Position Paper

Anti-lock Braking for Agricultural Tractors

EUROPEAN ASSOCIATION OF AUTOMOTIVE SUPPLIERS
CLEPA

Prepared for the European Commission Expert Working Group Agricultural Tractors
August 9th, 2013
Facts about CLEPA

Founded in 1959

Represents 103 corporate members of the world’s most prominent suppliers for motor vehicles parts, systems and modules

25 National trade and European sector associations representing more than 3000 member companies

more than 5 million employees

€15bn invested by suppliers p.a. for RDI

with 600 billion EUR sales

Partner of the EU and the UN

Association Partner: MEMA
Tractors are the #1 initiating vehicle of the accident

- 62% of accidents with agricultural tractors involvement are caused by the tractor
- 92% of accidents involving agricultural tractors take place on public roads
- While the driver of the tractor is quite safe in the cabin (5%), the other party will suffer disproportionately (95%)
- 3x more people per accident are being killed in road accidents involving tractors than in all road accidents

Initiator of accident where vehicle class was involved
(Germany, Destatis 2008)

Persons killed or seriously injured (in accidents caused by tractors in #, Germany, Destatis 2011)
New agricultural tractor applications demand new requirements for safety systems

- Agricultural tractors significantly extended its scope of application, e.g. increased transportation of goods (e.g. to biomass power plants), winter service, highway maintenance, construction.

- Thus, both on-road operations (public roads), speed and weight significantly increased in the last decades. However, safety systems remained nearly unchanged over several decades.

- The trend that end users demand for larger engines and thus, a higher speed capability of >40km/h is noticeable in the registration statistics and is expected to continue.
Only government action can increase the road safety of vulnerable road users

<table>
<thead>
<tr>
<th>Year</th>
<th>Speed</th>
<th>Deceleration</th>
<th>Braking Distance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1980</td>
<td>25 km/h</td>
<td>2.4 m/s²</td>
<td>10 m</td>
</tr>
<tr>
<td>1998</td>
<td>40 km/h</td>
<td>3.1 m/s²</td>
<td>20 m</td>
</tr>
<tr>
<td>2016</td>
<td>60 km/h</td>
<td>5 m/s²</td>
<td>27 m</td>
</tr>
</tbody>
</table>

Lack of Safety Systems

- 90% of people inside the tractor survive the accident without any injuries, while only 22% of the other party does.

Improved deceleration requirements have not kept pace with increasing speed. ABS provides a possibility to compensate for the increased braking distance through steerability.

While most road users significantly benefit from purchasing safety systems like ABS, agricultural tractor users only benefit slightly – if at all (less likelihood of (serious) injuries).

Thus, only government action (mandated compulsory fitment) can increase road safety of vulnerable road users.

1 without reaction time
ABS supports the driver to control the vehicle in critical situations for low add-on costs

What is an anti-lock braking system?

- A safety system supporting the driver during driver initiated braking
- A system preventing the wheel from locking in order to:
  - maintain steerability
  - maintain stability (incl. tractor/trailer combinations)
  - reduce stopping distance in most situations

What are the costs of an anti-lock braking system?

- Less than 0.5% of AT sales price add-on component costs for OEMs comprising:
  1. 4 x Wheel speed sensors
  2. 1 x Anti-lock braking electronic control
  3. 1 x Brake actuator for rear axle (integrated in the ECU mentioned before)
  4. 1 x Brake actuator for front axle

Anti-lock braking platform lays the foundation for implementing further safety systems
Reliable ABS systems available since the 1970’s.
A mature technology

Development of requirements with regard to vehicle stability

- Electronic stability control (EC) 661/2009
- ABS – compulsory fitment 88/194/EEC
- ABS – technical requirements 85/647/EEC
- Motor vehicle/trailer braking compatibility 75/524/EEC **
- Distribution of braking effort among axles 74/132/EEC *

Braking Directive 71/320/EEC


today

over 25 years

* Not applicable if fitted with ABS
** Only applicable laden if fitted with ABS

Anti-lock braking mandatory for over 25 years, except for agricultural tractors
Tractor and heavy-duty truck have comparable kinetic energy but non-comparable safety req.

<table>
<thead>
<tr>
<th>Picture</th>
<th>Fendt 900 Vario</th>
<th>Iveco Trakker 190T35 4X4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vehicle class</td>
<td>Agricultural vehicle</td>
<td>Commercial vehicle</td>
</tr>
<tr>
<td>Max. permissible mass</td>
<td>16t</td>
<td>18t</td>
</tr>
<tr>
<td>Kinetic energy</td>
<td>City: 1.543,2kJ</td>
<td>City: 1.736,1kJ</td>
</tr>
<tr>
<td></td>
<td>On-road: 2.222,2kJ</td>
<td>On-road: 2.500,0kJ</td>
</tr>
<tr>
<td>ABS mandatory</td>
<td>(mandation to be defined)</td>
<td>(since 1989)</td>
</tr>
</tbody>
</table>

Despite **comparable mass, speed and kinetic energy, safety system requirements significantly differ** between comparable vehicle classes (commercial and agricultural vehicles).

Comparable vehicles should have equivalent safety requirements

- **Type-approval “framework” directive 2003/37/EC**
  Anti-lock braking, according to 71/320/EEC, is already required on tractors with a maximum speed greater than 40km/h (T5)

- **Type-approval “framework” regulation (EU) 167/2013**
  “Vehicles with a maximum design speed of >40km/h meet an equivalent level of functional safety with regard to brake performance and, where appropriate, anti-lock braking systems as motor vehicles and their trailers.”

All vehicles with a maximum design speed more than 40km/h
- equivalent brake performance as motor vehicles and their trailers
- anti-lock braking systems, where appropriate

“where appropriate” is only applicable to the vehicle category, not the maximum design speed!

**Anti-lock braking provides the same level of safety for vehicles having maximum speed capabilities >40km/h**
Implementation of ABS led to a decrease of accidents by 24% on non-high-speed roads

What do USA studies\(^1\) say?

- On non-high-speed roads that are also used by agricultural tractors, a **significant reduction of accidents for vehicles with ABS** was reported in a 2010 study for heavy-duty trucks.
- Significant reduction of accidents by 24% on non-high-speed roads due to the implementation of ABS.

Based on a **comparable kinetic energy level as well as speed**, this should also be applicable on agricultural tractors.

**Reduction by type of accident:**

- Fatal run-off-road overturn accidents: 27%
- Fatal run-off-road other accidents: 14%
- Accidents involving the hitting of animals, pedestrians or cyclists: 19%

Source: \(^1\) NHTSA (2010): The Effectiveness of ABS in Heavy Truck Tractors and Trailers

**Similar accident reduction can be expected for agricultural tractors.**
Only government action can increase the road safety of vulnerable road users

Tractors are the #1 initiating vehicle of the accident (62%). 92% of these accidents take place on public roads. The death rate per accident is 3x higher than accidents involving all types of vehicles. 95% of those killed or seriously injured are vulnerable road users.

Comparable vehicle classes (commercial and agricultural vehicles) should have equivalent safety requirements (ABS).

24% reduction of accidents on non-high-speed roads as a result of the introduction of ABS.

However the owner/driver of the agricultural tractor has no incentive to purchase ABS.

Only the mandation of ABS >40km/h will improve road safety.
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