한국해양공학회 2006년도 추계학술대회 특별강연 pp. 1~4
The 20th Anniversary of the Korea Society of Ocean Engineers
The KSOE Annual Conference and International Workshop, Busan, November 17-18, 2006

Role and Vision of Korea Society of Ocean Engineers (KSOE) Among International Ocean/Offshore Engineering Societies

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KEY WORDS: Ocean engineering, offshore engineering, KSOE, ISOPE, engineering society, technology developments, Korea, USA and Europe.

Dear President Hong, KSOE Colleagues, Participants and Fellow Engineers:

I am honored by your invitation to deliver a few words in celebration of the 20th anniversary of the Korea Society of Ocean Engineers (KSOE) — formerly the Korea Committee for Ocean and Resource Engineering (KCORE).

KCORE was born in 1986, as a cooperating society representing Korean offshore and ocean engineering communities to the former version of the Annual International Offshore and Polar Engineering Conference held in Tokyo in 1986. Since then, KSOE has expanded its global standing in remarkable fashion.

It was only in the early 1980s that Korean shipyards started in the business of offshore structure construction, while gaining shipbuilding experience for the export market. In this short period of development, the gap between engineering design and construction was initially huge; the small and medium industry base was nearly nonexistent. Now the gap starts to become small.

Shipbuilding in Korea in 1950s and 1960s

Some forty years ago, in 1963 to be exact — and for the first time since Admiral Yi Sun Shin's iron-clad turtle ship in the 15th century — a South Korean shipyard designed and built a 1,000-ton-class steel ship, the 1,600-ton *Shinyang Ho.* It was built at Josun Gongsa (Korea Shipbuilding Corporation), Busan. It was my college classmates' design and construction.

During our college days, 1960-61, Mr. Changhwan Han and I, supervised by Prof. Cheung Hoon Kim, designed, model-tested (Photo 1) and constructed a 17-foot-long class hydrofoil boat, SNU HR-1 (Photo 2), the first in Asia in 1960 at Seoul National University (SNU). Model test was conducted in the first towing tank built in Korea.

A little history: Upon completion of the compulsory 18-month military service, we graduated in 1961. This is the year Korea changed to a new government, which initiated and carried out a dynamic industrialization plan: Many new opportunities opened for young engineers. In 1962, the new government sent a team of some 60 engineers including naval architects to West Germany for training. During the German language training, I chose instead the University of California at Berkeley for an advanced degree.

By the way, already in the early 1950s the first steel boat, a tugboat of the 100-ton class, had been designed and constructed at Josun Gongsa. Also in the 1950s, North Korea had built a naval ship of the 500-ton class on the East Coast.

New Technology Developments Outside Korea from 1940s Through 1980s

During the 1940s and 1950s, Germany and Switzerland developed "flying" hydrofoil boats, and the United States oil companies started offshore drilling and production. In the 1960s, the U.S. and France built floating drilling structures, the U.S. NSF conducted Project MOHOLE in developing sophisticated multihull floating structures, and underwater missile-launching submarines and a deep-sea rescue vehicle were built. In the 1970s, this century's innovation, the *Hughes Glomar Explorer* was built, fully dynamically positioned, equipped with a huge moonpool, a 5,000-meter riser and seafloor robotic vehicle. The at-sea tests for commercial purposes were conducted in the North Pacific Ocean in 1976 and 1978. An extensive, advanced, commercial mining system and technology where I was the team leader were developed during 1975-1980 by a consortium involving Lockheed Missiles & Space Co., Dutch Shell and others. Russia was developing the WIG plane, and the U.S. Navy developed the large surface effect ship. In the 1980s, Japan built and sea-tested the first prototype superconducting boats.

Start of Supertanker Shipyards and Ill-Fated New Ocean Engineering Department at KAIST

When I was visiting the Ulsan Shipyard in 1974 at the government's invitation, while working for Lockheed Missiles & Space Co., the yard was just starting everything from ground zero, including training welding engineers for international certification. All engineering and design were 100% done by foreign companies. To start with, Korea was earning foreign currency with skilled labor for the development of the industry.

