

# Study for Operation Improvement at QP Refinery

JCCP implemented the “Study for Operation Improvement at QP Refinery” in fiscal 2012 with Qatar Petroleum’s Mesaieed Refinery as its counterpart and Cosmo Engineering Co., Ltd. as a participating partner from Japan, and successfully brought the study to a close

after making constructive improvement proposals.

## 1. Background

QP’s Mesaieed Refinery is comprised of three main systems, namely Refinery 1, Refinery 2, and a condensate refinery. The first group of crude oil atmospheric distillation units (Refinery 1) was constructed in 1974 with a 10,000 b/d capacity. The second group of crude oil atmospheric distillation units (Refinery 2) was constructed in 1984 with a 70,000 b/d capacity, along with other downstream facilities. Furthermore, export/import facilities were installed in 1989, a group of condensate distillation units (condensate refinery) was constructed in 2001, and various enhancements have been made for greater efficiency thereafter.

Against this background, JCCP has continuously implemented a number of technical cooperation projects with the Mesaieed Refinery as its counterpart, since fiscal 2004. They have included a study on flare gas



*Members from the Mesaieed Refinery and Cosmo Engineering Co., Ltd.: Mr. Salim (third from left)*



*Final report meeting*

reduction technologies, a study on LPG recovery, a study for operation improvement, and technical support for corrosion/fouling problem. Based on the relationship of trust that these projects have fostered, JCCP agreed to implement the following project in fiscal 2012 in response to a strong request from its Qatari counterpart.

## 2. Overview

At the Mesaieed Refinery, LPG and naphtha fractions from the atmospheric distillation column are distilled into total naphtha, and the total naphtha is processed in a naphtha hydroprocessing unit. There were concerns, however, about unwashed naphtha falling into the slop tank during start-up and shut-down of the unit or during a malfunction, because unwashed naphtha contains flammable gas (LPG), which could swell and damage the floating roof in the slop tank or cause a large amount of hydrocarbon vapor to be released into the atmosphere. Thus, measures for operation improvement were sought. Additionally, in the polymer gasoline unit, not only is gasoline produced from light olefins from the residual oil fluid catalytic cracking unit, but LPG is also generated as a by-product, and the remaining offgas is used as fuel gas in the refinery. Again, there were concerns of the fractions of the by-product LPG flowing into the offgas and reducing the yield of by-product LPG fractions, so operation improvement was desired as a means for improving LPG yield.

Under this situation, a study was implemented to provide support for operational improvement at the Mesaieed Refinery based on Japan's experience and accumulated technologies for operation improvement

in the oil industry. The study not only contributed to improving operations in the refinery, but also has successfully transferred Japan's oil refining technologies and experience in operational improvement to Qatar Petroleum.

## 3. Summary

In regard to the operational improvement of atmospheric distillation units, the majority of refineries in Japan have a unit that separates flammable gas fractions from distilled naphtha (stabilizer), so it would be unusual for them to experience the type of problem that the Mesaieed Refinery is facing. Therefore, to address the problem at the Mesaieed Refinery, the status of actual operations was investigated and operating data was collected with the cooperation of the refinery, and the collected operating data was analyzed. Based on the results of the above, the following proposals were made based on thorough consultation and discussion.

- Proposal for addressing the issue through an improvement of operational procedures
- Proposal for addressing the issue through a diversion of part of the equipment
- Proposal for addressing the issue by installing a new unit (two examples)

In addition to the above, an explanation was also given of the actual startup procedure for atmospheric distillation systems in Japanese refineries.

In regard to the issue of improving the yield of by-product LPG from the polymer gasoline unit, the initial request from the Mesaieed Refinery was to investigate the lack of capacity of the by-product LPG separation system. However, as a result of examining operating status with the cooperation of the refinery, it was judged that the hydrogenation system upstream of the by-product LPG separation system would also need to be examined, so a final report was prepared that included the hydrogenation system in the scope of the study. The fact that the final report meeting was held with the attendance of concerned parties from various departments in the refinery, and that active, cross-departmental discussions sprang up on the spot after the report, indicated that the proposals were of high relevance and benefit to the Mesaieed Refinery.

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