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Oil from a Wasteland - The Jatropha Project in India – Part 5



Oil is extracted from the jatropha seeds, which can be processed to high-quality bio diesel.

Transesterification, in which the glycerin is replaced by methanol, makes it possible to use the processed plant oil as fuels. However, that's only the first step in the transformation of plant oil into biodiesel. After transesterification, the resulting raw product is centrifuged and washed with water to cleanse it of impurities, such as glycerin and excess methanol. Only at the end of this process is the biodiesel of usable quality.

The CSMCRI team was not willing to wait until after the first harvest in order to start the search for the right process for refining jatropha oil, so it bought eight tons of jatropha nuts that farmers had gathered from wild plants in various parts of India. By spring 2004, the team had extracted a total of 1,300 liters of high-quality biodiesel from this raw material using a variety of processes. The biodiesel was passed to DaimlerChrysler India, which used it to fuel an eye-catching round trip through the country. A Mercedes-Benz C 220 CDI specially modified to use jatropha biodiesel toured the

In a simple process plant oil is converted into bio diesel fuel. Crossing India a Mercedes-Benz C-Class tested the fuel on the road.

From Jatropha Oil to Biodiesel

Parallel to the search for the most effective way to cultivate the jatropha plant, the project partners are pursuing another important goal: the development of a simple and economical process for converting the plant oil extracted from the oilseed into high-quality biodiesel fuel. For this purpose, the scientists at CSMCRI have set up three small pilot plants in Bhavnagar that have a combined production capacity of 100 liters of biodiesel per day.

In these chemical mini-factories, the jatropha oil is subjected to a process called transesterification. Plant oils - those derived from jatropha as well as the oilseed rape and soya beans from which biodiesel is produced in Europe and the U.S. - consist mainly of triglycerides, the fatty acid esters of glycerin. They are extremely viscous and tend to resinification - qualities that are not desirable inside a fuel tank.



By transesterification and purification in a centrifuge, seed oil is processed to biodiesel.



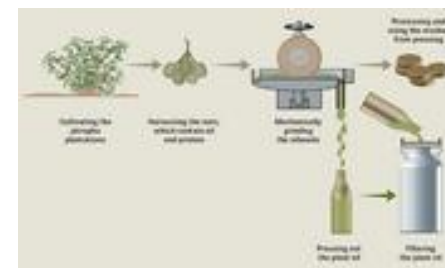
Powered by diesel fuel made of jatropha seeds this Mercedes-Benz C 220 CDI covered a distance of 5900 kilometers across India

country between April and May 2004, covering around 5,900 kilometers and visiting 11 major cities on a route extending from Pune to Bangalore, Hyderabad, Mumbai and Delhi.

The results of the experiment have been very satisfactory for two reasons. Firstly, it has revealed that jatropha-based biofuel can be used without any problems in modern CDI engines adapted for biodiesel. What's more, this fuel produces only half of the unburned hydrocarbon emissions and one-third of the particulate emissions produced by diesel fuel derived from crude petroleum.

Secondly, the team from Daimler India received a tremendous amount of public interest. According to George Francis from the project team headed by Klaus Becker in Hohenheim, two more Indian states are now in the process of setting up and financing jatropha cultivation in wasteland areas.

The fuel specialists at Daimler Research, under the leadership of Rudolf Maly, have now taken an in-depth look at the quality of biodiesel made



Processing of biodiesel using jatropha seeds

from jatropha. "This fuel has not yet reached optimal quality, but it already fulfills the EU norm for biodiesel quality," says Maly. "That's a remarkable achievement, in view of the simple production processes involved." Maly's team subjected the emissions associated with jatropha biodiesel to tough laboratory tests that confirmed their Indian colleagues' observations of the advantages of this fuel. In addition, this renewable fuel's high cetane values, very low sulfur content and high oxygen content give it excellent combustion properties.

"What's more, the CO₂ balance of fuels derived from renewable energy sources is much better than that of fuels based on crude oil," Maly adds. After all, the combustion of biodiesel releases only the amount of CO₂ that the plant removed from the atmosphere when it was growing. Only the amount of energy used for the cultivation, harvesting and transport of the plants plus the energy needed to produce biodiesel affects the CO₂ balance. And in principle, it is possible to significantly reduce that energy figure.

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Abstract of study results available from:
<http://www.informaworld.com/smpp/content~db=all?content=10.1080/00207230701766499>