

DTL™ Process Technology

No Need to Burn Money Anymore

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DTL™ at a Glance

Converts light olefins destined for fuel gas into high-octane gasoline blend stock

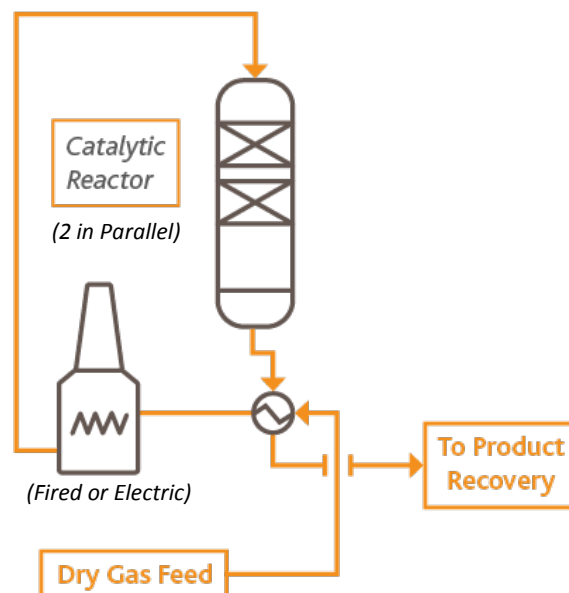
Value driven by the spread between Gasoline Blend-stock value and replacement Fuel Value (if any)

Applicable to FCC, RFCC, DCC or Coker off-gas feed

High olefin conversion (>95%), high liquid yield (85% C4+/ 75% C5+) and high octane (93-94 RON)

Low CAPEX/OPEX, Small Footprint, Standard Refinery Equipment

13 Commercial plants in operation





TOPICS

KOCH-GLITSCH - IPT PARTNERSHIP

THE DTL™ TECHNOLOGY

DTL™ CASE STUDIES

WRAP UP & QUESTIONS

Koch-Glitsch and IPT Partnership

WE ARE KOCH



INVISTA is an independently managed, wholly owned subsidiary of Koch Industries, Inc.
In 2004, subsidiaries of Koch Industries, Inc. acquired INVISTA.

*Koch revenues fluctuate with the price of commodities. They have been estimated by *Forbes* as high as \$100 billion.

Commodity Trading

Electronic Components

Energy

Fertilizers

Forest and Consumer Products

**Process and Pollution Control
Equipment and Technologies**

Minerals

Polymers and Fibers

Ranching

Refining, Chemicals and Biofuels

Glass



**Koch revenues fluctuate with the price of commodities. They have been estimated by *Forbes* as high as \$115 billion.

IPT – KG Partnership

IPT is INVISTA's technology transfer business with more than 40 years in continuous licensing

Licensed more than 100 license projects for PTA, Polyester, BDO, PTMEG and Nylon 66 since joining KII in 2004

Supporting technology development, commercialization and licensing within KII since 2013

Entry into the refining space spawned by collaborations with KII Affiliates, Flint Hills Resources and Koch-Glitsch

IPT-KG Partnership to Offer DTL™ and other Refining Technologies to the Market



DTL™ Process Technology

CATALYST - THE HEART OF THE PROCESS

Complex metal modified, Nano-size
ZSM-5

DTL™ catalyst oligomerizes, isomerizes
and aromatizes the reactants and
intermediate products

A variant of the catalyst used in our
IsoA™ Process has the added
capability to dehydrogenate C5-C7+
paraffinic feed to produce high octane
blend-stock from these low value
feeds



