IEEE

OES

Oceanic Engineering Society Newsletter

VOLUME XXXVIII NUMBER 2

EDITOR: FREDERICK H. MALTZ Spring 2004 (USPS 420-910) ISSN 0746-7834

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IEEE Oceanic Engineering Society Newsletter (ISSN 0746-7834) is published quarterly by the Oceanic Engineering Society of the Institute of Electrical and Electronics Engineers, Inc. Headquarters: 3 Park Avenue, 17th Floor, NY 10017-2394. $1.00 per member per year (included in Society fee) for each member of the Oceanic Engineering Society. Printed in U.S.A. Periodicals postage paid at New York, NY and at additional mailing offices. Postmaster: Send address changes to IEEE OCEANIC ENGINEERING SOCIETY NEWSLETTER, IEEE, 445 Hoes Lane, Piscataway, NJ 08854

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President's Message

What are we doing?

During our recent Executive Committee Meeting, and during our Administrative Committee meeting in San Diego, our deliberations brought us to the realization that no one really knows what the IEEE Oceanic Engineering Society does, or what our Field of Interest covers. We seem to be a well-kept secret. This thinking, not so explicit when I first articulated it in San Diego in September, led me to our "Let's Get Famous" watchword. It's not a watchword yet, but let's keep working on it. This "Best Kept Secret" leads me to initiate a rewrite of our official Field of Interest statement. This is Article II of our Constitution(http://www.oceanicengineering.org/main.cfm?rank=7.00&ID=21&level=2) and it isn't as up-to-date as one might wish. Two improvements suggest themselves to me immediately. First, with the opening of the computer fields and, to take one other example, biomedical engineering, the IEEE is no longer limited to electrical and electronics engineers. In the case of Ocean Engineering particularly, we are involved each day with those from many other disciplines including physics, chemistry, biology, and mechanical engineering, to name only a few. Second, with generality comes vagueness. And with vagueness we come up against the "Best Kept Secret". Actually, the Field of Interest Statement probably ought to be broad and non-specific, or we'd be changing it frequently. But it ought to be a good basis for Getting Famous. What should our Field of Interest Statement imply so that you can invite your colleagues and friends to join us? Would a good Vision Statement help? Somehow each on of us has to share the pride and excitement of what we do so that the listener will be moved to join in and see how he or she likes it. Your thoughts and recommendations will be welcome.

Thomas F. Wiener

Rewriting our Constitution and By-Laws

Speaking of our Constitution, the Administrative Committee has been discussing a rewrite of that document for almost two years now. This is, of course, a major undertaking. The process we must follow is specified in Article X of our Constitution. When the Administrative Committee completes its work, we submit the proposal to the IEEE for approval to be sure we are not in contravention with the IEEE Constitution, By-Laws, and Procedures. We will then publish the proposed change in our Newsletter. Thirty days later, we will send out a ballot asking for approval. If the membership approves the changes, they will be effective as provided in the change document. I hope that we can gain approval before the November AdCom meeting in Kobe, and that the changes will enter into force on January 1, 2005. To inform the membership of the proposals in a timely fashion, I am sketching out the major items to be changed here. These are not guaranteed to be in the proposed changes submitted to the membership by the AdCom. They do reflect my thinking now. I invite you all to inform me and the Administrative Committee of your views, concerns, and recommendations. In addition to bringing some of the language up to date, clarifying some vagueness, and moving some or the more changeable sections to the more easily amended By-Laws, I hope that the proposed changes will include the following items:

- Institute the office of President-Elect
- Increase the number of Vice Presidents from three to four, and the following paragraphs briefly describe the essence of the proposed changes.

Institute the office of President-Elect

At present we have a President, elected for a two-year term, once renewable. he or she is assisted by the Junior Past Presi-

dent and the Senior Past President, the immediate predecessors in office. I propose to change this "Three President" structure to the President-Elect, the President, and the Immediate Past President. This will give a clear line of succession to the Presidency, and give the President-Elect the opportunity learn the job and to begin initiatives that he or she can see through his or her term of office.

Increase the number of Vice Presidents from three to four

Our current Vice President lineup comprises Vice Presidents for Technical Activities, Professional Activities, and International Activities. The proposed four are Vice Presidents for Technical Activities, Professional Activities, Conferences, and Publications. The current Vice President for Technical Activities is responsible for conferences and publications, the major sources of our revenues, as well for the activities of the Technical Committees. This proposed change allows each Vice President to concentrate on a single major category of activities. Further, Vice President for International Activities, in large part because of the activities of the incumbent, Joe Vadus, has become something of an anachronism. It is based on the model of a United States organization with some activities outside of the country. The IEEE and especially the Oceanic Engineering Society, I am pleased to say, is rapidly moving away from this situation and becoming truly a world organization. In fact, the position of Vice President for Publications exists under another name. We have a Publications Committee under the capable chairmanship of Prof. Glen Williams. This Committee is responsible for producing a quality Journal and for ensuring its financial well-being. This responsibility seems to me to deserve the importance and prestige of a Vice Presidency, and have the incumbent elected rather than appointed by the President. There are a lot of details implied in these broad headings. These will be developed as we formulate the precise text to propose. The Administrative Committee will be exchanging emails as we work toward a draft of the proposal that we will consider in at the meeting in Houston. We welcome, indeed, count on, your thoughts and recommendations as we proceed.

Conferences Coming!

2004 is the first year of many conferences. The Offshore Technology Conference in Houston, May 3 – 6, has its usual impressive Technical Program (19 Regular Sessions, 26 Special Sessions) as well as the usual Awards Luncheon, Geographical Active Arena, this year focused on the North Sea. By the Way, OCEANS '07 Europe is scheduled for the spring of 2007, so we can go see the North Sea first hand. In addition, there will be the usual General Sessions, Industry Breakfasts, Panel Sessions, and Topical Luncheons. And of course the not-to-be missed exhibits fill the Reliant Center. In June, from the 15th to the 17th, we are going to Klaipeda, Lithuania, for the first U.S.A. – Baltic Symposium on "Advances in Marine Environmental Research, Monitoring &Technologies". The symposium objectives are to discuss and exchange information on problems, needs, requirements &solutions new technologies and ideas advances in application of new technologies in Marine Research, Environmental Monitoring, and Environmental Technologies. This is an important conference because of the delicacy of the Baltic Sea as an ecosystem. We are just beginning to appreciate the environmental issues there and this initial effort will be an excellent first step, not only in addressing the problem, but also in extending the reach of the IEEE and our Society. Special thanks are due to Vice President for International Affairs Joseph Vadus and Environmental Technology Committee Chair James Barbera. Overlapping the U.S.A. – Baltic Symposium on June 17th and 18th, the Autonomous Underwater Vehicle Workshop will be in Sebasco, Maine, U.S.A. This workshop will deal with Multiple Autonomous Underwater Vehicle Operations. This continues the practice of well-focused workshops dealing with issues in AUVs. The Oceanic Engineering Society is co-sponsoring IGARSS 2004, being held September 20 – 24 in Anchorage, Alaska. We promised to provide 50 papers for oral presentation, but we didn't do nearly that well. Our part of the program is focused on in situ measurements and modeling to support the remote sensing that the Geoscience and Remote Sensing Society does. Next is a conference we have an interest in: IEEE SENSORS 2004 will be held in Vienna, Austria, October 24 – 27. the Oceanic Engineering Society is one of 26 Societies that are members of the IEEE Sensors Council. I will be there not only as a representative of OES, but also as the President of the Council. OCEANS/Techno-Oceans '04 will be in Kobe, Japan, November 8 – 11. For the first time, our partner, the Marine Technology Society joins us at an OCEANS conference outside North America. In addition, OCEANS is partnering with the well-established Techno-Oceans conference. There will be the usual outstanding technical program, an excellent collection of exhibits, and all the usual festivities associated with the OCEANS Conference. Finally, we will have the Second Homeland Security Technology Workshop in Valley Forge, Pennsylvania, U.S.A. December 7 — 9. This Workshop promises to be bigger and better than the great success of last year. With this increase in the number of conferences, we are reaching and serving a much larger percentage of the Ocean Community. In 2005 and later, we are planning two OCEANS Conferences each year. And of course our smaller meetings, such as the Autonomous Underwater Vehicles Workshops, the Submarine Cable Workshop, the Current Measurement Technology Conference, and new and quite successful Homeland Security Technology Workshop will continue. These events happen because interested members of the Society care enough to make them happen. Not only must we administer the meetings by arranging venues, publishing proceedings, and managing the finances, but more importantly, we must attract solid technical contributions. The focus of this part is our Technical Committees. We are developing larger Technical Committees to support the increased opportunities for researchers and practitioners to present their work. Those of you who have been involved in organizing meetings know that is a difficult but very satisfying labor of love. If you are among those who have contributed and are contributing to the success of the meetings, thank you from me and from your Society and your Profession. For those who are waiting to be invited to come out and play, here is your invitation. Enjoy the rewards of doing something useful for your Profession and your Society. Make your plans now. Y'all come! And help.

National Chapters – Can your country use one?

by Jim Collins, OES VP of Professional Activities

James Collins

Much oceanic engineering activity is based on federal or nationally oriented funding and government structures. Starting with taxation the list almost develops in a natural way. Whether it's the United States, Canada, China, India or most other countries, federal government laboratories are used as incubators for oceanic engineering research and development. This includes defence, fisheries and oceans, ports and harbors and wave energy for examples. Even offshore petroleum exploration and production is regulated by the law of the country that holds title to the seabed.

The trait continues into universities where graduate student funding is normally based on federally oriented grant systems. Patents are usually granted by nations. Plane fares are occasionally reduced for the nationals of a country traveling locally.

There are exceptions to the nationally oriented groupings of oceanic engineering. In Europe much of the drive for oceanic engineering comes from the European Union. Much of the traditional defence funding continues on a national basis of course.

With so much in common it is surprising that there are not many nationally based associations of oceanic engineers! For example how would you address situations like the following? If a graduate student writes an oceanic engineering thesis at a university in Cochin in western India, how likely is it that a company or laboratory in eastern India will realize that relevant talent is available within the country? How do oceanic engineers in your country get together on a more or less periodic basis to address related technical, policy and funding concerns? Do you have an email-based newsletter to publicize developments and issues in oceanic engineering that have particular relevance to your nation?

IEEE societies can form chapters where twelve or more members reside and submit a petition. Usually they live within a ten to twenty mile radius of each other. However there is nothing to prevent members in a country who are sufficiently motivated from forming a Chapter to facilitate their interests. The Chapter would base its most frequent interactions on the internet and this interaction would serve to foster other national interaction such as workshops of local interest and perhaps even regional oceanic technology conferences.

The presence of a Chapter behind any proposal to the OES bolsters the strength of that proposal and can make accessible OES funding support and technical support for conference program design through the OES Technical Committee that has been set up for that purpose.

If finding twelve members in your location is a problem because of IEEE dues are relatively high because of exchange rates then it might help to use a fee reduction program that allows reduced payment. Applicants who certify that their prior year's income did not exceed US $11,300 or equivalent are granted a 50% reduction in IEEE dues, regional assessment and dues for one IEEE Society and its optional publications. Written certification is required with application and payment. Student members are **NOT** eligible. For more information on membership refer to www.ieee.org and select the membership item on the side bar.

If you are interested in pursuing this idea relative to your country and wish to see who your countrymen are, please refer to the 2002 issue of the IEEE OES membership Directory which gives geographic breakdown of members throughout the world on pages 63 to 67.

