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Trip Report -- Chulalongkorn University, Bangkok, Thailand. January 27-31, 1992

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Proposal for M.S. Degree Programs in Petrochemical Technology (Chemical Engineering) and Polymer Science at Chulalongkorn University -- An academic partnership between the Petroleum and Petrochemical College of Chulalongkorn University and:

Case Western Reserve University
The University of Michigan
The University of Oklahoma

Introduction

Under a Cooperative Agreement between The Association of Big Eight Universities and the United States Economic Assistance Mission in Thailand (USAID), faculty representatives from universities in the United States visited Chulalongkorn University in Bangkok, Thailand, on January 27-31, 1992. The institutions represented were: Case Western Reserve University, the University of Michigan, and the University of Oklahoma. The purpose of the visit was to assess the feasibility and consider specific designs for a cooperative effort among the parties in offering graduate programs in polymers and petrochemistry at Chulalongkorn University.

This visit to Thailand followed visits by representatives of the Association of Big Eight Universities to the respective U.S. universities in October 1991 and a visit to Chulalongkorn University in November 1991. The purpose of these earlier visits was to determine interest and feasibility of proceeding with more specific program designs.

Faculty representatives from the U.S. universities meeting with officials of Chulalongkorn University were:

Dr. Hatsuo Ishida, Department of Macromolecular Science, Case Western Reserve University

Dr. Johannes W. Schwank, Department of Chemical Engineering, The University of Michigan

Dr. Jeffrey H. Harwell, School of Chemical Engineering and Materials Science, The University of Oklahoma

Dr. Raymond D. Daniels, School of Chemical Engineering and Materials Science, The University of Oklahoma

The Academic Objective

Chulalongkorn University proposes to establish new graduate programs in the areas of petrochemistry and polymers. The programs will be at the master's degree level initially. All instruction will be in the English language. The degree programs will be offered by Chulalongkorn University's new College of Petroleum and Petrochemistry. The plan is that the instruction and research in the degree programs be carried out as a joint academic endeavor with the three cooperating U.S. universities.

The government of Thailand has made a major commitment to the program through appropriation of funds for construction of a building for the College of Petroleum and Petrochemistry. Construction of a fifteen-story building is underway. Seven stories will be allocated to the College for instructional and laboratory space. A budget of $6,000,000 (US) has been set aside for procurement of laboratory and research equipment in the new building.

Economic development in Thailand is accelerating. Over the past five years manufactured exports have grown at a rate of 35 to 40 percent per annum. Growth in GDP in 1991 was in excess of 10 percent. Rapid industrialization is creating severe shortages of science and engineering manpower. Some engineering graduates of Thai universities go or are sent to the United States to earn Master's degrees, but not enough of them to satisfy industrial demand in Thailand for Master's level engineers, fluent in English, with an open and participatory professional style characteristic of engineers educated in the United States.

The Program Model

The goal of the new program is to produce 20 MS graduates in polymer science and 20 MS graduates in petrochemistry per year to help meet the needs of Thailand's industry. The model envisions all instruction in the English language and development of first rank laboratory and research programs.

The model is based on the very successful ten-year old MBA program of the Sasin Graduate Institute of Business Administration at Chulalongkorn University. The MBA program is a joint academic endeavor of Chulalongkorn and the Kellog Graduate School of Management at Northwestern University and the Wharton School of the University of Pennsylvania. All instruction in the MBA program is provided by U.S. faculty.

There are limits to the application of the Sasin model to graduate programs in engineering. Major differences exist in a number of areas. Among the major differences is the need to establish strong, well funded research programs to support the graduate

thesis research. This requires the extensive involvement of Thai faculty in the research (and, eventually, in the instruction). Incentives for U.S. faculty participation are also quite dependent on the development of viable research programs, particularly programs that complement those carried on at the U.S. universities. The success of the program in meeting a recognized international standard will hinge as much on the quality of the research as on the instruction.

U.S.A.I.D. Support

The U.S.A.I.D. Mission in Thailand has expressed interest in supporting the start up of this graduate program if sustainability can be demonstrated. Although Thailand will soon no longer qualify as a less developed country (LDC), A.I.D. is interested in helping establish linkages between U.S. universities and institutions of higher learning in such countries as they seek to build the technological infrastructure and develop the human resources to support an industrial economy. These are envisioned as long term relationships that benefit the U.S. universities as well as the industrializing nation.

A proposal for U.S.A.I.D. start-up support will be discussed after details of the degree program are described.

Degree Program Outline

The graduate degrees to be offered are Master of Science in Petrochemical Technology and Master of Science in Polymer Science. The curriculum in Petrochemical Technology is essentially chemical engineering with emphasis on process technology relevant to down-stream operations in a petroleum-based industrial economy. Admission requirements to the graduate programs will be equivalent to those required for admission to similar programs in the U.S. Admission will require acceptable scores on the TOEFL examination.

