

## Modular Design Available

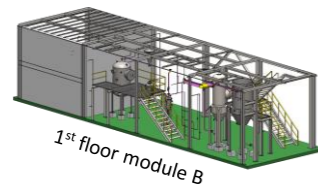
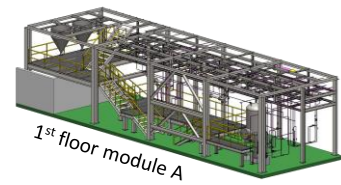
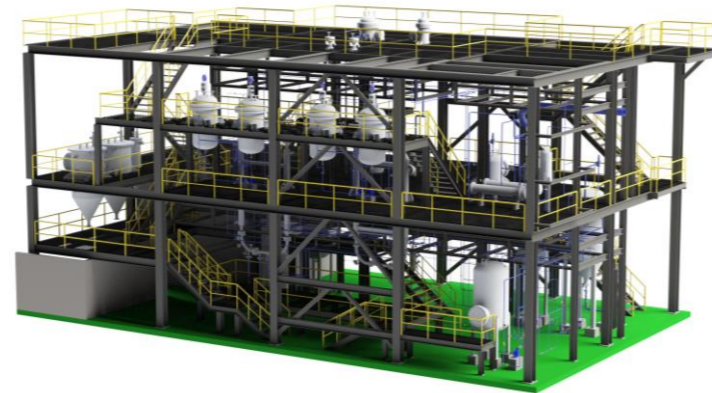
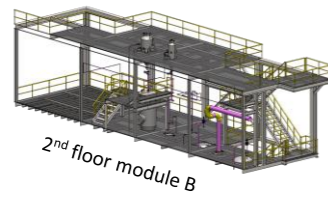
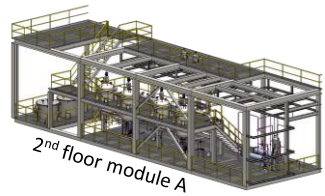
For the pilot plant, CES recommends modular design, fabrication and installation at customer site. Modular construction is one of the most efficient and cost-effective methods to build a plant. It needs just 1- 2 weeks for on-site setup, so plant can be in operation in weeks instead of months. Other advantages include:

- Lower construction costs
- Single point construction responsibility
- Reduced interruption to existing plant
- Improved on-site safety
- Higher quality workmanship
- Construction in remote locations
- Movable to another location



## POLYOLEFIN ( PE & PP ) PILOT PLANT

The amount of plastic production is about 370 million tons per year globally. More than half of them are polyethylene and polypropylene. Polyolefin has excellent physical properties, so its consumption is steadily increasing.



### Why Pilot Plant?

To improve the competitiveness of polyolefin plants, more efficient processes, improved product characteristics, and optimized catalysts, all secured through numerous experiments and trials and errors are needed.

As it is difficult to perform these tasks in commercial plants, many companies are doing R&D using a pilot plant which can simulate the commercial plants.



