

Field Test of 20 Rapeseed Oil Fuelled Tractors

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Rapeseed oil as fuel for tractors...

- saves up to 91 % greenhouse gases compared to diesel
- is sustainable (2009/28/EC)
- is standardized (DIN 51605)
- secures protein feed supply
- supports regional agriculture and jobs
- protects water and soil in case of leakages

Aim

Research & demonstration of sustainable propulsion technology in agriculture by use of locally produced rapeseed oil fuel



Figure: Rapeseed oil fuelled tractors Deutz-Fahr Agrotron TTV 1160 and John Deere 6125R

Field test on farms

- 20 rapeseed oil fuelled tractors of exhaust gas stages from I to IV
- Practical evaluation of maintenance, reliability and wear

Tractor test stand

- Power take-off performance and exhaust gas emissions
- Testing of catalysts and filters of the exhaust after-treatment (EAT)

PEMS - Portable emission measurement system

- Investigation of real emissions in field
- Comparison of emissions between test stand and real driving

Rapeseed oil fuelled tractors	Emission Stage	Power in kW
Fendt Farmer Vario 412	I	94
Deutz-Fahr Agrotron TTV 1160	II	119
Fendt 820 Vario ^{greentec}	IIIA	152
Fendt 820 Vario ^{greentec}	IIIA	152
John Deere 6930	IIIA	134
John Deere 6630	IIIA	96
John Deere 7830	IIIA	173
John Deere 6930	IIIA	134
Deutz-Fahr Agrotron 650 M	IIIA	136
John Deere 6630	IIIA	96
John Deere 6210R	IIIB	154
Fendt Vario 718 SCR	IIIB	133
John Deere 6125R	IIIB	92
John Deere 6125R	IIIB	92
John Deere 6115R	IIIB	85
John Deere 6100RC	IIIB	74
John Deere 5080R	IIIB	66
John Deere 6210R	IIIB	154
John Deere 6215R	IV	159
Fendt Vario 724 S4	IV	174

Emission analyzers after EAT

FTIR (AVL SESAM)
PM dilution tunnel
Particle Analyzer (DMS500)

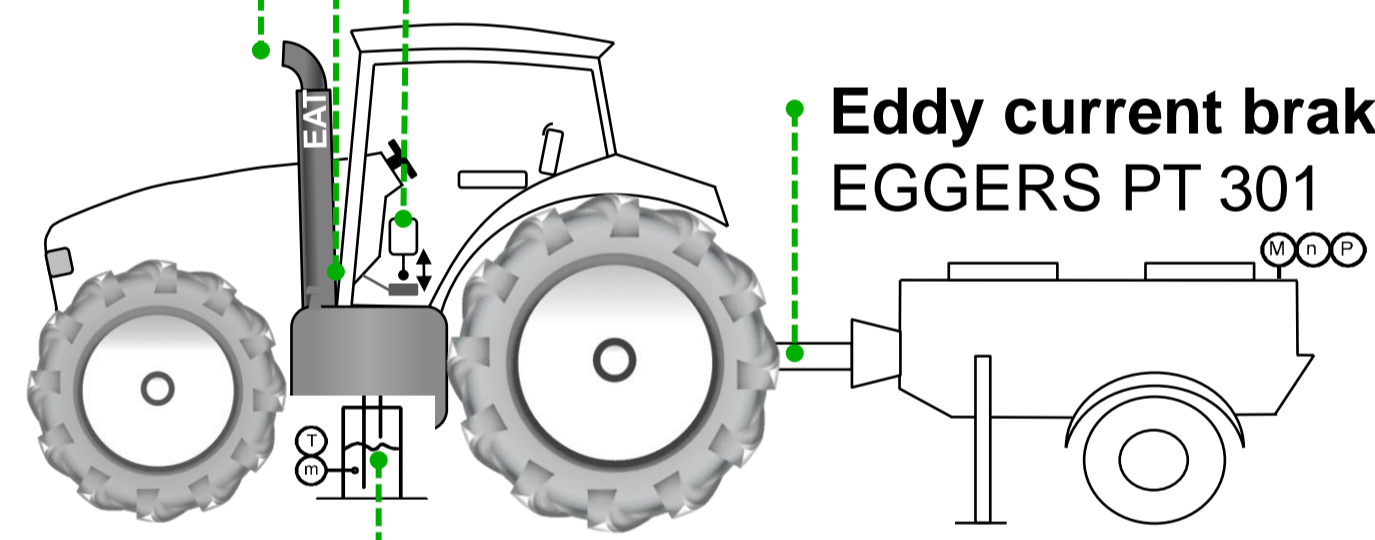
Emission analyzers before EAT

FID (M&A ThermoFID)
NDIR (ABB AO 2020)
CLD (EcoPhysics CLD 822 Mhr)

Gas pedal regulator
RACO K6E4-105

Eddy current brake
EGGERS PT 301

Fuel und urea balances
Mettler-Toledo KB60.2
Mettler-Toledo KB30.2



Semtech Ecostar PEMS (Sensors Inc.)