DTL™ INTEGRATION INTO THE REFINERY

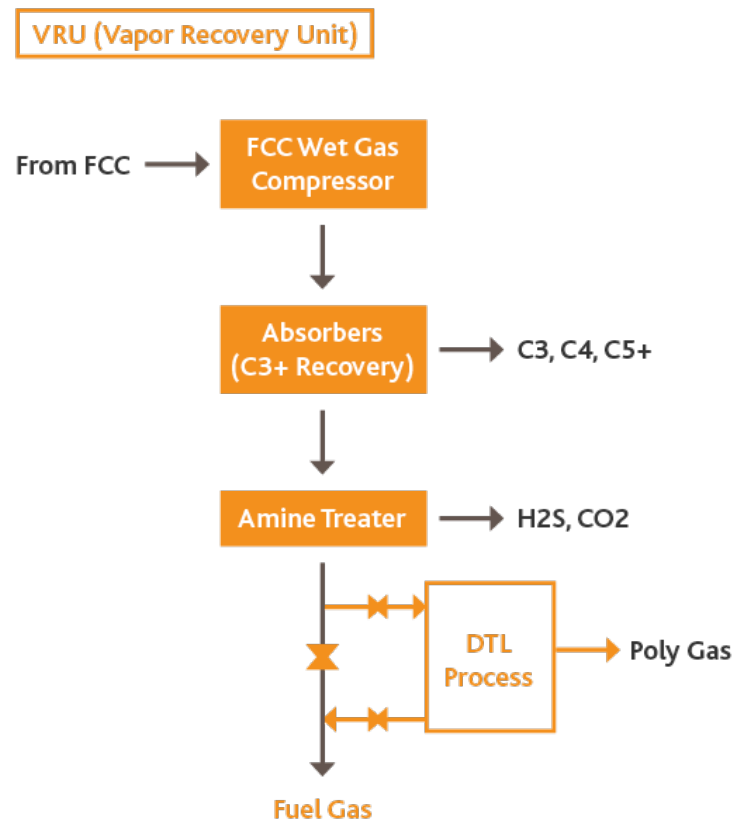
Typically integrated downstream of the off-gas FCC amine treater

Olefin-rich gas is processed through the DTL™ plant with olefin lean gas returned to the fuel gas header.

Supplemental fuel addition (e.g. natural gas) or partial bypassing of the DTL™ process are options for maintaining the fuel gas header pressure, if required

The DTL™ process unit operations are standard for refineries (fixed-bed reactors, absorption column, fired heaters, etc.), with a wide operating window for ease of operation

The compact footprint increases options for facilities siting and supports modular construction



DTL™ PROCESS FLOW

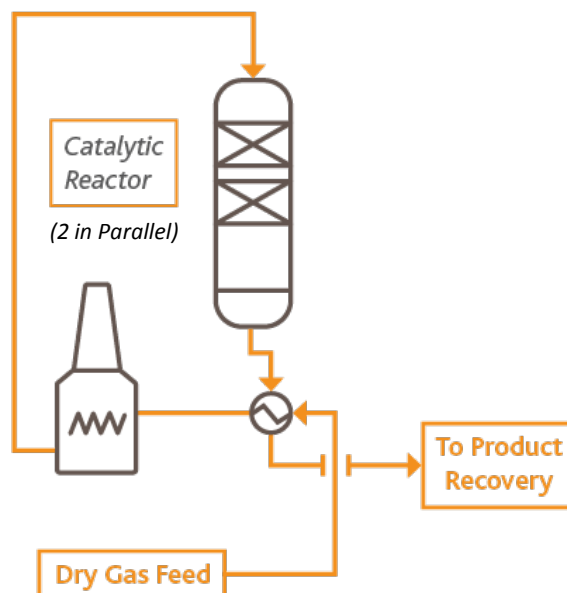
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Option to Co-Feed olefin containing LPG

Recovery process customized for integration with the refinery



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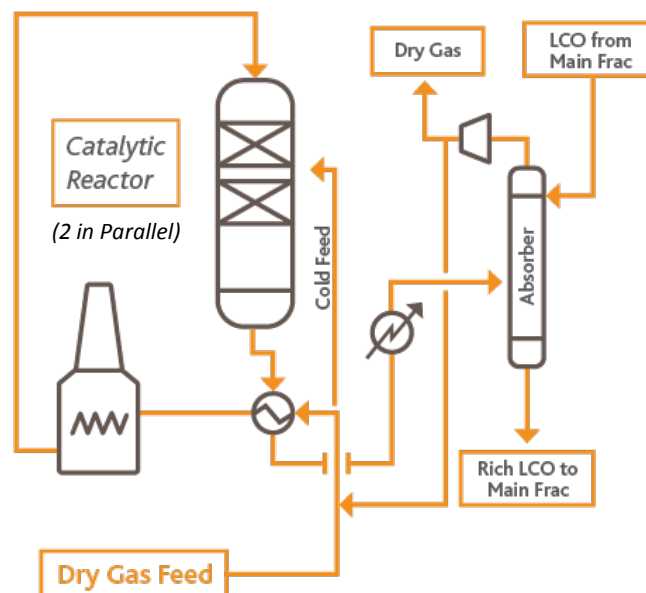
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Typical product



	n-paraffin	iso-paraffin	olefin	Cyclo-paraffin	aromatics
Total	<10% (5% typ.)	20 to 25%	10% to 15%	10% to 15%	35 to 40%
RON	93 or 94				

