

TOP-PPC Catalyst Evaluation Services



(TOP-PPC CaTES)

Since 2010, Thai Oil Public Company Limited (TOP) has been collaborating with the Petroleum and Petrochemical College, Chulalongkorn University (PPC) to develop the pilot units for catalyst testing and continuously improve the catalyst evaluation program especially for hydrotreating catalysts.

We are now ready to share our expertise by offering the catalyst evaluation service to the Thai and regional petroleum and petrochemical industries. Two types of pilot units are available. Firstly, hydrotreating pilot units are for evaluating the performance of hydrotreating catalysts. Secondly, light hydrocarbons pilot unit offers ability to perform various reactions; for example, alkylation, isomerization, aromatization and so forth, using light hydrocarbon feeds.

Outstanding Features of the Pilot Units

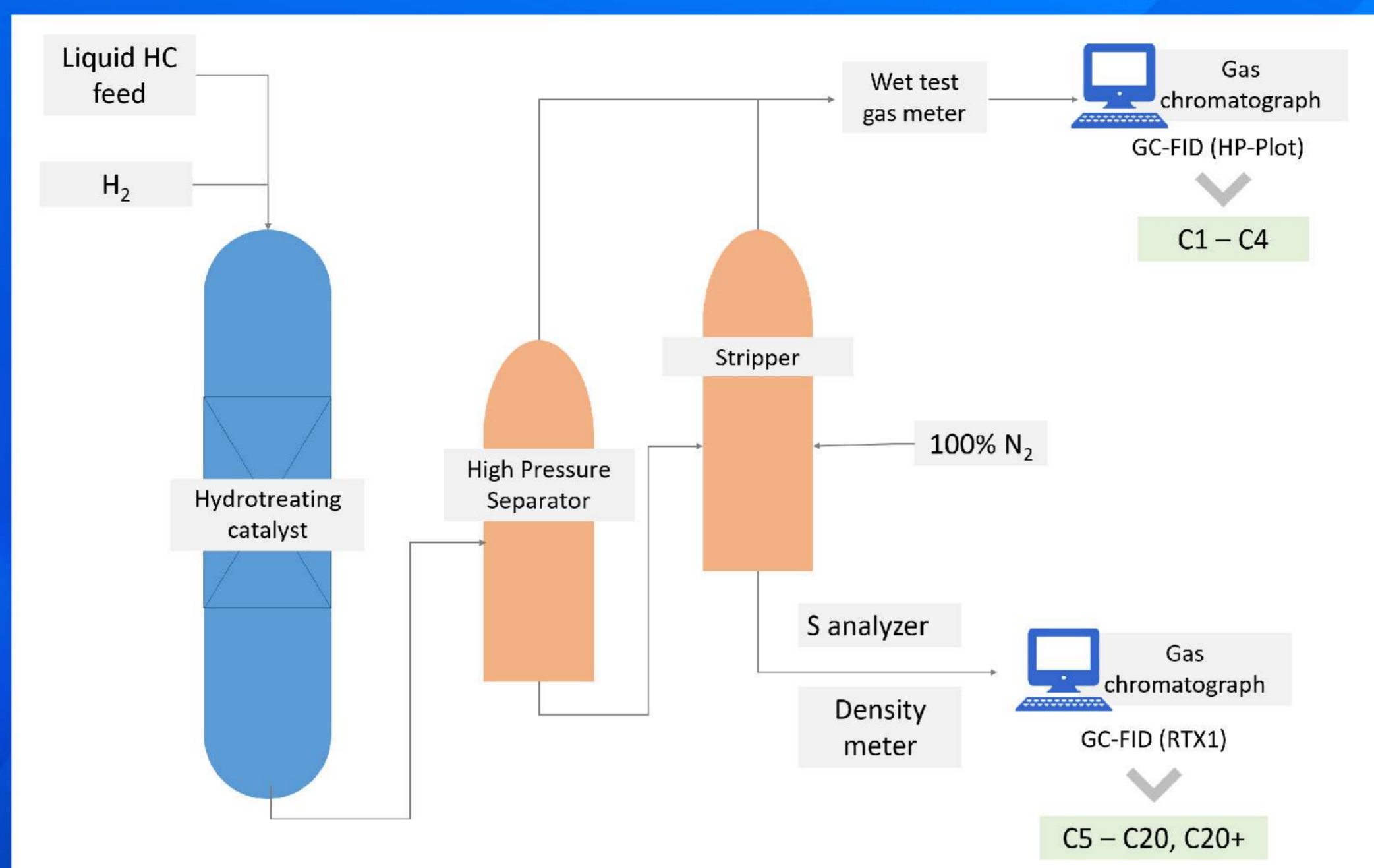
- In-house design & installation
- Versatile applications to have ability to modify as needed
- Inter-laboratory benchmarked with world-class pilot facility
- Online monitoring & alarm message to ensure **Safe & Reliable** operation
- Back-up power supply

