



The cost to produce a new airline jet engine costs hundreds of millions of dollars, so the aviation industry is keen to find a renewable fuel that works with existing equipment

Companies and researchers are creating new ways to produce drop in fuels directly from microorganisms like algae and bacteria, and from advanced refinery processes

Drop in' fuels: the next generation

Until recently, most biofuels companies have focused on producing first generation biofuels from terrestrial crops (corn, soya, rapeseed, palm oil, sugarcane) for biodiesel, and ethanol.

A more recent generation of biofuels from non-food crops such as jatropha, algae, and cellulosic ethanol from sorghum and energy cane have seen massive investment from 2006-2009 as sources of biomass production for biodiesel, ethanol, renewable diesel and biocrude.

Now, a new generation of fuels called 'drop in' fuels is emerging to meet a critical issue for energy companies. The key issue is 'how can petroleum, defense and aviation companies get biomass-based fuels to fit into their existing systems?'

For example, the US has already spent over \$7 billion (€5.4 billion) on its existing petroleum refining, storage, pipeline and distribution structure. Moreover, the cost to produce a new airline jet engine costs hundreds of millions of dollars in R&D.

In 2007 and 2008, the arrival of renewable diesel via Conoco-Tyson, UOP and Neste Oil brought a new era of producing biofuels to meet the specs of petrol companies. The biofuels mantra among petroleum and aviation companies is 'every molecule counts' and underscores a critical need for biomass-based fuels to meet system compatibility, energy content, and fuel engineering specifications.

From 2008-2009, a new group of molecular scientists is engineering microorganisms such as algae, bacteria,

yeast and fungi to transform biomass into 'drop in' fuels. The focus of this group is to engineer microorganisms to work as processors of biomass directly to renewable diesel, renewable gasoline and aviation fuel.

Microbial engineers are employing synthetic genomics to feed carbon dioxide, sugars and low-cost sources of carbohydrates directly to bacteria (Amerys) and algae (Solazyme) to produce renewable diesel fuel as a drop-in fuel.

In similar processes, Algenol is using blue-green algae or cyanobacteria to produce ethanol, while Sapphire Energy is applying synthetic genomics to algae to produce renewable petrol as a drop-in fuel, as well as a biocrude that can be delivered directly to petroleum and biodiesel refineries.

For aviation fuel, a group of scientists at Arizona State University have used algae to produce kerosene and jet fuels, while UOP has refined a process to produce drop in fuels from Jatropha, algae, and other forms of biomass that require no changes to distribution, storage or engines for planes.

From 2009-2020, the industry will see increasing investment into the production of 'drop in' fuel technologies and refinery processes to meet rising demands for the integration of biomass and petroleum systems, and to support national biodiesel mandates and targets for biofuels production. ●

For more information:

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