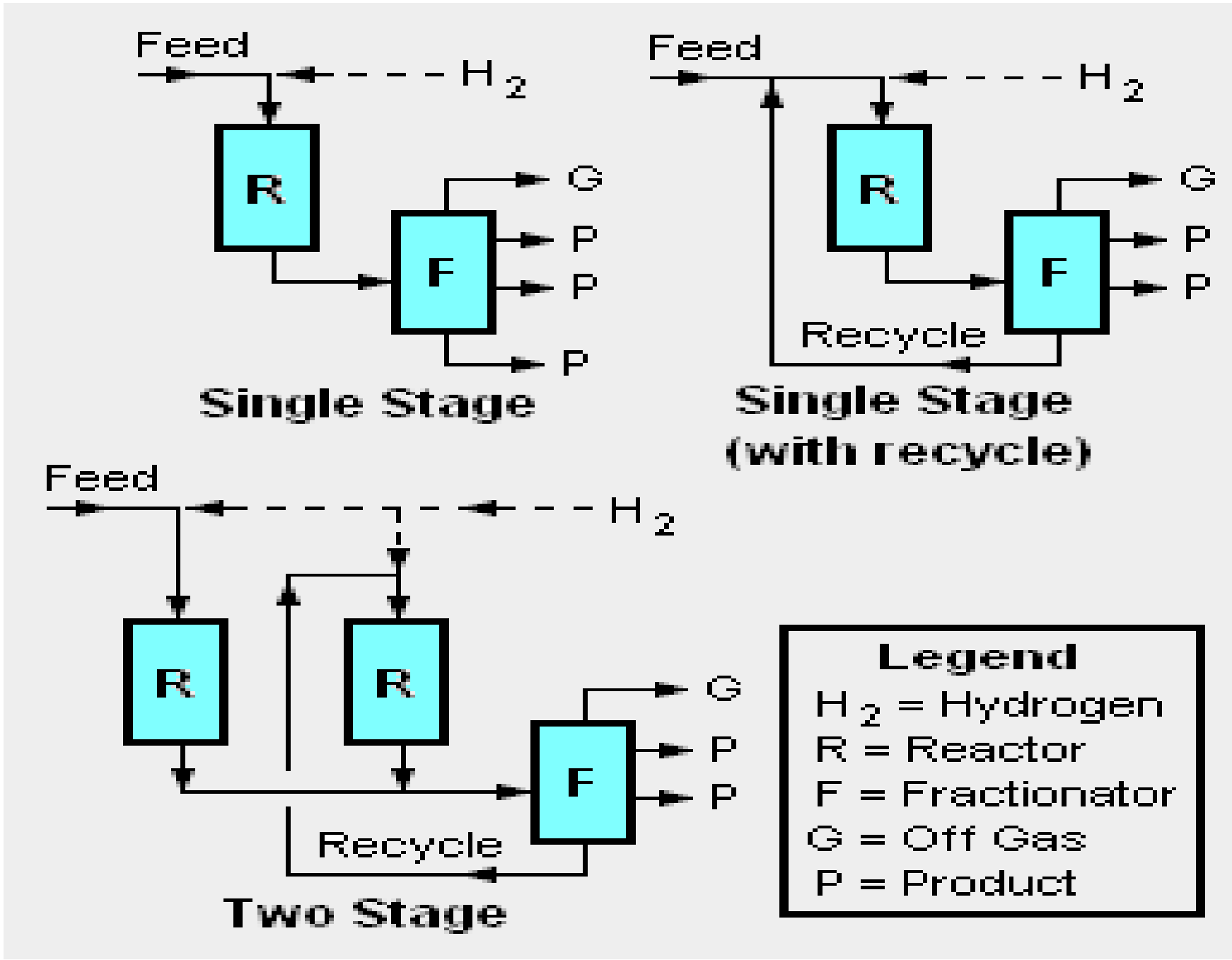