Recorded parameters & analysers:

- Exhaust gas mass flow (Pitot pipe)
- NO and NO₂ - NDUV
- CO and CO₂ - NDIR
- THC and methane - FID
- Particle mass or number analyser
- Operation data (CAN) and Position
- Ambient conditions

Results

- Reliable operation of 20 tractors over 60,000 h with rapeseed oil fuel in practice
- Maintenance intervals of modern rapeseed oil compatible tractors as for diesel tractors
- Same engine efficiency during test stand runs with rapeseed oil and diesel fuel
- High long-term emission reduction efficiency of catalysts and particulate filters
- Exhaust emission limits are met in the field and on the test stand

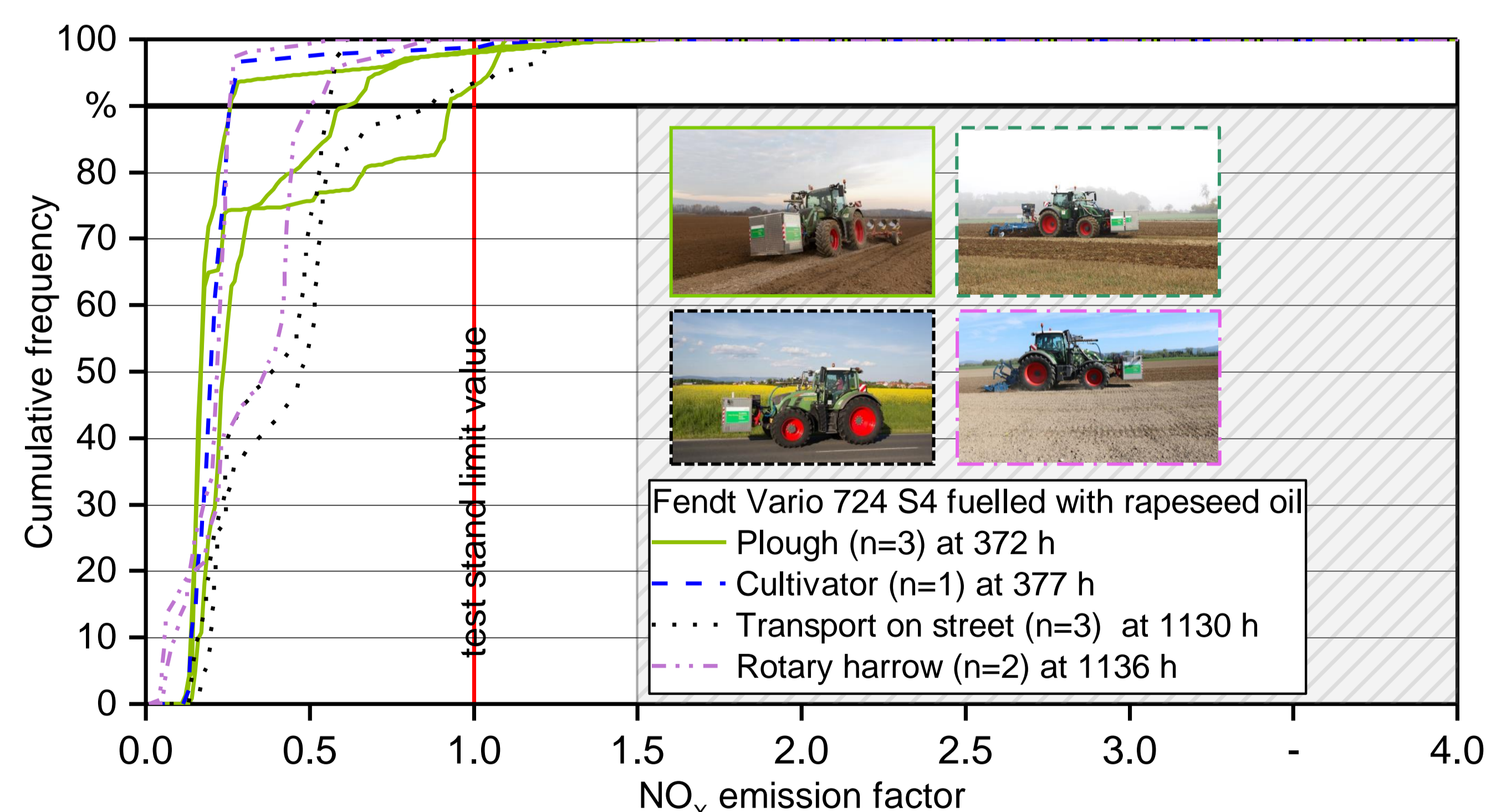


Figure: Rapeseed oil fuelled tractor of the stage IV emits during field work over 92 % less NO_x compared to test stand limit value (factor of 1.0)