The programs will be organized to cover two academic years. The number of semester credit hours required for the degrees will be 36, with 12 hours allocated to the master's thesis. Twenty-one semester hours of course work will be required in each of the programs. The anticipated distribution of requirements is as follows:

seven 3-credit courses	7 x 3 =	21
one pre-course orientation		1
seminars, 1-credit per year	2 x 1 =	2
thesis research		12
Total		36

In each curriculum there will be 4 core courses:

Petrochemical Technology

- Thermodynamics
- Transport
- Kinetics/Reaction Engineering
- ChE Calculations/Mathematical Modeling

Polymer Science

- Polymer Synthesis
- Polymer Processing
- Physical Chemistry of Polymers
- Polymer Physics

In addition, there will be several elective courses offered in each curriculum. Students will be required to take at least two of the four core courses in a curriculum, three more courses in that curriculum, and two courses from the other curriculum (i.e., a student majoring in petrochemical technology must elect two courses in polymer science, and vise versa).

The courses to be offered are among those now offered for graduate credit by the participating U.S. universities. It is envisioned that a U.S. student should be able to take any of these courses in Thailand under a U.S. instructor and receive resident credit at the home institution.

Startup and Scheduling

The academic year in Thailand runs from mid May to mid February. It is planned to offer courses in 4-week modules, i.e., each three credit hour course will be taught over a 4-week period, with students taking only one course in a given period. Eight scheduling periods are planned for the academic year. Three 4-week periods will be scheduled back-to-back in the three summer months (15 May - 15 August), but there will be a 1 or 2 week break between most other periods in the academic year.

A U.S. faculty member offering a 4-week course at Chulalongkorn University will probably be gone from the home institution for about 5 weeks. While in Thailand the faculty member will be responsible for instruction (2 to 3 hours per day, 4 or 5 days per week) and for working with students and Thai faculty in the identification and initiation of thesis research. Each U.S. faculty member instructing in Thailand will be responsible for advising, on average, four graduate students. The faculty member will have a continuing responsibility to monitor progress in the thesis research even after return to the U.S. Provision for communication and follow-up visits to Thailand in connection with the thesis research will be built into the program. However, on-

site supervision of the thesis research will be the responsibility of Thai faculty.

The graduate program will start with admission of the first class of 40 students, 20 in petrochemical technology and 20 polymer science, in the Spring of 1993. Entering students will have a one-month precourse orientation period, including review of technical English, prior to the first classes scheduled to start May 16, 1993. At steady-state, there will be 80 students in the program, 40 first-year students and 40 second-year students.

U.S. Faculty Involvement

It is proposed to offer 10 courses per year (5 in each degree program)for each of the first two years 1993-94 and 1994-95, all taught by U.S. faculty. After the second year, it is proposed that up to 50 percent of the courses be taught by Thai faculty. Thus, for the third year and beyond U.S. faculty will be called upon to teach only about 5 courses per year in Thailand. This is a sustainable level, that should not tax the manpower resources of the three U.S. universities (1 to 2 courses each per year).

It is expected that cooperative research relationships between Chulalongkorn University and the U.S. universities will continue and be strengthened in subsequent years. Success here will depend largely on the level and compatibility of the research developed and the commitment of industry in Thailand (and in the U.S.) to support of the research.

Remuneration for U.S. faculty teaching in Thailand will be on an overload basis. Time spent on research development, monitoring research progress, and follow-up visits to Thailand relating to research will be in-load with reimbursement to the academic department

The proposed schedule for teaching a 4-week course is as follows:

Four-week course	Stipend	$12,000
	Travel & housing	4,000
	Total	$16,000

For accounting purposes, the research component will be keyed to the instruction as follows:

Research advising, monitoring, etc.	$ 8,000
Associated travel & communications	5,000
Total	$13,000

Thai Faculty Involvement

Thai faculty will work closely with U.S. faculty during the first two years of the program, assisting with instruction and helping

Thai students who may experience language difficulties. In the third year and beyond they will have responsibility for teaching about one-half of the courses.

Thai faculty will have primary responsibility for thesis research direction. To develop some coordination between the ongoing research in the U.S. universities and the research to be developed in these programs at Chulalongkorn University, it is planned to have Thai faculty spend time in a research capacity at the U.S. universities. Starting in Fall 1992, it is proposed to have a Thai faculty member in residence at each of the three U.S. universities for at least one semester. Ideally, six Thai faculty will spend one semester in the U.S. during the 1992-93 academic year.

Industry Involvement

A key to sustainability of the academic program is support by industry in Thailand, both through scholarship support for students and through support for research projects. Part of the startup phase of this program will be a major effort to develop industrial support, first for student scholarships and then for sponsorship of projects.

Resident Academic Advisor

It is proposed to have a U.S. faculty member serve as a resident academic advisor in Thailand for a start-up period of two years. This individual will have to be recruited.