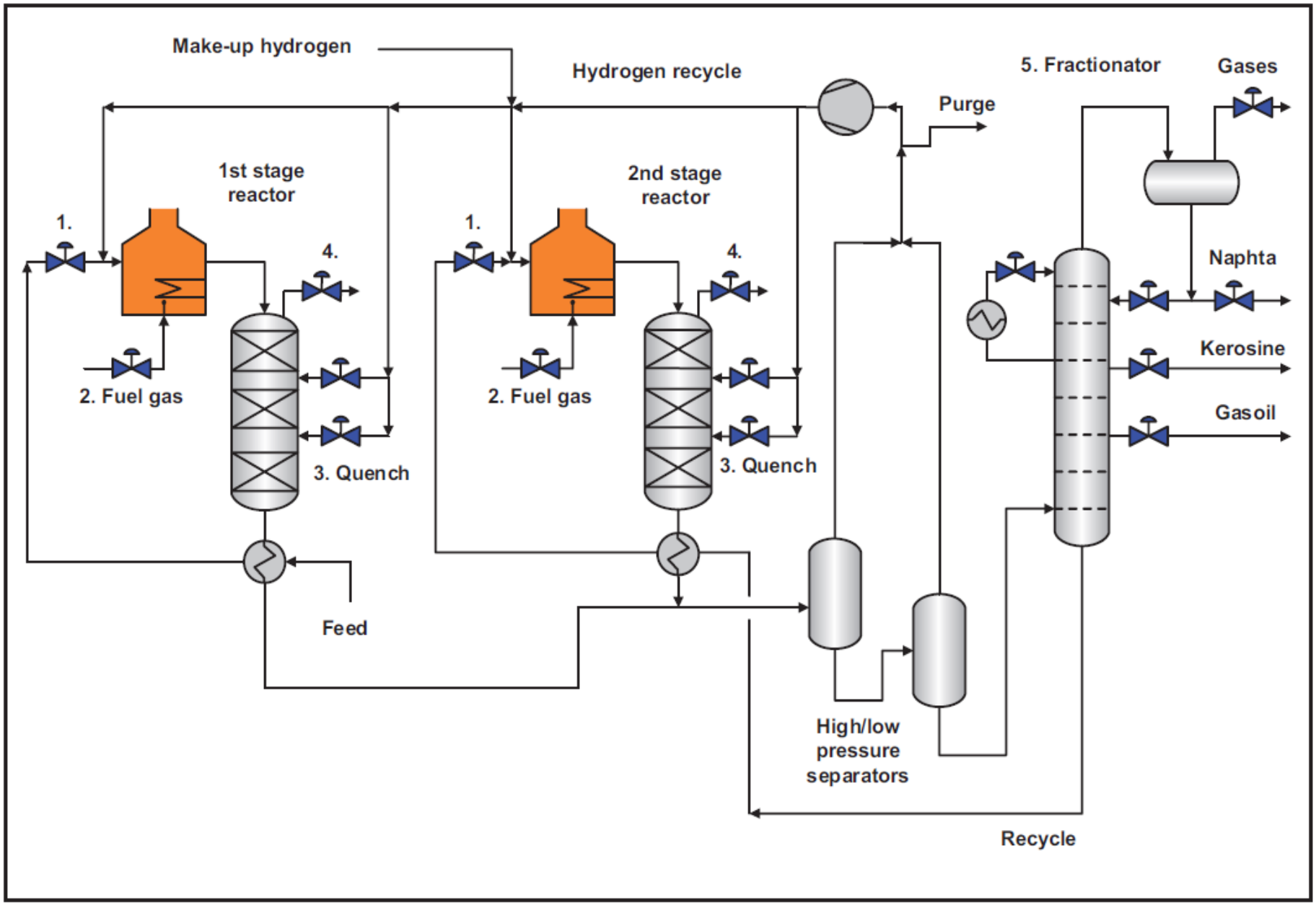
MOPCO Refinery Project

