

3. FY2003 Results

The following exchange programs were held to promote exchanges with researchers in oil-producing nations.

3.1 King Fahd University of Petroleum and Minerals (KFUPM) (Part 1)

3.1.1 Researcher

Dr. Zaki Shaker Seddigi

Associate Professor at KFUPM (Chemistry Department)

3.1.2 Organization providing training

School of Engineering, The University of Tokyo

(Assistant Professor Tatsuya Okubo, Department of Chemical System Engineering)

3.1.3 Schedule: July 7 - 14, 2003

The research by Dr. Zaki at the School of Engineering, The University of Tokyo, was initially scheduled to run for four weeks up to the first of August; however, Dr. Zaki became unwell. As a result of discussion with Assistant Professor Okubo, it was decided that it was impossible to continue with the research, and Dr. Zaki returned home on July 14. As a result, there was no research report made in relation to this assignment.

3.1.4 Research topic

Synthesis and Characterization of Micro Mesoporous Materials

3.2 King Fahd University of Petroleum and Minerals (KFUPM) (Part 2)

3.2.1 Researcher

Dr. Shakeel Ahmed

Associate Professor at KFUPM (Chemistry Department)

3.2.2 Organization providing training

Kyoto University Graduate School of Engineering

(Professor Koichi Eguchi, Department of Energy and Hydrocarbon Chemistry)

3.2.3 Schedule: July 14 - August 8, 2003

3.2.4 Research Topic

Water - Gas Shift Reaction

Research and development of a catalyst to shift the carbon monoxide created during synthetic gas manufacture to carbon dioxide. Three types of catalyst were prepared for this research and their activity compared with that of commercially available catalysts. Results showed that, depending on operating conditions, activity was higher than in commercially available catalysts.

3.3 King Fahd University of Petroleum and Minerals (KFUPM) (Part 3)

3.3.1 Researcher Assigned

Dr. Mohammad Ashraf Ali

KFUPM RI Research Scientist III Associate Professor

3.3.2 Organization providing training

Faculty of Environmental Engineering, University of Kitakyushu

(Professor Sachio Asaoka, Department of Chemical and Environmental Engineering)

3.3.3 Schedule: July 23 - August 20, 2003

3.3.4 Research Topic

Catalytic Evaluation of Novel Hydrocracking Catalysts

This research continues from research carried out the previous year at The University of Kitakyushu, Faculty of Environmental Engineering. Model fluid was used to evaluate the desulfurization activity and resolution of the seven types of catalyst synthesized the previous year.

With regard to the catalyst with the best desulfurization activity in those evaluation tests, the same tests were carried out using both straight-run and desulfurized vacuum light oil as feedstock.

3.4 King Abdulaziz University (KAAU)

3.4.1 Researcher Assigned

Dr. Mohammed Ismail Abdulsalam

Assistant Professor and KAAU Chairman at the Chemical and Materials Engineering Department

3.4.2 Organization providing training

National Institute for Materials Science (NIMS)

(Tadashi Shinohara, Director, Materials Lifetime Estimation Group, Materials Engineering Laboratory)

3.4.3 Schedule: August 18 - September 11, 2003

3.4.4 Research topic

Study on Electrochemical Properties Inside Crevice

With regard to local corrosion of materials used in oil refinery production equipment, research was carried out from an electrochemical viewpoint, on crevice corrosion that takes place within the enclosed solution, based on actual measurements related to dissolution velocity distribution. In other words, research was carried out with regard to crevice corrosion based on dissolution behavior that can be measured *in-situ* by the moiré system. This research was performed to study the relationships of environmental factors such as temperature, ion concentration, and electrode potential, and material factors such as alloying elements. Furthermore, by combining the results of these actual measurements with a mathematical model created using the finite element method, estimation of crevice dissolution and PH were performed, as well as an analysis of how the various factors affect the behavior from the outset of corrosion to its fully developed state.

3.5 Kuwait Institute of Scientific Research (KISR)

As the KISR researcher assignment was two young KISR researchers, this was carried out as a training assignment. This year, there were requests from KISR for training of quality improvement control techniques for both light oil and residue (vacuum residue), so the following two assignments were organized for training.

3.5.1 Researchers

(1) Mr. Abdul-Wahab S. Al-Hendi

KISR (Petroleum Production Department) Research Assistant

(2) Mr. Ahmed Al-Otaibi

Born September 9, 1976

2002: Graduated from Chemical Engineering Department, College of Technological Studies (Kuwait)

2001 - 2003: Entered KISR (Petroleum Production Department) as Research Technician

3.5.2 Organization providing training

(1) Central Research Laboratory, Cosmo Oil Co., Ltd. (Satte-shi, Saitama-ken)

(2) Catalyst Research Institute, Catalysts & Chemicals Industries Co., Ltd. (Kitakyushu-shi, Fukuoka-ken)

3.5.3 Schedule

(1) Cosmo Oil Co., Ltd, Central Research Laboratory (January 19 - 30, 2004)

(2) Catalysts & Chemicals Industries Co., Ltd, Catalyst Research Institute (February 2 - 18, 2004)

3.5.4 Research topic

(1) Training for Pilot Plant Operation for Gas Oil Deep Hydrodesulfurization (Cosmo Oil Co., Ltd)

Desulfurization activity was studied using three types of catalyst with Middle-East light oil flow containing 1.1 wt% sulfur content as the feedstock. For the study, a bench-scale pilot plant in the laboratory was used, and a sequence of training involving catalyst adjustment, loading the reaction vessel with catalyst, preliminary sulfurization and desulfurization running at several reaction temperatures was performed and assessed. As the study period was short, the effects of catalyst activity were studied under stricter running conditions than normal.

(2) Training for Pilot Plant Operation for Residue Upgrading (Catalysts & Chemicals Industries Co., Ltd)

Vacuum residue with a 4.075% wt sulfur content and containing nickel and vanadium at 20.5 ppm and 59.6 ppm, respectively was used as the feedstock. Commercially available Catalysts & Chemicals Industries Co., Ltd, catalysts were used, and the desulfurization flow, metal removal rate, and dissolution rate were studied. For the study, a bench-scale pilot plant in the laboratory was used, and a sequence of training involving catalyst adjustment, loading the reaction vessel with catalyst, preliminary sulfurization and desulfurization running at several reaction temperatures was performed and assessed. The running temperatures were 370°C, 380°C, and 390°C.