If you are interested, I would like to discuss this idea with you. Please contact me at j.s.collins@ieee.org or +1 250 595 6928

Jim Collins
IEEE OES Vice President of Professional Activities

From the Editor

SeptemberAdCom Meeting

Included in this issue are some highlights from the minutes of the September 2003 AdCom Meeting held in conjunction with the recent Oceans Conference in San Diego. (see page 15). A good part of that meeting was taken up with Oceans Conference planning. Also of note, in the minutes, were other conference reports namely, OTC '02, '03, and following years plus AUV '03 and '04 (Maine). These briefings were given by Claude Brancart. Other domestic conference briefings included Homeland Security Workshop held in Warwick, Rhode Island delivered by Pam Hurst, IGARSS '04 (to be held in Anchorage, Alaska), presentation given by Stanley Chamberlain and finally a report on the IEEE Seventh Working Conference on Current Measurement Technology (CMTC '03) made by Sandy Williams. Offshore conference reports included Tokyo, Japan where there was a Scientific Submarine Cable Workshop reported on by Hisaaki Maeda. Also, James Collins gave a presentation on an upcoming symposium in Cochin, India on Ocean Electronics. Dr. Forng-Chen Chiu gave a presentation on UT '04

Fred Maltz

Conference in Taipei, Taiwan, which will be held from 20-23 April 2004 and finally, a briefing was given by Joe Vadus and Jim Barbera on the US-Baltic Symposium to be held in Klaipeda, Lithuania, June 2004.

OES History Project

In addition, at the September AdCom meeting, Stan Chamberlain gave a presentation on the OES History Project. After discussions with individuals on their initial efforts, Stan recommended that each one of the governing body that has been involved in some facet of OES prepare a brief summary/history of the activity, trends and accomplishments for their facet. Then we can have someone edit them and integrate this into an overall picture.

Recent IEEE All Society Survey

Also included in this issue is a selected sample of slides taken from a presentation entitled IEEE All Society Research Project. This was a survey conducted over the last year or so, by IEEE, to provide societies with membership planning information. This effort was coordinated by Elena Gerstmann, Director of Research at IEEE. The survey showed that one-third of our members belong to just the OES and one-third belong to another society as well. And finally, two-thirds of the members stated that they maintain their membership in OES to obtain technical information plus OES publications so as to keep current in their fields. In this regard there was a fairly high level of satisfaction indicated by the survey. (See page 18).

ALERT!!! Time to nominate OES Award Candidates and AdCom Candidates… OES Awards

The IEEE Oceanic Engineering Society is seeking nominations from the OES membership for the Oceanic Engineering Society Distinguished Service Award and the Distinguished Technical Achievement Award. These awards will be announced and presented at the OCEANS '04 MTS/IEEE / TECHNO-OCEAN'04 Conference in Kobe, Japan.

The Distinguished Service Award is presented to the OES member who has distinguished her/himself in their service to the OES and the profession. The last five Distinguished Service Awardees are:

1999: Pierre Sabathe at OCEANS'99 MTS/IEEE in Seattle, Washington

2000: Frederick H. Maltz at OCEANS'2000 MTS/IEEE in Providence, Rhode Island

2001: Claude P. Brancart at OCEANS'01 MTS/IEEE in Honolulu, Hawaii

2002: James S. Collins at OCEANS'02 MTS/IEEE in Biloxi, Mississippi

2003: Joseph Czika at OCEANS'03 MTS/IEEE in San Diego, California

The Distinguished Technical Achievement Award is presented to a member of the profession whose technical achievements in oceanic engineering are recognized by their peers. This award is the OES's way of affording acknowledgement to the technical accomplishments of individuals who have produced and furthered the reputation for technical excellence currently enjoyed by the society. The last five Distinguished Technical Achievement Awardees are:

1999: William M. Carey at OCEANS'99 MTS/IEEE in Seattle, Washington

2000: Albert J. Williams 3rd at OCEANS'2000 MTS/IEEE in Providence, Rhode Island

2001: Werner R. Alpers at OCEANS'01 MTS/IEEE in Honolulu, Hawaii

2002: James Candy at OCEANS'02 MTS/IEEE in Biloxi, Mississippi

2003: Georges Bienvenu at OCEANS'03 MTS/IEEE in San Diego, California

The Nominations Packet(s) for the OES Distinguished Service Award and the Distinguished Technical Achievement Award should include a Letter of Nomination accompanied by a one page vita of the candidate.Nominations will be accepted through 31 August 2004 and should be submitted to:

Glen Williams
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College Station, Texas 77843
(O) (979) 845.5485
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OES Administrative Committee

The OES is also seeking nominations from the OES membership for the CY 2005-2007 OES Administrative Committee. This committee serves the OES as the governing body of the society, administering the professional, technical and financial aspects of the OES. Qualifications for AdCom membership include IEEE and OES membership, and a willingness to serve the oceanic engineering profession. The Nominations Packet should include a Letter of Nomination accompanied by a one page vita of the candidate. Nominations will be accepted through 31 August 2004 and should be submitted to:

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Tension Leg Platform Design Optimization for Vortex Induced Vibration

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Abstract- Tension Leg Platform design is a challenging and popular area of research in the offshore oil industry. In order to compete in the International Student Offshore Design Competition (ISODC), a Tension Leg Platform (TLP) was designed. Our TLP design addresses five fundamental areas of technical competency (General Arrangement and Overall Hull/System Design, Weight, Buoyancy and Stability, Global Loading, General Strength and Structural Design, Risk Assessment) and three specialized areas of technical competency unique to a Vortex Induced Vibration (VIV) optimized design (Hydrodynamics of Motions and Loading, Fatigue Strength, and Structural Analysis: global and local strength).

Our design optimization process begins with a four-caisson, four-pontoon tension leg platform, operating at a depth of 3,000 ft. Hydrostatic and hydrodynamic analysis for design iterations are performed by our own MATLAB script, which calculates the effects of motions due to Vortex Induced Vibration (VIV). Structural analysis addresses fatigue loading from VIV. Our design includes risk-based analysis and conforms to class society rules and regulations. VIV phenomena cause uncontrollable motions of offshore platforms, as well as fatigue damage and failure of components such as cables and risers. The effects of VIV need to be addressed early in the design process to avoid costly platform damage and costly retrofits, such as hydrodynamic strakes for platform tendons.

I. INTRODUCTION

The offshore industry encompasses those structures which are engineered specifically for the deeper ocean, as opposed to those marine structures, like boats, which are used in any body of water. An oil rig is a primary example of such a structure. Because the environment for which offshore engineers are designing can be so hostile, the constraints and safety measures which govern the design are crucial. These structures are located in the mid Gulf of Mexico where dangerous hurricanes and rogue current eddies are a constant menace, and for the North Atlantic and Pacific where wave heights and sea states are so extreme that often the structure must be designed to operate autonomously because it is too dangerous to risk the personnel. The offshore industry, although challenging and often stressful, is a very exciting and cutting-edge field to be a part of.

Offshore drilling began over 50 years ago, and the challenges that engineers working in this area are presented with are extremely complex and difficult. Because of this, companies who exist in this sector of our economy, require highly skilled engineers and scientists. It is therefore in the best interests of these companies, mostly oil companies, to encourage young professionals and engineering students to get involved with offshore design. The International Student Offshore Design Competition (ISODC), an offshore platform design competition sponsored by the Society of Naval Architects and Marine Engineers (SNAME) as well as the American Society of Mechanical Engineers (ASME), is a means to achieve this goal.

Megan Hendry-Brogan at Oceans 2003 with Norman Miller and Ed Crenshaw, displaying her award for student paper entitled Tension Leg Platform Design Optimization for Vortex Induced Vibration.

A team from the Department of Ocean Engineering of the Massachusetts Institute of Technology is entering a design of a Tension Leg Platform (TLP) that is optimized for Vortex Induced Vibration (VIV).

II. PRELIMINARY RESEARCH PHASE: CHOOSING AN EXISTING VESSEL AND FIELD

The starting point for the design of our TLP, nicknamed "Tim," was to determine which field and what kind of production field we were targeting. This process led us to an understanding of the range of water depths and operating conditions in which the TLP is found to be economically and operationally viable. The choice was made to model our design, at least preliminarily, after an existing larger TLP. Shell Deep Water Development's "Brutus" was chosen.

Brutus encompasses two leases approximately 265 kilometers (165 miles) southwest of New Orleans in water depths ranging from 838 to 1,005 meters (2750 to 3300 feet). The estimated gross recovery from the development is 230 million barrels of oil equivalent with a 70:30 oil to gas ratio. The project cost the company approximately $750 million with ¾ of that going to the fabrication and installation of the TLP, and the rest is associated with drilling. Brutus went into service in August of 2001 [1].

III. FUNDAMENTAL DESIGN AREAS

A. General Arrangement and Overall Hull System Design

A Tension Leg Platform (TLP) concept was selected for our offshore platform design because it has cost and station keeping properties that make it an appropriate and viable design for deep water applications [2]. A TLP is a compliant, free-floating offshore platform concept. Unlike fixed offshore platforms, compliant platforms respond to external effects with motions. Mooring systems control these motions. A TLP is compliant in the horizontal degrees of freedom, surge and sway. In the vertical degrees of freedom, a TLP is fixed. The feature that distinguishes a TLP from other moored platform concepts is its reserve buoyancy. Because the buoyancy of a TLP exceeds its weight, vertical moorings called "tendons" keep the TLP vertically stable and control heave motions. The cost of TLPs does not significantly increase with depth, because most of the steel in the structure is in the hull, which only extends to a finite depth. This is not the case with offshore structures such as towers, piled towers and jackets [2].

The "Tim" TLP design is based on Shell's Brutus TLP in the Gulf of Mexico. The main components of both Tim and Brutus are the deck, hull, and mooring system. The deck supports accommodations, working area, processing equipment, derricks, cranes, pumps, the helideck, and control room of the TLP. The hull consists of four hollow cylindrical caissons and horizontal pontoons. The hull houses bilge and ballast systems, drilling and potable water, diesel fuel, pumps, and machinery. Caissons and pontoons provide buoyancy for the hull, and caisson spacing influences platform motions response. A four-caisson square TLP is simpler to build in a shipyard than other geometric configurations, allows for a large deck area, and good stability features [2].

The mooring system consists of three thin walled, tubular steel tendons on each caisson, for a total of twelve tendons. Foundations (tension piles in our design, gravity base structures in some other TLP designs) anchor each tendon in place. The foundations, and subsequently the mooring, are permanent [2].

B. Weight, Buoyancy and Stability

As with any naval architectural project, keeping running tabs on the weight and placement of the systems being incorporated into the design is critical. Being that we weren't able to do the detailed design of the components of the superstructure, we resorted to asking the creators of Brutus for an outline of the major weights which make up the TLP hull, deck and topsides. Our gracious 'resource' at Shell, Peter Young, provided us with the abbreviated weight and balance spreadsheet for Brutus. The major weight contributors were the hull structural components, including the tendon system, weighing in at 12,247 metric tons (~13,000 long tons). The next largest components were the Drilling (1,927 metric tons), Power (1,927 metric tons), Process (2,494 metric tons), Quarters (1,973 metric tons), Wellbay modules (3,220 metric tons), and the Drilling Packages (2,585 metric tons). We took these numbers for granted as the same for Tim. Table 1 outlines the centers of gravity and flotation (buoyancy) in the transverse (North-South, East-West) directions as well as the vertical direction.

With the following basic geometric parameters listed in Table 2, we generated the displacement and buoyancy characteristics of the vessel. The first few times the figures were determined, they were done by hand, after that, a Matlab script file was written to perform the calculations automatically. The main structural members which contribute to the buoyancy of the vessel were modeled as the geometric prism which looked most similar. The caissons were fully displacing hollow cylinders; the pontoons were hollow rectangular prisms, and the tendons were flooded hollow cylinders. The vessel total weight/displacement is 42,421 metric tons (41,752 long tons). The displacement and buoyancy of the vessel, as predicted by the Matlab script we wrote, is 52,052 metric tons (51,230 long tons). Another useful parameter with respect to weight and balance is, of course, the waterplane area. In Tim's case the waterplane

TABLE 1

Vessel Centers of Buoyancy and Flotation

	East-West	North-South	Vertical
CG (m)	-0.27	0.21	45.1
CB (m)	0.64	0.49	13.1

area is 1,290 square meters (13,892.9 square feet). The stability of the vessel is discussed in detail in the "Dynamic Response Estimates" section.

