of ideas, issues, problems, etc. pertaining to using our computers, internet, and anything else as relates to our businesses. If you have any problems, pet peeves, or solutions, bring them to this meeting.

I want to take this opportunity to wish all of our Jewish members, friends, colleagues, and their families a healthy, happy, and prosperous New Year. I would like to extend my best wishes to everyone for health, happiness, and prosperity.

Meetings

October 2005

7:00 PM, Tuesday, October 11, <u>not</u> the first Wednesday.

Briarcliffe College, 1055 Stewart Avenue
Bethpage, NY.

Topic: "Running Your Business – Tips & Tricks"
A discussion group lecture moderated by
Mr. Peter Buitenkant, Consultant, of Dix Hills, NY

Admission is free (no charge). No pre-registration is required. For information, contact John Dunn at (516) 378-2149. Guests are welcome.

Directions:
LIE Exit 44, South 2.77 mi on Route 135 to Exit 9, Right on Broadway 0.12 mi, Right on Cherry Avenue 0.42 mi, Right on Stewart Avenue 0.45 mi, Left at the fire house and traffic light (Pine Avenue) and you're in front of Briarcliffe College. Turn right into the second parking lot.

If coming from Southern State Parkway on Route 135, Take Exit 9 and turn Left onto Broadway. Follow the remainder of the above directions.

November 2005

7:00 PM, November 2, the first Wednesday.

Briarcliffe College (see above).

Topic: Negotiating.

Admission is free (see above).

Directions: See above.

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Ocean – Related Industries

Dr. Richard LaRosa, sealevelontrol.com

NA KIKA

My sea level control activities have exposed me to a world of industries that are new to me. One of the most fascinating is the oil and gas exploration, drilling, and extraction on continental shelves and deep ocean basins. This is referred to as the offshore industry and there is at least one offshore technology conference each year. Our pursuit of oil and natural gas has taken us from land wells to wells on the continental shelf, and now into the deep waters beyond the shelf. One of the newest deep water oil and gas facilities is Na Kika, about 144 miles southeast of New Orleans. It is named after the octopus god of the Gilbert Islands, whose many arms served him well when he shoved up the earth from the bottom of the sea to form the islands, the beaches, and the rocks. Hurricane Katrina has passed directly over this facility, and the trade magazines have not yet reported on its damage, which is probably extensive, judging by the news photos of other floating production platforms deposited on shore or jammed under bridges.

The Na Kika operations are spread around a floating production platform moored in water 6350 ft deep. It was built by Hyundai Heavy Industries in Ulsan, South Korea and transported to Corpus Christi, Texas aboard the ship Mighty Servant 1. Flotation and ballast for the Na Kika platform is supplied by four vertical steel columns located at the corners of its 266 ft square footprint. Each column has a 56 ft square footprint and a 142 ft height. The columns are connected at their bottoms to four steel pontoons whose rectangular cross section is 41 ft wide x 35 ft high. The Mighty Servant 1 has a beam (width) of 164 ft, so the Na Kika platform overhung the transport ship's deck by 51 ft on each side. Na Kika's topside structure added appreciable height and some width. Looking at a photograph of this piggy-back combination, one would expect the whole works to roll over in the water, but the center of buoyancy must have been above the center of gravity because it made the ocean journey OK.

The Na Kika host platform is connected to six oil and gas fields on the bottom of the Gulf of Mexico. Oil wells are connected by pipe-in-pipe insulated flowlines, while the gas lines are not insulated. If the oil cools too much it will form hydrates and wax, so the oil lines have provision for electrical heating. Wells within each group are connected together by pipes on the bottom, and the groups are connected to the center of the host platform by risers. The expected output of Na Kika is 425 million cubic feet of gas and 110,000 barrels of oil per day.

Bundles of anchor cables pass through guides at the bottom of each of the columns and spread out to anchors on the sea bottom. Cable tensions are adjusted by devices on the platform deck. I will attempt to learn how cable tensions are adjusted in preparation for a hurricane, and whether the risers are disconnected and capped. I assume that everybody was evacuated.

The maximum depth of the six Na Kika fields is 7600 ft. Divers cannot work at this depth and manned submersibles are too expensive and risky. This gets us into the subject of underwater vehicles which are not inhabited by people or animals.

UNMANNED (?) UNDERWATER VEHICLES

REMOTE OPERATED VEHICLES (ROVs)

These are operated by a crew at the surface. Video and other sensor information is sent up via fiber optic or wire cables and control signals are sent down by fiber or wire. Work class ROVs vary in size and power. The big bruisers do jobs like cable and pipe burying, and lifting little Russian submarines up to the surface to rescue the crew. Power is sent down via high voltage heavy gauge cables or hydraulic lines. Most have open rectangular frames. They are maneuvered by means of four propellers, one inside each corner of an open rectangular frame, aimed at 45 degrees, so that forward and back, right and left, and turning motions can be achieved by the proper speed and direction of each propeller. Work class ROVs have various tools installed on them. A manipulator can consist of a claw, wrist, forearm, elbow, upper arm, and a shoulder joint or swivel. The wrist can be capable of continuous rotation and a wrench socket can be substituted for the claw. One manipulator might do the work while another manipulator grabs onto the pipe or other structure to keep the

ROV in position. The Super Scorpio ROV that rescued the Russian crew must have had a cable cutter to free the sub from the tangle.

