The Offshore Industry, Houston, and the Creation of OTC

By Joseph A. Pratt

The time was ripe for the creation of the Offshore Technology Conference (OTC) in 1969. The offshore industry was nearing the end of a long and productive era from 1946 to 1969, when ambitious and innovative industry pioneers and their companies laid the foundation for the future development of offshore technology. They had developed and refined the basic technologies needed for mobile drilling and the design, construction, and installation of production platforms and offshore pipelines in the 1940s, 1950s, and 1960s. By the mid-1960s some 1,000 platforms in water depths of up to 300 feet produced about one million barrels of oil per day in the Gulf of Mexico. In 1969 the offshore industry stood poised to move off the edge of the continental shelf into deeper waters.[1] There and elsewhere a lengthy list of challenges awaited the offshore industry. Some had already been identified; others were visible on the horizon. To meet these challenges, the industry would have to close ranks and become a fraternity of sorts, with freer exchange of technical research and closer cooperation among individuals and companies.

The 1969 OTC On-site Program, marking the conference's inaugural year.

Many prominent members of the post-World War II generation attended the first OTC; some organized sessions and presented technical papers or abstracts. They had fought the good fight offshore for twenty-five years, gaining insights into issues such as design criteria for production platforms, technical innovations needed to drill in deeper and deeper waters; and the early, but steady, advances being made in subsea work. They had learned hard lessons that could provide much needed context for a younger generation of offshore engi-

OTC celebrated its fiftieth edition in 2018 with the celebration culminating in the golden anniversary in 2019. All photos courtesy of OTC.

Attendees leave the Astrohall after a long day of networking during the early years of OTC.

neers and other offshore specialists whose careers returned to these issues as the industry moved forward.

The presence of the old hands at the launch of OTC boded well for the future of the offshore industry. The illustrious careers of many of these men and women before 1969 made them among the first inductees into the Offshore Hall of Fame, established by the Offshore Energy Center in 1998 and housed in the Ocean Star Museum. The program for the 1969 OTC shows that many participants, including some who had made notable contributions to the offshore industry in its formative years, had already conducted serious research on key technical and organizational issues that came to the forefront in future years.[2] When experienced old pros and ambitious younger people early in their careers sat in the same sessions discussing technical processes, lessons learned from the elders could be swapped for new ideas from the youngsters—to the benefit of both.

The challenges facing the offshore industry in 1969 were not all new. The industry was at a turning point. Its future pointed toward international expansion, venturing out into ever deeper waters, and finding innovative technical solutions to unknown problems that loomed in the oceans but had not yet been encountered in the relatively shallow and tame waters of the Gulf of Mexico. Industry leaders did not have to confront these challenges alone, for they were armed with a relatively new tool — computers. The digital revolution was in full swing, and its application gradually transformed all phases of the industry. Some of the pioneers regretted this change. One said simply, "Intuitive design and an entrepreneurial spirit gave way to computers and an era of no surprises…we were less afraid of failure" before the coming of powerful computers.[3] Surely fifty years later many of the young people at the first OTC are quite happy that they have had access to high powered computers during their careers.

One of the most difficult challenges in 1969 was an old, unsolved problem: The design and construction of production platforms and drilling rigs that could stand up to the concentrated wind and wave power of major hurricanes. Griff Lee, who worked at McDermott for most of his career, recalled the lack of information about the Gulf of Mexico available to the offshore construction industry in the years just after World War II, explaining, "There had been no construction of open frame structures in open water before." Lacking precedents and having little data about conditions in the Gulf concerning wave heights, wind speeds, or soil conditions, industry pioneers had to start from scratch in designing, building, and installing platforms in the Gulf of Mexico.[4]

Griff Lee, for one, relished the challenge of accumulating much needed data about wave heights and wind velocity in the Gulf of Mexico. The industry needed this data to put together best guesses on standards for offshore construction. This work was done in a world of Big Chief tablets and slide rules, not powerful computers. It relied not on sophisticated weather satellites, but on storm reports from ships or forecasts from former "weather officers." During World War II these men had the responsibility of providing the best possible predictions of weather conditions that troops could expect when they landed on beaches or jumped from airplanes. From 1946 into the 1960s the weather officers became the available experts who analyzed conditions in the Gulf of Mexico. More than a decade passed before the industry had reasonable estimates of hurricanes' power or historical data about their frequency or paths in the Gulf. The best the weather experts could offer was information about hurricanes from "hindcasting," that is, studying data about storms in the past to construct plausible theories about the likelihood and destructive potential of 25-year storms or 100-year storms and the height above sea level offshore platforms needed to be built to avoid having their decks swept into the ocean by storm-driven waves.