C. Global Loading, Strength, and Structural Design

The global loads on the structure are weight, buoyancy, and wave and current loading. The structural components of the TLP are made of steel. The critical structural components of a TLP are the tendons, foundations, caissons and pontoons, connections between columns and pontoons, deck girders, and connections between the deck and pontoons. Because they are long columns, the tendons are subject to buckling. Tendon pre-tension is a static, permanent load on the TLP foundations. Environmental loads such as wave loads and currents are variable loads, and lateral inclination of the tendons causes lateral loads on the foundations. The TLP caissons and pontoons are orthogonally stiffened shells. The caisson shells have a cylindrical cross-section and the pontoon shells have a rectangular

cross section. The stiffened shells are subject to buckling failure under compressive loads and yielding under tensile loads. The stringers and attached shell plate may buckle together, the panels themselves may buckle, or the shell plating may buckle locally, while the stiffeners remain stable. The deck girders, like the stiffened shells, may buckle or yield, but are not subject to external water pressure [3].

D.Risk Assessment

Given the scale of engineering time and capital investments that are involved with a functioning offshore production platform, managing risk and reliability from the start is imperative to the success of the project. Assessing the risk associated with a system allows the project manager to select the most cost-efficient design based upon considered facility risks. The first step in managing risk is identifying the most prevalent sources of uncertainty, and, in many cases, associating probabilities of occurrence and costs with the various failure or near-failure situations. In the offshore industry, managing risk is very nearly enforced by whichever classing agency you are employing to certify your production vessel. As production projects in the Gulf of Mexico (GoM) move into deeper and deeper waters, costs and complexity have increased. Therefore, the current industry standards and practices for identifying and mitigating risk to the facilities, personnel and the environment are becoming insufficient. The conventional sources for risk assessment guidance in the GoM are the API (American Petroleum Institute) RP 14C, 14J, and 2A WSD [4].

TABLE 2

Weight and Geometric Data for Brutus: initial design parameters

Height (m)		Weight (ton)		Diameter (m)	
Superstructure	37	Hull	55,577	Cylinder	20
Deck	12	Deck/ Superstructure	22,353	Tendon	0.81
Pontoon	51				
Cylinder	7	Tendons	76,203	Design Draft (m)	
Tendons	884	Pilings	996		
Pilings	104			19	

Classification and inspection organizations, such as Det Norske Veritas (DNV) and the American Bureau of Shipping (ABS), are developing new tools, and enhancing the existing ones, to extend coverage over new sources of risk associated with deeper water projects and, specifically, with the design-accidental-loads and performance standards for the safety of critical elements. They hope to expand the use of more detailed risk-assessment techniques in order to provide a sufficient method of considering hazard scenarios and impact on personnel and facilities, thereby ensuring better documentation of design performance and improving future projects. The Minerals Management Service (MMS) estimates approximately $1 million extra dollars in additional costs as a result of executing the proper hazard analyses for new floating production systems. However, the use of risk-based reliability is extremely cost effective when you adequately consider the cost of a major catastrophe [5].

Determining risks and managing risks are two separate processes, once aware of your potential hazards, it is imperative that offshore engineer has a system which monitors the vessel operations so as to warn against impending problems. To ensure that a vessel, TLP in our case, is performing satisfactorily during operation, operators make use of barrier diagrams, Bow-Tie analysis and criticality reviews. Bow-tie analyses are where one connects a primary event with its potential consequences, threats, preventative measures and recovery measures. The operator must monitor the mechanical integrity of the vessel as well as the SHE (safety, health and environment) systems. Control measures, to prevent occurrences or mitigate problems, are linked to something called a platform SMS (safety management system). Most all operating platforms have one of these systems, in one form or another, and through them, they manage the key barriers to failure and the performance standards of the vessel [5].

In order to get a sense for the risk associated with operating the TLP "Tim," we researched a private risk-management consultancy firm named Noble Denton. The firm claims to have a quality team of analysts who are adept at implementing Failure Modes and Effects Analyses, HAZOP studies, fault and event tree analysis and cause consequence analysis. They also have an extensive database of offshore accidents which supports there analyses. Through their technical expertise, they can identify risks stemming from fire or explosions, stability, structural reliability, dropped objects, evacuations, escape and rescue procedures, pollution and smoke dispersion and to the personnel. From information provided on their web site [6], we were able to identify the following risks.

Collision Risk includes the physical arrangements for bringing on board or offloading supplies, etc. Installation Risk examines the potential threats to the assets and personnel which can arise as the vessel is being transported and/or installed. Heavy Lift Risks are related to the installation or maintenance to the superstructure and other systems. Other areas include Loss of Stability and Structural Reliability Risks, Dropped Object Risks, and Optimizing Subsea Engineering, Tow Risks, Lifeboat and Evacuation Risks, and Mooring System Reliability.

IV. SPECIALIZED DESIGN AREAS

A.Hydrodynamics of Motions and Loading

1). Tendon Design: VIV Analysis and VIVA Runs

Some of the more fatigue sensitive areas of an offshore structure are the mooring and production systems. The forces that this collection of tendons and risers are exposed to are understood and controlled to a much lesser extent than those in the hull and superstructure or pilings. The forces they see are related to the random set of currents and environmental situations that will occur over the life of the system, and have nothing to do with the engineering or construction of the vessel.

The ability to withstand these random forcing functions however, is directly linked to the quality and thoroughness of the engineering design beforehand. These structures must be de-

signed against rogue currents and storms which might only occur once every 100 years or more, but pose serious environmental, safety and economic threats.

Engineers are faced with the challenge of first understanding and modeling the full range of possible environmental characteristics, and then being able to model the response of the system in these situations and ensuring proper safety factors and fatigue lives. The TLP after which this design was preliminarily modeled, Shell Oil's "Brutus", is known to have had fairings retrofitted onto its risers based on problems that it did in fact experience with VIV induced fatigue. Subsequent Shell testing programs have proven the superior performance of fairings

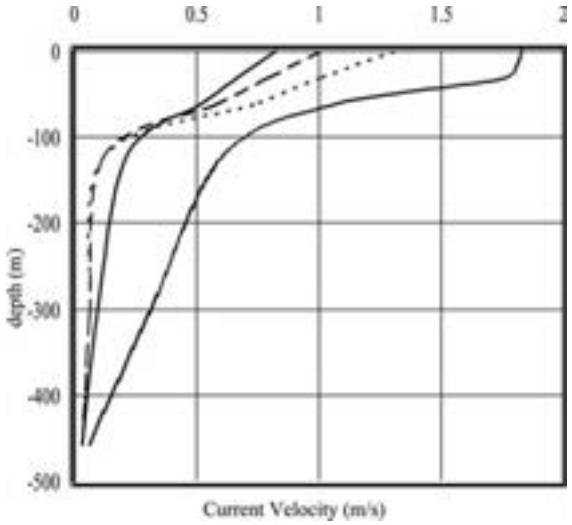

Fig. 1. Current profiles as a function of depth

TABLE 3

VIVA Input and Output Files and Descriptions

Input Files	Description
Risdyn.dat	Tendon Tension, current profile, damping coefficients
Rispre.dat	Riser Properties: length, number of segments, diameters, etc.
Test.dat	Boundary conditions
Risfat.dat	Fatigue constants (A,B) and stress concentration factor
Mode-def	Tells VIVA whether to calculate natural frequencies or if they are specified
Output Files	
Bend.dat	Stress response and bending moments as a function of depth
Bend-mm.dat	Multi-frequency stress response and bending moments as a function of depth
Fat.out	Fatigue life calculations
Out.dat	Motions response
Out-mm.dat	Multi-frequency motions response
Sum-sta	Summary of all motions, stress, and bending moment response

over helical strakes with both smooth and rough (i.e. barnacles and marine growth etc) surface conditions. For the design of the TLP "Tim," computational analyses of the response of the tendons in varying currents will be carried out using two sets of commercially viable VIV codes: VIVA and Shear7.

The first and most important part of the process is to obtain

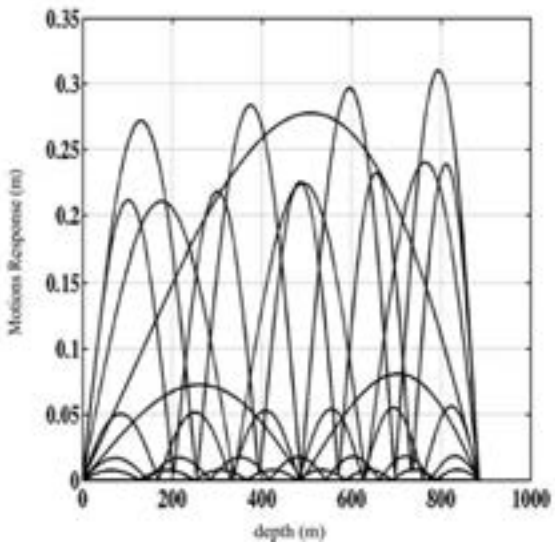

Fig. 2. Motions response as a function of depth for Normal Operation current conditions

quality current profiles for varying current events. This was difficult in that much of the data available is highly proprietary and the researchers were only able to obtain profiles with, on average, 6 data points. Most often the industry uses profiles with upwards of 40 data points; however they also spend large quantities of money on the equipment necessary to take these measurements and, thus, are highly protective of them. Eight current profiles were used in our analyses. The first four currents used: the 100 year storm, reduced extreme storm, normal operation, and eddy current event, all came from an Offshore Technology Conference (OTC) proceedings source. The next four, OTC 8606, OTC 8405, Typhoon and Non Typhoon, came from varying sources, all of which were found in past years OTC proceedings [10]. Obviously the typhoon and non-typhoon current events have an extremely low probability of occurrence in the Gulf of Mexico (GoM).

However, the researchers did not feel it would hurt the design process to see the dynamic response of the tendons in the largest cross-section of environments possible. Fig. 1. shows the first four current profiles. For profiles where maximum depths did not coincide with the design depth for our vessel, the last available speed value was simply extrapolated to depth. The vortex shedding frequency off of the tendon scales with velocity given by the following equation:

$$0.2 \cdot U(z)/D \qquad (2.1)$$

'U(z)' is the current velocity at a given depth 'z,' and 'D' is the diameter of the tendons (approximately 1 meter). After obtaining a sufficient array of current conditions in which to analyze the tendon system, the next step is to prepare the input files for the respective hydrodynamic codes. To date, the only

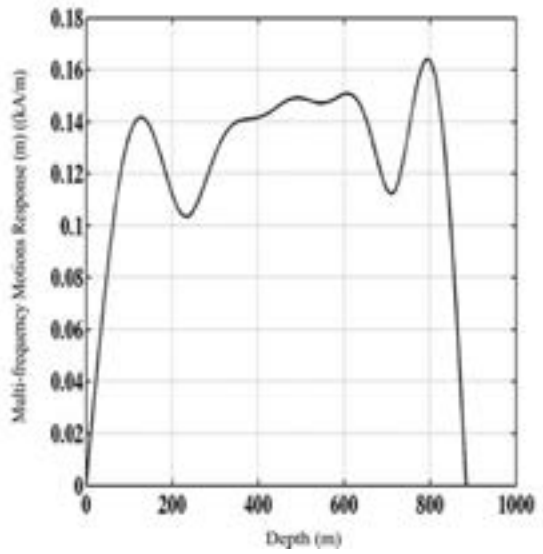

Fig. 3. Multi-frequency motions response as a function of depth for Normal Operation current conditions

TABLE 4

Maximum Displacements and Problem Nodes for Each Current Condition

Current	Multi-modal Displacement (cm)	Modal Displacement (cm)	Problem Mode
Normal Operation	31	16	4
100 Year Storm	24	45	6
Eddy Current Event	25	43	12
Reduced Extreme Storm	21	40	5
OTC 8045	25	49	7
OTC 8606	19	35	11 and/or 5
Typhoon	30	55	12
Non-Typhoon	27	63	2

code which has been utilized is VIVA. VIVA requires a set of input files which describe the physical and material properties of the tendons, the boundary conditions, and the currents [9]. Table 3 outlines the file names and descriptions which were generated for each run.