Hydrotreating Pilot Units



“The results obtained from our hydrotreating pilot units have been accepted and trusted by several world class catalyst companies, i.e. UOP, Shell Catalysts & Technologies, Haldor Topsoe, Nippon Ketjen and Axens Solutions.”

Simplified Diagram



Pilot Units Specifications

No. of unit	3	Feed	Liquid/Gas
Max catalyst	45 mL	Product	Liquid/Gas
Max reactor temp	600 °C	Heated in-line	Yes (Unit no. 3)
Max reactor	60 barg	HC yield estimation	Yes (C1 - C20, C20+)
Operating mode	Down-flow	Exposure to Sulfur	Yes

Benefits from Catalyst Evaluation

For our case, Thairoil believes that selecting the most suitable hydrotreating catalyst can lead to the estimated cost saving of 15 million baht/year/reactor.

Objectives of Catalyst Evaluation Program

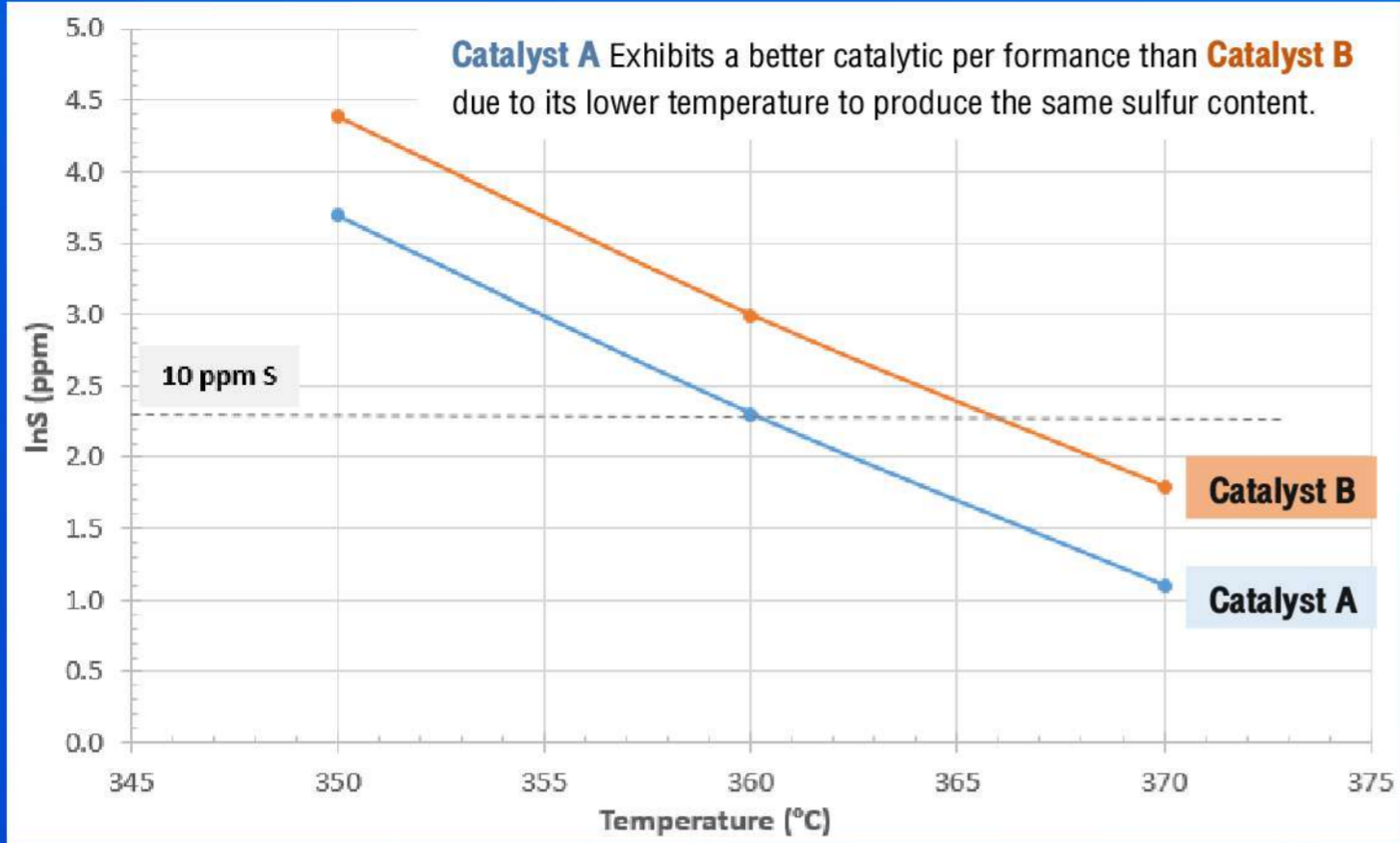
To evaluate catalytic performance of hydrotreating catalyst in terms of the Start of Run (SOR) temperature (°C) and deactivation rate (°C/month). Essential process parameters can also be determined; for example, mass balance, hydrocarbon yields, and so forth.