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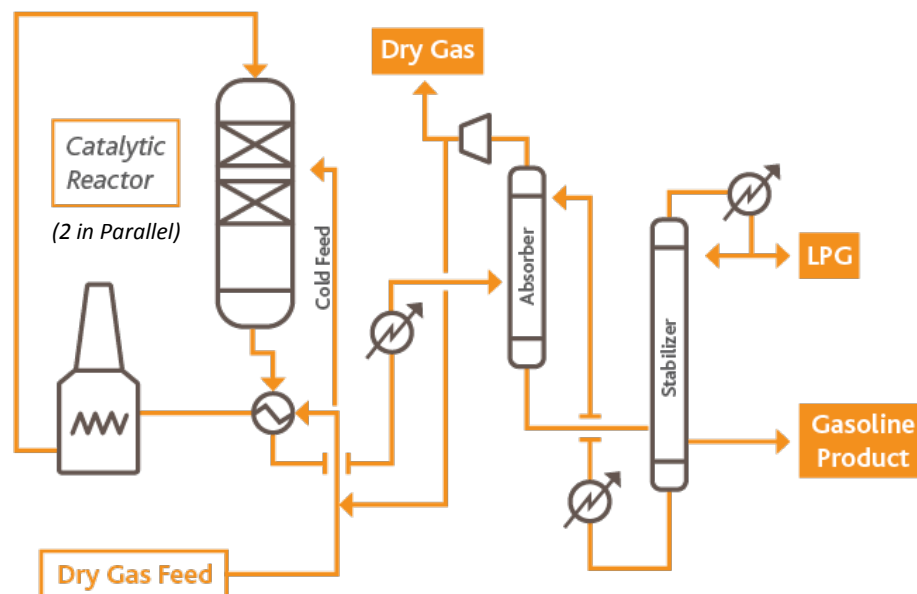
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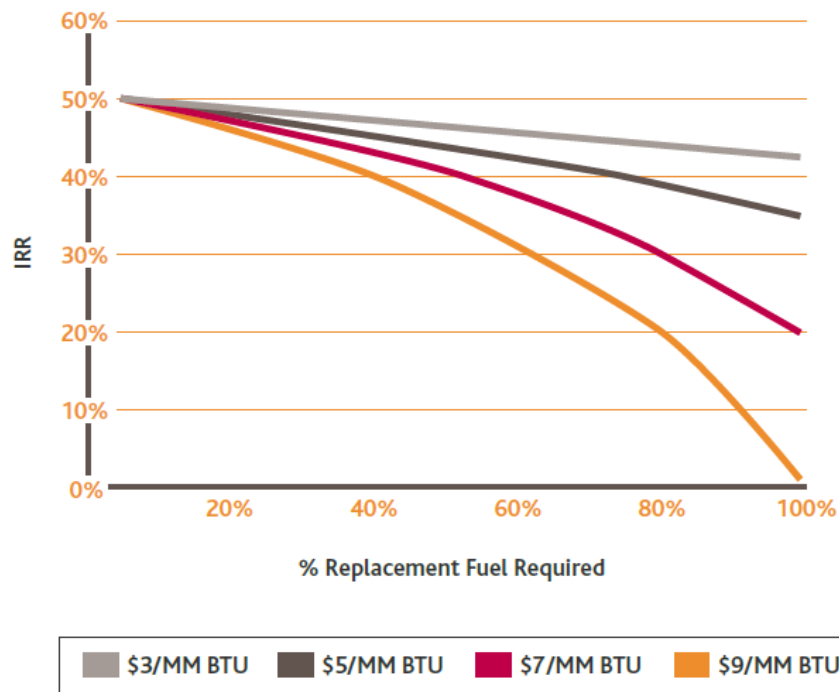
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DTL™ CASE STUDY