ISOCRACKING PROCESS

- Isocracking named due to the usually high ratio of isoparaffins to normal paraffins in its light products.
- High % of paraffins increases L.N products O.N & M.D cold flow properties (kerojet freeze point and diesel pour point).
- Chevron enhance its process capabilities in heavy paraffin isomerization by Isodewaxing process where it is combined with Isocracker to produse high viscosity index, low pour point lube oil base stocks.


Feed
H 2
R
F
G
P
P
P
Single Stage
Feed
H 2
R
F
G
P
P
Recycle
Single Stage
(with recycle)
Feed
H 2
R
R
F
G
P
P
Recycle
Two Stage
Legend
H 2 = Hydrogen
R = Reactor
F = Fractionator
G = Off Gas
P = Product

ISOCRACKING PROCESS



ISOCRACKING PROCESS

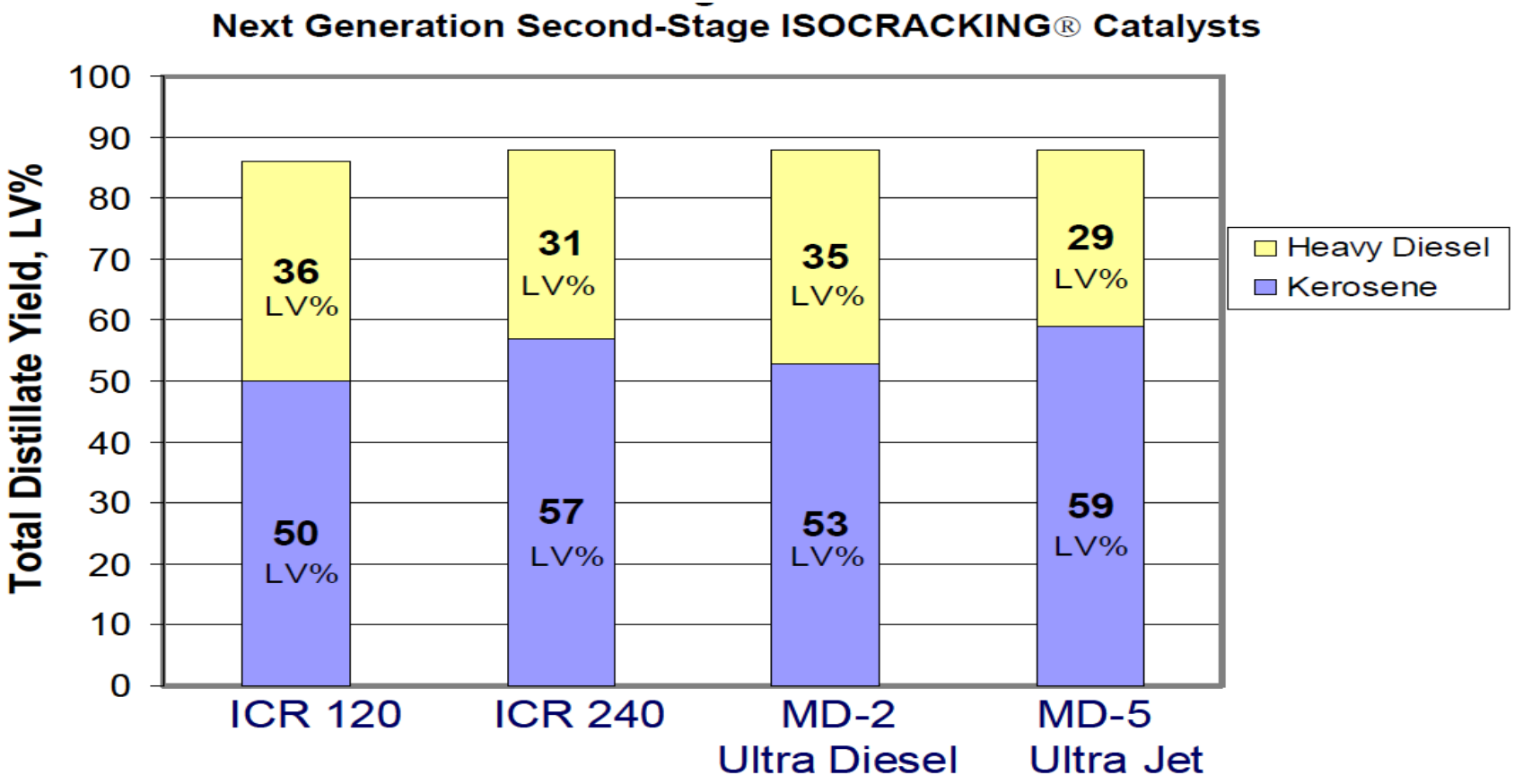
- Isocracking product yields

Second-Stage ISOCRACKING for Middle Distillates, Middle East VGO

	ICR 120	ICR 240
Catalyst Activity, °F	Base	Base + 4
Yields		
$C_1 - C_4$, Wt %	5	3
Naphtha, LV %	21	21
Kerosene, LV %	50	57
Heavy Diesel, LV %	36	31
Kerosene + Heavy Diesel, LV %	**86**	**88**

ISOCRACKING PROCESS

- Isocracking shifting in diesel / Jet yields



ISOCRACKING PROCESS

- Isocracking product qualities

Product Qualities in Second-Stage ISOCRACKING for Middle Distillates

	ICR 120	ICR 240
Kerosene		
Smoke Point, mm	41	45
Freeze Point, °C	-61	-67
Heavy Diesel		
Cetane Index	68	69
Cloud Point, °C	-14	-7

ISOCRACKING PROCESS

- Isocracking + Isodewaxing

product	Wt%	PROPERTIES
C5 – 180^{o}c	4.8	
180 – 290 ^{o}c	15.4	Smoke point 22 mm
290 – 370 ^{o}c	16.4	Cetane index 56 F.P 145 ^{O}C
370 – 425 ^{o}c	13.7	
425 -475 ^{o}c	19.3	VI 97
475+	27.4	VI 105