Once the input files are properly generated they can be fed to VIVA which then produces an extensive set of output files. Table 3 also shows the names and descriptions of these output files. The first set of results which will be discussed is the overall motion, first with the separate modal responses graphed independently and then the full spectrum response. Fig. 2 shows the modal responses and Fig. 3 shows the multi-modal responses in the normal operation current situation. Similar plot were obtained for all eight current situations.

The features of this set of results which it is important to note include the maximum offset in the multimodal tendon motions and also those when each mode is excited independently.

In most cases the maximum displacement in a particular mode for the given current excitation is greater than that of the multi-modal response. This is important and the stresses/strains which are correlated with these large displacements must be designed against because there is no way to ensure that a random excitation force won't drive the riser at the exact natural frequency which correlates to resonances in the problem modes. For example, in the last case, the Non-typhoon current event, the maximum displacement in the modal response graph appears to correlate with the second mode where the riser displaces almost 70 centimeters at ¼ and ¾ of its length. Yet, in the multimodal response, although the overall shape of the tendon resembles mode 2, the maximum deflection is only approximately 30 centimeters. Table 4 outlines the maximum multi-modal and modal responses for each current situation.

TABLE 5

Modal and Multi-Modal Bending Moments and Stresses for Eddy Current Event Condition

Current	Multi-modal Bending Moment (Nm)	Multi-modal Stress Pa (N/m^2)	Modal Bending Moment (Nm)	Modal Stress Atm (kgf/cm^2)
Normal Operation	6.5×10^4	4.3×10^6	1.3×10^5	8.7×10^6
100 Year Storm	2×10^5	13.5×10^6	4.2×10^5	28×10^6
Eddy Current Event	4.7×10^5	32×10^6	10.8×10^5	80×10^6
Reduced Extreme Storm	1.1×10^5	7.5×10^6	2.2×10^5	14.9×10^6
OTC 8045	2.4×10^5	17×10^6	5×10^5	34×10^6
OTC 8606	3.5×10^5	24×10^6	7.6×10^5	53×10^6
Typhoon	7×10^5	52×10^6	16×10^5	110×10^6
Non-Typhoon	1.13×10^5	7.7×10^6	2.5×10^5	17×10^6

As discussed, the maximum modal displacement values are all greater than those expected for multi-mode excitation. The largest values occur for the typhoon and non-typhoon current events. Because these situations are very unlikely to occur in the GoM, the researchers will probably design against the bending moments induced by the next biggest problem current, the OTC 8045 current. It can also be noted that the esti-

mated problem frequencies seem to be at around mode numbers 11 or 12, and then between 5-7. This information and the natural frequencies with which these modes are correlated is very valuable in the design process.

The next group of data we will discuss is the bending moment and stress values in both the modal and multi-modal responses. Table 5 outlines the maximum bending moment and stress found for each current event in the two response schemes. In order to conserve space, only the graphs for the current event which produced the largest stress and moment values are shown in Fig. 4-7.

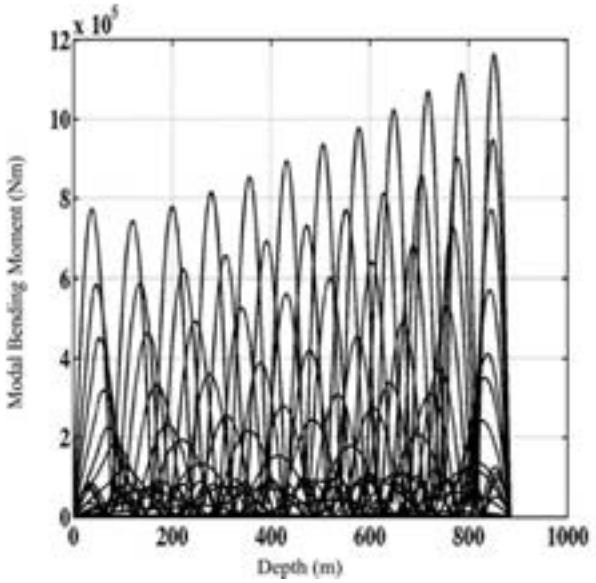

Fig. 4. Modal bending moment as a function of depth for Eddy Current Event Condition

As Table 5 delineates, the greatest stress concentrations occur in the tendons in the Typhoon current event. Again, however, since this current is not probable in our operating environment, we instead focus on the second largest values within our operations range.

Interestingly, the second largest stress and moment values are associated with the Eddy current event as opposed to the OTC 8045 as would have been proposed given the displacement results. The explanation for this behavior is probably linked to the fact that the difference between the maximum displacements between the top 3 or so current events is not significant; therefore it is difficult to make failure expectations based solely on the displacement data. Please observe Table 5 along with the graphical representation of these values as shown in Fig. 4-7, because in the design process, it is just as important to know where the maximum stresses occur as to know what the value of those stresses are.

The purpose of completing an analysis of tendon vortex induced vibration responses in varying currents is to ultimately evaluate the integrity of the system from a structural fatigue perspective. All of the displacement, moment and stress data is generated with the aim of determining how long the structure could withstand a given environmental criterion. At this point in the discussion we will move to this topic and the results which VIVA generated for our TLP "Tim." Fatigue life determinations must be observed with caution.

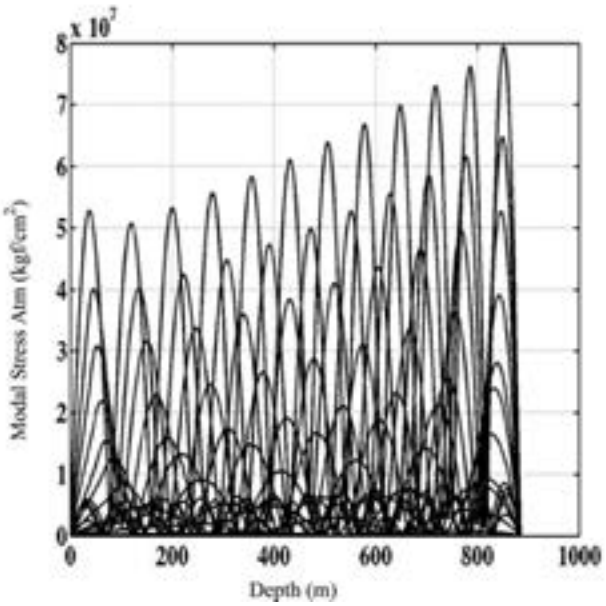

Fig. 5. Modal stress as a function of depth for the Eddy Current Event condition

It is easy to forget that the life of the tendon as quoted by whatever code the designer is utilizing represents the time it would take for the tendon or system to fail if it was continually exposed to the given current event. A TLP or other offshore structure is not going to see 10 straight years, for example, of an eddy current event. The calculations are useful none-the-less because if the fatigue life of the system in a given environment is analytically determined to be, say, 2 hours, or even worse, 5 minutes, the tendons will have to be redesigned to increase the life to within satisfactory factors of safety.

Table 6 describes the minimum fatigue life, as determine per mode, for each current event. The complete fat.out files, which are not included in this paper due to lack of space, give the fatigue lives in all modes and the associated stress contributions for the minimum.

Once again, the Typhoon event produces the least satisfactory fatigue life results with the Eddy current event being the next worse within the range of probable environmental conditions. For the eddy current, if the system is driven at the natural frequency of mode 12, 0.4747 Hertz, failure will occur after only 80.3 days. In the multi-modal response, the system could last for 63 years, however with this type of analysis you must place some sort of weight factor on the results which correlates to the reliability and accuracy of the analysis tool. In this case, if we were only 50 percent sure of our results, the minimum multi-modal fatigue life would be approximately 30 years, and for an offshore system whose design life is somewhere in that range, this might not be a satisfactory result.

A cohesive look at the displacement, bending moment, stress, and fatigue life results, as determined by VIVA, shows that the problem current event is the Eddy Current. Given the proper data, the design could then move forward to the associated probabilities of occurrence with each current event and

even further establish the reliability of the structure. It is immediately obvious however, that Tim could not withstand a typhoon condition under any circumstances. It would be interesting to reevaluate these results given a tendon model which represented the faired, or even straked, retrofit. This level of complexity is simply not feasible or necessary for this type of design project.

2).Dynamic Response Estimates

The TLP dynamic behavior is similar to that of a pendulum. The natural period determinations were modeled as such. These calculations were also done by hand initially and then subsequently by a Matlab script. Given that the vessel behaves like a pendulum, the first value to be determined was the natural frequency of oscillation in pendulum motion which includes the swaying side to side, and associated "set-down", of the vessel. All calculations were done in English units, which carried with it significant frustration. The basic equation of motion (EOM) of the vessel in this degree of freedom (DOF) is

$$I\,(d^2\varphi/\delta\tau^2) + k\,(\varphi) = 0 \qquad (1.1)$$

Assuming there is no forcing function and no damping, 'I' represents the sum of the vessel moment of inertia and the added moment due to the entrained mass of water. It is found my multiplying these two masses by the length of the tendons (moment arm) squared. The symbol 'k' represents the stiffness of the vessel in this DOF, and it is found by multiplying the tension in the tendons by the length of the tendons. The natural period in pendulum motion for Tim was found to be 23 seconds.

The next dynamic characteristic to be determined was the vessel natural period in heave. Due to the large amount of tension in the tendons, you can imagine that the vessel oscillates quickly in this DOF.

The process followed in the hydrodynamic Matlab script was to first determine the dynamic and static stiffness coefficients, 'k_{dyn}' and 'k_{stat},' of the vessel. These values were based on the waterplane area of the vessel and have to do with the incremental buoyant force generated by a unit displacement in the vertical direction. The natural frequency in heave is found by the following equation:

$$\sqrt{((k_{stat} + k_{dyn}) / (m + m_{added}))} = 1.9 \text{rad/sec}\ \ (0.3\text{Hz}) \qquad (1.2)$$

The third and final DOF that was analyzed in the dynamic analysis of Tim the TLP was the Pitch/Roll (relatively equal for a TLP) direction. In this case again, the static and dynamic stiffness coefficients in this direction of movement must be determined. The static stiffness is given by

$$K_{stat} = 2a^2 g\,\tilde{n}\,AWP \qquad (1.3)$$

where 'a' is the distance from the centerline of the vessel to the center of each caisson, 'g' is the acceleration of gravity, 'ñ' is the density of seawater, and 'AWP' is the waterplane area. The dynamic stiffness is given by

$$K_{dyn} = (\,2a^2 E\,A\,n_{tendons}\,) / L \qquad (1.4)$$

where 'E' is the Young's modulus of the tendon material, steel, 'a' is the cross-sectional area of the tendons, $n_{tendons}$ is the number of tendons, and L is the length of the tendons. The next step in the analysis is to determine the mass moment of inertia of the vessel in the pitch/roll DOF as well as the added mass moment of inertia associated with the water accelerated by the moving hull. These calculations were tedious and required us to make some assumptions about the radius of gyration for the major hull components.

Therefore the error associated with this calculation is probably greater than for the other two DOFs. After going through all of these calculations, by hand and computationally, the final natural frequency in pitch/roll was determined to be 3.069 radians per second (0.5 Hertz).