PB1 Plant

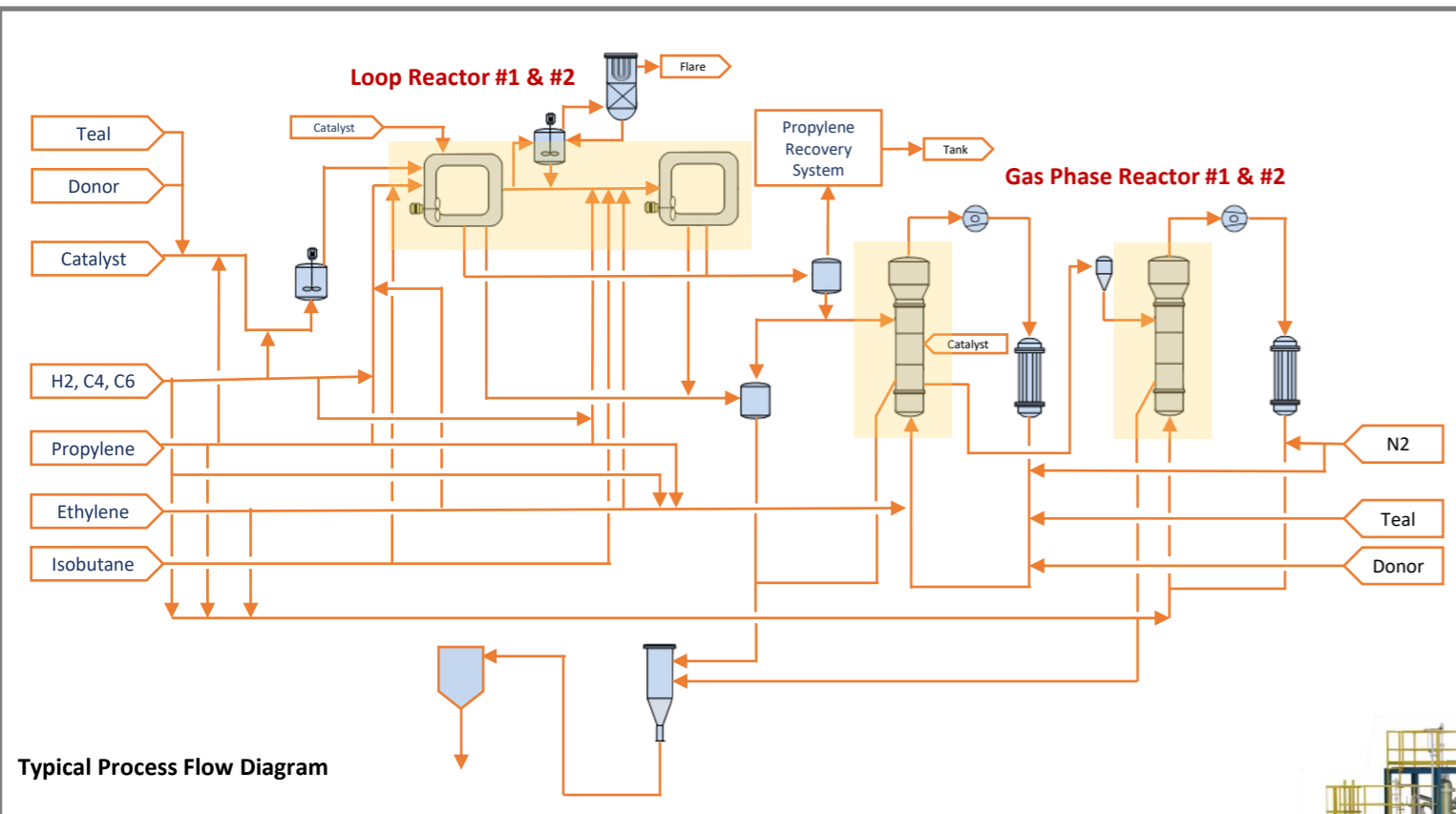
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## Why CES Is Your Best Choice?

### VERSATILE DESIGN OF PE & PP PROCESS

- \* Design the necessary process according to the needs of the client.
- \* Select the optimum configuration of PE & PP process as gas phase PE, gas phase PP, slurry phase and bulk PP.



Typical Process Flow Diagram

### Operation Mode of Polyolefin Pilot Plant

Product	Reactor	Catalyst	
		Feeding	Phase
Homo PP	Loop Reactor #1	Syringe Pump	Mud Slurry (Zn Catalyst in Oil / Grease Mixture)
Homo PP	Loop Reactor #1, 2	Ditto	Ditto
Random PP	Loop Reactor #1, 2 Gas Phase Reactor #1	Ditto	Ditto
ICP*	Loop Reactor #1, 2	Ditto	Ditto
C6-HDPE	Loop Reactor #1, 2	Ditto	Ditto
Terpolymer	Loop Reactor #1	Ditto	Ditto
ICP*	Loop Reactor #1, 2 Gas Phase Reactor #1	Ditto	Ditto
C6-HDPE	Gas Phase Reactor #1	Proprietary Feeding System	Slurry (Cr Catalyst in Isobutane)
C6-LLDPE	Gas Phase Reactor #1	Ditto	Slurry (Metal Catalyst In Mineral Oil)
Homo PP	Gas Phase Reactor #1	Ditto	Slurry (Zn Catalyst In Mineral Oil)
ICP*	Gas Phase Reactor #1, 2	Ditto	Ditto
C4-LLDPE	Gas Phase Reactor #1	Ditto	Ditto

\* ICP : Impact Copolymer

### PROPRIETARY CATALYST FEEDING SYSTEM

- \* The design of reliable feeding system for various kind of catalyst and cocatalyst
- \* Addressed the issue with the small-capacity Solid Catalyst Feeding in the Pilot Plant.

