

# Energy Conservation Study on CDU Furnace of Dung Quat Refinery in Vietnam



*Members of the final reporting meeting held at the Dung Quat Refinery*

In fiscal 2012, JCCP implemented the Energy Conservation Study on CDU Furnace of Dung Quat Refinery under the Special Cooperation Program for Vietnam, with Vietnam Petroleum Institute (VPI), a subsidiary of Petrovietnam, as its counterpart, and Idemitsu Engineering Co., Ltd. as a participating company from Japan.

## 1. Background and Objective

Vietnam is garnering expectations for even greater growth in the future, not only because it is rich in natural resources such as crude oil, but also because it has displayed a continuous trend of high economic growth in recent years. At the same time, however, the country is dependent on imports for most of its industrial products, and while it is an oil-producing country, it imports most of its oil products, as well as faces chronic electricity shortages, among other energy issues.

Binh Son Refining & Petrochemical Co., Ltd. (BSR), an affiliate of Petrovietnam, commenced operations of the Dung Quat Refinery in 2009, and took a large step toward the domestic production of oil products. As the country's first refinery, the Dung Quat Refinery has had its initial problems, but it overcame them and now

enjoys stable operations. Under this situation, its next challenge is said to lie in promoting energy conservation. However, the country is ill-prepared to formulate energy conservation measures on its own, as there are few human resources in Vietnam who possess the necessary skills and experience in oil engineering. JCCP thus decided to investigate whether Japan could contribute to the effective utilization of energy in Vietnam by transferring the Japanese oil industry's engineering skills and experience to local engineers. The study focused on analyzing the present status of energy consumption of the crude distillation unit (CDU) furnace at the Dung Quat Refinery, examining potential energy conservation technologies suited to the facility, and on calculating the cost required for facility renovation, to evaluate cost performance if BSR were to actually renovate the facility.

For this study, an investigative team was organized with the inclusion of Vietnamese engineers, and the series of examinations were jointly pursued by Japanese and Vietnamese members, so that Japan's vast experience in introducing energy-saving measures to furnaces, and the process of examination toward their introduction, could be transferred to the Vietnamese side.

## 2. Overview

The study mainly comprised the following three activities.

### (1) Analysis of thermal efficiency of the CDU furnace

First, the operating data of an actual CDU furnace was obtained, including its crude oil throughput, fuel use and furnace temperature, and its present operating performance was examined in terms of heat exchange efficiency and other relevant factors. By comparing this data to that of Japanese refineries, it was possible to identify areas for improvement.

### (2) Examination and economic evaluation of facility renovation for efficiency improvement

As a result of examining energy conservation measures for the CDU furnace based on the areas for improvement that were identified, the following two measures were selected as the most appropriate from among various improvement technologies employed in Japanese refineries.

- Introduction of an optimum combustible air control system based on oxygen content in exhaust gas as an indicator
- Installation of a combustible preheater for recovery of heat from exhaust gas

A basic design was formulated for the introduction and installation of the above two measures to the CDU furnace at the Dung Quat Refinery, and the cost of introduction and energy conservation effects were estimated and compared. The result indicated that both measures are effective measures with short payback periods, and that they are worthy of further consideration.

### (3) Technical transfer of the process of examining energy conservation measures through an invitation seminar

By discussing issues in (1) and (2) above jointly with VPI, the process of examining energy conservation measures for the furnace, and specific matters for consideration at each stage of the process, were able to be transferred to VPI.

At the same time, engineers from VPI were invited to attend a seminar, which featured intensive lectures

and an exercise in applying the actual results of furnace renovation measures. The seminar provided practical knowledge to the engineers and promoted exchanges between oil engineers from both countries.

## 3. Observations and Summary

The study analyzed the present efficiency of the CDU furnace and examined renovation measures for efficiency improvement, and thereby clarified the cost effectiveness of a renovation for energy conservation.

The conclusion derived from the study was that a renovation toward energy conservation of the furnace would be an effective measure with a short payback period, and that it is a measure worthy of further consideration. Furthermore, other potential key issues were also brought to light and presented to VPI toward the next stage in the renovation of the furnace, including the impacts of changes in operating conditions accompanying the renovation to other existing facilities and the valuation of such impacts, and ancillary construction work that would arise in conjunction with the renovation.

Moreover, through the study, energy conservation technologies were transferred to Vietnamese engineers, and a stronger partnership was established between relevant parties in the two countries.

With their newly acquired knowledge, VPI engineers are expected to be capable of examining and implementing facility improvement measures on their own, and of ultimately contributing to the further development of oil refining technologies in Vietnam.

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*Reporting of the results of the study to the Dung Quat Refinery*