Final Report

Rhiza S. Sadjad

Control Systems and Instrumentation Laboratory, Department of Electrical Engineering
Faculty of Engineering, Hasanuddin University, MAKASSAR Indonesia 90245
Email: rhiza@unhas.ac.id, URL: http://www.unhas.ac.id/rhiza/

I. Introduction

This is an interim report (for the period of June 28 to September 28, 2012) on my participation in the research fellowship program related to the Hasanuddin University's New Engineering Campus Development Project (JICA Loan No. IP-541) offered to interested faculty members and arranged in a 6 (six) month visit to a university in Japan. Thanks to the help of Prof. Manabu Kano (Kyoto University), Dr. Manabu Tsunoda (JICA) and the JICE, I was accepted to visit Prof. Hiroya Seki's Process Systems Engineering Laboratory at Tokyo Institute of Technology (TITECH). I arrived at Tokyo on Thursday, June 28, 2012, settled in to stay at the TITECH's International House at Ookayama TOKYO and met with Prof. Hiroya Seki in his laboratory at TITECH's Suzekakedai campus YOKOHAMA, at the same day.

Fig. 1. The International House at the TITECH's Ookayama Campus

Based on the "Terms of Reference" [**?**] issued by JICE and my own "Statement of Purpose" [**?**], the scope of my work during the 6 (six) month visiting program in Japan should cover more or less the following purposes: (1) to get a better understanding on the teaching and learning process in an engineering higher-education system in Japan, (2) to create and to develop a research collaboration activity, (3) to gather as much information as possible to prepare a proposal for the establishment of a new study program - the Engineering Physics study program - and, last but not least, (4) to collect the lessons learned from the Japanese experience in the collaboration between the academic world and the real industrial plant, which was the main goal of this visit originally [**?**].

II. General Overview

Having campuses in 3 (three) different locations: the Tamachi campus, the Ookayama campus and the Suzukakedai campus, TITECH (nicknamed "Tokodai", abbreviated from "Tokyo Kogyo Daigaku" or Tokyo Institute of Technology in Japanese) is really an excellent reference model for the Hasanuddin

University Faculty of Engineering, whose campuses are also located in 3 (three) different places: the old Baraya campus, the current Tamalanrea campus and the new Gowa campus.

Fig. 2. The TITECH's Suzukakedai Campus

I have not visited TITECH's Tamachi campus yet, but I could say that the old Baraya campus in downtown Makassar can be proposed to function as a home for all kinds of the vocational, high-school level, extension and reach-out programs similar to the TITECH's campus at Tamachi. The new campus at Gowa could take the Ookayama campus as a model, emphasizing its main function to host the mono-disciplinary undergraduate and graduate programs. The inter-disciplinary and multi-disciplinary research and graduate programs could stay on in Tamalanrea campus to take the TITECH's campus at Suzukakedai as reference. The Hasanuddin University Faculty of Engineering may still be able to take advantage of being co-located with other Faculties in many inter-disciplinary and multi-disciplinary research and graduate programs, so it is strongly recommended not to move those programs currently located at the Tamalanrea campus to Gowa campus.

Fig. 3. My Work Station at the Process Systems Engineering Laboratory

Geographically, the positions of the TITECH's three campuses relative to each other are very similar to the positions of Hasanuddin University Faculty of Engineering's three campuses. It takes around 40 minutes by train, for instance, to go from the Ookayama campus to the Suzukakedai campus, then it also

takes approximately that much time to go by car from the Tamalanrea campus to the new campus at Gowa. The Baraya campus is also located close to the downtown Makassar, the same way as how the Tamachi campus is to the downtown Tokyo.

III. Curriculum and Learning Process

I did not have a chance to take a look at the Tokodai's curriculum and learning process in more details, yet from the limited talks and discusions I made with a few Indonesians who study at the Tokodai, I started to get an impression that the students at the Tokodai generally do not take many courses except in the first three years of the undergraduate program. Even the undergraduate students do not take as many classroom courses as the undergraduate students in Indonesia, moreover the graduate students. As a matter of fact, I rarely see students attending lectures in the classrooms, especially in Tokodai's campus at Suzukakedai. I saw the campuses are relatively very quiet, maybe because I arrived almost at the end of Spring semester and at the beginning of the summer vacation, while the next Fall semester will not begin until the end of September or the beginning of October. In many campuses in the world, especially in Indonesia, we usually see university students are busy attending classes from time to time, moving from room to room in one building to another, but not here in Japan, at least not here in Tokodai.

