Professional societies face many challenges in today’s market. Some challenges are ongoing, such as attracting and retaining members, offering appropriate services, conferences, meetings, and products all while managing efficient and cost-effective operations. Other challenges are driven by changing professional needs, new markets and emerging technologies. In chemical engineering, the American Institute of Chemical Engineers identified a series of factors that impacted our ability to function as a professional society. They were a flat to declining membership, declining attendance at major meetings, struggling local section activity, dramatic changes in employment demographics for chemical engineers and the continued negative public image of chemical industry. In consultation with leaders in industry and academia, these critical issues were identified: changing nature of chemical engineering, globalization and industry consolidation, education pipeline and relevancy, and the importance of sustainable development.

AIChE recognized that we must change to meet future needs of chemical engineers and the organizations they serve. For example, we recognized the broader nature of technologies enhanced by chemical engineering, biotechnology, nanotechnology, electronics and information development or delivery. We need to take an active role in redefining the education pipeline, especially an enhanced awareness of science and math in K through 12, as well as a broadening of the chemical engineering undergraduate curriculum. We must look to redefining the goals of industry and their responsibilities to society, that is, sustainable development, while we continue to support the core industries and knowledge base of chemical engineering.

If we define “Industry” as where we work, “Technology” as how we work, “Education” as how we teach/learn, and “Society” as how we behave/develop, we can readily present AIChE’s historic role as a professional society in Figure 1. Chemical engineering knowledge was disseminated educationally through a core curriculum, we served a chemical and energy focused industry with core technology in process engineering, and our principal societal impact was through environmental health and safety.

However, we recognize the changing role and application of chemical engineering in a global scope along with the relative maturity and commoditization of the chemical process industry. This leads us to accommodate a refined educational pipeline and curriculum as well as new process applications in emerging technology areas. An expanded role for chemical engineering is presented in Figure 2. Biotechnology, pharmaceuticals and electronics have moved significantly into our industrial world, process engineering has expanded to the molecular level, societal impact must also address sustainability and the educational path has broadened both technically as well as in ethics and business.
Figure 1. AIChE’s Historic Role as a Professional Society
Figure 2. Expanded Role of AIChE and Chemical Engineering
AIChE has developed a “Genesis” plan for implementing these expanding changes. A key aspect of this plan is the formation of institutes or societies under the AIChE umbrella that meet the future needs of chemical engineers and the organizations that they serve. To address technologies and business practices for a sustainable world, the AIChE Institute for Sustainability (IfS) has been created. AIChE has relied on the Bruntland Commission Report (1987) for a definition of sustainability: "Development that meets the needs of the present without compromising the ability of future generations to meet their own need."

The IfS is a catalyst for driving the development and deployment of new technologies and practices that are needed to shape a world that can truly sustain future generations. Through multidisciplinary partnerships with engineering and scientific societies worldwide, government entities and NGOs, the Institute is working to deliver technically viable, commercially feasible and environmentally and socially sustainable solutions to meet the challenges of tomorrow. The IfS will promote awareness as to the scientific and engineering challenges of sustainability, develop practices and tools that will guide the creation of more sustainable manufacturing processes, and support and encourage chemical engineers to contribute towards meeting the needs of tomorrow’s world.

The mission for the IfS is to develop and implement cost effective technologies, processes and practices needed to meet global societal and marketplace challenges. The objectives of the institute are to:

- Facilitate the advancement of R&D and evaluation frameworks for sustainability that will enable industry to meet societal needs while reducing the impact of their operations.
- Match industry’s needs for innovative technologies, processes and practices with the resources of leading academic institutions and national laboratories.
- Empower chemical engineers to help make the entities they serve contributors toward a more sustainable world.
- Cultivate mutually beneficial alliances with government agencies, industry and NGOs to identify critical issues regarding sustainability, and work collaboratively to develop and promote solutions. Develop and integrate sustainability concepts into K-12, college & professional curricula. Communicate to the public how chemical engineers are developing the technologies to create a more sustainable world, and the benefits to society of sustainable engineering, manufacturing, development and production practices.