It's dark down there, so ROVs generally carry lights so the video camera can see where the vehicle is going and allow the topside operator to guide it and do the work. Inspection ROVs are usually smaller than work class ROVs, especially if they must fit into small spaces or inside of pipes. Sometimes these are battery powered and communicate with the surface via a fiber optic cable.

AUTONOMOUS UNDERWATER VEHICLES (AUVs)

Some of these are propeller driven and some are gliders. The propeller driven ones come in various sizes. The smallest is about two meters long and can be carried by a man. Most are circular cylinders with rounded noses. There is a single propeller at the stern with four steering fins either alongside of the propeller or behind it. Lights and camera are in the nose, enabling the AUV to follow along pipelines or search for minefields or other underwater objects. Some have side-looking sonars and can be programmed to map sea bottoms. They can be programmed to follow a predetermined course. Antennas for communication and navigation equipment are located on the top and the AUV can be programmed to surface to get a position fix, receive instructions, and transmit data from its sensors.

The Alistar 3000 is a larger AUV in the shape of an ellipsoid five meters long with four shrouded propellers (thrusters) arranged around its stern for longitudinal propulsion. There are two propellers with vertical axes embedded in small wings that stick out the sides to provide vertical propulsion. There are two horizontal thrusters for sidewise motion. The eight thrusters give it the ability to follow pipelines and hover. It was demonstrated for BP in the Gulf of Mexico this summer.

Gliders do not have thrusters. They have inflatable bladders to give them positive or negative buoyancy. They have wings that allow them to glide forward while they rise or sink. They can be programmed to follow a sawtooth course in a vertical plane in some preset azimuth direction. They can surface at the top of the sawtooth to transmit data and receive instructions and navigation information. In some, the battery moves fore and aft to put the center of gravity in the right place. They have sensors that measure and record parameters of oceanographic interest, such as temperature, salinity, turbidity, and chemistry as a function of depth, latitude, and longitude.

Solar AUVs (SAUVs) have recently been demonstrated. A rectangular photovoltaic panel sits on top of a tubular hull with a single propeller at the rear. I cannot find the steering mechanism in the photos that are available so far. The SAUV can be programmed to sit on the surface during the day and go to assigned locations at night to make and record oceanographic measurements. The Autonomous Undersea Systems Institute (AUSI) recently demonstrated the ability of a group of these vehicles to cooperate in a surveillance operation. Some carried out the surveillance while others were charging their batteries. AUSI is developing software programs to allow different types of autonomous vehicles to work together.

SEA LEVEL CONTROL

The offshore industry is developing technology to lay pipes and cables on the sea floor and connect them to valves, pumps, wells, etc. Deep sea moorings and anchors are also being developed and used. Unmanned underwater vehicles are being developed for this industry as well as military, homeland security, oceanographic studies, and other applications. A lot of this has direct application to slowing down ocean currents to reduce the rate of heat transport to the polar regions. The purpose is to retard the destruction of ice and snow sheets to reduce the rate of sea level rise. There is another benefit from preserving the ice and snow cover, which reflects solar energy better than the land or open water that would be exposed: global warming is reduced.

The slowing down can be accomplished by converting ocean current power to electricity or simply dissipating it with drag devices. There is another possibility. Recent hurricanes have made us aware that their intensity is increased as the ocean surface becomes warmer. But the warm water at the top is sitting on top of a vast body of very cold water.

A mixed layer at the surface is stirred by wind and waves, and night time cooling of the solar-heated surface water. Below this mixed layer is the thermocline, where the temperature is stratified and there is little vertical circulation and therefore little vertical heat transport. The warmest, lightest water is at the top, and the coolest, heaviest water is at the bottom. This is a very stable situation, so the thermocline acts as a heat insulator between the mixed layer and the

reservoir of cold water at the bottom. It takes power to stir the thermocline and increase vertical heat transport. But we might want to do this where there is a strong ocean current. There are many places where there is horizontal motion, but vertical movement is restrained by buoyancy forces.

For example, the Yucatan Current feeds the Loop Current in the Gulf of Mexico. If we could use some of the power of the Yucatan Current to induce vertical circulation, we might effect some reduction of surface temperature in the Gulf of Mexico. This would reduce the energy picked up by hurricanes crossing the Gulf. I have tried a couple of ideas that provided a great learning experience on the way to demonstrating that they won't do the job. But maybe the next one will turn out better?