B.Structural Analysis: Finite Element Methods

The design team was not able to complete the solid model and finite element analysis for Tim due to time constraints and limited personnel. However, familiarity with Abaqus, a commercial finite element method software package, was achieved and preliminary structural analysis was commenced. The input, output, and calculation procedure of Abaqus is described by Yingbin Bao in "Introduction to Abaqus [7]." The user en-

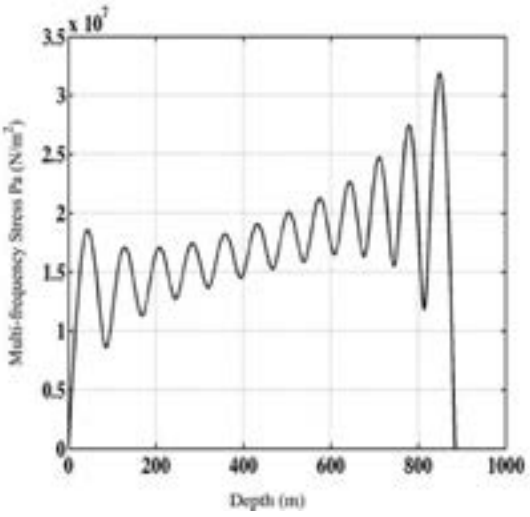

Fig. 6. Multi-frequency stress as a function of depth for the Eddy Current condition

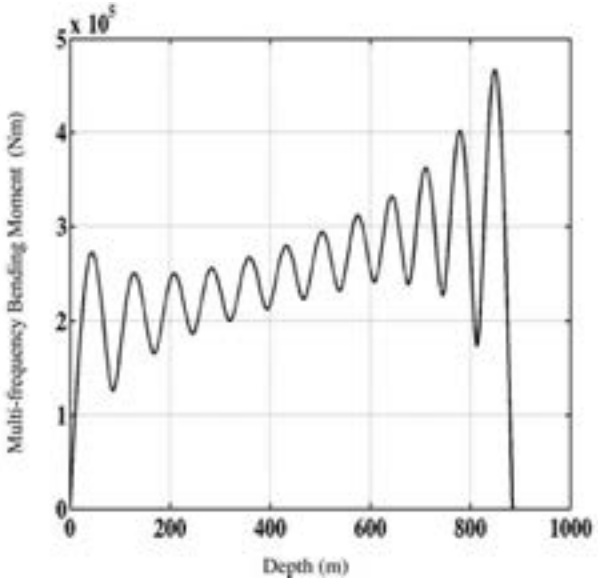

Fig. 7. Multi-frequency bending moment as a function of depth for Eddy Current condition

TABLE 6

Modal and Multi-Modal Fatigue Life Estimates Predicted by VIVA

Current	Multi-Modal Minimum Fatigue Life (years)	Multi-Modal Location (m)	Modal Minimum Fatigue Life (years)
100 Year Storm	5100	833.7	43
Eddy Current Event	63	851.5	.22
Reduced Extreme Storm	68000	821.9	810
OTC 8045	1600	833.7	17
OTC 8606	240	848.5	1.5
Typhoon	6.6	851.5	.052
Non-Typhoon	43000	836.7	370

Current	Modal Location (m)	Problem Mode	Associated Stress Pa (N/m^2)
100 Year Storm	833.7	7	8×10^6
Eddy Current Event	851.5	12	2×10^7
Reduced Extreme Storm	824.9	6	4.6×10^6
OTC 8045	833.7	7	1×10^7
OTC 8606	848.5	11	1.4×10^7
Typhoon	854.4	13	2.9×10^7
Non-Typhoon	833.7	7	4.9×10^6

ters parameters into the CAE pre-processor, which outputs a .inp file. The .inp file is loaded into a standard solver, which outputs a .odb file. The .odb file is loaded into the CAE post-processor. Abaqus uses finite element method algorithms to calculate the displacement, stress, strain, and reaction force.

The pre-processor has eight user interface menu options. The Part feature allows the user to sketch two dimensional profiles and create part geometries. The Property feature allows the user to define material properties and section properties. The Assembly feature allows the user to assemble models from sets of parts. The Step feature allows the user to configure analysis procedures and output requests. The Load/BC/IC allows the user to apply loads, specify boundary conditions and initial conditions of the part or assembly. The Mesh feature allows the user to choose from triangular or rectangular elements and create a mesh. The Job feature submits the mesh assembly for analysis. The Visualization feature displays the results [7].

In order to calculate displacements and loads on the structure, Abaqus uses finite element methods. In finite element analysis, as described by Thomas J. R. Hughes [8], a continuous structure such as a plate or beam is divided into discrete elements, and continuous loads are divided into discrete nodal point loads. The elements are connected at nodes. The most common elements are triangular and rectangular elements. Elements can be the same size throughout the structure, or a "graded mesh" where the elements are smaller in the region where a more detailed modeling is desired. The advantage of triangular elements is a constant stress value within the element. Finite element analysis always predicts deflections that are less than the deflections predicted by elastic beam theory. To satisfy compatibility, a displacement function is assumed, which causes the finite element model to be stiffer than the actual structure.

V. CONCLUSIONS

The hydrostatic and hydrodynamic analysis of the TLP "Tim" is valid. However, the TLP design is weakest in the structural design and analysis, and is lacking in riser design. More detailed structural design, including all buckling modes of structures, needs to be done. An Abaqus solid model and finite element calculations need to be done. Riser design and analysis needs to be done, including VIVA runs for motions response, stress, bending moments, and fatigue, and analysis of lock-in phenomena. The extent and effects of limitations of the vortex-induced vibration analysis, such as current profile data points, need to be examined. Other concerns that need to be addressed for a more complete design are cost, component fabrication, and system assembly.

Acknowledgments

The authors would like to thank our faculty advisor, Professor Michael Triantafyllou; Professor Kim Vandiver for Shear7 and mechanical vibration consultation; Dr. Dave Burke and Yingbin Bao for structures and Abaqus instruction; Micaela Pilotto for Abaqus instruction and consultation; the MIT Department of Ocean Engineering for supporting the design team; and our contacts in industry: Peter Young of Shell Exploration and Production Company; Dr. Steve Leverette of Atlantia Offshore, Ltd; and Chad Musser.

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Highlights of the September AdCom Meeting at the OCEANS '03 Conference

The IEEE Oceanic Engineering Society (OES) Administrative Committee (AdCom) met on 22 September 2003 at the Town and Country Hotel in San Diego, California. The following are some highlights from the minutes of that meeting.

1. Mr. John Reagan, the IEEE Division IX Director-Elect, gave a presentation on the state of the IEEE and where he feels it is going.
2. Dr. Ralph Wyndrum, IEEE-USA VP for Technology Policy, gave an overview on the IEEE-USA's 2003 Technology Policy Activities.
3. The OES President and two Vice Presidents gave introductory remarks.

Tom Wiener, OES President, discussed both the major and strategic issues for 2004, as well as comparisons between the major and strategic issues for 2003 versus 2004. He then discussed paths to OES efficiency and how he rationalized it through strategic and tactical planning. Finally, he addressed issues related to developing strong line management, managing of the budget, and needed changes to the Constitution and By-Laws. He noted that we should advertise our association with the OES and submitted a new theme for us to follow called "Let's Get Famous". He also felt that the OES officers should get in touch with their counterparts in the MTS.

Stan Chamberlain, Vice-President of Technical Activities, presented information that was folded later into different sections of the report. He stated that Ken Ferer will step down from his position as Technical Committee Chair for Oceanographic Instrumentation. The new person for this role will be Mike Harris of NRL. Also, Sandy Williams will also step down from his position as Technical Committee Chair for Current Measurement. His replacement will be Steve Anderson of Horizon Marine. Finally, Ed Gough will also step down from his position as the Technical Committee Chair for Modeling, Simulation, and Visualization. His replacement is TBD from the Naval Meteorology and Oceanography Command. There is also a new Technical Committee formed called "Homeland Security", with Bob Bannon and Pam Hurst as the Chairs, as well as "Ocean Policy", chaired by Joe Czika.

Joe Vadus, Vice President of International Activities, gave introductory remarks about several upcoming domestic and international conferences.

4. OCEANS CONFERENCES and planning through year 2007.

JOAB/Permanent Technical Committee - Rene Garello gave several introductory comments about the Joint OCEANS Advisory Board (JOAB) process. One of the important points was that present conference leaders need to work with future conference leaders.

OCEANS 2003 - Bob Wernli gave a presentation on the status of the present OCEANS '03 Conference in San Diego, CA.

OCEANS 2004 Asia-Pacific - Joe Vadus introduced Dr. Tamaki Ura, who gave a briefing on the OCEANS/Techno-OCEAN 2004 Conference which will be held from 20-22 November 2004 in Kobe, Japan

OCEANS 2005 Europe - Joe Vadus introduced Rene Garello, who gave a presentation on the offshore OCEANS '05 Conference, to be held from 20-23 June, 2005 in Brest, France.

OCEANS 2005 America - Barry Stamey gave a presentation on the OCEANS '05 Conference in Washington, DC.

OCEANS '06 Asia-Pacific - John Potter gave a presentation on the OCEANS '06 Conference in Singapore.

OCEANS '06 America - John Irza gave a presentation on the OCEANS '06 America Conference in Boston, MA.

OCEANS '07 Europe - Dr. John Watson and Brian Horsburgh gave a presentation on the proposed OCEANS '07 Conference in Aberdeen, Scotland.

OCEANS '07 America - Jim McFarlane gave a presentation on a proposed North American conference in Vancouver, British Columbia, Canada in 2007.

5. OCEANS CONFERENCES proposals for the years 2008 and 2009.

OCEANS '08 America - Philippe Dupont and Ferial El-Hawary gave a presentation on a proposed North American conference to be held in Quebec City, Quebec, Canada in 2008.

OCEANS '08 America - A presentation was made by Jerry Carroll for a 2008 or 2010 North American Conference in Biloxi, MS.

OCEANS '09 Europe - Dr. Christoph Weldmann gave a presentation on a proposed conference in 2009 in Bremen, Germany.

6. Chapter Activities.

Chapter Operation Guidelines have been developed and submitted to IEEE HQ. They will be sent out to all of the Chapters along with a request for their annual report by the end of the year. The salient points of the guidelines are:

a) A Chapter needs to hold a minimum of two meetings a year to continue as an active Chapter. A report on each meeting needs to be sent to the sponsoring section following each meeting (L-31 form). An annual summary of the Chapter activities should be sent to the Society Chapter Coordinator at the end of each year. b) Chapter officers include at least a Chair, Vice-chair, Treasurer and Secretary. c) Chapters need to develop programs for their local areas of interest. Chapter meetings are an excellent opportunity for networking on a local basis and Chapters should make use of speakers from industry and academia in their local area. d) Chapters should also get involved in local activities such as supporting projects, e.g. human powered submarine races, school science fairs. e) Chapters should reach out to local universities and students to promote the Student Poster Sessions and solicit poster abstracts for the conferences. The Chapter could consider a local Poster session at a Chapter meeting and then send the winner to the annual OCEANS Conference.

7. Chapter Development.

Efforts are underway to form a Chapter in Singapore and in Genoa, Italy. We have also been in contact regarding a chapter in India. Since the AdCom meeting we have been contacted regarding the formation of a chapter in the Montreal/Quebec area.

8. Student Activities.

The Society continues to support the National Ocean Sciences Bowl Finals. Each year we sponsor four awards to High School teams and receive recognition at the Awards ceremony for our participation. We need to continue our support of CORE and the NOSB.

The Society also supports the Human Powered Submarine races both financially and with personnel. This program should be also continued. The Student Poster Sessions at the OCEANS Conferences still continues as a large part of the Society's contribution to the conference. We gain members from the students each year and many of them continue on to work with the Society when they begin their careers. The Student Poster Session is becoming better known in the academic community and the number of abstracts that we receive each year has been growing. For example we received 124 abstracts for OCEANS '03. From this 25 abstracts were selected.

9. Meeting Summary.

(1) Mot-SD-AdCom-03-1: A motion was made for the approval of the conferences in Boston 2006, Singapore 2006, Aberdeen 2007, and Vancouver 2007. This motion was voted on and passed unanimously for the first three conferences. This motion also proposed to accept provisionally the Vancouver Conference in 2007, subject to the approval of both the Presidents of the MTS and IEEE OES, and upon receipt of a proposal two years or earlier before the conference. This portion of the motion also passed unanimously.

(2) Mot-SD-AdCom-03-2: A motion was made to accept provisionally the Quebec City Conference in 2008, subject to the approval of both the Presidents of the MTS and IEEE OES, and upon receipt of a proposal two years or earlier before the conference. This motion was voted upon, whereby there was one objection (Glen Williams) and three abstentions to this proposal. The rest of the AdCom members approved this motion.

