
WORLDWIDE REFINERY PROCESSING REVIEW

Monitoring Technology Development and Competition in One Single Source

Third Quarter 2009

Hydrocracking and Catalytic Reforming

Plus

Latest Refining Technology Developments & Licensing



HYDROCARBON PUBLISHING COMPANY

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Abbreviations

1Q, 2Q, 3Q, 4Q ..(the first, second, third, and fourth quarters, respectively	America
AAAAmerican Automobile Association (US)	IPO.....initial public offering
ANSAlaskan North Slope crude	j.v.....joint venture
API.....American Petroleum Institute (US)	LPGliquefied petroleum gas
ARA.....Antwerp, Rotterdam, Amsterdam	Kthousand
ASTM.....American Society for Testing & Materials	kL.....kiloliter
b or bbl.....barrel(s)	lbpound(s)
Bbillion	METIMinistry of Economy, Trade and Industry (Japan)
boebarrel(s) of oil equivalent	MM.....million
CACalifornia	MOU.....memorandum of understanding
CAA.....Clean Air Act (US)	mpg.....miles per gallon
CARBCalifornia Air Resources Board	mt.....metric ton
cf.....cubic foot, cubic feet	MW.....megawatt
cfr.....cost and freight	N.A.not applicable or not available
cif.....cost, insurance, and freight	NAAQSnational ambient air quality standards
ConcaweConservation of Clean Air and Water Europe	NESCAUMNortheast States for Coordinated Air Use Management
CIS.....Commonwealth of Independent States	NGnatural gas
CNG.....compressed natural gas	NGL.....natural gas liquid
cst.....centistoke	NPRANational Petrochemical & Refiners Association (US)
d.....day	NWE.....Northwest Europe
DOE.....Department of Energy	NYMEXNew York Mercantile Exchange (US)
EECEuropean Economic Community	OECDOrganization for Economic Cooperation & Development
EIA.....US Energy Information Administration	OPEC.....Organization of the Petroleum Exporting Countries
EPAUS Environmental Protection Agency	OSHAOccupational, Safety and Health Administration (US)
EPC(M)engineering, procurement, and construction (management)	PCpetrochemical(s)
EU15.....15 original EU members	PMparticulate matter
EU25.....EU15 and the 10 new members admitted in May 2004	RBOBRFG before oxygenate blending
EUROPIA.....European Petroleum Industry Association (Brussels)	RFGreformulated gasoline
FCVfuel cell vehicle	RMTrefining, marketing, and transportation
fd.....free delivered	RVPReid vapor pressure
FEEDfront-end engineering design	SCAQMDSouth Coast Air Quality Management District (California)
fob.....free on board	VLCCvery large crude carrier
galgallon	WTIWest Texas Intermediate
GTLgas to liquid(s)	yyear
h.....hour	¢US cent(s)
H1 or H2.....first or second half of the year	€.....EU euro(s)
ICE.....Int'l Commodity Exchange (UK—formerly Int'l Petroleum Exchange)	£UK pound(s)
IEAInt'l Energy Agency (Paris-based)	\$US dollar(s)
IPAA.....Independent Petr. Assoc. of	¥.....Japanese yen

Please note that other international currencies are abbreviated using International Standards Organization codes, which can be found at www.xe.com.

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1 INTRODUCTION

This issue of the *Review* covers recent hydrocracking and catalytic reforming technology advances, technical challenges, and R&D work. Additionally, the "Latest Refining Technology Developments & Licensing" section provides updates on various refining technologies.

In the hydrocracking section, new products and topics covered include:

- Revamping a Chevron Lummus Global ISOCRACKING unit with a two-stage recycle configuration;
- ExxonMobil's revamp of a VGO HDS units with MPHC design to increase conversion on the unit;
- UOP's enhanced-two stage Unicracking process;
- Albemarle's 1015MD distillate selective catalyst;
- Axens's HYK 742 catalyst for use in their HyK-HC process;
- Chevron Lummus Global's ICR 179, ICR D179, and ICR 183 catalysts;
- Haldor Topsøe's BRIM TK-605 catalyst;
- Sinopec's RHC-1 catalyst;
- New advanced process control (APC) systems;
- Recent concerns and interests for refiners: using a flexible catalyst during an operational change; maximizing diesel production in VGO hydrocrackers; upgrading LCO and/or HCO in hydrocrackers; employing integrated processing schemes to reduce consumption of fuel oil, natural gas, and fuel gas and CO₂ emissions; a need for novel catalyst formulations to deal with changing feeds and evolving product demands; and advanced hydrocracking catalysts that improve cold flow properties;
- Latest R&D works related to integration of HC and other processing units, kinetic modeling to improve unit efficiency, use of amorphous solid acid, mixed zeolite and amorphous substrates in a single catalyst formulation, mesoporous MCM-41, and heteropoly acids and anions.

In the catalytic reforming section, new products and topics covered include:

- Updated information and Axens's, UOP's, and ExxonMobil's commercial offerings;
- Profile Wire Scallop from UOP to allow for larger catalytic reforming units;
- New reforming catalyst offerings from Axens, BASF Catalysts, Criterion Catalysts & Technologies, ExxonMobil, Indian Petrochemical Corp., Sinopec, and UOP;
- Advanced process control and catalyst management systems to improve efficiency and energy use;

1 INTRODUCTION

- Current plant practices and operations include feed considerations for optimizing product flexibility, meeting product specifications, and limiting contaminants in the processing reactor; strategies to specifically reduce benzene in gasoline products; avoiding the deposition of polynuclear aromatics in the reformer and heat exchangers; experience for revamping fixed-bed reformers to full or partial CCR modes; schemes to extend catalyst life and to reduce energy use/CO₂ emissions in catalytic reforming operations; identifying problems in the catalyst circulation loop and justifying a catalyst changeout;
- Novel process, hardware, and catalyst technologies in patents and R&D work regarding process optimization and flexible operations, modeling techniques, catalyst formulation, catalyst preparation, enhancing hydrogen yield and recovery, utilizing halide promoters, and recovering precious metals from spent catalysts.

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