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1904-1991

By Hoyt C. Hottel

SAKAE YAGI, former head of chemical engineering at the University of Tokyo, then executive vice-president of Chiyoda Engineering and Construction Company, died on July 15, 1991 (born Meiji 37) at the age of eighty-six. Because of his contributions to chemical engineering education, research, and industrial applications, Dr. Yagi was elected a foreign associate of the National Academy of Engineering in 1981 and was considered by many of his associates to be Japan's number-one chemical engineer.

Dr. Yagi's higher education started at Tokyo Imperial University in applied chemistry and led to research in the fields of optics and infrared spectroscopy. Dr. Yagi left Tokyo Imperial University to become an assistant professor in chemical engineering at Tokyo Institute of Technology, where he developed his interest in fuels, furnaces, radiative transfer, and combustion. In 1935 he was given a two-year leave of absence to study abroad. His first year was spent in the Chemical Engineering Department of the Massachusetts Institute of Technology (MIT), where he carried a heavy load of graduate subjects while doing research on flame lengths. In a farewell dinner party for the chemical engineering staff, he said that he would return to Japan to start many chemical engineering departments in his nation's universities. His audience did not visualize the enormity of his coming effort to make that statement come true. Dr. Yagi spent his second year abroad visiting important industrial companies and federal re

search agencies in the United States and similar organizations in Europe. During these visits, he had discussions in his principal areas of interest with notable scientists and engineers, including G. I. Taylor and Theodore von Karman, among many others.

On returning to Japan Dr. Yagi became the first head of the new chemical engineering department at Tokyo Institute of Technology. A few years later he accepted a professorship at the University of Tokyo, where he became the prime mover in establishing first a petroleum engineering department, then a department of chemical engineering, and later, an expansion of the applied chemistry department. He was a faculty member of both of these universities, and students in chemical engineering could study or do research at either institution, or both. A few among many other activities in Dr. Yagi's early postwar period were his involvement in a nuclear power plant project, another visit to MIT to discuss research problems, and the heading of Japan's first world trade fair. He had been one of the founders of the Society of Chemical Engineering, Japan, in 1936. In 1961 he was elected its president and arranged for a celebration of the society's 25th anniversary, with invitations to members of the world's major chemical engineering departments; a two-week symposium was held, one week in Tokyo and one in Kyoto.

From heading the chemical engineering department at the University of Tokyo, Dr. Yagi moved on to become dean of engineering, then head liaison among chemical engineering, applied chemistry, and petroleum engineering. Full retirement from the university came in 1965, when he was made the executive vice-president of Chiyoda Engineering and Construction Company.

It is typical of the career of many a scientist-engineer-turned-administrator to drop slowly out of direct productive research as management activities increase. Not so with Dr. Yagi. His definitive research and outstanding technical papers and lectures continued throughout his career. A brief summary of his output in three areas follows.

The first field of interest that Dr. Yagi developed and expanded was industrial furnaces and the areas of heat transfer, fluid mechanics, and chemical kinetics on which furnace con

struction and operation were based. There followed papers on flame luminosity, flame length, heat transfer, and a book in the early 1930s on industrial furnaces. A generation later the book was reedited and enlarged.

From 1948 to 1961 Dr. Yagi published many papers on chemical reactions in fluidized beds, papers typically showing that his strong interest in theory and his high analytical competence were motivated by the need for theory to guide practice. Attention to fixed beds overlapped the fluidized-bed research; papers and lectures came on the effective thermal conductivity of packed beds, coefficients of heat transfer, axial movement of solids in packed beds, and temperature and concentration distribution in fixed-bed reactors.

In Dr. Yagi's later years he turned to the broad objective of integrating knowledge of chemical reactors to achieve an economic optimum in their design and performance. The papers were first on the properties of different reactor types, then on the overall process of optimization. While heavily loaded with managerial activities under Chiyoda, he still found time to lecture at Nagoya University on reaction engineering and to write a book on the subject. Collaboration with Professor H. Nishimura produced an optimized process network based on a linear model, which drew from an American expert the assessment that the model was superior to more mathematically complex models available at that time.

On retirement as executive vice-president of Chiyoda, Dr. Yagi became senior adviser and chairman of the board of directors of Chiyoda International Company, Inc. This involved many more trips to the United States. Later he was appointed senior adviser to Japan's Ministry of International Trade and Industry (MITI). When in response to a request from the U.S. Department of Energy the National Research Council set up an ad hoc committee on the Industrial Energy Conservation Program, the committee arranged a trip to Japan. Dr. Yagi, representing MITI, was a prime source of information for the committee. That exchange, between Japan and the United States, of knowledge about progress in engineering and science was characteristic of Sakae Yagi's dedication to the educational process, worldwide.