The responsibilities of the advisor will be:

a. Act as department head for this program.
b. Serve as academic advisor and curriculum coordinator.
c. Teach at least one course in the program.
d. Supervise 3-4 thesis students.
e. Evaluate performance of visiting faculty.
f. Recommend on equipment acquisition.
g. Help with industrial liaison.

Qualifications:

a. Faculty member (or emeritus) of U.S. university at level of at least tenured associate professor.
b. Major field chemical engineering or polymer science.
c. Industrial experience and/or administrative experience desirable (dean, chairman, director of center).
d. International experience desirable.
e. Two-year contract desirable, one-year considered.
f. Must not be Thai.

Project Milestones

1. Gaining institutional and faculty support (Feb-Mar 92)
   a. White paper to gain institutional support for the project.
   b. Discussions with colleagues to obtain faculty participation.
   c. Memorandum of Understanding (MOU) among participating U.S. universities and Chulalongkorn University (one page document).
2. Proposal to U.S.A.I.D. - conceptual, programmatic, budget (Mar-Apr 92).
3. Recruiting for resident advisor (start Jul 92).
4. Program preparation (Jun 92 - Apr 93)
   a. Consulting on laboratory development, equipment acquisition, library resources.
   b. Development of program literature.
      (1.) Initiation brochure (June 92)
      (2.) Student recruiting (Oct 92)
      (3.) Industrial support brochure (Oct 92)
   c. Finalize course schedules (Jul 92)
      (1.) List of courses and schedule dates for 2 years
      (2.) List of instructional faculty
   d. Admissions review for incoming students (Feb 93)
5. Thai faculty visits to U.S.
   a. List of faculty and their research interests (Jul 92)
   b. First faculty visits (Fall semester 92)

6. Administration/Governance
   a. Academic Advisor (U.S.) and Dean provide overall guidance.
   b. Industrial Advisory Board (establish by July 92).
   c. Academic Advisory Board (already established).
   d. Diplomas (desire signature of department heads of U.S. universities).
   e. Logos (desire use of logos of participating U.S. universities on program literature).
   f. Transfer of credits (covered by MOU and other basic agreements).

Program Management

The three U.S. universities will be equal partners with Chulalongkorn University in this program. The University of Oklahoma, as prime contractor with U.S.A.I.D., will serve as lead U.S. institution in the development phase of the academic partnership. The University of Oklahoma will also have lead responsibility for the U.S. participation in the graduate program in Petrochemical Technology. Case Western Reserve University will have lead responsibility for U.S. participation in the graduate program in Polymer Science. The University of Michigan will contribute in both instructional programs and will have a major

roll in research development.

Proposed U.S.A.I.D. Support

Assumptions: The U.S.A.I.D. Mission in Thailand will fund startup costs and the costs of U.S. faculty participation in the graduate programs for the first three years. Beyond the first three years U.S. faculty participation will be funded by tuitions and industrial support.

Program phases:

Phase I	Program and facilities development, Jul 92 - Jun 93.
Phase II	First year of program operations, Apr 93 - Mar 94.
Phase III	Second year of program operations, Apr 94 - Mar 95.
Phase IV	Third year of program operations, scaled-down U.S. faculty involvement, Apr 95 - Mar 96.

Overall Budget - by catagory, Phases I, II, III, and IV

Instruction and Research Supervision (U.S. Faculty)

Phases II,III		
10 courses/yr @ 16k x 2 yr =	$320,000	
10 research components @ 13k x 2 yr =	260,000	
Phase IV		
5 courses/yr @ 16k x 1 yr =	80,000	
5 research components @ 13k x 1 yr =	65,000	
Subtotal		$725,000

Program Administration

Startup and Consulting (U.S.), Phase I		
1 FTE salary, FB, travel, etc.	$150,000	
Resident Advisor (Thailand), Ph. II, III		
1 FTE @ 200k/yr x 2 yr =	400,000	
Administration (U.S.), Phase II, III, IV		
0.33 FTE, @ 50k/yr x 3 yr =	150,000	
Subtotal		$700,000

Administrative and Faculty Visits

Thai faculty residencies in U.S., Phase I		
6 faculty @ 16.5k ea =	$100,000	
U.S. Department Head advisory visits		
in Thailand, Phases II, III, IV		
3 @ 5k ea x 3 yr =	45,000	
Thai administrative visits to U.S.A.,		
Phases I, III, IV, 5k ea x 3 yr =	15,000	
Subtotal		$160,000

Program Development

Industrial Interaction, Ph. I, II, III, IV		
25k/yr x 4 yr =	$100,000	
Unrestricted Research Grants,		
Phases II,III, IV, 25k/yr x 3 yr =	75,000	
Research Challenge Grants,		
Phases II, III, IV, 50k/yr x 3 yr =	150,000	
Continuing Education, Seminars, Symposia,		
Phases III, IV, 50k/yr x 2 yr =	100,000	
Subtotal		$425,000
Total Budget		$2,010,000