(3) Mot-SD-AdCom-03-3: A motion was made for provisional acceptance of the Central Gulf Coast conference in 2010, subject to the approval of both Presidents of the MTS and IEEE OES, and the acceptance of a proposal two years or earlier before the conference. The vote was split, with 6 people for, 15 opposed, and 1 person abstaining. The decision was to defer a definite decision for now, and then revisit the negative concerns some members had about the location and accommodations in Biloxi. The attendees were more positive about considering the Gulf Coast area in 2010 vs. 2008. Jerry was asked that the Biloxi team thank graciously all those (e.g., the Chamber of Commerce) who worked on planning activities for this meeting.

(4) Mot-SD-AdCom-03-4: A motion was introduced to recognize Dr. Dan Alspach and Orincon Corp. for their contributions of $10,000 for Student Poster Exhibits support. This motion was voted on and approved unanimously.

(5) Mot-SD-AdCom-03-5: A motion was introduced to name the winner of the student paper competition the IEEE OES Edward Early Award. This motion was voted on and approved unanimously.

(6) Mot-SD-AdCom-03-6: A motion was introduced to thank Jim Barbera on his efforts in getting the OES shirts for the AdCom members. This motion was voted upon and approved unanimously.

(7) Mot-SD-AdCom-03-7: There was then a motion to reconsider Glen Williams's earlier tabled motion for the OES to allocate $45,000 to upgrade the digital archives through 2003 and for the production of library DVDs, which would be made on demand. This motion was then voted on and passed unanimously. Glen noted that the contractor won't be able to make them until next year and he will negotiate with them further for the best deal on this arrangement.

(8) Mot-SD-AdCom-03-8: Glen Williams again acknowledged Norm Miller for his long service as Vice President for Professional Activities. He served this position for seven straight terms over fourteen years. A motion was then introduced to acknowledge and thank Norm Miller for all his efforts over the years. This motion was voted upon and approved unanimously.

(9) Mot-SD-AdCom-03-9: A motion was introduced by Steve Holt to extend another $5,000 grant for the UnderSea Camp project. After some discussion, this motion was voted upon and approved unanimously.

(10) Mot-SD-AdCom-03-10: A motion was introduced to approve the minutes from the last AdCom meeting in Houston, Texas in May, 2003. This motion was voted upon and approved unanimously.

Boston Chapter News

By John Irza, Boston Chapter Chairperson

The OES Boston Chapter wrapped up its 2003 year with the "MIT Ocean Engineering Students Night" meeting on December 4th, 2003. The evening consisted of pizza and presentations and was attended by students, OES members, and even an OES "dad" and his two elementary school age sons who were interested in learning more about oceanic engineering as a career path.

The evening began with Dr. Tom Consi providing a multimedia overview of the "Discover Ocean Engineering Freshman Pre-orientation Program." This program introduces new students to the exciting field of OE by actually having them build small ROVs called Sea Perches, test the ROV's in a pool, and then test them in Boston Harbor – in only 4 days! (see picture) The "Discover OE" program has been so successful that other departments within the university have created their own spinoffs. For more information see the web site at http://oe.mit.edu/discover/

Next on agenda, MIT student Karl McLetchie presented past successes and future goals for the MIT Course-13 Student Engineering Association also known as the 13Seas Student Group. The 13 Seas was created in Fall 2001 as a collaboration of ocean science and engineering professional societies dedicated to enhancing the experience of ocean engineering, naval architecture, and marine technology students at the Massachusetts Institute of Technology. More information about the 13Seas can be found on their web site at http://web.mit.edu/13seas/www/

Finally, fellow student Addie Yandell presented the results of the MIT students participation in the 2003 Marine Advanced Technology Education (MATE) ROV competition and a offered a glimpse into this year's effort. The OES Boston Chapter sponsored the MIT team in 2003 and the Society at large supported the MATE competition as well. A team of fifteen eager students make up the ROV team for 2004 with assistance and leadership from experienced participants including Addie. Dr. Franz Hover has volunteered his time as team advisor, and Dr. Tom Consi will also be lending his expertise. More information on the MATE ROV Competition can be found on the web at http://www.marinetech.org/

Upcoming Conferences

UT '04 IEEE International Symposium on Underwater Technology
April 20-23, 2004
Taipei, Taiwan, R.O.C.
http://ut.na.nfu.edu.tw/ut04

Offshore Technology Conference
May 3-6, 2004
Houston, Texas
www.otcnet.org

U.S.- Baltic International Symposium
June 15-17, 2004
Klaipeda, Lithuania
www.oceanicengineering.org

AUV 2004 A Workshop on Multiple AUV Operations
June 17 & 18, 2004
Sebasco Estates, Maine
www.oceanicengineering.org

IGARSS 2004
September 20-24, 2004
Anchorage, Alaska
www.igrss04.org

SEA Tech Week - International Week for Marine Science and Industry
October 18-22, 2004
Brest, France
www.oceanicengineering.org

IEEE Sensors 2004 The 3rd IEEE Conference on Sensors
October 24-27, 2004
Vienna, Austria
www.ieee.org/sensors2004

Oceans/Techno-Oceans 2004
November 9-12, 2004
Kobe, Japan
www.oceans-technoocean2004.com

Excerpts From the IEEE All Society Research Project Overview

Overview of Project

- In February 2003, Society presidents endorsed a research project that would, for the first time, survey all IEEE Societies. This project was named, "IEEE All Society Research Project."
- The project was coordinated by Elena Gerstmann, Director, IEEE Research.
- Each Society appointed a point of contact (poc) to work on this project.
- The Socpoc team, via email, oversaw the processes. This team included one person from each Society, a staff member from RAD, a staff member from TAD, and the two-person IEEE Research staff.

IEEE

Goals

- The goals of this project were to provide each Society with membership information in order to:
  - Plan for the future
  - Measure membership satisfaction with each Society and IEEE
  - Develop strategies for membership growth & retention
  - Assess the value and importance of existing programs and services (publications, conferences, websites, etc.) and of membership, in general
  - Highlight "hot" content areas
  - Determine membership demographics (employment status, industry, years of professional experience, etc.)

IEEE

Methodology - Questionnaire

- Questionnaire development
  - The Socpoc team came to a consensus on the format and wording of a template questionnaire.
  - This template questionnaire provided a framework for each Society's questionnaire.
  - The template contained both standard questions that were the same for all Societies and questions that could be customized by each Society.
  - Each Society representative customized the questionnaire for his or her Society.

IEEE

Methodology – Sample

- Sample
  - The population of members that could have been selected for participation were Higher grade Society members (Associates, Fellows, Members, Senior Members; no Life members or Students) with an email address on file (approximately 88% of IEEE members have an email address on file)
  - 1,200 members were randomly selected per Society
  - A sampling plan was developed that assured that each member would only receive one questionnaire regardless of how many Society memberships she or he holds.
  - Comparisons between the randomly drawn sample and the Society populations were made to ensure representative samples

IEEE

Methodology – Data Collection

- Data collection began in early June 2003
  - Society Presidents had an option of sending an email message to the sample informing them of the survey
  - Elena Gerstmann, Director, IEEE Research, sent an email invitation to each sample explaining the project along with the URL to the Society's web survey
  - Approximately 14 days after the initial email message was sent, a reminder email was sent. This message thanked those who had already completed the survey and encouraged those who hadn't completed it to do so.
- An additional sample of 1,800 IEEE non-Society members received a similar survey

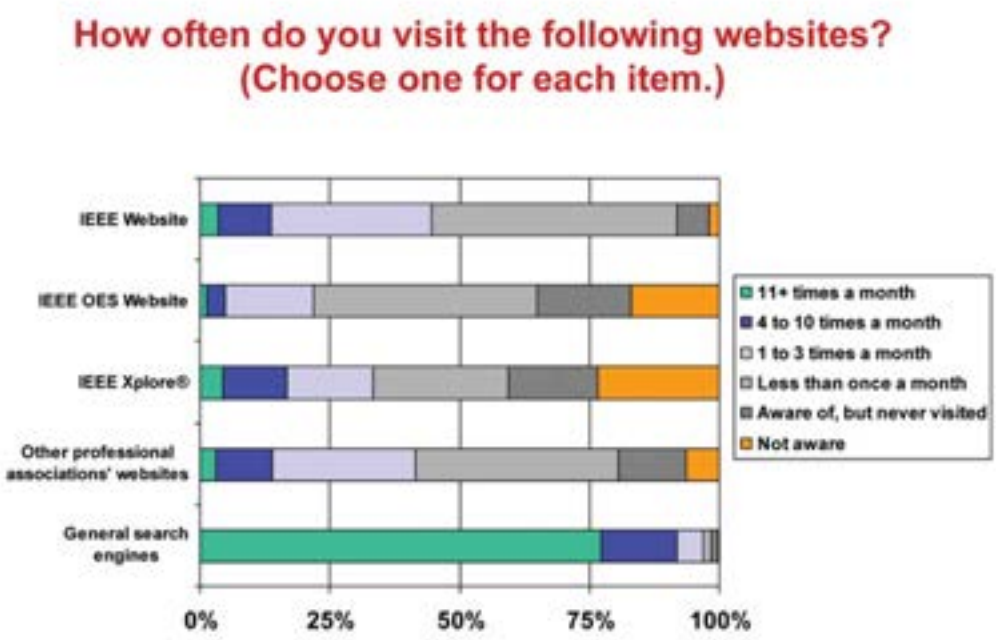
IEEE

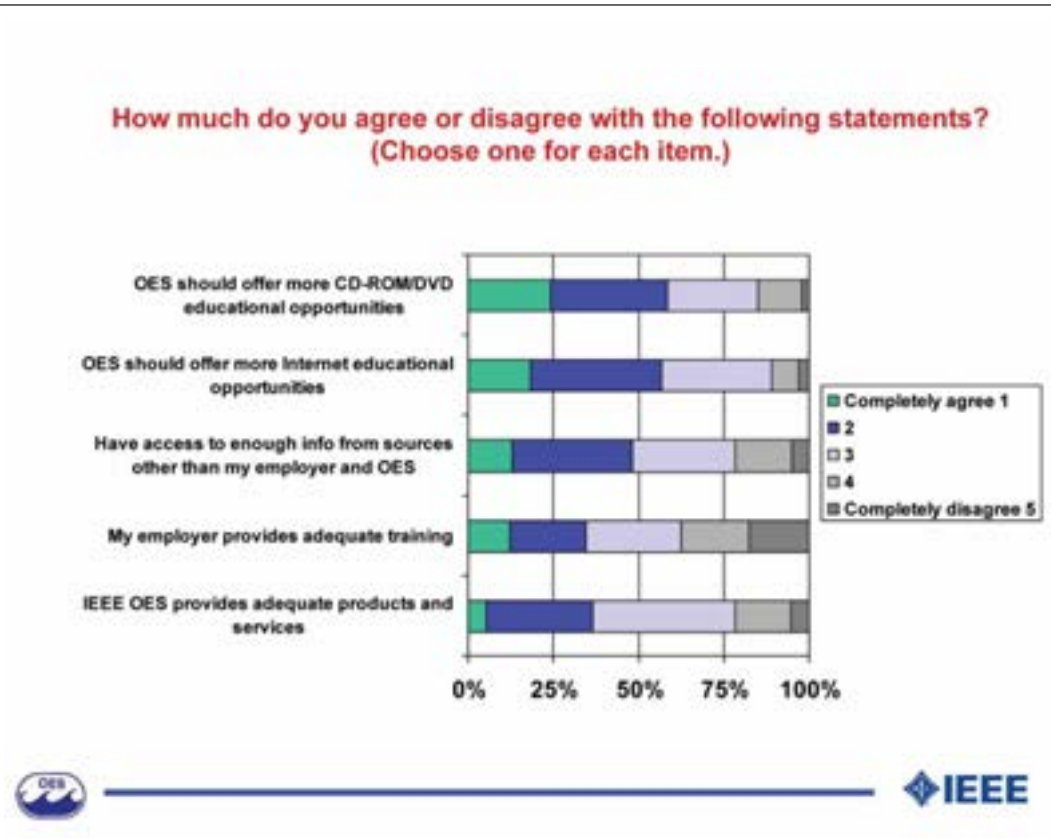
Response Rate for IEEE Oceanic Engineering Society

