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# Giving Gas a Boost: The Catalytic Development of High Octane Gasoline

**Lead: In the 1930s, oil companies were struggling to boost the octane of gasoline. Eugène Houdry's catalytic cracking process made it possible and may have helped win World War II.**

**Intro.: *A Moment in Time* with Dan Roberts.**

**Content: When it comes from the ground, crude oil is almost useless, a mixture of thousands of different types of hydrocarbons: asphalt to gasoline to natural gas. Each has a different molecular weight, therefore,**

**crude oil must be refined to pull out the impurities such as sulfur compounds and separate different components such as kerosene, gasoline, fuel oil, and so forth.**

**In the 19th century kerosene was the most valuable product because it was used in lamps and for heating. Because it was so unstable, gasoline was often just dumped on the ground or in a nearby stream and natural gas, considered completely useless, was just burned off at the well. By the early 20th century things had changed. Because of the automobile, the most valuable product of crude oil had become gasoline. It, however, was becoming more and more rare as automobiles grew in number and**

**power. The problem was that not all gasoline was the same. Different grades of gas are determined by the level of octane they contain. The scale is 0 to 100. The higher the number the greater the power and the less knocking.**

**In an internal combustion engine, gasoline is combined with air inside a cylinder, it is then fired off by a spark plug, and the resulting explosion creates compression which pushes the cylinder and turns the engine. Compression also can cause a secondary explosion, this is called knocking and it reduces the efficiency of the engine. As engines increased in size and compression, knocking became a real problem. Oil**

**companies, from almost the beginning, worked to increase output, the number of gallons of gasoline from each barrel of oil, and the octane level of their gasoline so as to reduce knocking, but it was not easy.**

**One of the first ways of increasing output and octane was called thermal cracking. Oil was boiled under high pressure in an attempt to change or crack the molecular structure to get more gasoline and higher octane. As they were improving the output level in the early 1920s, oil companies also discovered the anti-knock properties of such additives as TEL (tetraethyl lead), but you could not add too many additives or they would gum up the engine.**

**Enter Eugène Houdry. Raised in wealth, this World War I veteran of the French Army had a love for automobiles. A chance encounter with a chemist in the early 1920s set him onto the fascinating properties and opportunities of catalysts, first for the formulation of gasoline from lignite or coal. This did not turn out to be so promising, but then he began to use catalysts for increasing the octane level of gas.**

**A catalyst is a chemical compound that provides a surface to which other chemicals adhere. They loosely attach themselves temporarily to the catalyst, react to each other without consuming the catalyst, detach**

**themselves as an altered compound, and leave the surface of the catalyst so that it can continue to serve the same purpose for additional similar chemicals. Houdry believed that he could run crude oil or lightly refined oil through a vessel containing a catalyst and transform the heavier molecules in the oil to gasoline and at a higher octane rate without adding substances such as tetraethyl lead.**

**He struggled to find financial backing and finally found it in the United States, ultimately partnering with Sun Oil of Pennsylvania, owned by the Pew Family. Together their research led to more efficient manufacturing techniques. They experimented with better catalysts**

**many of which used a form of silica or clay as a foundation. By the late 1930s, when other refiners could only make gas with an octane level of 60, they were extracting from a barrel of crude 48 percent of gasoline at 81 octane.**

**When the Royal Air Force began using 100 octane aviation fuel based on Houdry's catalytic process plus tetraethyl lead, it transformed the battle in the skies over Europe in 1940, helping the Allied cause at one of the darkest moments of the war.**

**From Richmond, Virginia this is Dan Roberts.**

## Resources

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**http://inventors.about.com/od/gstartinventions/a/gasoline_2.htm**