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Ecotane® vs. MTBE Relative Cost Calculation



What is Ecotane®

Ecotane® is a lead-free and iron-free compound that economically adds up to 2 octane numbers to straight-run gasoline, lead-replacement gasoline, or unleaded gasoline. Because it is based on manganese, it has low toxicity, does not pollute the environment, and is a drop-in replacement for other octane boosters. It is compatible with all oxygenated and aromatic blending components. See the Ecotane® product data sheet(s) and MSDS for additional information.

Comparing Octane Cost

A convenient way to price octane is to measure the cost to increase the octane number of a barrel (42 gals) of gasoline by one number, referred to as the cost per octane number barrel (ONB). Comparing cost/ONB for various octane boosters is the most accurate way to compare cost per performance. A comparison between MTBE and Ecotane® is performed below. The calculation method is described, and can be easily modified for changes in prices of various components.

Basis

For the purpose of this analysis, the following assumptions are made:

1. We start with a gasoline stream with an octane number of 85.
2. We add either MTBE or Ecotane® to increase the octane by 2 RON points, from 85 to 87 octane.
3. MTBE has an octane number of 110, and a density of 0.74 kg/liter. Octane response is linear.
4. MTBE cost is US\$700/MT = \$0.52/liter = \$1.96/gal (SG = 0.74, Aug 2006 PRC).
 $US\$700/MT \times 1 MT/1000 kg \times 0.741 kg/l \times 3.785 l/gal = US\$1.96/gal.$
5. Wholesale gasoline cost (no taxes) is US\$2.50/gal = US\$0.66/liter = \$930/MT (SG=0.71, Aug 2006 US).

Cost of Octane from MTBE

1. First, we calculate the amount of MTBE that must be added to increase the gasoline octane number by 2 points. Let (x) be the fraction of MTBE, and (1-x) be the fraction of straight-run gasoline in the final blend. Assuming linear blending response, the following formula calculates the percentage of MTBE that is required.

$$(x) (110 \text{ octane}) + (1-x) (85 \text{ octane}) = 87 \text{ octane.}$$

$$(110) (x) + (85) - (85) (x) = 87$$

$$(25) (x) = 2$$

Solving, $x = 0.08 = 8\%$ MTBE to raise the octane +2.

2. Based on this, the final blended 87 octane gasoline contains 8% MTBE and 92% straight-run gas. The cost/gal is:

$$(0.08) (\$1.96/\text{gal MTBE}) + (0.92) (\$2.50/\text{gal gasoline}) = \$2.46/\text{gal blended 87 octane gasoline.}$$

The decrease in cost is $(\$2.50/\text{gal}) - (\$2.46/\text{gal}) = \$0.06/\text{gal}$ savings to add 2 octane numbers with MTBE.

3. The cost per octane number barrel (\$/ONB) is therefore:

$$(\text{increase in cost}) / (\text{increase in octane}) \times \text{gals/bbl}$$

$$= (\$-0.12/\text{gal}) / (2 \text{ octane numbers}) \times 42 \text{ gals/bbl} = - \$2.52/\text{ONB using MTBE.}$$

Cost of Octane from Ecotane®

1. Tests have shown that adding Ecotane® 3000 at the rate of 18 mg Mn/liter into gasoline increases octane number by an average of 2 points (sometimes as high as 3 depending on the composition of the straight-run gasoline). Ecotane® 3000 contains 24.4% by weight manganese (Mn). Therefore the recommended treat rate is:

$$(18 \text{ mg Mn/liter}) \times (1 \text{ g} / 1000\text{mg}) / (24.4\text{g Mn} / 100\text{g Ecotane® 3000}) = 0.0738\text{g Ecotane® 3000} / \text{liter gasoline.}$$

2. This results in the addition of the following amount to a barrel of gasoline:

$$(0.0738\text{g Ecotane 3000} / \text{liter}) \times (1 \text{ kg}/1000 \text{ g}) \times (3.785 \text{ liters}/\text{gal}) \times (42 \text{ gals}/\text{bbl}) = 0.117 \text{ kg Ecotane® 3000} / \text{bbl.}$$

3. The cost per octane number barrel (\$/ONB) based on a price of \$35/kg Ecotane® 3000 is therefore:

$$(0.117 \text{ g Ecotane® 3000} / \text{bbl}) \times (\$35/\text{kg Ecotane® 3000}) = \$0.410/\text{bbl Ecotane® 3000 added cost}$$

$$(\text{increase in cost}) / (\text{increase in octane}) \times \text{gals/bbl}$$

$$= (\$0.410/\text{bbl}) / (2 \text{ octane numbers}) = \$0.205/\text{ONB using Ecotane®.}$$

Conclusion

As MTBE prices increase (as they are doing), Ecotane® will become the more economical way to increase the octane number of gasoline. A maximum of 2-3 octane numbers is achievable using Ecotane®. Ecotane® works in conjunction with MTBE – adding MTBE and Ecotane® can add up to 4 octane numbers to gasoline. Adding additional MTBE to realize this octane boost is impractical.