Maximizing product value

Leading Technology of Choice

The NExOCTANE process selectively converts isobutylene to iso-octane (2,2,4 trimethylpentane), which results in the highest quality commercially available product. Iso-octane is a cost effective and higher value replacement of methyl tertiary butyl ether (MTBE) than alkylate or polymerate. Iso-octane (and iso-octene) offers excellent blending characteristics in gasoline, such as low vapor pressure (RVP). The olefinic product provides an especially good octane blending contribution.

Since establishing NExOCTANE technology in Canada in 2002, it has emerged as the technology of choice among MTBE producers worldwide.

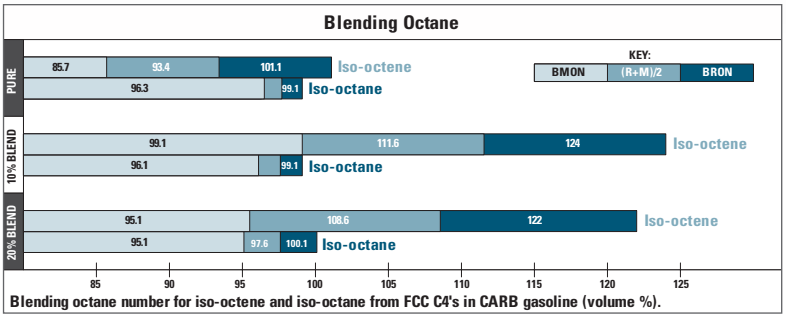
The high quality iso-octane and iso-octene produced from the NExOCTANE process allows producers and blenders to maximize product value.

NExOCTANE leads in the total number of licensed units and capacity for MTBE revamps

Typical Product Properties	Feed from FCC (C4)		Butane Dehydro
	Iso-octane	Iso-octene	Iso-octane
Specific Gravity, 60°F	0.70	0.73	0.70
RONC	99.1	101.1	100.5
MONC	96.3	85.7	98.3
(R+M)/2	97.7	93.4	99.4
RVP, psia	1.8	1.8	1.8
Distillation ASTM D86			
10 vol %	211 °F	215 °F	208 °F
50 vol %	216 °F	221 °F	212 °F
90 vol %	234 °F	238 °F	246 °F
Endpoint	390 °F	380 °F	378 °F

- Low RVP maximizes lighter, lower value streams
- Greater blending flexibility maximizes profits by increasing production of higher grade gasoline
- Sulfur, aromatic and benzene-free product helps meet tightening environmental specifications
- High selectivity results in higher quality product, while high conversion maximizes yields
- High product value maximizes return on MTBE conversion investment

Environmental issues, regulatory changes and potential legal liabilities have effectively eliminated the use of MTBE as a gasoline additive in the United States. Without MTBE, refiners are faced with the challenge of replacing the lost volume and octane value. The increased use of ethanol addresses some of the needs but also creates a greater challenge in meeting tightening vapor pressure specifications and moving lighter, lower value products via gasoline blending.



Blending octane number for iso-octene and iso-octane from FCC C4's in CARB gasoline (volume %).

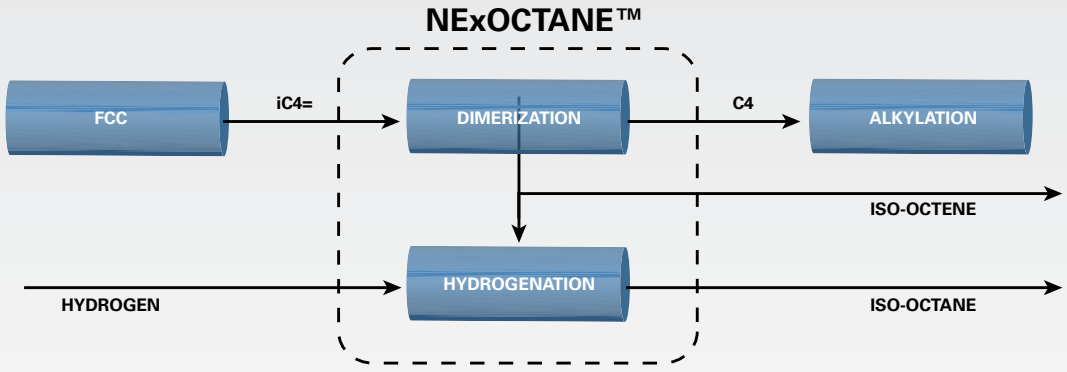
KBR

To learn more, visit: petrochemicals.kbr.com or e-mail petrochemicals@kbr.com

Cost effective technology

Iso-octene is produced by dimerization of isobutylene feedstock through a low cost revamp of the existing MTBE facility. Iso-octene can be further processed in a hydrogenation unit to produce saturated iso-octane. The NExOCTANE process features:

- Liquid phase, fixed bed dimerization reactors
- Dimerization catalyst system based on acidic ion-exchange resin, specifically developed for isobutylene dimerization and exclusively available for the NExOCTANE process
- The catalyst provides superior performance and substantially longer run lengths than standard resins to reduce operating costs
- Product recovery in existing MTBE plant distillation equipment minimizes capital investment
- Low cost hydrogenation technology featuring trickle bed design based on commercially available catalysts, using once-through hydrogen operation, which eliminates the expense of a hydrogen recycle compressor



INTEGRATION OF NExOCTANE IN A REFINERY

Flexibility of Design

The NExOCTANE process is suitable for a wide variety of C4 feedstocks from FCC refineries, olefins plant raffinate and isobutane dehydrogenation. The technology is a simple, cost-effective solution that is particularly attractive for the conversion of existing MTBE units. Dimerization and hydrogenation are independent sections of the NExOCTANE process. This means the technology can be offered to produce iso-octene without hydrogenation, allowing the producer to utilize existing hydrogenation facilities or to blend iso-octene into the gasoline pool.

Licensing

Technology licensing services are offered through a partnership of Neste Jacobs Engineering/ Neste Oil and KBR. Neste Oil is the developer of NExOCTANE technology, which is an extension of their interest in fuels, etherification, and hydrogenation technologies. KBR is the exclusive licensor of the technology and is a world-class provider of technologies, engineering and construction services for the process industry.