

## Research, technology, and engineering

Expertise in research and technology represents one of Neste Oil's key success factors and plays a major role in the company's cleaner traffic strategy. Research concentrates on supporting Neste Oil's current businesses and strengthening the Group's potential for developing new businesses in the future.

**Neste Jacobs won a number of major contracts**

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**New raw materials in use**

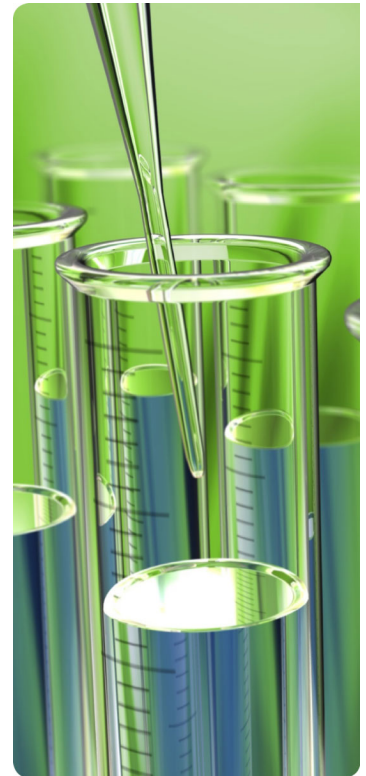
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**70%**  
of R&D expenditure went on renewable raw material research

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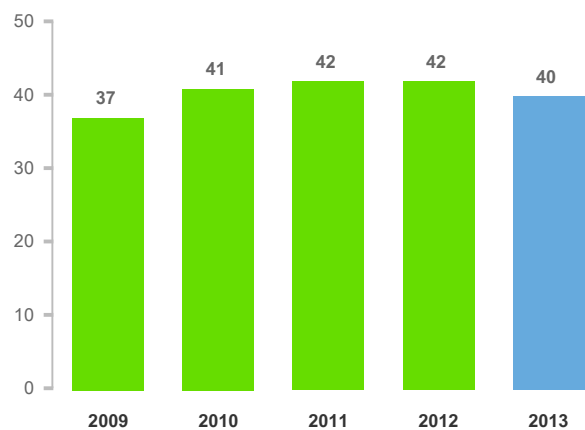
**Ongoing research on renewable feedstocks**

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What were our targets?	Achievements in 2013	What next?
Increase productivity by improving the performance of Diesel Line 4 at the Porvoo refinery and further develop NExBTL technology	<ul style="list-style-type: none"> <li>• Another new production record was set by Diesel Line 4 at Porvoo.</li> <li>• The NExBTL refineries in Singapore and Rotterdam operated at full capacity.</li> </ul>	<ul style="list-style-type: none"> <li>• Continue improving the operational performance of Diesel Line 4 at the Porvoo refinery and extend the range of feedstocks used at NExBTL facilities.</li> </ul>
Extend the feedstock base used in producing renewable fuels to provide greater flexibility	<ul style="list-style-type: none"> <li>• Technical corn oil, spent bleaching earth oil and tall oil pitch were added to the feedstock base.</li> <li>• The use of waste and residues increased and these materials accounted for 52% of the renewable raw materials.</li> <li>• Neste Oil and Raisioagro launched a research project to investigate the potential of straw as an input for producing renewable diesel.</li> <li>• Tall oil pitch was used at the TCC unit at the Naantali refinery.</li> </ul>	<ul style="list-style-type: none"> <li>• Increase the use of waste and residues in producing renewable fuels.</li> <li>• Continue developing pilot-scale microbial oil technology to enable a decision to be taken on moving to the semi-commercial phase.</li> <li>• Review different types of algae oil and sign partnership agreements.</li> <li>• Increase the use of tall oil pitch at the Naantali refinery.</li> </ul>
Develop new product technologies	<ul style="list-style-type: none"> <li>• New applications in areas such as heating, mining, solvents, and petrochemicals have been investigated to broaden the NExBTL product range.</li> </ul>	<ul style="list-style-type: none"> <li>• Continue developing new product technologies.</li> </ul>
Protect Neste Oil's immaterial property rights	<ul style="list-style-type: none"> <li>• Neste Oil acted to protect its IPR assets by filing patent infringement actions in the US, Finland, and Singapore.</li> </ul>	<ul style="list-style-type: none"> <li>• Continue protecting and defending Neste Oil's immaterial property rights.</li> </ul>
Develop strategic partnerships	<ul style="list-style-type: none"> <li>• Partnerships with numerous Finnish and international research organizations were developed.</li> <li>• Research partnerships focused on new, long-term feedstocks and enhancing production efficiency.</li> </ul>	<ul style="list-style-type: none"> <li>• Continue developing Neste Oil's network of partners, particularly in the area of new feedstocks.</li> </ul>

**R&D expenditure, EUR million**



Case: Developing straw as a new input for producing renewable fuel



## Straw as a raw material of renewable fuel



Microbial oil technology developed by Neste Oil enables straw to be used as a feedstock for producing renewable NExBTL diesel. Trials have been carried out using straw to produce microbial oil

production at Neste Oil's pilot plant at Porvoo and the results have been promising.

Large quantities of waste straw are produced as agricultural residue in Finland and elsewhere, and only a small proportion of this is currently used. The joint Neste Oil–Raisioagro project is looking at whether a logistically effective and efficient, large-scale straw harvesting chain could be created in Finland. The storability of straw for use as an industrial input year-round is also being investigated. Developments in technology and the growing size of today's farms, for example, together with the shift to more specialized farming methods, have improved the potential for making greater use of straw. The goal of the research project is to investigate the practical questions involved in collecting straw under different conditions, how efficiently it can be done, and various quality-related issues. The level of interest among farmers and contractors in making greater use of straw will also be studied.