

# ExoS™ SULFUR EXTRACTION TECHNOLOGY

## Key Benefits

- » Save 2-4 octane numbers
- » Reduce hydrogen use by ~50%
- » Produce a raffinate that is less than 10 ppm in sulfur
- » Help achieve sustainability targets by reducing Scope 1 emissions
- » Low OPEX cost
- » Hydrogen consumption of hydrotreater can be reduced up to 50%

## Facility Construction

- » KES-led project teams can deliver a modular plant in two years at lower cost than your next best alternative

## Superior Outcomes

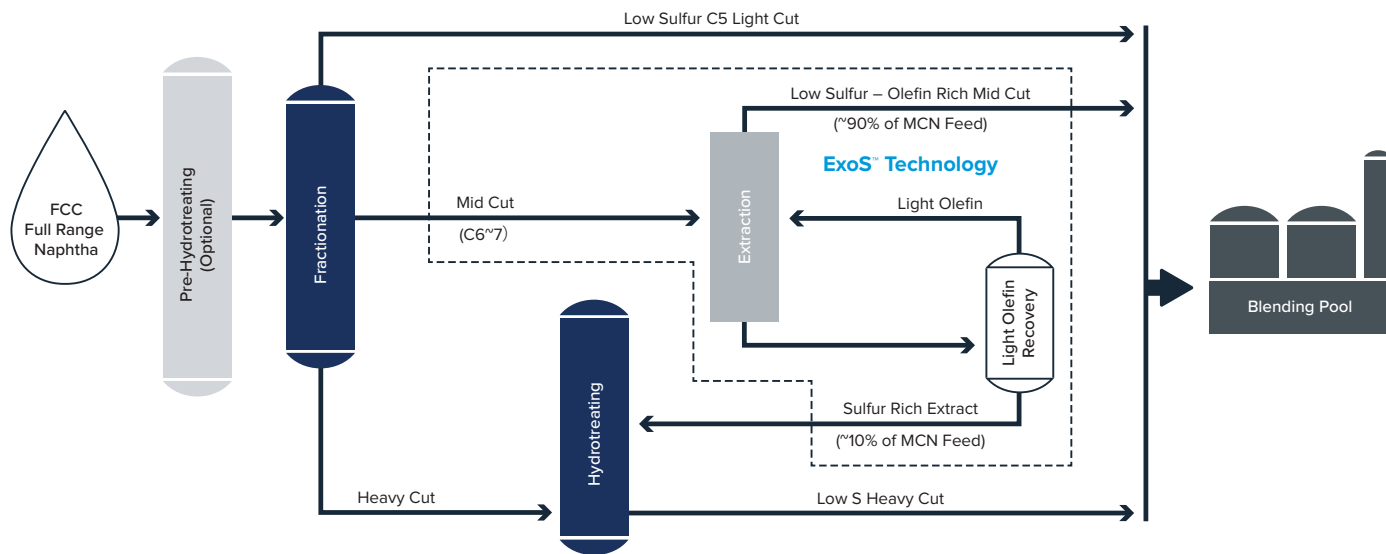
- » ExoS™ technology lowers emissions while adding value to your bottom line
- » IRR between 20% to 30% depending on octane value and size of Unit

**Koch Technology Solutions (KTS), a Koch Engineered Solutions (KES) company,** can deliver our ExoS™ licensed technology that preserves octane value from your mid-cut naphtha while lowering the sulfur content and reducing your hydrogen use. Emissions and operating costs are also reduced from the lower energy consumption of a combined ExoS™ Unit with an FCC naphtha hydrotreater. By bringing our capabilities to bear across our affiliate companies and acting as a single counterparty, KES offers a unique, comprehensive solution that offers favorable returns.

## Multiple Benefits of the ExoS™ Unit Technology

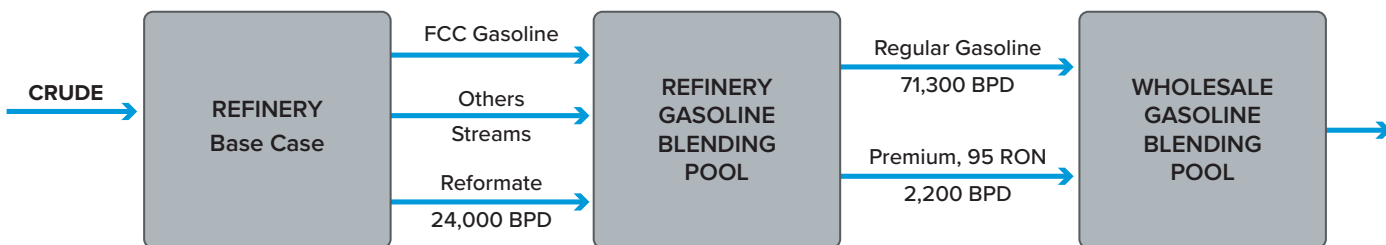
An ExoS™ Unit preserves octane value from your mid-cut naphtha while lowering the sulfur content to less than 10 ppm. Since ~40% less feed is required to pass through the naphtha hydrotreater, there will be a reduction of hydrogen use by ~50%. Scope 1 emissions are reduced due to lower operating cost from lower energy consumption of a combined ExoS™ Unit with an FCC naphtha hydrotreater. The olefin rich and low sulfur raffinate can be sent to the gasoline blending pool, where it can be used to upgrade lower octane products. The FCC mid-cut naphtha is processed to make high octane 10 ppm sulfur naphtha.

### ExoS™ Process Flow Diagram

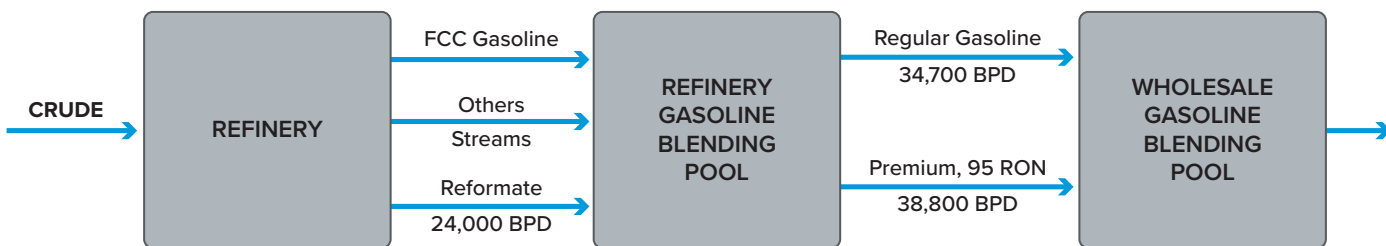


### Economic uplift by combining an ExoS™ Unit with an existing FCC naphtha hydrotreater<sup>1</sup>

#### Scenario without an ExoS™ Unit



#### Scenario with an ExoS™ Unit



**PROJECT INCREMENTAL ECONOMICS**

Project with ExoS™	38,800 BPD
Base without ExoS™	2,220 BPD
Change	36,600 BPD



Product Value	3.5 Octane (Prem – Reg)
Additional Value	1.5 CPG / OCT
	\$80,700 / Day
	\$26.6 MM / Year

<sup>1</sup> Does not include additional benefit of reducing hydrogen usage, lowering energy consumption, or for sulfur reduction and lower emissions

Koch Engineered Solutions (KES) is a global solutions provider that encompasses products, services and expertise across a wide range of industries. KES companies design, manufacture and install process, pollution control and sustainability solutions for industries and cities around the world. More information is available at [KochEngineeredSolutions.com](http://KochEngineeredSolutions.com).