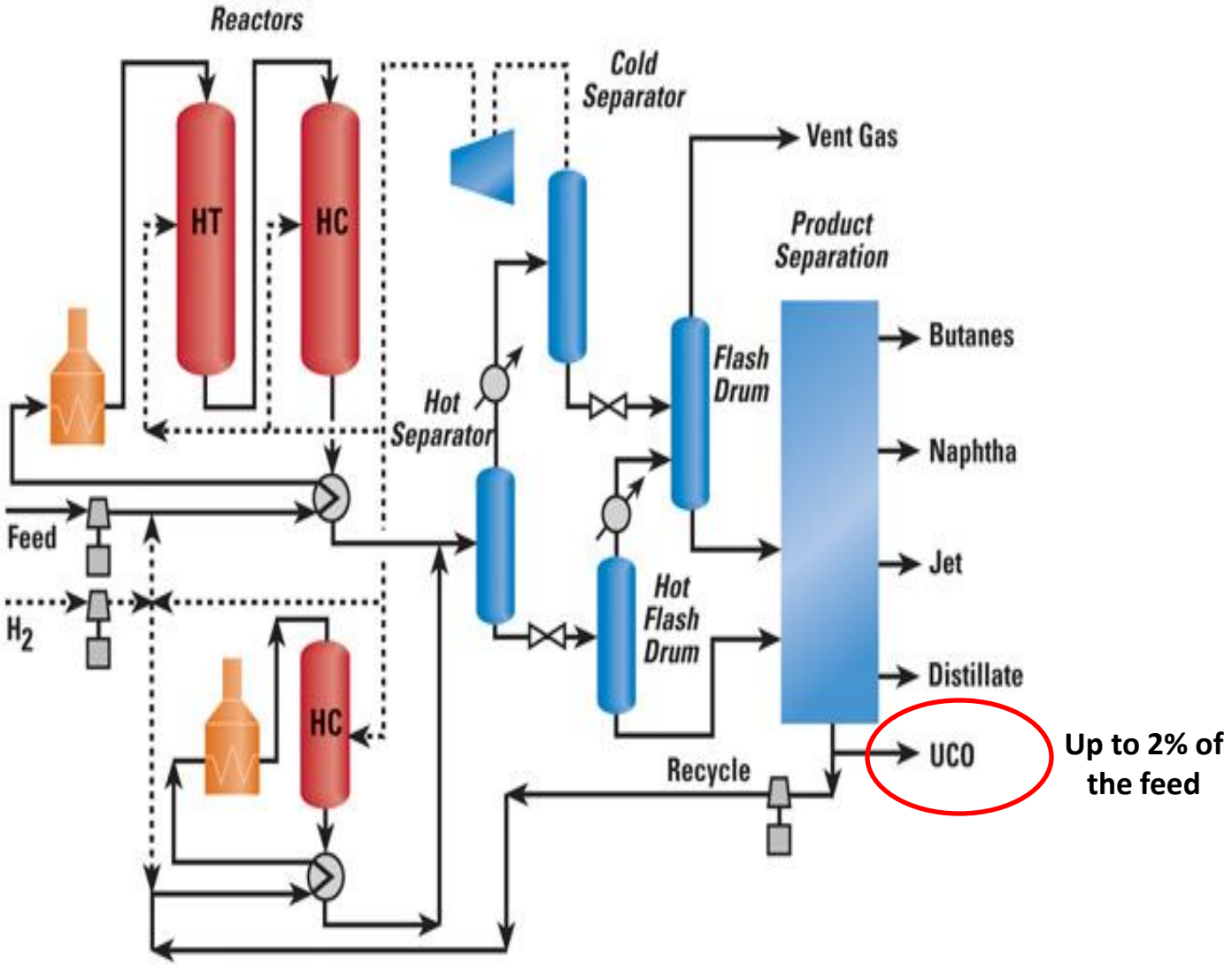
ISOCRACKING PROCESS

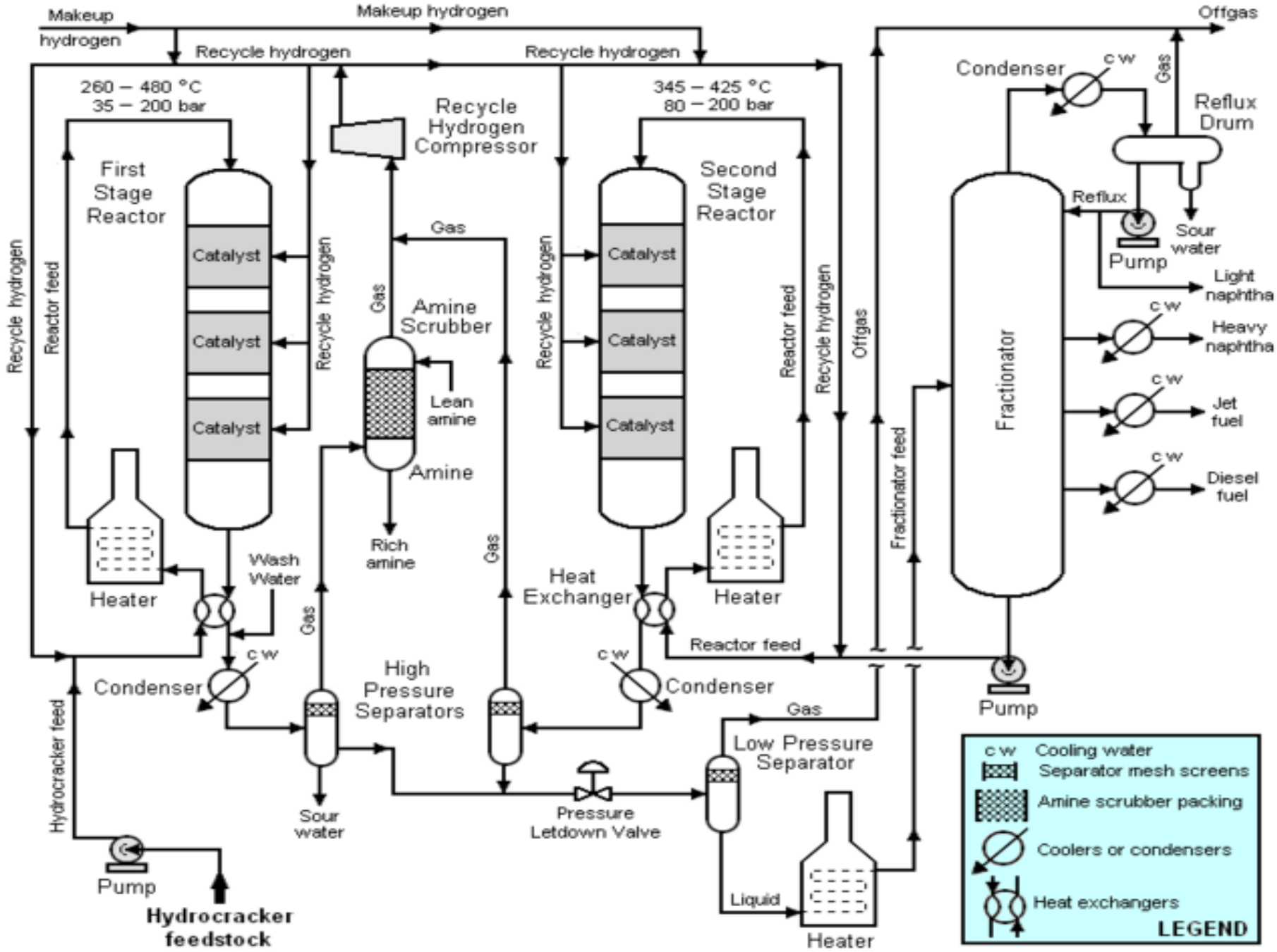
dvantages

Process Features	Process Benefits
Produces diesel fuels with very high cetane number and low pour point	Can be blended with poorer quality streams and still meet refiner's diesel pool cetane specs
Produces kerosenes with low freeze points and high smoke points	Results in optimum fuel combustion characteristics
Produces hydrogen-rich heavy products	Excellent feedstock for downstream processing (e.g., FCC, ethylene or lube oil), providing better yields and product properties in these units
Unique catalyst systems result in maximum yield of middle distillate products and lube oil base stocks	Optimum catalyst selection will produce about 5% more higher-value distillate product yield than competing hydro-cracking technologies