- A total of 308 IEEE OES members responded to the questionnaire
- Estimating that 1,100 email invitations were delivered, the response rate was 28%
- Assuming these responses constitute a representative sample because the sample was randomly drawn and was representative of the population of IEEE OES members with email addresses
  - the margin-of-error is within ±5% with a 95% degree of confidence

IEEE

Websites and Educational Opportunities





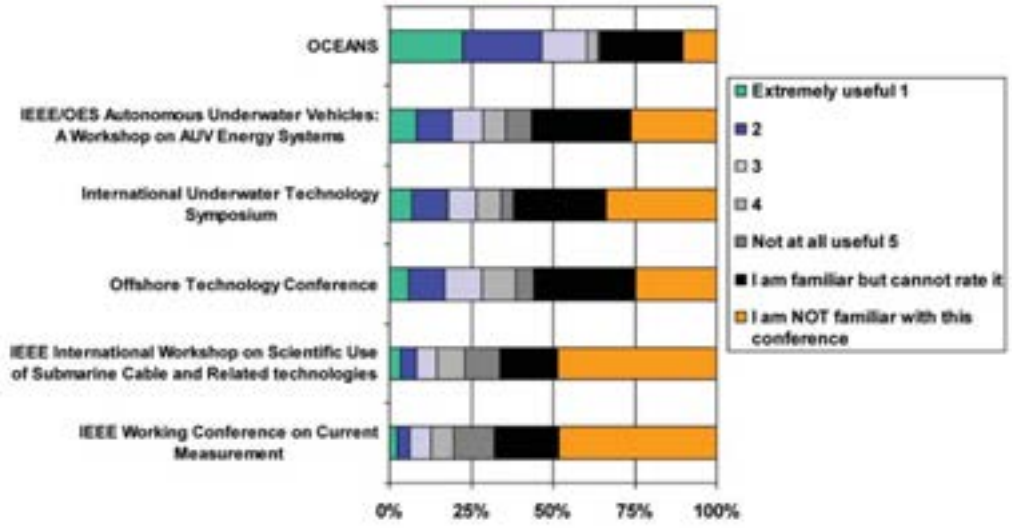
Conferences

Number of Conferences Attended

- How many technical conferences, meetings, or workshops do you attend in a typical two-year period? Mean=3.25; Median=3; Mode=0; Range = 0 to 20
- If you attend conferences in a typical two-year period, please indicate their sponsorship.
  - Sponsored or cosponsored by OES Mean=.77; Median=0; Mode=0; Range = 0 to 5
  - Sponsored or cosponsored by another IEEE Society (not OES) Mean=.95; Median=0; Mode=0; Range = 0 to 8
  - Not sponsored or cosponsored by IEEE or an IEEE Society Mean=1.88; Median=1; Mode=0; Range = 0 to 22
  - Conferences that I am unsure who sponsors Mean=.34; Median=0; Mode=0; Range = 0 to 13

IEEE

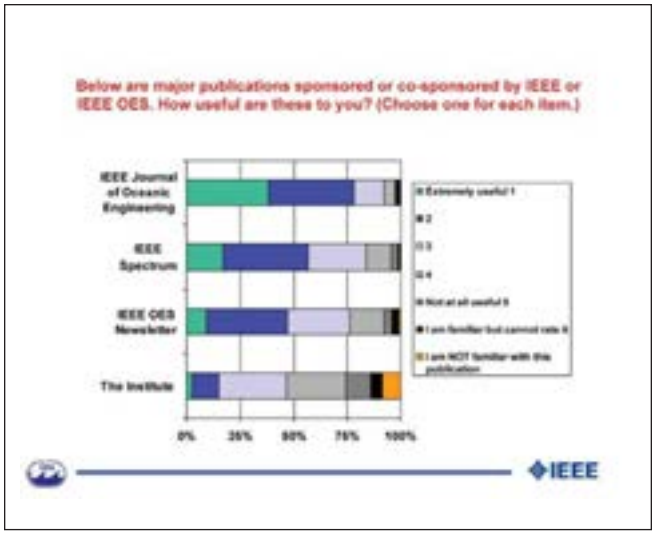
Below are major conferences sponsored or co-sponsored by OES. How useful are these to you? (Choose one for each item.)

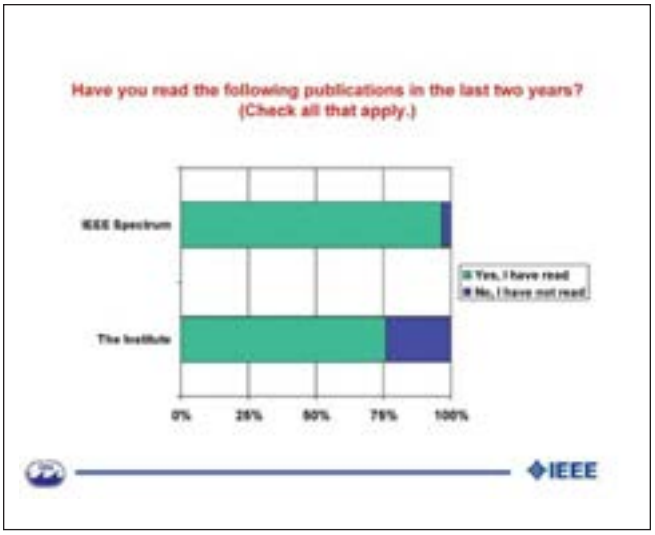


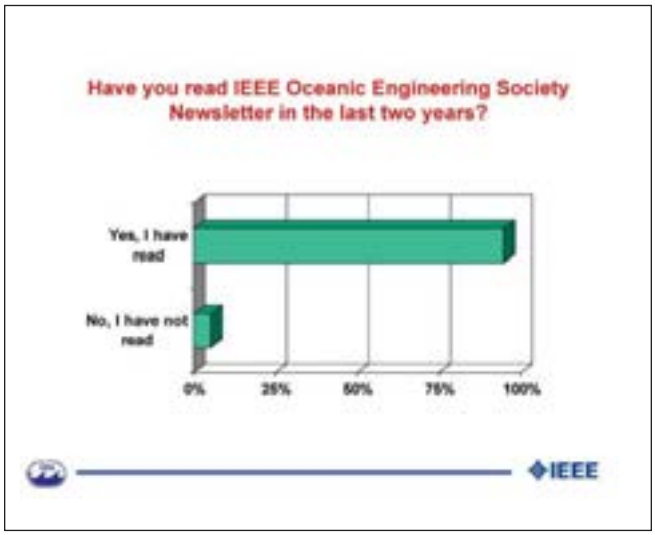
IEEE

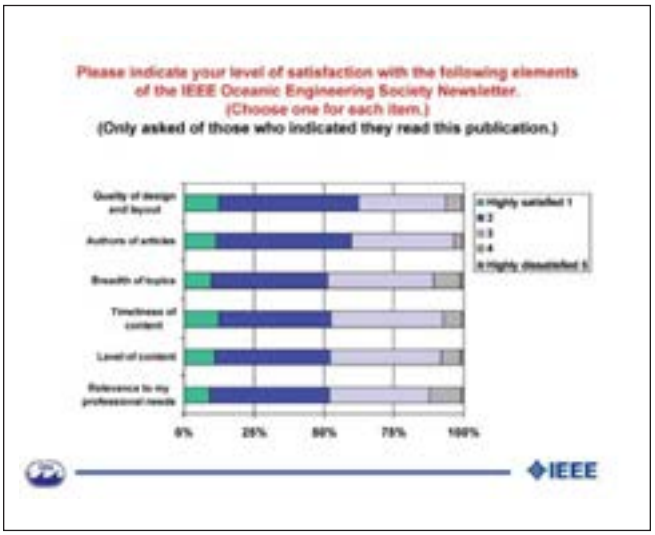
Note: 82 Respondents (27% of Total Respondents) were **not** asked to rate the Offshore Technology Conference. All other conferences above were presented to all Respondents.

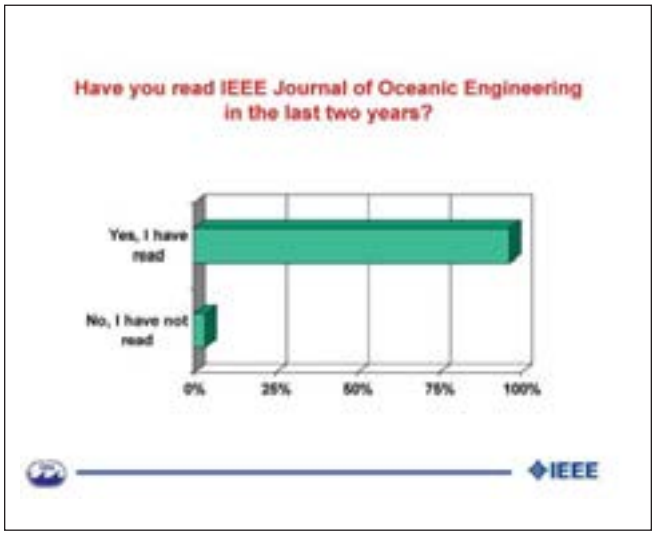
Publications

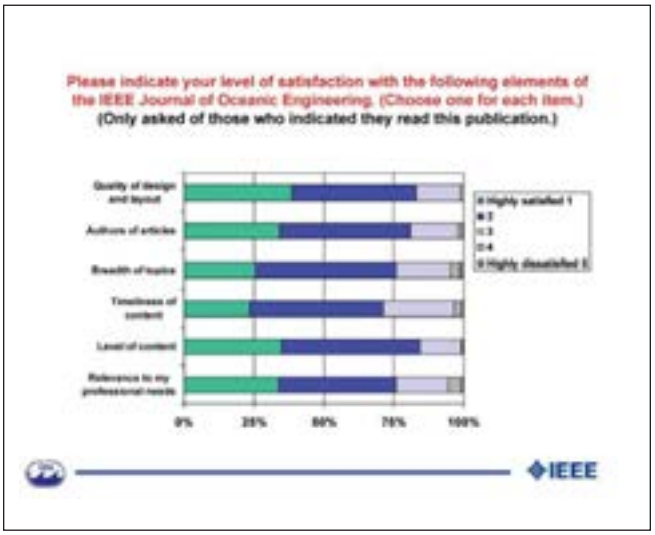












AUV 2004

Autonomous Underwater Vehicles 2004

A Workshop on Multiple AUV Operations

17 & 18 June 2004
Sebasco Harbor Resorts
Sebasco Estates, Maine

The CALL for Papers

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Web Page:
http://www.oceanicengineering.org/
(Conferences and Workshops, AUV 2004)

Engineers interested in presenting a paper at the AUV 2004 Workshop are requested to submit an abstract. The abstracts should be focused on multiple AUV operations technology.

AUV 2004 will be a two-day event of interest to engineers involved with autonomous underwater vehicles. The workshop will offer an opportunity for presenters, registrants, facilitators, and keynote speakers to interact with each other. The focus of this AUV workshop will be multiple AUV operations. Each day will start with keynote speakers, leaders in the AUV community. Subsequently, there will be two sessions per day. The last session will attempt to look into the future and formulate benchmarks to challenge people and create a vision for future multiple AUV research.

In view of the topics and workshop venue, attendance will be limited. Approximately twenty papers will be selected for presentation. The conference papers and workshop summaries will be available in CD format after the workshop.

All workshop activities, including meals and hotel arrangements will be at the Sebasco Resort (www.sebasco.com) Thursday evening, the workshop will move to a lobster bake venue with the beautiful Maine coastline for surroundings. All details relative to registration and transportation options will follow in a subsequent update in early March.

