2\textsuperscript{nd} VegOil

Demonstration of 2\textsuperscript{nd} Generation Vegetable Oil Fuels in Advanced Engines

Workpackage 2
Engine development

Deliverable N° 2.2:
Test stand

Publishable summary

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1 Engine

For the 2\textsuperscript{nd} VegOil project a certain range of tractor models was selected for the fleet demonstration. These models are the 6830 Premium, 6930 Premium, 7430 Premium and 7530 Premium tractors of John Deere. Those models are powered by the 6068 PowerTech Plus Stage 3A engine at different power levels. The 6830 Premium and 6930 Premium tractors have got the CD6068HL481 engine and the 7430 Premium and 7530 Premium the CD6068HL482. Those two engine models differ for example in the stability of the crankshaft, but not in major technological properties like air or fuel system. The different power levels are implemented by different ECU software versions. Those tractor models were selected as they are the largest and most powerful tractors produced at the John Deere Werke Mannheim (JDWM). After evaluation of the market demand it is clear that mostly owners of large tractors with numerous operating hours demand a plant oil powered tractor. In that case the highest saving potential is achieved and the investment in the engine technology is profitable.

For the test stands the CD6068HL481 was selected. This engine is installed in eight of 14 tractors of the fleet demonstration. Also, if there are any problems with plant oil operation they are expected to be more considerable with the CD6068HL481 than with the stronger engine (CD6068HL482).

Figure 1 and Figure 2 show the John Deere PowerTech Plus 6068 engine which has been converted for rapeseed oil operation and installed on the test stand. In addition, a diesel particle filter (DPF) has been mounted.
Figure 1: John Deere PowerTech Plus 6068 Stage 3A engine in test stand from front left side.

Figure 2: John Deere 6068 PowerTech Plus Stage 3A engine in test stand from front right side.
2 Measuring points

In order to understand the behavior of the engine during tests and to ensure a safe engine run, several engine data have been measured. The most important parameters are:

- Temperatures and pressures:
  - Engine coolant water
  - Engine oil
  - Intake air
  - Exhaust gas
  - Fuel
- Engine speed
- Torque
- Air mass
- Fuel mass
- Fuel to air ratio
- Cylinder pressures

In order to check if the converted engine complies with the EU Stage 3A emission standard, the following emissions have been measured:

- Hydrocarbons (HC)
- Carbon monoxide (CO)
- Nitrogen oxides (NO\textsubscript{x})
- Particulate matters (mass, smoke number, size)

3 Diesel particulate filter (DPF)

For understanding the difference of DPF loading and regeneration behavior between diesel and vegetable oils during operation, a retrofit DPF from Airmeeex has been mounted. This exhaust aftertreatment system has a passive regeneration with a fuel born additive (Figure 3).
Figure 3: Exhaust aftertreatment system from Airmeeex.