in the form of fellowship awards to one or two chemical engineering lecturers to work with a major design-contracting company for a specific period every year.

The design portion of the internship year must deal with the following key topics:

- **Chemical Engineering Systems Analysis: definition of needs and goals, evolution/innovation, chemical engineering systems and environment interaction, effect of socio-techno-economic criteria.**
- **Chemical Engineering Design Analysis: a) principles of authentic design, b) creativity-innovation-reliability in design which should include group dynamics, brainstorming, definition and types of failure, and reliability parameters in design, c) chemical engineering design project, d) feasibility study involving physical realizability, economic worthwhileness, and financial feasibility, e) preliminary design including design concept, mathematical modeling, and sensitivity compatibility and stability analysis, f) synthesis of solutions involving methods of optimization, linear, nonlinear and dynamic programming, and general simulation techniques, and g) evaluation and decision including value/worth transformations, estimates of system utility/worth, the decision matrix, decision under risk/certainty/uncertainty, expected values—probabilities, competitive decisions, and mixed stategies.**
- **Chemical Engineering Application Analysis: a)network planning techniques with general network methods, critical path analysis, time-cost effectiveness studies, and control of the system in action, b) matching of the design to the environment, c) modifications, d) implementation, and e) trouble shooting.**

The design course should not be a theoretical one. The implementation part should require the actual construction of a plant (or some units of it) by the student-lecturer group. In situations where there is not enough information for design, the group should use research methods to fill the gap. In this way students would learn to appreciate the value of research in an industrial concern. This value is not recognized by graduate engineers in Nigeria and other developing countries. To assist this program, Nigerian government policy should make it possible to award part or all of plant design contracts to chemical engineering departments at various universities in the country. Some of the benefits of such a policy would be an increase in revenue for the institution, a faster rate of technology acquisition, and more confident and capable graduates. It is assumed that a solid understanding of design and construction would help the graduate to adapt to any type of engineering function. In this proposal, I have also assumed that the principles of design for the component units of a plant would be covered in various areas of chemical engineering fundamental courses.

Implementation of such a program should reduce the inability of Nigerian engineers to apply the knowledge they possess. The argument for the use of university facilities for the internship training is that there are few industries in Nigeria. Chemical plants that do exist have been built under turnkey contract and students cannot learn much since their role would be primarily one of operator, a role they have already learned during their long vacation (summer) industrial attachment. □

ChE books received

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Water Treatment Principles & Design, James M. Montgomery, Wiley-Interscience, New York, NY 10158; 696 pages, $49.95 (1985).

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Heat Transfer in High Technology and Power Engineering, Wen-Jei Yang and Yasuo Mori. Hemisphere Publishing, New York, 10016; 602 pages, $95.00 (1987).