# COREFLUX™

## Enhanced NGL Recovery

TOYO ENGINEERING


## COREFLUX™ Concept

Toyo Engineering Corporation (TOYO) has developed COREFLUX™ (Cold Reflux) technology to extract Natural Gas Liquids (NGL), ethane and Liquefied Petroleum Gas (LPG) from Natural Gas/ Liquefied Natural Gas (LNG) using a reflux enhancement method. Our unique processes are known as COREFLUX™-$C_2$ for NGL recovery from Natural Gas, and COREFLUX™-LNG for ethane and LPG recovery from LNG.

Key features of COREFLUX™-$C_2$/LNG concept are ;

- Simple flow scheme- lower CAPEX compared to conventional NGL extraction process
- High ethane recovery rates
- Low total energy consumption with advanced cold heat integration- lower OPEX compared to conventional NGL extraction process

## COREFLUX™–$C_2$ Applications and Features

COREFLUX™-$C_2$ is a highly efficient and competitive process technology with a deep NGL recovery from Natural Gas, oil associated gas and off-gas from refinery plants. This proprietary process suits following applications ;

- High ethane recovery required
- Rich feed gas
- Revamping project to increase feed throughput and/or ethane recovery rate

COREFLUX™-$C_2$ recovers more than 95% of ethane from feed natural gas at less compression power compared to the conventional split vapor process. Easy modification from the conventional process to COREFLUX™-$C_2$ is also applicable. NGL recovered will be utilized for petrochemical feedstock and contribute to feasibility of gas processing complex.

## COREFLUX™–$C_2$ Process Configuration

One of the key to achieve a high ethane recovery rate on NGL extraction process is feeding a methane rich reflux to the demethanizer. Higher concentration of methane in the reflux stream improves the rectification effect in the distillation tower which will lead to a high ethane recovery. To produce such high methane concentration liquid as reflux, the feed gas must be cooled to -100 °C level, which requires a large amount of energy in the conventional technologies.

Process configuration of COREFLUX™-$C_2$ is shown in Fig.-1. Turbo expander cools down the feed gas similar to the conventional split vapor process, however in COREFLUX™-$C_2$, all of the feed gas is sent to the turbo expander to maximize the power recovery. To produce a methane rich reflux, a gas-liquid separator is provided

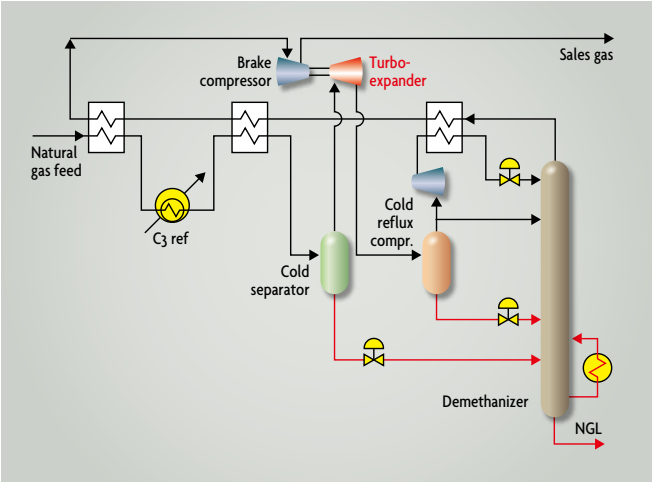


**Fig.-1 :** Flow scheme of COREFLUX™-$C_2$

at the outlet of the turbo expander. The methane rich vapor from the separator is recompressed by a compressor and totally condensed against the cold stream from demethanizer overhead. The condensed liquid contains high concentration of methane and works as an effective reflux. Maximum power recovery at the turbo expander and the methane rich reflux lowers total compression power by 20% compared to the conventional processes. Comparison in compressor power consumption for 275 MMSCFD plant is shown below (Table-1).

**Table-1 :** Comparison in compressor power consumption

| | | Conventional | COREFLUX™-C2 |
|---|---|---|---|
| Ethane Recovery (%) | | 93.5 | 94.7 |
| Cold Heat Duty (MW) | | 2.90 | 2.70 |
| Compressor Power (kW) | | 3,950 | 3,050 |
| | Product | 3,950 | 1,510 |
| | Cold Reflux | — | 1,540 |

## COREFLUX™–LNG Applications and Process Features

COREFLUX™-LNG is an efficient LNG processing technology to recover ethane and LPG from LNG. Process features in COREFLUX™-LNG include ;

- High ethane recovery rate (more than 98%) with enhanced reflux
- Low energy consumption with an advanced cold heat integration
- Simple flow scheme for easy operation and maintenance with low initial investment cost

Extracting ethane and LPG at the LNG regasification terminal is an effective method to meet the heating value specifications with downstream gas pipelines requirements. COREFLUX™-LNG provides additional value to LNG regasification terminals, i.e., an opportunity to sell petrochemical feedstock and improve terminal complex feasibility. COREFLUX™-LNG is applicable to regasification terminals where ;

- Imports high heating value LNG under long-term contract
- Sells lower heating value Natural Gas to end users
- Has ethane and LPG demand as petrochemical feedstock

## COREFLUX™–LNG Process Configuration

Process configuration of COREFLUX™-LNG is shown in Fig.-2. In ethane recovery process, a high ethane recovery rate can be achieved when a methane rich reflux is fed to the overhead of the demethanizer. Many recent LNG processes use a portion or all of the LNG feed as reflux, while the high ethane and heavier component in LNG feed limits its function as a reflux.

Process feature in COREFLUX™-LNG is in demethanizer overhead condenser system, where the overhead vapor is partially condensed against the cold LNG feed stream in the conventional process. In COREFLUX™-LNG, a part of condensed liquid from the condenser is returned to demethanizer as reflux. This reflux contains more than 99 mole% of methane, and this methane rich reflux enables more than 98% of ethane recovery rate at demethanizer. The remaining vapor from the condenser is compressed with an overhead compressor before being fully condensed against the feed LNG. For energy conservation, a methanol heating medium, suitable for cold heat transfer, is applied.

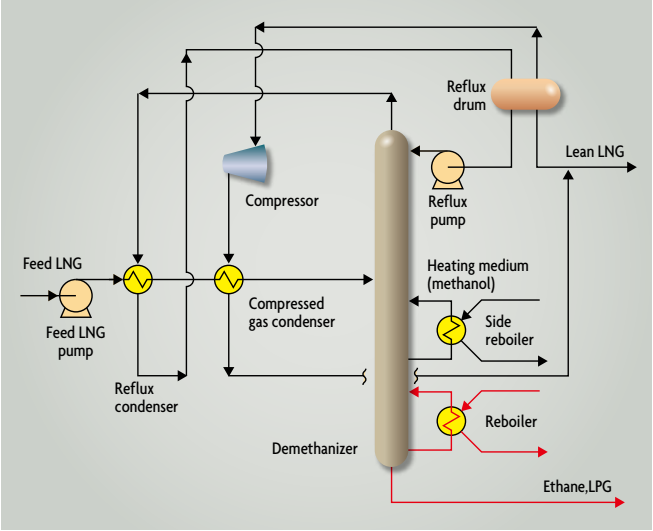


**Fig.-2 :** Flow scheme of COREFLUX™-LNG

## Commercially Proven Process

In 2006, Oil and Natural Gas Corporation Ltd (ONGC) selected the COREFLUX™-LNG for a 5 million LNG tons per annual $C_2$-$C_4$ extraction facility located in Dahej, India. ONGC also awarded TOYO as EPC contractor for the COREFLUX™-LNG construction project. This plant has been in operation successfully since August 2015.

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