That was the time that then President Park wanted to establish a new department of ship (and ocean) engineering at KAIST. It was to start in a mechanical engineering department and become a separate department. I added "ocean engineering" to "ship engineering," as I envisioned the forthcoming discipline would be broader in scope — ocean/offshore engineering, which had already been created as a new discipline when I joined Esso Production Research in 1969. It could have been a possible new direction of the graduate-level ocean engineering and science at KAIST: Healthy competition and coexistence are good for making progress. The creation of a new department was a necessity for developing and advancing the ship and ocean business. However — perhaps I was viewed "too young" at the age of 37? — I encountered incredible resistance because of possible competition from the existing universities.

New Technology Development, Engineering Societies and Conferences in U.S.

In the United States in the 1960s and 1970s, the university curriculum wasn't catching up with industry needs and the changing world. The U.S. oil industry had already experienced such a situation in the 1960s, and it had initiated its own technology developments. SNAME didn't cover topics beyond the monohull ship except for publishing papers from the NSF's MOHOLE project, the first twin pontoon or multihull, semisubmersible platform. IEEE did underwater acoustics for naval applications.

But the U.S. Navy was making good progress on the new-class Trident submarine for underwater long-range missile launch, as well as the associated underwater equipment and DSRV (Deep-Submergence Rescue Vehicle). Thus the U.S. Navy and Office of Naval Research steered the U.S. leadership in innovation and new technology from the end of WWII, and they set out their own technical symposia with a high standard, were active ahead of the related engineering societies such as SNAME and IEEE, and excelled for many years.

In order to meet the need for deeper-water drilling and production technologies, a few major oil companies started their own research in the 1960s. In 1970, not one of the universities around the world was able to simulate multihull semisubmersibles. The oil industry had already received deeper-water leases (6,000 feet) for petroleum development. It needed the deeper-water drilling, production and transport technologies within a short period — interdisciplinary engineering beyond naval architecture and civil engineering. The only way for the oil industry to meet this goal was to form its own research brain and group.

But to meet this challenge within 10 years, Esso Production Research Co. drafted a very innovative interdisciplinary research plan, and it hired many PhD holders from the Top 10 percent from Top Ten universities, in applied mechanics, mathematics, physics and other disciplines. This is how deepwater technologies began to evolve. This is one reason the majors' oil company research got to the forefront in the deeper-water technology.

The U.S. NSF developed the ambitious project MOHOLE and designed the first semisubmersible simulation and design software (by General Electric) in 1962. Though the construction contract to Brown & Root was terminated, the technologies developed under the NSF project became the reference book for every starter.

Later in the 1960s, France conducted a national program of developing the floating drilling platform, the Pentagon 81, and model-tested and built the semisubmersible later. But France at the time didn't possess the computer simulation software, which I had already developed at Esso.

The Navy started a twin-hull project, SWATH, while the oil companies had already developed design technologies and were involved in construction. The Navy started to pay closer attention to the oil industry's technology.

In the 1970s, the SNAME, ASCE and the U.S. university curriculum, not even to mention other countries, were not ready to embrace and actively promote these new offshore technology fields in a timely fashion, and they weren't ready to change quickly to meet the fast-moving industry's needs. Civil engineering covered the coastal, bottom-fixed platform. While the multihull floating drilling and production technologies and underwater equipment and system were being developed, not a single engineering society was ready or able to accommodate such offshore technology fields and business. This is one of the reasons for the birth of Houston's Offshore Technology Conference, to establish a forum to meet this industry need. The Society of Petroleum Engineers — the SPE — played the key role; the famous Morison formula for wave force was also published in the *SPE Transactions* in 1950.

Offshore Mechanics

It was realized during the rapid deeper-offshore developments and engineering efforts in the 1960s and 1970s that no traditional branches of engineering alone could handle complex, sophisticated offshore problems. It required advanced technology and systems integration through an interdisciplinary approach. Many with the applied mechanics specialty played a key role in the industry, integrating various branches of engineering to meet the industry need.

In 1981, I achieved a consensus with the colleagues active in major oil companies in Texas and introduced this interdisciplinary branch as "Offshore Mechanics." This instantly hit a nerve with many engineers and researchers in America, Europe and Asia: The responses were spontaneous. The first Offshore Mechanics Symposium held in 1982 was an instant success. Another factor for this success was my personal contact, which I established while conducting deep-ocean mining systems technology developments in the 1970s.