Deliverables

- o Start of Run temperature (SOR) at targeted sulfur (°C)
- o Catalyst deactivation rate (°C/month)
- o Mass balance
- o Hydrocarbon yields (C1 - C20, C20+)
- o H₂ consumption
- o Daily analysis of sulfur (ppm) and density (g/cm³)

Exemplary Results

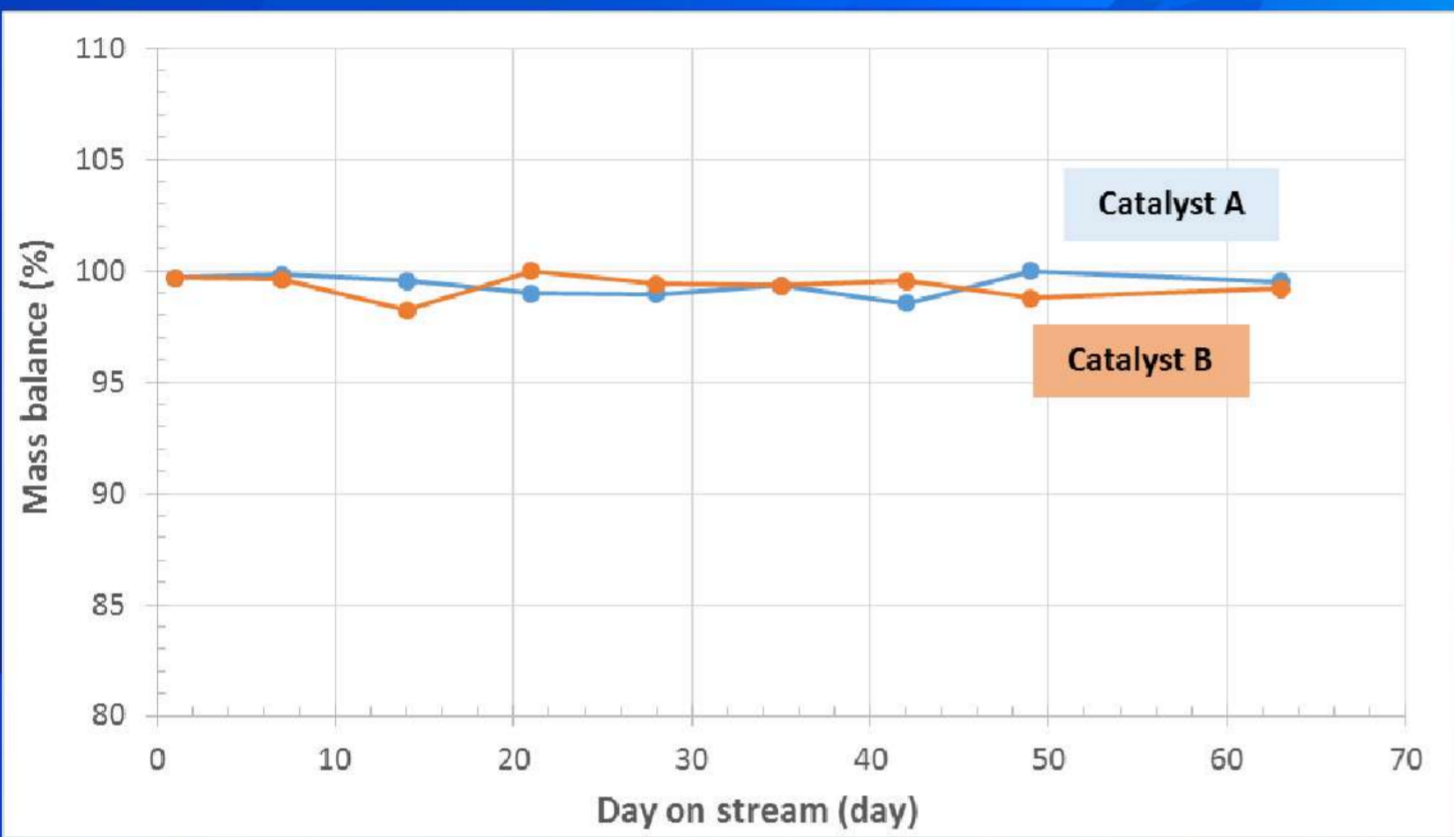