The offshore industry was lucky that during its formative years few major hurricanes threatened offshore facilities in the Gulf. But good luck bred complacency. Three large hurricanes—Hilda in the fall of 1964, Betsy in 1965 (both labeled as "100-year storms"), and the monster storm Camille in 1969—finally shattered the

The 1974 OTC On-site Program cover speaks to the power of offshore waves.

industry's prevailing assumption that the hurricane problem had been solved. Many people at the first OTC had been involved since 1964 or earlier in efforts to better understand the impacts of Gulf hurricanes. Three major storms in the 1960s brought both good news and bad news. The good news was that helicopter fleets servicing the offshore platforms and rigs could evacuate offshore workers quickly and efficiently when a severe hurricane seemed headed their way.[5] Loss of life was not the problem, however. With no loss of life, Hilda still caused an estimated $100 million in damages while destroying thirteen platforms and severely damaging five others.

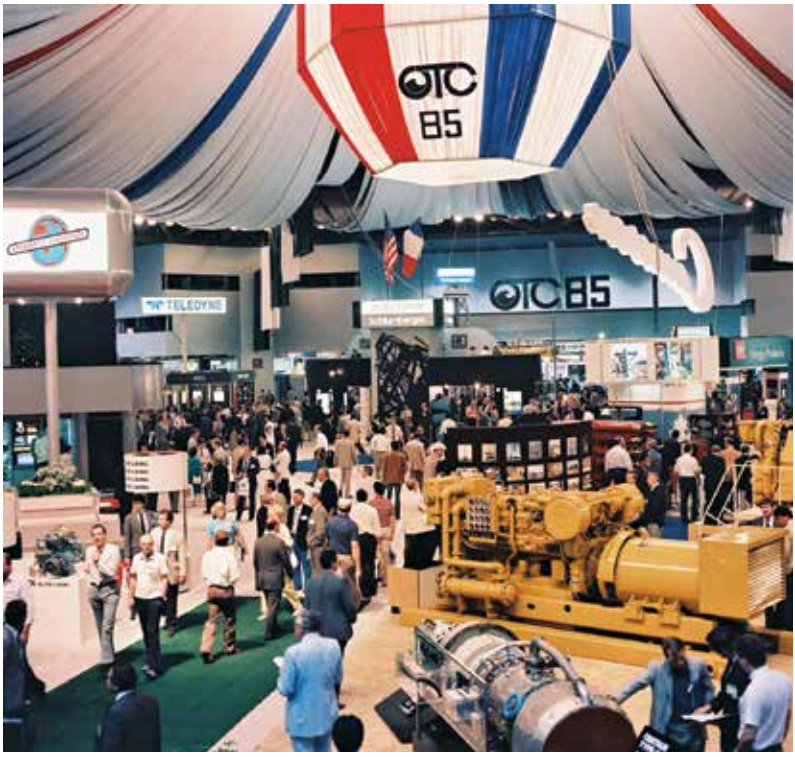
A year later Betsy caused similar damage. One of its casualties was Zapata's new state-of-the art jack-up drilling rig, "Maverick," which simply disappeared in the storm, never to be found. Camille, a terrifying Category 5 hurricane with top winds estimated at 200 miles per hour, caused extensive damage offshore while destroying and damaging platforms and drilling rigs. This so-called "400-year storm" caused an estimated $100 million in damages offshore, even though it did not score a direct hit on "offshore alley," the area of the Gulf of Mexico where most offshore platforms are clustered.

Raising greater concern than the loss of money was the reality of the stunning power of an angry Category 5 hurricane, which had tossed around platforms and drilling rigs that many in the offshore industry had assumed could survive major storms. Like Betsy, Camille had its way with old and new platforms alike. Shell—the acknowledged offshore leader in the Gulf of Mexico—lost three recently built platforms, one of which had been installed five months earlier, claiming the title of "tallest fixed deepwater platform in the world" until Camille swept it away.