CALL for Papers

The Call for Papers identifies the subject matter to be covered in the workshop. There will be Keynote addresses followed by four half-day sessions, two per day. Each session will be moderated by a Facilitator to focus interactive discussions. The last session will be devoted to in-depth discussion and future multiple AUV research. The session topics include (but are not limited to):

TOPICS

- **Multiple UUV accomplishments & issues**
- **Control strategies for multiple UUVs (AI, launch, control, monitor, planning, mission, user interface)**
- **Multiple UUV communication and navigation (sensors needed for MUUVs)**
- **Modeling and simulation (analysis, multiple UUV behaviors and applications)**

ABSTRACT SUBMISSION

Prospective authors are invited to submit one-page abstracts by e-mail. Please use the form for abstract submittal. When using e-mail, please include the same information within the e-mail message, and as an e-mail attachment. In the abstract, authors should define the topic/problem that is being addressed and indicate its importance of and how it pertains to the advancement or understanding of underwater technology. Following review of abstracts by the technical program committee, accepted authors will be notified immediately and an author's kit for paper preparation will be provided. The following deadlines will be adhered to:

Abstract Deadline	**8 March 2004**
Notification of Acceptance	**22 March 2004**
Manuscript Due	**9 July 2004**

EXPENSES RELATED TO PAPERS

All papers are to follow the format provided in the author's kit. It is the responsibility of the authors to prepare the manuscripts, including halftone black and white photos, for the workshop proceedings. Authors are responsible for all expenses incurred, including time spent, costs for preparation of manuscripts and illustrations, travel to the symposium, and symposium registration fees. Presentations will only be allowed for those authors submitting a paper for publication in the Proceedings. Accepted authors who fail to submit a paper for the Proceedings but who present their papers at the workshop will be billed for the cost of publishing the paper.

Press Release

March 2004

Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, Russia, Sweden & USA

USA-Baltic International Symposium

CMR

IEEE OES NOAA Office of Naval Research GLOBAL Science & Technology

June 15-17, 2004---Klaipėda, Lithuania

http://www.us-baltic2004.org

WELCOME

We welcome your presence and participation in the first US-Baltic International Symposium and encourage interaction for mutual benefits. Our program provides notable speakers and a cross section of papers representative of the nine Baltic countries that border the Baltic Sea and from the U.S.A., to promote the exchange of science and technology information beneficial to the health of the marine environment. Ocean observation systems, marine research and sustainable development of ocean resources in harmony with the environment are important to maintain a healthy marine eco-system.

Co-Chairs: Joseph R.Vadus, Vice President IEEE Oceanic Engineering Society USA
Dr. Algirdas Stankevicius, Director,Center of Marine Research, Lithuania

Symposium Program (tentative)

The opening address will be presented by Lithuania's Minister for the Environment, Arunas Kundrotas. He has been active in environmental protection and sustainable development issues, and has many publications on environmental management. In this regard, he takes an active part in the work of the EU and OECD.

Remarks are also expected from other notable dignataries.

Plenary Session Part I: June 15 (0930-1215)

USA: **Dr. Richard W. Spinrad,** Assistant Administrator Ocean Services & Coastal Zone Management, NOAA "Integrated Ocean Observing Systems: Applying Advances in Marine Environmental Research Monitoring and Technologies to Meet Global, National, and Local Needs"

Germany: **Professor Bodo von Bodungen**
Director, Baltic Sea Research Institute
"Baltic Research in Marine Biology"

Finland: **Mrs. Eeva-Liisa Poutanen,** Environmental Protection Department
Ministry of the Environment
"Assessment of the Status of the Baltic Marine Environment"

Lithuania: **Dr. Mecislovas Zalakevicius,** Director, Institute of Ecology
"Global climate change impact on Baltic wildlife: Results, problems, co-operation between nations and prospects"

Finland: **Saara Back,** Finnish Environment Institute
Baltic Sea Protection Research Programme
"EU water framework directive and biological monitoring program"

Plenary Session Part 2: June 16 (0830-1200)

USA: **Rear Admiral Timothy J. McGee,** Commander Naval Meteorological & Oceanographic Command, Stennis Space Center, MS. "Technical Advances in Naval Meteorology and Oceanography"

Poland: **Dr. Eugeniusz Andrulewicz,** Senior Scientist, Sea Fisheries Institute, Gdynia. "Ecosystem health assessment – a challenging issue for Baltic Marine Science"

Russia: **Dr. Vadim Paka,** Director
Atlantic Branch-P.P. Shirshov Institute of Oceanology
"Advanced technologies for Baltic research"

Sweden: **Dr. Hans Dahlin,** Director, EuroGOOS Office, SMHI, Norrhoping
"Monitoring of the Baltic Sea – in the past, present and future"

Latvia: **Prof. Andris Andrushaitis,** Director
Institute of Aquatic Ecology, University of Latvia
"The Baltic Sea Regional Project, BSRP"

Estonia: **Prof. Juri Elken,** Director
Marine Systems Institute, Tallinn Technical University

Denmark: **Dr.Eric Buch,** Director, Operational Oceanography Division
Danish Meteorological Institute
"Baltic operational oceanographic system (BOOS)"

Germany: **Prof. Horst Oebius,** Technical University-Berlin
"Some German aspects on the transport of oil and oil products in the Baltic Sea and possible consequences in the case of casualties"

A field tour will be conducted June 16 (1230-1700) to visit the nearby Curonian Spit, a 90 km sliver, flanked by the Baltic Sea and lagoon bordering the mainland, and declared a World Heritage site by UNESCO. Lunch near Nida village on the Baltic.

Over 100 papers, within the theme "Advances in Environmental Research, Monitoring and Technologies" will be presented in 20 sessions--4 parallel tracks.

SESSIONS (5 papers each):

Oil Pollution Impacts
Dredging & Dumping Impacts
Ocean Systems I
Baltic Sea Observations
Oil Spill Monitoring
Phytoplankton Dynamics
Oceanographic Measurements
Baltic Sea Eco-Impacts
Sediment Contamination I
Fisheries Impacts
Remote Sensing I
Ocean Systems II
Sediment Contamination II
Coastal Sea Eco-Impacts
Remote Sensing II
Environmental Monitoring I
Sand & Sediment Transport
Coastal Sea Observations
Environmental Monitoring II
Oil Spill Response & Cleanup

SYMPOSIUM SUMMARIES
Session Chairs will summarize session highlights, including major problems and solutions. Conclusions and Recommendations.

Registration and hotel accommodations are available on the web site. The Advance Program will appear on the web site around May 1.

http://www.us-baltic2004.org

Oceanic Engineering meets Remote Sensing

IGARSS 2004

Science for Society
Exploring and Managing a Changing Planet

Anchorage Alaska, Egan Convention Center
September 20-24, 2004

Each year the IEEE Geoscience and Remote Sensing Society sponsors the International Geoscience and Remote Sensing Symposium. IGARSS has become an international focus for remote sensing programs, applications and activities and draws hundreds of scientists and engineers from around the world. IGARSS '04 will be held September 20-24, 2004, in Anchorage, Alaska.

This year the IEEE OES will be participating as a Co-Sponsor. Five Ocean Engineering tracks have been established for both oral and interactive presentation. More information, including a detailed Call for Papers, can be found on the IGARSS '04 web site, http://ewh.ieee.org/soc/grss/igarss.html.

We believe this shared venue and the opportunities it presents to members will be of lasting benefit to both Societies. We encourage you to participate in IGARSS '04.

Contact at OES:
s.chamberlain@ieee.org

r.garello@ieee.org

Oceanic Engineering meets Remote Sensing

IGARSS 2004

OES Technical Topics for IGARSS'04

Current Measurements and Oceanographic Instrumentation

- *H01 Surface Current Measurements*
- *H02 Acoustic Doppler Current Profilers/Velocimeters*
- *H03 Real-Time Monitoring*

Oceanic Applications of Remote Sensing Technologies/Techniques

- *H04 Modeling, Simulation and Databases*
- *H05 Inverse Problems (Tomography)*
- *H06 Environmental Technology*

ROV/AUV Sensor Platforms

- *H07 Localization and Tracking*
- *H08 Space-Time Distributed Sampling*
- *H09 Multi-Vehicle Cooperative Sensing*

Underwater Acoustics

- *H10 Sidescan, Multibeam and Synthetic Aperture Sonar*
- *H11 Sonar Signal Processing*
- *H12 Matched Field Processing*

Underwater Signal, Image and Information Processing

- *H13 Computer Vision and Pattern Recognition*
- *H14 Underwater Acoustics and Non-Acoustics Processing*
- *H15 Multidimensional Signal Processing*

Oceanic Engineering meets Remote Sensing

IEEE

OES

Additional OES Technical Topics

Current Measurements & Oceanographic Instrumentation

- Electromagnetic Sensing
- Non-Acoustic Sensing
- Ocean Instrumentation
- Transducers & Arrays
- Integrated Observatories
- Air/Sea Interaction
- Atmospheric/Ocean Dynamics
- Boundary Layer Turbulence
- Buoy Technology
- Plume Sensors

Oceanic Applications of Remote Sensing Technologies/Techniques

- GIS
- Visualization
- Data compression
- Data standardization/distribution
- Communication
- Navigation
- Positioning

ROV/AUV Sensor Platforms

- Cost-effective sensing via AUV's
- Real-time In-water Groundtruthing
- AUV-to-User Data Connectivity

Underwater Acoustics

- Acoustic Boundary Interaction
- Pressure Vector Sensors
- Acoustic Tomography
- Acoustic Validation
- Marine Bioacoustic Groundtruthing
- Ocean Modeling

Underwater Signal, Image and Information Processing

- Classification
- Optics and imaging
- Holography / Tomography
- Environmentally Adaptive Processing
- Data Fusion

DON'T MISS!
First Joint Event of OCEANS and TECHNO-OCEAN in Japan.

OCEANS'04 MTS/IEEE / TECHNO-OCEAN'04 (OTO'04) is a joint international convention, combining annual OCEANS conference and exhibition usually held in the USA, with those of TECHNO-OCEAN held biennially in Japan. OTO'04 is the first OCEANS conference in Asia, crossing over the Pacific Ocean.

The theme of this international joint convention is "Bridges across the Oceans", which stands for our hope to provide people living in the continents and islands over the world, with bridges to connect each other, to give them chances of face-to-face talks and to exchange information on oceanic activities. You can't miss the largest and most significant convention of its kind.

KOBE, JAPAN is waiting for you to come.

The host city, Kobe, is one of the traditional port cities as well as the advanced oceanic cities in Japan. There are ocean-related organizations in research and academia, industry and public sector, including Japan Coast Guard and others, in Kobe. OTO'04 will offer you a valuable interface arena not only on ocean and coastal science, technology and engineering but also for future ocean business.

Kobe is also a very beautiful city with its sea and mountains. You can enjoy a "million dollar night view" and an easy access to Kyoto and Nara, ancient capitals of Japan. Please come and join us!

Outline of Kobe

Back in 1868, the Port of Kobe was opened to external trade. Since then Kobe has been developed into one of leading international trade ports in the world. Kobe is home to people from all over the world. In fact the population make-up includes residents from about 100 different countries. The long history of exchange with the outside world has made Kobe people open-minded and warmly hospitable to conference participants.

Nestled between the lush green of the Rokko Mountains to the north and shimmering water of Seto Inland Sea to the south, Kobe is blessed with beautiful natural surroundings. A mild climate together with its natural beauty makes Kobe an ideal venue for conventions.

Visitor attractions

Major visitor attractions in the city include Kobe Maritime Museum, Akashi Strait Bridge, Sake (Japanese rice wine) Brewery Museum and Arima hot spring. There are also quite a few cruise ships you can choose from.

Kobe is close to historical cities such as Kyoto, Nara and Himeji. Kyoto and Himeji can be reached in an hour by train while Nara in about two hours.

Kobe Convention Center

Kobe International Exhibition Hall

Access to Kobe

- **From Kansai International Airport**
  65 minutes to Sannomiya
  (down town Kobe) by limousine bus.
- **From Osaka (Itami) International Airport**
  40 minutes to Sannomiya
  (down town Kobe) by limousine bus
- **From Tokyo**
  2 hours and 47 minutes to Shin-Kobe Station by Shinkansen bullet train.

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