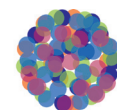
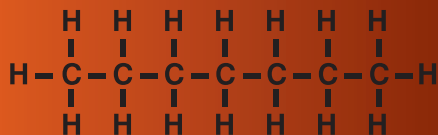


P6 PETROCHEMICALS



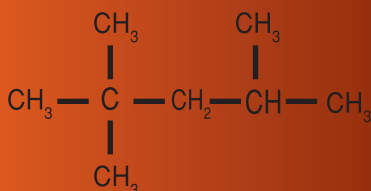
CHEMICAL
INDUSTRIES
RESOURCE PACK

OCTANE RATING



Heptane

Octane number = 0



Isooctane (2,2,4-trimethylpentane)

Octane number = 100

Gulf oil spill in the news

24 May 2010

BP plans to use heavy mud and cement to stop the breach, a manoeuvre called a top kill. Suttles said on the CBS Early Show the effort should start on Wednesday morning and they'll know the same day if it works. BP said on Monday its costs for responding to the spill had grown to about \$760m, including containment efforts, drilling a relief well to stop the leak permanently, grants to Gulf states for their response costs and paying damage claims. On Sunday, some brown pelicans coated in oil couldn't fly away on Barataria Bay off the Louisiana coast. All they could do was hobble. Their usually brown and white feathers were jet black, and eggs were glazed with a rust-coloured substance.

2 June 2010

The oil has been spreading in the Gulf since the Deepwater Horizon rig exploded six weeks ago, killing 11 workers and eventually sinking. Shares in British-based BP were down 3% on Wednesday morning in London trading after a 13% fall the day before. BP has lost \$75bn in market value since the spill started with an April 20 oil rig explosion and analysts expect damage claims to total billions more.

Introduction

One of the factors that determine a fuel's effectiveness is its ease of ignition. If petrol ignites too quickly, the engine will not run smoothly and the engine will make a metallic noise. This is called 'knocking'. On the other hand, if petrol is too difficult to ignite, the engine will be difficult to start, especially in cold weather. The relationship between knocking and the structure of the hydrocarbons in petrol depends on the following:

- branched alkanes and cycloalkanes burn more evenly than straight-chain alkanes
- short alkanes (e.g. C_4H_{10}) burn more evenly than long alkanes (e.g. C_7H_{16})
- alkenes burn more evenly than alkanes
- aromatic hydrocarbons burn more evenly than cycloalkanes.

Petrol pumps display different numbers: 91, 93 or 95. These numbers are called the petrol's **octane number** or antiknock rating and are a measure of the petrol's ability to burn without knocking. The octane number compares a fuel with a mixture of two reference fuels - isooctane (2,2,4-trimethylpentane) which is a good fuel and resists knocking; and heptane, a poor fuel that knocks readily.

The following table shows the octane numbers of some pure hydrocarbons. High-quality petrol contains many branched hydrocarbons.

Hydrocarbon	Octane number
Heptane	0
Hexane	25
1 - heptane	60
Pentane	62
1 - pentane	84
Butane	91
Cyclohexane	97
Isooctane	100
Toluene	112

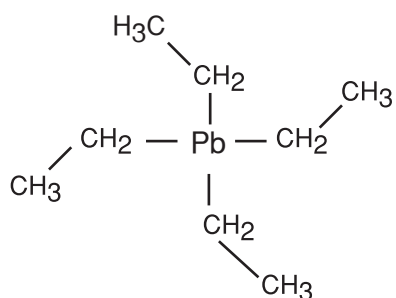
The news articles were published on www.news24.com. Learners - if you use any part of it you need to write it in your own words and include the following in your reference list: News24.com. 2010. Gulf oil spill plug hits new snag. [Online]. Available: <http://www.news24.com/World/News/Gulf-oil-spill-plug-hits-new-snag-20100602>. [21 July 2010].

Additives to petrol

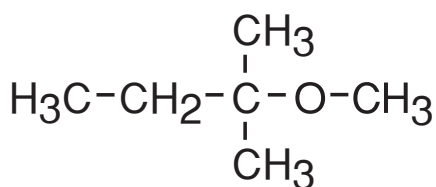
Several compounds can be added to petrol to boost its anti-knocking properties. The best-known of these additives is tetraethyl-lead, but this causes high levels of lead in the air, particularly in cities. Lead is poisonous and can cause brain damage in young children. Modern cars are fitted with catalytic converters to remove pollutants from the exhaust gases. Lead and other metals poison the catalyst in the catalytic converter and inhibit its catalytic ability.

The negative effects of lead have prompted bans on lead additives in petrol for some years in the USA, Europe and other countries. South Africa has conformed and only unleaded petrol has been sold since January 2006.

A lead-replacement petrol for older cars has been developed as an interim measure. Other, more environment-friendly additives to replace lead have also been developed. These additives e.g. the oxygenate TAME (tertiary amyl methyl ether), can boost the anti-knocking properties of petrol.



Tetraethyl-lead



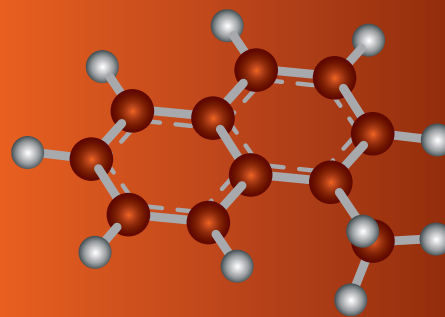
Tertiary amyl methyl ether (TAME) or 1,1-dimethylpropyl methyl ether

Impurities in diesel

Diesel consists of a heavier hydrocarbon fraction than petrol and has a higher boiling point. The ease of ignition of diesel is indicated by its cetane number. Cetane (hexadecane) has a cetane number of 100 and 1-methylnaphthalene has a cetane number of zero. A diesel with a cetane number of 48 will have the same ignition quality as a mixture of 48% cetane and 52% 1-methylnaphthalene.

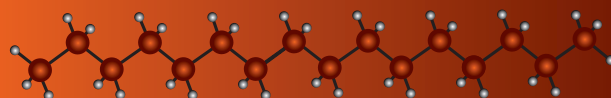
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1-Methylnaphthalene



Source: Wikimedia Commons

Hexadecane



Source: Wikimedia Commons



Source: Mind over Matter, www.sasol.com