After thirty years of offshore operations in the Gulf, Camille washed up a new design problem. Mudslides on the ocean flood caused by the storm's powerful surge moved one large platform Shell had designed to withstand 100-foot waves. The flow of mud pushed it down the slippery ocean floor until it came to rest 100 feet away on the bottom of the sea. Anyone who saw the Biloxi, Mississippi, area before and after Hurricane Camille gained a lifetime of respect tinged with fear for major hurricanes. Anyone in the offshore industry who seriously considered the damage Camille would have caused had it moved 100 miles to the west through the most densely developed offshore areas realized that much work remained to be done on the wind, wave, and soil forces produced by big storms.[6] A good bit of that work came in numerous sessions on wave forces at OTCs, including the first one.

A somewhat similar set of problems arose in the late 1960s when North Sea exploration began in earnest. As in the earliest years in the Gulf of Mexico, those who wanted to develop a new oil frontier in the North Sea had to start from scratch; the drawn-out process of defining the jurisdictional boundaries of the various nations bordering the North Sea delayed exploration, leaving the early entrants into the region with almost no reliable data on wave heights and wind and wave forces on platforms.

In the North Sea, the offshore industry confronted severely cold weather, sudden storm winds strong enough to generate 100-foot waves, and water depths in parts of the sea



Industry professionals engage with one another on the exhibit floor at OTC in 1985.

more than double that encountered by 1969 in the Gulf of Mexico. North Sea winds could be comparable to Category 2 or 3 hurricanes, with gusts up to 120 miles per hour and sustained winds of 80 miles per hour for as long as an hour. Unlike North Sea gales, Gulf of Mexico hurricanes could be tracked, leaving time to evacuate platforms; the rapid rise of North Sea gales meant that at times offshore platforms could not be evacuated. Those who ventured from the Gulf of Mexico to the North Sea in search of oil and gas also faced the challenge of adapting equipment used in the Gulf to the much harsher conditions encountered in the 185,000 square miles covered by the North Sea.[7]

Work offshore in the Arctic, another relatively new petroleum frontier, added the challenges of working in thick layers of ice to harsh conditions similar to those found in the North Sea. One 1969 OTC session had three papers discussing the difficulties encountered in the Cook Inlet southwest of Anchorage. One veteran of offshore work in the Cook Inlet said of his tour of duty there: "Extreme tides and low winter temperatures influence engineering and operating considerations to a greater degree in the Cook Inlet than heretofore experienced in other offshore oilfield development." In the 1960s, *Offshore* magazine gave a more succinct opinion of working conditions in the Cook Inlet, which it called "worse than any spot on the globe."[8]

Those who doubted this observation should have talked with the unlucky Brown & Root employee who drew the short straw when it came time for someone to hop aboard a run-away platform that had escaped its launch barge. He reported back regularly as strong ice floes pushed his platform up and down the icy waters of Cook Inlet. Combined with wind and water currents, these ice floes, which varied from thirty to thirty-five feet in height, exerted three to four times the lateral pressure on platforms experienced by standard

platforms in the Gulf of Mexico. One estimate held that Cook Inlet platforms had to withstand twice the thrust of the Saturn rockets used in the Apollo moon shots.[9]

Although the Cook Inlet was about five hundred miles south of the Arctic Circle, it provided a measure of preparation for future work in the real Arctic. The problems presented by thick ice and extreme ice floes could also be experienced in parts of the Arctic, as could the limited time to work given the harsh winter weather that slowed progress on projects. The discovery of the giant Prudhoe Bay field on Alaska's North Slope in 1968 focused attention on conditions in the Arctic. Laying 800 miles of large diameter pipe from Prudhoe Bay to the ice-free port of Valdez on Alaska's southern coast made extraordinary demands on welders and managers alike.

Even greater demands have emerged since the 1970s in numerous ventures to find and produce oil in the harsh conditions in offshore waters off the North Slope. The problems with Arctic conditions had already caught the attention of some of those at the 1969 conference, and they remain a challenge that the industry has not completely overcome in the forty years since the completion of the Trans-Alaska Pipeline System pipeline in 1977.[10]

The brochure for the 1969 conference contained many listings of technical papers and abstracts about subsea work. This has remained an important area of technological change in the last fifty years, and it will remain on the agenda for years to come. These early papers laid out frameworks for understanding the demands of subsea work in deeper and hasher environments; they also put forward research programs to meet these demands. They helped demonstrate how technical changes can evolve from ideas to realities through the collaborations of collections of experts over time.

