

**GREEN POWER**  
**Feeds Your Engine**



**2<sup>nd</sup> VegOil**

# **Demonstration of 2<sup>nd</sup> Generation Vegetable Oil Fuels in Advanced Engines**

**Workpackage 3  
Fuel development**

**Deliverable N° 3.4:  
Report on optimised oil**

**Publishable summary**

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prepared by:

WALDLAND, VWP  
Hannes Blauensteiner (WALDLAND), Christine Schübl (WALDLAND),  
Thomas Kaiser (VWP), Stefan Innerhofer (VWP)

Oberwaltenreith 10  
A-3533 Friedersbach

Tel.: +43 2826-7443

Fax.: +43 2826-7443-500

Email: [hannes.blauensteiner@waldland.at](mailto:hannes.blauensteiner@waldland.at)

[christine.schuebl@waldland.at](mailto:christine.schuebl@waldland.at)

Partner website: [www.waldland.at](http://www.waldland.at)

Project website : [www.2ndVegOil.eu](http://www.2ndVegOil.eu)



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## 1 Summary

To reach 2<sup>nd</sup> generation vegetable oil quality with a lower content of the elements phosphorus (P), calcium (Ca) and magnesium (Mg), the production process of oil pressing has to be optimised.

A decentralised oil mill of Waldland VermarktungsgmbH, Austria, was used for experiments to modify the pressing process as well as the process materials. The target of the developing process was to achieve element contents of phosphorus, calcium and magnesium approaching < 3.5 ppm without using additives. Further optimisation of vegetable oil was possible by using additives, which have a positive influence on reducing P/Ca/Mg in oil, into vegetable oil quality with higher element contents of phosphorus, calcium and magnesium than 12 ppm, and optimised vegetable oil. The achieved optimised vegetable oil quality enables supplying the whole demonstration fleet in WP 5 and the experiments with hybrid engine in WP2.

The development of optimised vegetable oil was carried out in several experiments of oil pressing and laboratory analyses.

To reach optimised vegetable oil with content of each element P/Ca/Mg < 3.5 ppm for pressing experiments a decentralised oil mill of Waldland VermarktungsgesmbH in Austria was used. The oil mill was converted several times for production experiments. During five press experiments, each with different modifications of the oil mill, a production process was developed to produce advanced vegetable oil quality with each element P/Ca/Mg < 3.5 ppm without additives.

Ongoing the first milestone, the achieved vegetable oil quality was used for further optimisation, through implementation of additives. The additives surveyed on task 3.3 are applied for laboratory experiments. They were added into advanced oil quality with element content of P/Ca/Mg < 3.5 ppm, to find out the most efficient additive to purify vegetable oil off mucilages (phospholipids) and elements (calcium, magnesium). During the project work the additive OBEFIL was recommended by an oil producing company, to try clarifying vegetable oil. In this developing process outstanding characteristics of OBEFIL to purify vegetable oil were discovered. For further experiments this efficient additive was used in different oil qualities, different dosages, reacting times and oil filter types.

Finally, an innovative process was developed to produce advanced vegetable oil in decentralised oil mills with content of each element P/Ca/Mg < 1 ppm.

Fuel developing in task 3.4 could be concluded and advanced oil quality < 1 ppm, of each P/Ca/Mg is producible. Because of the rapid development of advanced vegetable oil quality, the whole demonstration fleet in WP5 and hybrid engine experiments WP2, as well as all demonstration engines with higher emission stages than 3A can be supplied.

This basis of fuel quality enables further development of the 2<sup>nd</sup> generation vegetable oil production process, to optimise the element contents of sodium (Na) and potassium (K) in oil as well as to reach higher oxidation stability as DIN standard. VWP and Waldland together found out, that these elements are also decisive for a faultless engine operation.