Low CAPEX configuration – LCO absorption with rich LCO returned to the main fractionator

55,000 pph dry gas feed

26 wt.% C2=; 6% wt.% C3=



CONCLUSIONS

LOW CAPEX, LOW OPEX, SIMPLE EQUIPMENT AND WIDE OPERATING WINDOW

WHY BURN THE OLEFINS FOR FUEL VALUE WHEN DTL™ CAN CONVERT THEM TO HIGH OCTANE GASOLINE BLEND-STOCK?

INVISTA, IN COLLABORATION WITH KOCH GLITSCH, WILL CUSTOMIZE THE PROCESS AND CUSTOMIZE THE EXECUTION APPROACH TO MATCH YOUR NEEDS

GIVEN THE FEED FLOW RATE, COMPOSITIONS AND A FEW OTHER DETAILS, WE CAN QUICKLY COMPLETE AN ECONOMIC SCREENING AND JOINTLY DECIDE IF THERE IS A PROJECT WORTH CONSIDERATION

OUR IsoA™ TECHNOLOGY, UTILIZING A VARIANT OF THE DTL™ CATALYST, CAN TURN YOUR C5-C7+ PARAFFINIC STREAMS INTO HIGH OCTANE BLEND-STOCK ALSO

THANK YOU

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INVISTA Performance Technologies

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STRAIGHT-RUN NAPHTHA UPGRADING PROCESS FLOW

Converts low-value light paraffinic naphtha into high-value gasoline

Feeds: light naphtha, topped oil, raffinate oil, reformat, NG condensate... C5 to C7+ paraffinic naphtha

Products:

~80% to 85% gasoline

~15% LPG

<2% dry gas (C1/C2)

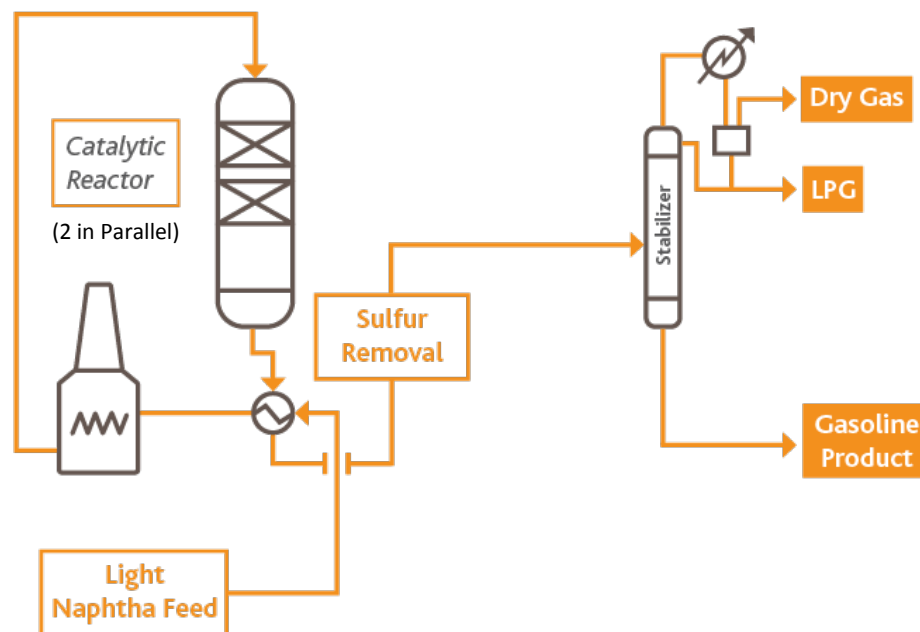
90+% sulfur removal, <10 ppm product with feed <120 ppm does not require Sulfur Removal Step

20+ point increase in octane (typical)

RVP control to seasonal spec

Type and Process Location of Sulfur Removal is dependent on Feed Sulfur Content plus Dry Gas and Gasoline Sulfur Specifications

Recovery process customized to the feed composition



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Co-feed of olefin containing LPG, boosts octane 2-5 points, lowers reactor temp, reduces heat input and improves yield

