High-efficiency Ethane & LPG Recovery Process

**Features**

The cold reflux technology (COREFLUX™) developed by Toyo Engineering Corporation can recover ethane and LPG from natural gas and LNG at a high product recovery rate with a relatively low energy consumption. The such excellent performance was achieved by a unique fractionation reflux scheme, which works to increase the rectifying effect of the distillation column. There are two types of processes.

1. COREFLUX™-C2 (Cold Reflux Compressor Process)
   - This is a process to recover ethane from light hydrocarbon gas such as natural gas, associated gas from oil reservoir, and off-gas from refinery plants, and featured by:
     - **High ethane recovery rate (>95%) achieved by generating reflux with high methane concentration;**
     - **Low compression power with an efficient use of a turbo expander;**
     - **Easy modification from the conventional process.**

2. COREFLUX™-LNG (Cold Reflux Technology for LNG Processing)
   - This is a process to recover ethane and LPG from LNG with a high efficiency and recovery rate, and featured by:
     - **High ethane recovery rate (>98%) achieved by generating reflux with high methane concentration;**
     - **Low energy consumption with an effective use of cold heat of LNG;**
     - **Simple process scheme for easy operation and maintenance.**

**Basic Concept or Summary**

1. COREFLUX™-C2
   - In order to increase the ethane recovery rate, it is necessary to feed liquid (reflux) with high methane concentration to the top of the distillation column. The higher the liquid fraction in reflux is, and the higher the methane concentration in the liquid is, the higher rectifying effect is achieved and more ethane is recovered. In order to generate such reflux liquid, it is necessary to generate the low temperature of a level around -100°C hence, how to achieve such a low-temperature condition is the key that determines the process performance. COREFLUX™-C2 effectively utilizes a turbo expander to produce the low-temperature condition. In addition, a separator is provided in the outlet stream of the turbo expander to produce methane-rich gas. Part of this gas is recompressed to increase its equilibrium temperature and make it easily condensed. It is then condensed by heat exchange with the low-temperature overhead gas from the demethanizer. In this way, reflux liquid with a high liquefaction ratio and high methane concentration is generated, allowing highly efficient methane-ethane separation.

**COREFLUX™-C2 process flow scheme**

![COREFLUX™-C2 process flow scheme](https://www.jase-w.eccj.or.jp/technologies/index.html)
2. COREFLUX™-LNG
Liquid natural gas (LNG) is composed of methane, ethane, and LPG, and its heating value differs depending on ethane and LPG contents (the heating value is larger when the ethane and LPG contents are higher). The Far Eastern countries such as Japan and Korea accept high heating value LNG. In contrast, Unites States and European countries require relatively lower heating value LNG. Hence, as a means of lowering the heating value, attention is being paid to a technology to extract ethane and LPG contents at LNG receiving terminals. Extracted ethane and LPG are effectively used as petrochemical feedstock.

In this process, two points, (1) reflux feeding scheme and (2) heat integration of feed LNG, were contrived in order to achieve a high ethane recovery rate and energy saving. Feed LNG received as liquid is heated and evaporated for the distillation operation that separates methane from ethane and LPG. In order to maximize the ethane recovery rate, it is necessary to feed liquid reflux with high methane concentration to the top of the distillation column. For this purpose, gaseous methane separated from the top of the distillation column needs to be liquefied again. Here, the key that determines the process performance is how to heat the feed LNG and how to provide the cold heat required for the liquefaction of methane. In COREFLUX™-LNG, reflux with high methane concentration is generated by heat exchange between the feed LNG and overhead gas from the demethanizer. Further, by pressurizing the gaseous methane separated in the demethanizer slightly, its condensation temperature is raised and thus, it is liquefied again, effectively using the cold heat of the feed LNG. In addition, by using a methanol indirect heating medium system, energy required for heating the feed LNG is effectively supplied.

Installation in Practice or Schedule

Overseas
COREFLUX™-LNG was adopted at a LNG receiving terminal in India. This technology produces a large benefit when introduced to a LNG receiving terminal where there is a need for ethane and LPG (higher value than methane) and the heating value reduction of LNG poses is not problem for consumer. COREFLUX™-C2 was adopted at a gas processing plant in Turkmenistan. This technology is beneficial when introduced to natural gas-producing countries where ethylene is produced from ethane.

Contact: Toyo Engineering Corporation, Strategic Marketing Division
Tel: +81-47-454-1875  Fax: +81-47-454-1718
E-mail: jp.marketing@toyo-eng.com
Toyo Engineering Corporation: http://www.toyo-eng.com/