



REDIFUEL

Deliverable report

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Project management: Uniresearch (NL) (<http://www.uniresearch.com>)



Executive Summary

A process concept and design for an industrial-scale REDIFUEL plant (~50 MW) was developed and reported in this deliverable, including calculation of the mass balance for the reference scale plant and CAPEX/OPEX calculation. The Inside Battery Limits (ISBL) for the process design included feedstock handling, gasification, gas cleaning, FT synthesis, FT product separation and hydroformylation. The Outside Battery Limits (OSBL) were estimated. The capital and operating costs of the total ISBL process were calculated. The starting data was collected from partners VTT, INERATEC and MPI. The total plant CAPEX was estimated at 242 M€. OPEX was calculated based on utility consumptions and amounted to 18 M€/a. The accuracy is order of magnitude.

The overall output of the final REDIFUEL alcohol/diesel blend from the plant is low, 3.3 kt/a. This originates from the low overall CO conversion content achieved in the FT section. With current catalysts developed during REDIFUEL the C5-C10 olefin selectivity drops by 25-40% when CO conversion per pass is increased from 20% to 50%. Thus, there is trade-off between CO conversion and olefin selectivity. A considerable part of the produced syngas goes to off-gas and is combusted to produce heat. With the current CO conversion level and olefin selectivity obtained with the FT catalyst developed in the project, also the alcohol production rate in the hydroformylation section (0.12 t/h) remains low due to inefficient separation of alcohols from paraffins in the distillation step.

When all hydrocarbon by-products and the REDIFUEL blend are considered, the total production of biofuels at the REDIFUEL plant is 15.3 kt/a. The original aim was to produce 10-30 kt/a of REDIFUEL blend at the 20-50 MW plant. While the overall production rate of biofuels is within the targeted range, the yield of REDIFUEL alcohol/diesel mixture is below the target level. This shows that the plant is not optimized for producing REDIFUEL mixture, rather, the amount of by-products is high. The major product generated at the plant is petrol, 5.9 kt/a. The diesel fraction derived from FT syncrude that does not contain oxygenates is produced at a rate of 4 kt/a. The diesel fraction remains after the REDIFUEL mixture is prepared by blending diesel with alcohols in fixed proportion (30% alcohols, 70% diesel).



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Project partners:

- 1 - FEV – FEV EUROPE GMBH - DE
- 2 - MPI – MAX-PLANCK-GESELLSCHAFT ZUR FORDERUNG DER WISSENSCHAFTENEV - DE
- 3 - CSIC – AGENCIA ESTATAL CONSEJO SUPERIOR DE INVESTIGACIONES CIENTIFICAS - ES
- 4 - VTT – Teknologian tutkimuskeskus VTT Oy - FI
- 5 - RWTH – RHEINISCH-WESTFAELISCHE TECHNISCHE HOCHSCHULE AACHEN - DE
- 6 - OWI – OWI Science for Fuels gGmbH - DE
- 7 - VUB – VRIJE UNIVERSITEIT BRUSSEL- BE
- 8 - NESTE – NESTE OYJ – FI
- 9 – MOL - MOL HUNGARIAN OIL AND GAS PLC - HU
- 10 – INER - INERATEC GMBH - DE
- 11 – T4F - TEC4FUELS - DE
- 12 – UNR - UNIRESEARCH BV - NL

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