The fact that in Tokodai the students spend more time in the laboratories rather than in the classrooms is very interesting. If the Hasanuddin University Faculty of Engineering is to follow this model, then its curriculum stucture should be changed from emphasizing on classroom courses like the current system into a new curriculum emphasizing on laboratory courses or research activities.

IV. Research Activities

From the first day at the office, Prof. Hiroya Seki has introduced me to a fellow professor who became my office mate until the end of July 2012. His name is Dr. Muhammad Shamsuzzoha, an Indian researcher who is now affiliated with the KFUPM (King Fahd University of Petroleum and Minerals) at Dhahran, Saudi Arabia. Dr. Shamsuzzoha has urged me to produce a scientific paper since the first time we met. He himself has been a productive author since the days when he was still a Ph.D. student in South Korea. Apparently, Prof. Seki and Dr. Shamsuzzoha shared the same interest in the Process Control area, especially the design, modelling and control of distillation columns. They are working on a special case of distillation columns called "Divided Wall Column" or DWC [**?**]. Every Friday they had a weekly meeting to discuss the progress of their reseacrh collaboration, and they allowed me to actively participate.

Before he left to his home country, Dr. Shamsuzzoha shared with me all his papers on "PID Tuning" [**?**] control systems, and suggested me to focus on that topic for my research activities. I followed his suggestion, and I have started to build a Simulink (of MATLAB) model of a self-tuning PID control system. We had a lengthy discussion on the possibility to implement a self-tuning PID controller algorithm design up to the micro-controller chip level to control a process control plant.

Prof. Hiroya Seki allowed me to use a modelling and design tool called "UniSim" widely used by researchers and system-designers in the process control technology. I was so unfamiliar at all with the software package so that I should learn about it from zero. Fortunately, Dr. Shamsuzzoha showed me an e-book containing of the step by step tutorial on how to use the software [**?**]. I successfully built the UniSim model of a gas processing plant described in the e-book, just by following carefully the step by step instructions in the e-book. To get a better understanding on the software package, now I am still working to build a UniSim model of my own - very simple - case. In the next step, I am planning to develop a relation between the UniSim dynamic model of that simple case and the corresponding Simulink model that I am more familiar with. Then I will continue to work on the self-tuning PID control by using both UniSim and Simulink models. I am quite certain that this work will keep me busy until the beginning of December when my visiting program comes to an end.

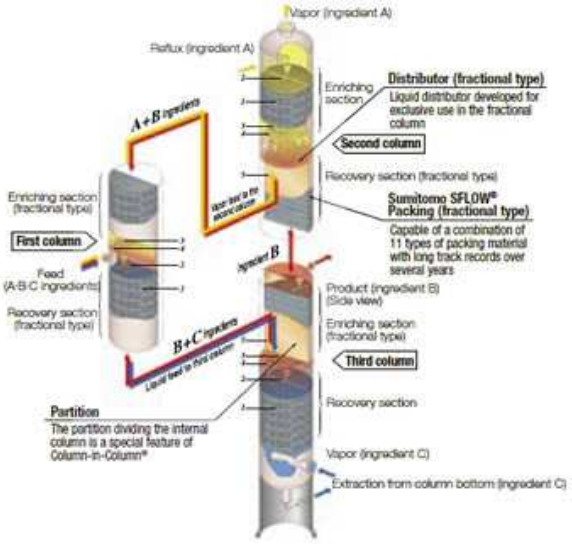

Fig. 4. An Example of Divided Wall Distillation Column from Sumitomo Heavy Industries, Ltd. [**?**]

V. Proposal Preparation

Another important purpose of my 6 (six) month visit to Japan is to prepare a proposal for the establishment of a new study program in the Hasanuddin University Faculty of Engineering. The new study program to be proposed is the Engineering Physics Study Program. The new study program is planned to consist of at least 3 (three) areas of study: (1) Instrumentation and Measurement, (2) Building Engineering Physics and (3) Process Control Technology. Among the three areas of study, the third one, Process Control Technology, is the most relevant to Prof. Hiroya Seki's Process Systems Engineering Laboratory that I am visiting.

VI. Concluding Remarks

Originally - as stated in the statement of purpose of my visiting program (see for details in [**?**]) - the main goal of the 6 (six) month visit to Japan is to collect the lessons learned from the Japanese experience in the collaboration between the academic world and the real industrial world, especially in the field of process control technology. To achieve this main goal, I am still thinking of any possibility to arrange a visit to at least one of the industrial manufacturing plants in the surrounding Tokyo metropolitant area. However, even if this is not possible, I think the research activities described in the previous section will certainly keep me busy in Prof. Hiroya Seki's Process Systems Engineeering laboratory until December 2012.

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