Catalytic Activity Comparison



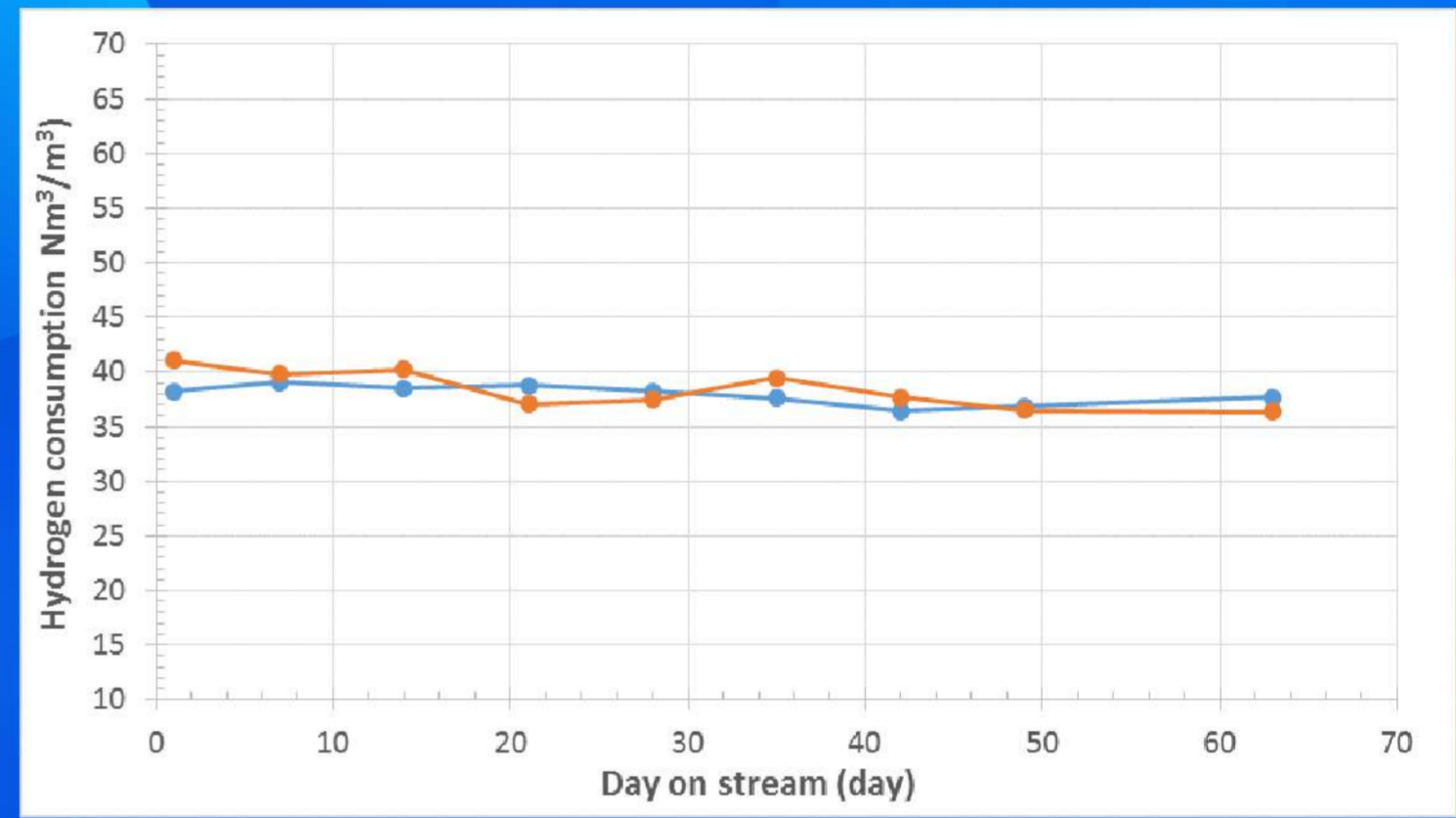
Hydrocarbon Yields (C1 – C20, C20+)

Hydrocarbon yields (n-Paraffin + non-normal)					
C1	0.00	%wt	C12	6.04	%wt
C2	0.02	%wt	C13	7.47	%wt
C3	0.07	%wt	C14	12.39	%wt
C4	0.09	%wt	C15	12.56	%wt
C5	0.08	%wt	C16	10.18	%wt
C6	0.12	%wt	C17	8.14	%wt
C7	0.51	%wt	C18	7.11	%wt
C8	1.08	%wt	C19	6.39	%wt
C9	1.44	%wt	C20	4.62	%wt
C10	3.48	%wt	C20+	12.53	%wt
C11	4.19	%wt	BTX	1.49	%wt

Mass Balance



Hydrogen Consumption



Start of Run Temperature at Targeted Sulfur (°C)

By using the above graph, SOR temperature can be identified at the targeted sulfur.

