

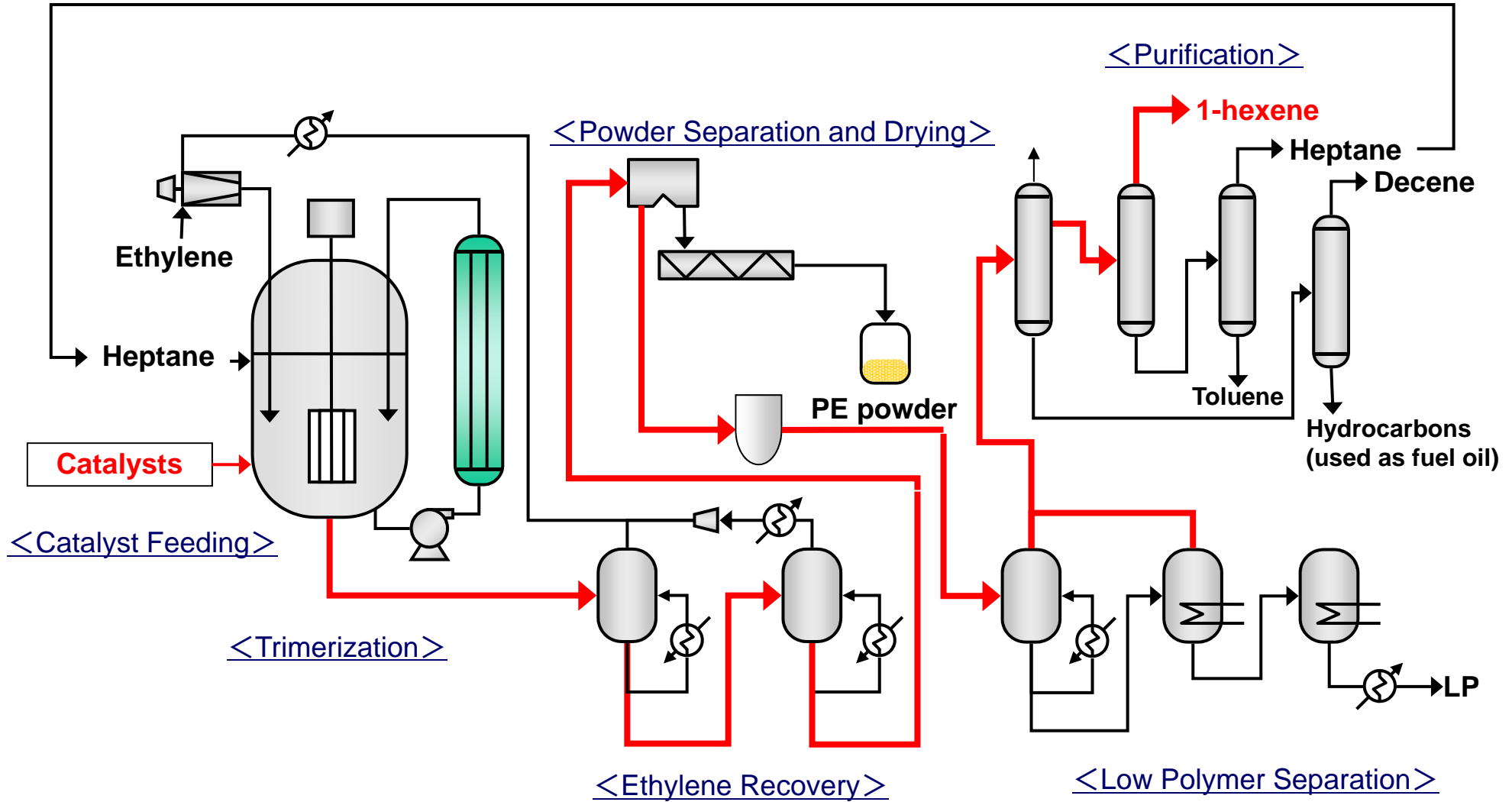
Mitsui 1-Hexene technology

Mitsui Ethylene Trimmerization, ***MET*** Process

MET Process

is the ***On Purpose 1-hexene***
manufacturing technology which combines
Ideal Process & Original Catalysts

Process flow scheme



Development history

In 2007, Mitsui Chemicals, Inc. (MCI) started to explore catalysts which trimerize ethylene to 1-hexene, in order to

- **reduce** co-monomer cost for m-LLDPE, avoiding market impact and
- **enhance** the variety of ethylene derivatives for cracker optimization

In 2008, laboratory scale continuous operation test facility for trimerization was on service. Also internal project team was formed, consisted of R&D team and Engineering team in order to perform R&D and Engineering parallelly, optimizing the lead time before commercial operation.

In 2009, “**MET process**” was set up and plant construction was started, following up the test results which were from

- batch wise laboratory test
- laboratory scale continuous operation
- bench scale test
- pilot scale test

In 2011, MET plant is in commercial service.

Advantage of “MET Process”

◆ Comparison table

Process	Full range oligomerization	Selective trimerization	MET process	Coal to liquid
C6 selectivity (%)	Low	High	High	Very Low
Plant Capacity (KTA)	Large	Small	Small	Large
Capex (million \$)	High	Medium	Low	High
Catalyst	AlEt ₃ , NiCl ₂ , ZrCl ₄	Cr	MCI catalyst	Fe-Co
Op. condition	High Pressure High Temperature	medium Pressure medium Temperature	Low Pressure Low Temperature	No information
Process owner	Company S, I, P	Company P	MCI	Company S

MCI catalyst features

- **Higher activity** in comparison to Cr
- **Higher C6” selectivity**

MET process features

- **Less** severe operation condition
- **Less** investment and compact plant

MCI license features

- In the world, trimerization process license is open **from MCI and other companies**
- In the world, **only MCI** is the licensor which **has operating plant** as plant owner

Summary



The best process, in view of process itself and catalyst

1. Mild operation conditions lead safety and **less CAPEX**.
2. Higher activity and selectivity contribute to **less OPEX**.

Rich experience and further more development

1. Reliable technical support based on **existing plant in Japan**.
2. R&D is continued for further more **technology updating**, to keep **leading edge**.

MCI's contribution to project and future plant operation

1. MCI supports licensee with its **experience** and the close relationship among its licensees.