The discipline of chemical engineering and its principles have allowed chemical engineers to play major roles in providing society with innovative products and services. Chemical engineers are important contributors to many industrial segments from basic materials and chemicals to pharmaceuticals, food and water, and they play key roles in understanding and ameliorating society's impact on the environment. As such, chemical engineers are uniquely positioned to develop tomorrow's sustainable processes by coupling chemical engineering principles and process synthesis skills with concepts of sustainability.

The dawning of the 21st century brings enormous challenges as we strive to improve the health and well-being of all mankind through economic growth, and we realize the natural resource, business and societal implications of achieving these goals. Meeting these challenges will undoubtedly require a multi-disciplinary approach by scientists, engineers and economists, as
well as different paradigms for driving innovation. This suggests that the unique expertise of chemical engineers will play an even more important role in supporting economic growth while meeting societal needs. That's why AIChE is committed to supporting chemical engineers as well as working with all professions to shape a world that can truly sustain our future generations.

The AIChE Institute for Sustainability was envisioned as being comprised of three Centers to reflect its major thrusts, the Center for Waste Reduction Technologies, the Center for Environmental Excellence, and the Center for Social Stewardship and Education. The Center for Waste Reduction Technologies develops technologies and management tools supporting sustainable growth, environmental stewardship, and Responsible Care®. The Center for Environmental Excellence is a resource center for practicing engineers with environmental and sustainability needs. This Center develops training programs and workshops supporting energy efficiency and sustainable practices to help engineers define the roles they can play in support of achieving sustainable development. The Center for Social Stewardship and Education develops products and services society needs to be more sustainable. Special emphasis is placed on using engineering expertise to improve the quality of life of disadvantaged populations and on outreach programs to explain the importance of chemical engineering in creating a sustainable world.

"Sustainability" has emerged as a driving force in transforming business practices and public policy. One way that AIChE is striving to provide members with a voice in shaping these transformations is by creating the Sustainable Engineering Forum (SEF), an intellectual forum that provides stimulus for defining the roles chemical engineers can play in support of achieving sustainable development. The Engineers Forum for Sustainability is co-sponsored by the American Institute of Chemical Engineers (AIChE), the American Society of Civil Engineers (ASCE) and the American Society for Engineering Education (ASEE). For example, the SEF will work with areas such as:

- Metrics for sustainability
- Developing approaches for designing products and processes that can be optimized to desired metrics criteria, and that incorporate environmental and societal benefit factors
- Assessing impacts of resource use (energy, material, and cost) on environmental and social benefits (or otherwise) of products, processes, and services
- Designing new processes or products that are comparatively benign (such as via green chemistry and engineering approaches)
- Technology developments in response to socioeconomic measures such as emission trading
- Educational elements relative to all previous points

The idea of sustainability and sustainable development emerged from the World Commission on Environment and Development (WCED), the so-called Bruntland commission, which defined sustainable development in Our Common Future (1987) as meeting the needs of the present without compromising the ability of future generations to meet their own needs. Earlier, the economist, Repetto (1985) wrote in this context: Current decisions should not impair the prospects for maintaining or improving future living standards. Another definition was recently arrived at by a group of experts from various disciplines at EPA's National Risk Management
Research Laboratory, and we offer this as a working definition, which is of course subject to modification as we begin serious deliberation on the topic in the SEF: Sustainability occurs when we maintain or improve the material and social conditions for human health and the environment over time without exceeding the ecological capabilities that support them.

Clearly incorporating the concepts of intergenerational equity and ecological capabilities would be a challenge for scientists and engineers in designing processes and products. SEF will do its part to add some scientific rigor to analyzing sustainability and to use appropriate metrics to determine comparative merits of alternatives. The mission of the Forum is to help promote the principles and practice of sustainability by:

- Providing a meeting place for interdisciplinary discussion and exchange of information;
- Identifying and distributing information on engineering education programs that incorporate sustainability;
- Encouraging practicing engineers to apply the principles of sustainability and participate in sustainability programs and activities at local, regional and national levels, and
- Keeping abreast of and sharing information on international developments that can contribute to global sustainability.

Activities such as the Sustainable Engineering Forum through organizations such as the Institute for Sustainability offer professional societies tools to face today’s challenges. We believe that professionals who wish to have social and global impact within their areas of technical expertise will find these venues rewarding. In addition, the leaders in industry and academia can readily support these expanding activities because of their importance in the changing nature of engineering and our relevancy to the world’s challenges.

References


Biographical Information

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