Minimizes formation of polynuclear aromatic (PNA) compounds in the reaction system	Achieves high unit on-stream factor by avoiding deposit of solids on process equipment.
Catalysts with superior stability result in long catalyst cycle length and ultimate life	Low catalyst replacement costs • Permits design of lower pressure hydrocrackers with lower investment cost
Extensive family of amorphous and zeolitic catalysts available for any application	Selection of optimum reactor/catalyst configuration gives refiners greater flexibility in processing a wide range of feedstocks from different crudes

THANKS

UOP UNICRACKING PROCESS




Makeup hydrogen
Makeup hydrogen
Recycle hydrogen
Recycle hydrogen
Offgas
260 – 480 °C
35 – 200 bar
345 – 425 °C
80 – 200 bar
Recycle Hydrogen Compressor
First Stage Reactor
Second Stage Reactor
Catalyst
Catalyst
Catalyst
Catalyst
Catalyst
Catalyst
Recycle hydrogen
Reactor feed
Recycle hydrogen
Gas
Amine Scrubber
Lean amine
Amine
Rich amine
Gas
Recycle hydrogen
Reactor feed
Recycle hydrogen
Offgas
Condenser
c w
Gas
Reflux Drum
Reflux
Pump
Sour water
Light naphtha
Heavy naphtha
Jet fuel
Diesel fuel
Fractionator
Fractionator feed
Heater
Wash Water
Heat Exchanger
Heater
Reactor feed
c w
Condenser
c w
Condenser
High Pressure Separators
Gas
Low Pressure Separator
Pump
Hydrocracker feed
Sour water
Pressure Letdown Valve
Liquid
Heater
Pump
Hydrocracker feedstock
c w Cooling water
Separator mesh screens
Amine scrubber packing
Coolers or condensers
Heat exchangers
LEGEND