Life sciences

biotechnology and food security

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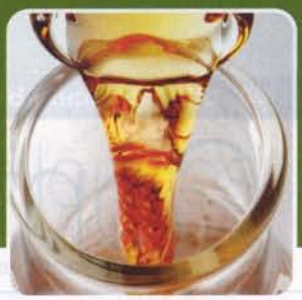

Science and businesses address the challenges facing us today

How we address our biotech futures.
How science and research are meeting food security issues.
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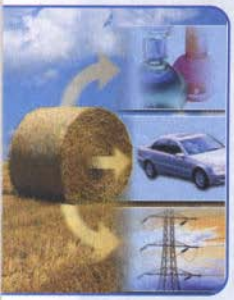
From straw bale to petrol tank

Murdoch Mactaggart **learns of innovative approaches combining old and new chemical engineering technologies to produce liquid fuels from plant waste.**

Waste biomass is increasingly recognised as feedstock for biofuel production as new technologies are developed.

"We expect to be able to produce high quality fuels at relatively low cost from waste biomass, turning straw into designer fuels."
Dr Nicolaus Dahmen



However, the sheer bulk of biomass and its low energy density are problems. This is something which the bioliq group, Division of Chemical-Physical Processing, Karlsruhe Institute of Technology (KIT), approach in an innovative way in producing high quality liquid fuels.

The first stage uses fast pyrolysis to transform dry biomass such as straw or residual wood into a slurry of coke and oil resembling crude mineral oil and known as bioliqSynCrude. This has an energy density around ten times higher than the original biomass but retains about 90% of the original energy and can be transported easily and cheaply from various regional locations. Pyrolysis is a process of thermochemical decomposition of organic material at high temperature and under pressure, used to produce gases, liquids and carbon.

BioliqSynCrude is then vaporised at a central plant to turn it into a mixture of carbon monoxide and hydrogen known as SynGas. The process involves mixing it with oxygen under pressure at temperatures higher than 1,000C, the exact mix of process elements determining the precursors to the final product output during stage four.

"We've developed a three-stage gas purification process." explains Dr Nicolaus Dahmen, project leader. "In contrast to deep temperature gas scrubbing this process does not require the gas to be cooled nor the system pressure reduced. This saves substantial amounts of energy as subsequent fuel synthesis takes place at high temperatures and pressures. We also apply a comparatively simple synthesis process and this will allow for much cheaper production of fuel than conventionally."

A fast pyrolysis pilot plant has been in operation at KIT, North Campus, since 2007 but the later stages are only just being developed following some €10 million of funding from the Federal government and a further €1 million from the Baden-Württemberg Ministry of Economics becoming available.

"After completion of this last phase we shall be able to demonstrate the complete process." says Dahmen. "For the third and fourth stages we intend to apply new approaches. Once everything is in place we expect to be able to produce high quality fuels at relatively low cost from waste biomass, turning straw into designer fuels at the initial pilot rate of 100 litres an hour."