The Yards, Design Technology, Research and Systems Integration

With government backing in the 1970s and 1980s, the Korean shipyards gained experience in constructing supertankers and large semisubmersibles. However, most phases of the design were subcontracted to foreign engineering companies. The shipyards were content with the profit from labor-intensive construction, and they didn't stress the systematic technology acquisition and development in the 1980s.

Now, in the 2000s, with today's high labor costs, the yards look to their own efficiency and design capability.

Recently, research institutes and universities have become more active in offshore engineering and underwater research. This activity could have followed the 1980s' government recommendation to develop offshore and underwater technology. A golden chance of 10 years was missed, but recent research seems to be moving toward this technology.

Still needed is a coherent systems integration of ocean and marine development plan and policies. All the individual items appear to be in the plan. A key to make it work in the long run is the proper integration of all the items — a plan workable in practice. The development, however, requires theories, equations, all the way to the data for the designers and operators.

Korean Naval, Maritime and Ocean Engineering Societies

Where were the Korean naval, maritime and ocean engineering societies in 1950s, 1960s, 1970s and 1980s? They stood still, in a catch-up mode within the Japan engineering society frame, and the U.S. and U.K. societies: Perhaps even now.

How Was KSOE (or KCORE) Born in 1986?

In the 1970s and early 1980s, only a few from Asia were members of the U.S. society or conference committee, and not many papers were accepted in American conferences. In 1983, Dr. Yamanouchi, a senior officer of SNAJ (Society of Naval Architects of Japan), Tokyo, recommended by my Berkeley classmate in NKK Corp., an active SNAJ member, visited me at my 2nd Offshore Mechanics Symposium in Houston, and explored the opportunity to host the symposium in Tokyo. Japanese colleagues were actively supporting the symposium, and I basically agreed and asked him to proceed. I believed this to be an opportunity to include a Korean society in the symposium in Tokyo, and offered an opportunity for a responsible SNAK (Society of Naval Architects of Korea) officer to join as a cooperating society. But I never got any response. Instead, the same Korean society asked SNAJ to explore an opportunity to join as a cooperating society; according to Dr. Yamanouchi, he came back in 1984 to discuss details of a draft agreement with us for hosting the 1986 conference in Tokyo. It was rather strange: While not responding to my offer, Korea inquired of Japan about the possibility to join the symposium. Japan forwarded the message to my office. But he agreed that Korea might not meet the 3 peer-reviewed paper requirements.

I as the chairman was compelled to print "Korea" in the symposium in Tokyo, but could not find a single Korean cooperating society whose name to print in the program. I explored which group in Korea could create an ocean and resource engineering organization to be able to meet the requirements for the cooperation for the symposium. Here I found Prof. K. M. Han and Prof. S. W. Oh in Busan. They started the organization, drafted the documents, and applied for the MOST (Ministry of Science and Technology) approval. As there was an objection from one existing society, the ministry approved it in 1986 on the basis of my endorsement of KCORE as ASME Division Chairman. But KCORE had no funds, and Han and Oh used the help of Dong-A University and their own personal money to start the KCORE operation.

Now KCORE-to-KSOE has made remarkable progress, the best-known Korean society on ocean and offshore in the world. Congratulations! In the early 1980s, it wasn't easy to find the names "Kim" or "Lee" among the authors.

Korean shipbuilding's 41% share of the world market is now clearly in the lead. The volume of offshore structures' construction has greatly increased. But let's remember that the market fluctuates all the time. This is the time to look for a new direction of business and to develop frontier technology. There must be many interactions among industry, research institutes and academia. The engineering society's role is important.

Role and Possible Direction for KSOE — KSOE Role in Future

The basic role of the society is to build solid bridges among industry, academia and government through various means. As the engineering as well as business communities become global, the bridges can cross borders, and there should be balanced two-way traffic on the bridges. A question is how to build what kind of bridges.

