



# S-MTO Methanol to Olefins Technology

## > Introduction

Methanol to olefins technology is a new route for the production of basic organic raw materials from coal or natural gas. This technology provides an effective way to bridge the coal chemical and the petrochemical industry. S-MTO technology is a proprietary technology developed by SINOPEC, which is based on coal or natural gas as raw materials, producing light olefins (polymer grade ethylene and propylene) via methanol. S-MTO technology can be applied in coal or gas to olefins process and revamp of ethylene cracker etc.

## > Process Description

The S-MTO process includes a methanol conversion part and a light olefins recovery part. The methanol conversion part includes: raw material preheating unit, reaction-regeneration unit, quenching unit and thermal unit. The light olefins recovery part includes: product gas compressor unit, cold separation unit, thermal separation unit, propylene refrigeration compressor unit and torch system. The typical process flow diagram is shown in Fig 1.

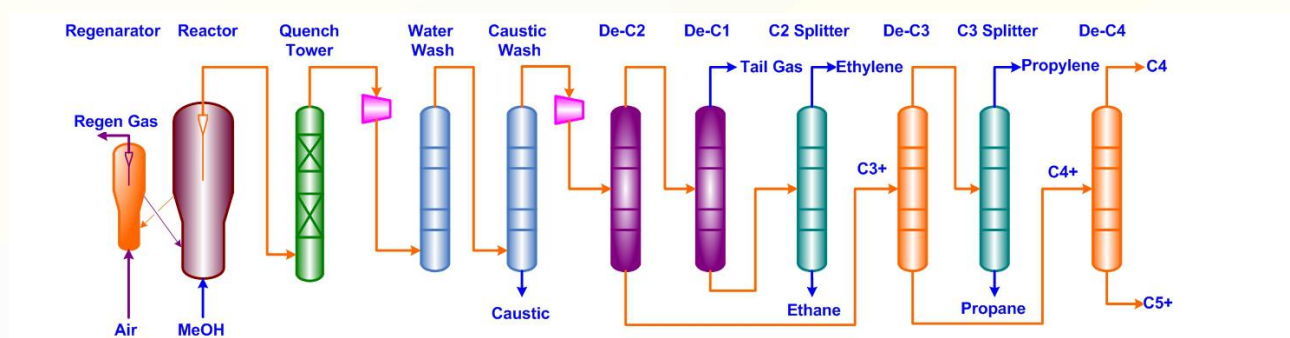


Fig 1. S-MTO typical process flow diagram

The heated methanol feedstock converts into products over a specially designed SMTO catalyst in a fluidized bed reactor. Reactor effluent is then washed and cooled to remove catalyst fines and recover the heat in the quenching unit. The deactivated catalyst is regenerated in a regenerator and recycled for re-use. After compression, the product gas enters washing column to remove oxygenates and acidic constituent. After drying, the product gas enters a de-ethanizer, the gas phase from de-ethanizer overhead will be sent to the de-methanizer, the liquid phase from de-ethanizer bottom will be sent to the de-propanizer. The gas from de-methanizer overhead enters the fuel system via ethylene recovery. The stream from de-methanizer bottom enters C2

splitter to separate ethylene and ethane. The gas phase from de-propanizer overhead enters C3 splitter to separate propylene and propane, the stream from de-propanizer bottom enters the de-butanizer to separate C4 and C5+ compositions.

The main parameters of S-MTO process technology are shown in Table 1.

Table 1. Main process parameters

Reaction temperature, °C	450–500
Reaction pressure, MPa (G)	0.08–0.25
Regeneration temperature, °C	600–700
Regeneration pressure, MPa (G)	0.08–0.25
WHSV, h <sup>-1</sup>	7–12

## > Features of Technology

With a high performance SMTO catalyst and a fluidized-bed reactor, the loss of catalyst is less than 0.25 kg/t methanol. The methanol conversion is more than 99.98 wt%. The selectivity of ethylene and propylene can reach 81 wt%, and the consumption of methanol is about 2.98 t/t (ethylene +propylene).

The ratio of ethylene to propylene can be adjusted from 0.9 to 1.1 (wt/wt) with high yield and high productivity output.

Crude methanol is also applicable, which can reduce the cost of methanol purification unit.

Front de-ethanization process is adopted in S-MTO process for olefins recovery. The purity of product ethylene and propylene can meet the requirement of polymerization grade monomer with the recovery rates more than 99.8 % respectively.

## > Catalyst

S-MTO technology adopts SINOPEC proprietary SMTO catalyst which is based on a silicoaluminophosphate zeolite as its active component. The SMTO catalyst has the advantage of high selectivity, high diffusion rates, large surface area, good stability and attrition resistance.

The SMTO catalyst has been applied in a methanol to olefins plant with capacity of 600,000 tons/year in Zhongyuan Petrochemical Company, Henan province, China. Stable long-cycle run length has shown that selectivity of ethylene and propylene is about 81 wt% and methanol conversion is more than 99.98 wt%.

## > Commercial Application

S-MTO technology has been applied in one commercial plant. Three sets of 1,800,000 tons/year of methanol to olefins plants are under design and construction.

## > Investment Estimation

At Chinese price level of 2015, the investment of building a 1,800,000 tons/year S-MTO plant in China is about RMB 2.6 billion.