One final challenge in 1969 was most noticeable by its absence in the 1969 OTC brochure. Participants submitted technical papers about the possibility of drilling in 1,300 feet of water in the Santa Barbara Channel with modern semisubmersibles, but they made no mention of the Santa Barbara oil spill in January of 1969, which occurred four months before OTC's first conference. This spill in a beautiful region produced much heated debate about offshore drilling, particularly in California. The following year a second well-publicized blow-out offshore Louisiana again captured considerable public attention.[11] Outrage at such spills fueled the growth of the environmental movement, which gained momentum in the late 1960s. The year after OTC's first conference witnessed the creation of the Environmental Protection Administration (EPA), the Occupational Safety and Health Administration (OSHA), the requirement of Environmental Impact Statements, and much stricter regulations of air and water pollution. Similar changes took place in Europe and Japan, and the oil industry became a target for protesters.

Attendees explore one of many exhibits outside the Astrodome in 1990.

An exhibitor explains his company's technological innovations to an interested attendee at the 1992 OTC.

Although technical innovation has remained the focus of the offshore industry, this episode taught an important lesson. The oil industry would have to commit more resources and expertise to preventing such disasters, or public opinion would push government regulators to assert greater control. "Clean up your own mess" was an admonition many heard from their parents; to do so, the oil industry had to do more to meet the challenge of growing social and political demands on issues as diverse as environmental stewardship, civil rights, and women's rights. The papers at subsequent OTC meetings indicate that combatting oil spills gradually became a topic of discussion.

Overcoming these and other challenges required increased cooperation in the offshore industry. This was good timing, since cooperation was in the air. In 1962, Shell held its "million-dollar school," where, for a substantial fee, Shell provided outsiders a glimpse inside the technical innovations that had made it the leader in the Gulf of Mexico. One unspoken lesson was that individual companies could not venture out alone into deeper and deeper waters. An offshore fraternity of supply and service companies had to

A 1997 exhibitor showcases its latest design advancements for its deep sea diving suit.

accompany them. In addition, innovative competitors were needed to push leaders in the industry to continue to create and apply new technology.

Increasingly, clusters of experts from different companies and professions contributed to the development of many of the cutting-edge technologies needed for offshore expansion in deeper waters and harsher conditions. According to one prominent Shell researcher, the million-dollar school and later OTC meetings served to "loosen the secrecy surrounding companies' research efforts, making it much easier to release important technical results."[12]

Another facilitator of growing cooperation was *Offshore* magazine. After its founding in 1954, the magazine quickly became a bulletin board of sorts for the industry, delivering useful and detailed information about important people and events. An older organization that encouraged collaboration in the industry was the National Petroleum Council (NPC), founded in 1946 as an advisory committee to the Secretary of Interior (and then to the Secretary of Energy after the Department of Energy's creation in 1977). Staffed and funded by the oil and gas industries, for more than seventy years the NPC has given the petroleum industry a place to bring together experts from numerous companies and disciplines. Under the NPC umbrella, these study groups cooperate in the research and writing of reports on questions of interest to high-level policy makers. Included in the NPC's work have been landmark reports on the offshore industry.[13]

Several failed efforts in Europe in the 1960s to create organizations somewhat like OTC served to emphasize the demand for places where those working offshore could mingle and discuss key issues. Much later OTC responded to the demands for more international meetings by holding conferences in Brazil and Asia, as well as a regular conference focused on the Arctic.

Among the most important predecessors of OTC were the voluntary committees that met after Hurricanes Hilda and Betsy to have hard-edged, open discussions about the need to establish better standards for offshore operations. The meeting after Hilda took place at the Roosevelt Hotel in New Orleans in 1964, and the one after Betsy met at the Rice Hotel in Houston in 1965. In a sense this was a move toward greater cooperation between the two primary cities involved in the offshore industry in the Gulf of Mexico. Those who voluntarily attended these meetings came fully prepared. They had suffered heavy losses by following standards suggested by hurricane "experts," and they voiced harsh criticisms of the old order that had focused on the likelihood of 25-year storms and the adequacy of platform decks 30 to 40 feet above mean sea level. Camille made a joke out of this "standard" when it produced waves measured at 75 feet high by Shell.

