# Research on renewable feedstocks

Extending the range of feedstocks used to produce renewable fuel is one of the most important goals of Neste Oil's R&D work, and 70% of R&D expenditure is spent on research into renewable feedstocks.

Neste Oil is currently the world's only biofuel producer that can produce renewable diesel from more than 10 different types of feedstock. Research work has made an important contribution to steadily extending the range of raw materials used, as starting use of a new material calls for extensive studies and testing before procurement can begin.

Research work again played an important role in 2013, in enabling tall oil pitch, spent bleaching oil and technical corn oil to be added to Neste Oil's feedstock base. Waste and residues accounted for 52% of the raw material used in producing renewable diesel in 2013.

**Technical corn oil is a nonfood by-product of ethanol production**

Used cooking oil (UCO) is likely to be the most interesting new alternative input over the short term. Over the longer term, Neste Oil's feedstock research is focusing on using microbial oil produced from residues such as straw (lignocellulose) and algae oil as feedstocks for producing renewable fuels. Both of these materials have already been used to produce laboratory-scale batches of NExBTL renewable diesel.

Neste Oil works closely with a number of leading research institutes and companies in the renewable feedstock research field, and its R&D network includes a total of around 25 universities and research bodies in Finland and elsewhere.

Read more about the current range of renewable rawmaterial used by Neste Oil.

Read more about the sustainability of the renewable raw material supply chain.

Read more about the use of technical corn oil in Neste Oil.

### Research on renewable raw material


## Tall oil pitch introduced as a new renewable raw material

Neste Oil is the first company in the world to begin using tall oil pitch as a feedstock for refining into traffic fuel. Tall oil pitch was trialed successfully in commercial operations at the Naantali refinery in spring 2013 and it can now be used on a continuous basis.

Prior to the success of the trial, it had not been possible to use tall oil pitch, a residue produced by tall oil refiners, as a commercial-scale feedstock for fuel refining purposes. Finnish tall oil refiners produce around 100,000 tons of tall oil pitch residue annually.

Read more about the use tall oil pitch in Neste Oil.

## Microbial oil research continuing in the pilot plant

Neste Oil continued pilot plant-scale development of its microbial oil technology during 2013. A pilot plant was commissioned at Porvoo in 2012 to consolidate the company's current technology and enable it to be scaled up. The pilot stage will be followed by semi-commercialization to ensure the broader viability of the technology before full-scale commercialization. A decision to move to the next stage will be taken in fall 2014 at the earliest.

## Focusing on developing algae oil processing technology

A number of different algae oil samples were tested during 2013 to ensure their suitability for feedstock purposes.

Neste Oil and Cellana, an algae biomass developer based in the US, signed a contingent commercial off-take agreement in 2013 that will enable Neste Oil to purchase Cellana's algae oil for use as a feedstock in the future for producing renewable fuel. The agreement is contingent on Cellana's future production capacity and on compliance with future biofuel legislation in the EU and US.

Neste Oil is currently involved in university-led algae research projects in Australia and the Netherlands that are testing a range of methods for cultivating algae outdoors.

Read more about the co-operation between Neste Oil and Cellana.