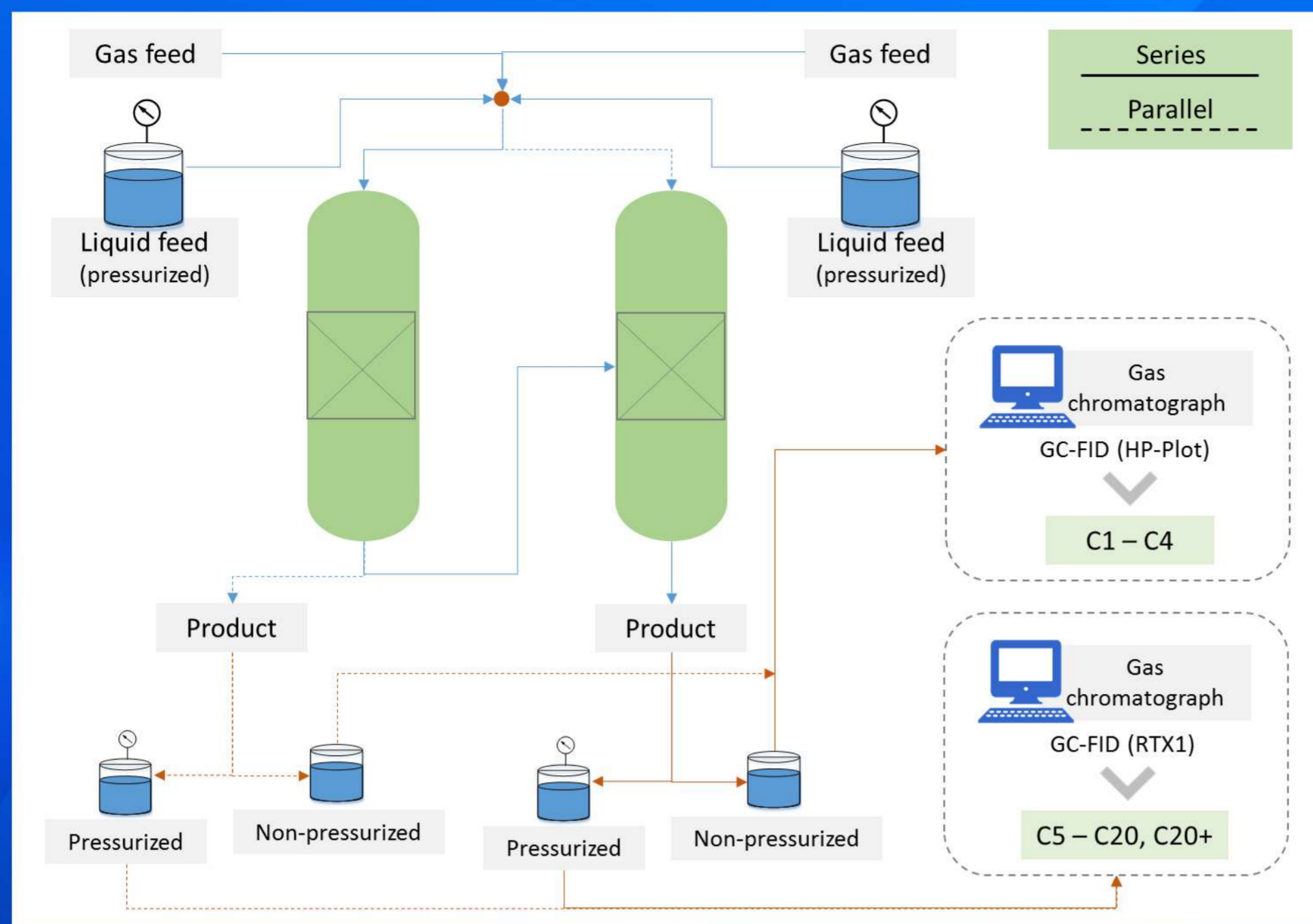
Catalyst Deactivation Rate (°C/month)

Catalyst deactivation rate is determined as the rate of temperature increment per month (°C/month) in order to keep the product at targeted sulfur.

Light Hydrocarbons Pilot Unit



Simplified Diagram



Pilot Units Specifications

No. of unit	2	Feed	Liquid/Gas
Max catalyst	45 mL	Product	Liquid/Gas
Max reactor temp	600 °C	Heated transfer	Yes (120 °C)
Max reactor	20 barg	HC yield estimation	Yes (C1 – C20, C20+)
Operating mode	Down-flow (individual/series/parallel)	Exposure to Sulfur	No

Key Features and Flexibility of the Pilot Units

- o Having multiple liquid feeds (Two liquid feeds)
- o Having multiple gas feeds (Two gas feeds)
- o Having options to operate two reactors either in series or parallel
- o Having two options of product collection

Focus Areas

- o Alkylation
- o Isomerization
- o Cyclization
- o Aromatization
- o Hydrogenation

Deliverables

- o Mass balance
- o Hydrocarbon yields (C1 – C20, C20+)

Contact information

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