One loud, persistent demand at the meeting after Betsy was for the establishment of a standing Offshore Standards Committee of the American Petroleum Institute (API). As the largest trade association for the petroleum industry, the API was an ideal organization to foster cooperative initiatives by the industry as a whole; the offshore standards committee soon came into being and set about the difficult task of creating and publicizing realistic standards for design, construction, and operations of offshore facilities.[14]

All of these efforts to create forums for discussion and research helped set the stage for the creation of OTC. The time was right in 1969 to create what OTC called "a major forum of national importance and scope for the dissemination of technology related to offshore resources and environment. The total benefits and influence of the conference are now beyond prediction, but many knowledgeable persons feel that it will be of considerable value to the nation in our development of oceanography and resources from the ocean."[15]

Sharing notes on research. Sharing coffee during breaks between sessions. Sharing ideas about potential innovations. Sharing reactions to exhibits. All of these things helped build cooperation; all of them paved pathways toward a stronger offshore industry.

An attendee participates in a product demonstration at OTC 2016.

Attendees take a break from walking the aisles of the exhibit hall floor in 2018 to enjoy a live presentation held at an exhibitor's booth.

If the time was right in 1969, the place also was right. Houston was enjoying a long post-war boom for oil, gas, and petrochemicals. Plants built or expanded to support the war effort had reverted back to private hands after the war, and new plants also had sprung up along the Houston Ship Channel and around nearby ports in Beaumont, Port Arthur, and Freeport. Two visible symbols of the maturing oil industry in Houston were the opening in 1963 of the new Humble Building (later renamed the Exxon Building), complete with the Petroleum Club, on the south end of downtown, and the completion of One Shell Plaza on the north side of downtown in 1971.[16] Occupied in large part by two of the world's largest oil companies, the two buildings provided bookends for the new Tenneco Building, which opened in 1963. Along with other leading natural gas transmission companies, including Transco, El Paso, and Texas Eastern, Tenneco chose Houston for its headquarters. The pipelines of these transmission companies provided key connections between the vast natural gas reserves in the southwest and the vast demand for natural gas in major northeastern cities. Natural gas also served as a feedstock for many of the petrochemical plants that proliferated in the region after the war. Houston proclaimed itself "the oil capital of the nation," but it could well have expanded this Texas brag by touting Houston as "the oil, natural gas, and petrochemical capital of the nation."

The 1960s also witnessed a measure of economic diversification in the region, with the continued expansion of the technologically intensive Texas Medical Center, the coming of NASA's Manned Spacecraft Center to Houston in 1963, and the growth of institutions of higher education (notably the University of Houston, Rice, Texas Southern, and St. Thomas Universities) with strong programs in engineering and chemistry as well as the liberal arts. The talk of the town, including technological advances, was the Astrodome, which opened in 1965 billed as the "Eighth Wonder of the World." The first all-purpose domed sports stadium, it featured such "high tech" innovations as plastic grass, the largest home air conditioner anywhere, and a parking lot for 30,000 cars.[17] The opening in the "arts district" of Jones Hall in 1966 and the Alley Theatre in 1968 indicated that Houston had embraced high culture along with major league baseball and high school football.

The first fifty years of OTC lived up to the promise of its first meeting in 1969. Attracting more than 4,000 participants to the initial conference strongly indicated the hunger for greater interaction and cooperation among those who worked for the many and varied companies in the offshore industry. The planning of the conference over the space of a year by volunteers drawn from the highest levels of the leading offshore companies and the willingness of leading experts from many related fields to organize sessions and write technical papers and abstracts demonstrated clearly that greater cooperation could deliver impressive results. In the context of events that occurred in the offshore industry of the 1960s, the time was right and the place was obvious for OTC to launch an endeavor to help bring the offshore industry together while pushing it forward.

Joseph A. Pratt, Ph.D, is professor emeritus at the University of Houston. He is also the founder and editor emeritus of *Houston History*.