IT and Automation to reduce Energy Consumption

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European Technology Innovation Center
March 13th, 2013
CO₂ Saving Potentials
Agenda

- **Engine / Transmission Controls**
- Pure Plant Oil Tractor
- Auxiliary Drive Control
- GPS / Autotrac
- TIM
- Telematics
- Electrification
Engine / Transmission Management

Fuel Map Optimization

AutoPowr
Engine / Transmission Management

electronically “shift up throttle down”

8% CO₂ reduction
In PowerMix

5-10% CO₂ reduction
In light duty application
DirectDrive® Transmission

• First patent in 1940 by Prof. Franke
• First commercial usage in 2003 by VW
Electromagnetic Shift Actuator

- Shift finger
- Shift rod
- Neutral spring
- Bobbin with Coils
- Armature
- Shift fork
- Yoke
Actuation Current Profile

- Shifting current
- Holding current
- Synchronisation phase
- Gear engagement
- Gear engaged

**6-8% CO₂ reduction**
In transport application vs. AutoPowr

Movement to synchron point
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6R Multifuel Tractor

SIMA Innovation Awards Gold 2013

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Technical Requirements for Multifuel

- Multi-Fuel Software
- Cold Start Device
- Fuel Sensor
- One Tank

Power decrease with bio-fuels due to lower heating value

Power compensation by software and software switch by fuel sensor.

1200 l/ha +
~ 2000kg colza cake
CO₂ Reduction according to Directive 2009/28/EC

Default reduction values:

- pure rape seed oil 57%
- rape seed biodiesel 38%
- sunflower biodiesel 51%
- soybean biodiesel 31%
- palm oil biodiesel 19% (process not specified)
- palm oil biodiesel 56% (process with methane capture at oil mill)
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• **Auxiliary Drive Control**
  • GPS / Autotrac
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Electronically Controlled Auxiliary Drives

Vistronic

- Air brake compressor w/ electronically actuated clutch
  - 2% less CO₂
  - In PowerMix

Charge air cooler in distributed cooling system

- 4% less CO₂
- Avg. annual

AC compressor usage w/ electronically actuated clutch dependent on trailer usage

- 0.5% less CO₂
- Avg. annual
- Switched off

In PowerMix

- 4% less CO₂
- Avg. annual

Avg. annual

- 0.5% less CO₂

Avg. annual

0.5% less CO₂

Switched off
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GPS / AutoTrac

• Precision with AutoTrac
  – SF1: +/- 23cm
  – SF2: +/- 5 cm
  – RTK: +/- 2.5cm

3-10% CO₂ reduction
By avoiding overlap
iTec Pro

• Automated headland turns
• Cycle time reduction at headland ~30%

2% CO$_2$ reduction
On a 10ha field during seeding.
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Tractor Implement Management (TIM)

Automated
• Deceleration
• Wrapping
• Ejecting
• Gate opening & closing

→ Ball cycle reduction from 45 to 42 sec.

6% CO₂ reduction
Due to cycle time reduction

Operator Fatigue

Working time

sec.

45

42

manual

automated
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Telematics - JDLink

- Since 2011, all large tractors are connected through JDLink
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Efficiency Improvement

• Fertilizer spreader ~ 4kW
• Tractor Hydraulic Pump ~ 2kW
• rpm reduction ~?

>4% CO₂ reduction
During fertilizing

Faster controllability and mass flow calibration enables further significant potential on CO₂ reduction
CO₂ Saving Potentials

In Summary
- Ag technology has reduced CO₂ emission
- No silver bullet technology
- Follow automotive technologies
- Data will drive new designs & technologies
- All in support for our European CO₂ strategy