KCORE (or KSOE) have already built many bridges and gained global recognition. For example, KCORE successfully organized and hosted the First (ISOPE) Pacific/Asia Offshore Mechanics Symposium, PACOMS-90 at Lotte Hotel, Seoul, June 24–28, 1990: Some 300 participants including Col. S P Wahi, Chairman, leading the Oil & Natural Gas Commission ONGC delegates and 26 Russians from all over Russia including Russian Academy of Sciences, perhaps the largest number of Russians coming to Korea in 1990. The government ministries, petroleum and steel companies and the foundation gave strong support. Further, KCORE was one of the primary societies supporting ISOPE in establishing itself as a premier international engineering society in 1989.

KSOE along with KSCE, SNAK and others hosted the 15th Annual International Offshore and Polar Engineering Conference, ISOPE-2005, at COEX, Seoul, the most successful conference among the annual ISOPE conferences: 750 participants including 98 graduate students. The industry, academia and research organizations from 46 countries participated equally in the conference; most of the world's major oil, steel and heavy-industry companies participated as well. Again, KSOE welcomed the participants from 46 countries, and received strong support from the steel and heavy-industry companies and many others.

Many More Tasks Toward Building Solid Bridges

Many more tasks must be accomplished toward planning the building of solid bridges.

Global scholarly recognition must be achieved. KSOE is already the best-known Korean society in the world in the field of offshore and ocean engineering. But it needs globally recognizable publications. Its goal should be set at a global competitiveness level and enhance the quality of the papers published by the society.

The engineering societies that meet the ever-changing market and interest of R&D communities will do well. For this to happen, the structure of the organization needs to be kept flexible, so as to be able to move toward new directions of technology and business.

- Interact with industry and encourage industry participation. Research topics come from the industry business; most do not come from one equation to another equation.
- Embrace newcomers who may bring new ideas with them.
- Invite newcomers with fresh ideas to form a core group of dedicated, high-power volunteers and have them nose out new developments.
- Develop working relationship with other countries.
- Provide the input necessary for the government's policy and fund managers.

Create forums to help the university curriculum toward being able to:

- Accommodate new technology and market developments. Identify the need for the local as well as global industry. For example, the supply of qualified engineers may be in short supply in some countries.
- Meet the students' interests — this will increase their participation.

Increase the society's technical exchange activities, such as workshops and symposia.

Broaden the spectrum of multidisciplines — integrated as well as interdisciplinary — to support the ocean, offshore, maritime, coastal engineering and business communities. Work in an interdisciplinary format with other societies. At the present, offshore engineering in Korea is more about floating structures, and not yet much about underwater equipment, which requires more sophisticated technologies.

Think ahead and move a step ahead in seeking new developments and new directions in technology and market trends and industry needs.

- One example: Monitoring fast developing IT and Web technologies for application to ocean technology and business.

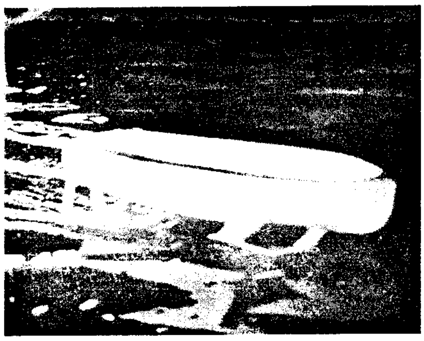

Photo 1. Hydrofoil model test in 1960 in the SNU towing tank, the first towing tank in Korea

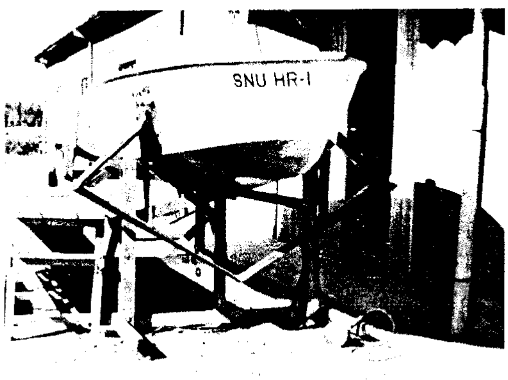

Photo 2. 17-ft Hydrofoil boat, *SNU HR-1*, constructed next to the towing tank, 1960