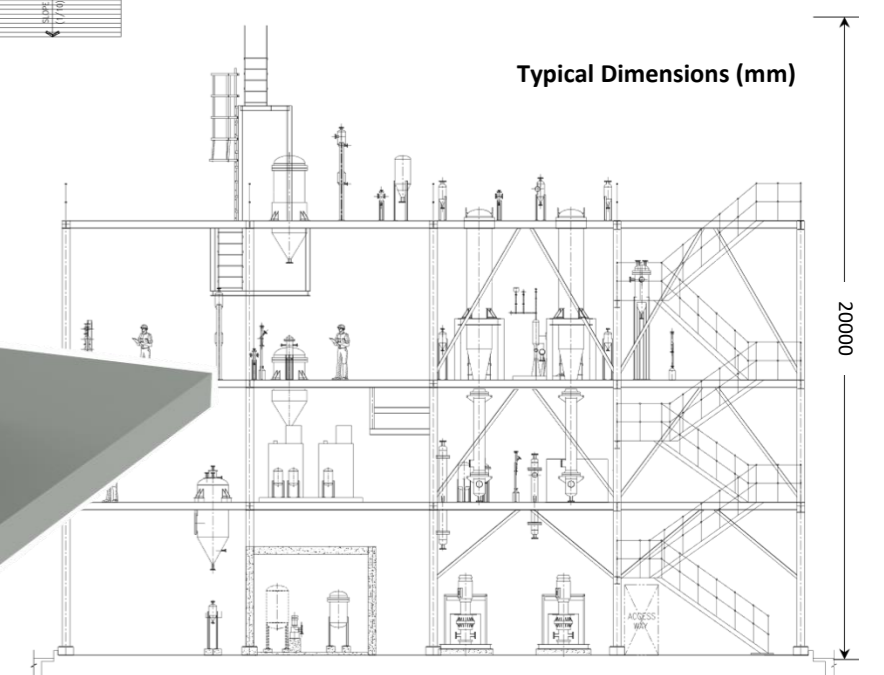
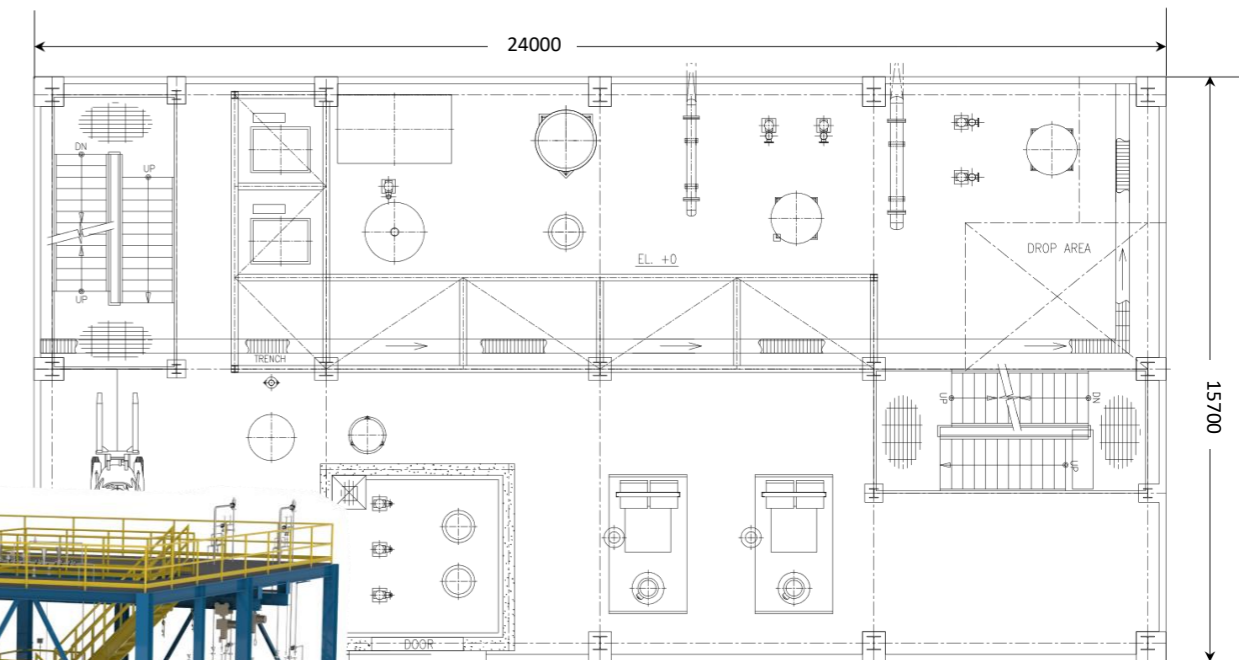
### SUPERVISING

Engineers with rich experience in start-up and grade change assist in operation supervising.

### Major experiences :

Client	Project	Experience
Ylem (Korea)	PB1 Commercial	EPC
Hanwha Total (Korea)	PIB Commercial	BE
Hanwha Total (Korea)	ADL (PO Pilot)	DE
LG Chemical (Korea)	PO Pilot	DE
Sibur (Russia)	PO Pilot	CD
Sibur (Russia)	PO Pilot	BE, Ongoing
Hyosung Chemical (Korea)	PO Pilot	BE
Hyosung Chemical (Korea)	PO Pilot	EPC, Ongoing

BE : Basic Engineering CD : Conceptual Design DE : Detail Engineering EPC : Engineering, Procurement, Construction



Typical Dimensions (mm)