Applying Innovations in Advanced Driver-Assistance Systems to Material Handling

Presented by:

Alexander Glasmacher
Managing Director
The ELOKON Group

- German company, founded 1986, 130 employees
- Developer & distributor of “Industry 4.0” solutions
- Leading global supplier of lift truck safety systems
- Strong partnerships with all major lift truck OEMs
- History of innovation, service, customer-first focus
- 3,000+ customers in 40 countries (new to U.S. market)
- Speaker: Alexander Glasmacher, Managing Director; Stanford University; 20+ years of experience in material handling with both U.S. and European companies

3,000+ Customers
40 Countries
1986 Established
130 Employees
ELOKON innovative electronic safety systems for the material handling industry

Increase VNA Safety

Very Narrow Aisle (VNA) safety system

Improve MHE Productivity

Material Handling Equipment (MHE) control systems for safety & productivity

ELOprotect
Mobile Personnel Safety System

ELOSpeed
Indoor/Outdoor Speed Control

ELOshield
MHE Proximity Detection

ELOfleet
Fleet Management System
Seminar content

Use of assistance systems

• Structure and function of driver assistance systems
• Use in the automotive industry
• Increased acceptance in material handling – how to make it happen

Trends in R&D and New Products

• Assistance systems and autonomous driving?
• Conclusion: assistance systems in the material handling industry
Assistance systems and their functions

- Electronic auxiliary devices on the vehicle
- Improved safety, comfort and ergonomics
- Provide optical, acoustic and tactile warnings
  - Before or during critical driving situations
- Autonomous or semi-autonomous control of the drive, steering or signalling functions
  - Alerts to prevent accidents to humans or vehicles
  - Active intervention to prevent unsafe driving situations
- The responsibility rests with the driver

Source: FEV Europe GmbH
Technical diversity of environment sensors

- **Forklift environment sensors**
  - Acoustic
    - Ultrasound
      - Mono
      - Stereo
      - 3D
  - Optical
    - Video
    - Lidar
    - Laser
    - Infrared
  - **Electromagnetic**
    - Radar
      - Short Range
    - RFID
      - Passive
      - Active
    - Car-2-X
      - 802.11p
    - RFID
      - Passive
      - Active
    - Car-2-X
      - 802.11p

Source: http://www.cbcity.de/fahrzeugumfeldsensorik-ueberblick-und-vergleich-zwischen-lidar-radar-video
**Assistance systems in the context of material handling**

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<tr>
<th><strong>Germany</strong></th>
<th><strong>Great Britain</strong></th>
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<tr>
<td>- Driver error and insufficient safety awareness are frequent causes of serious or fatal accidents involving forklifts</td>
<td>- “Five workers seriously injured or killed in incidents involving forklifts every weekday”</td>
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<td>- 40,000 accidents every year in Germany during internal transportation</td>
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<td>- 3,600 – 3,700 of these are accidents with forklifts</td>
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<td>- In 2014, 490 of these were serious, six were fatal</td>
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**USA**

- “20,000 workers are seriously injured in forklift related accidents every year in the U.S.A.”
- “100 workers are killed in forklift related accidents every year in the United States”

* Source: BGHW aktuell 3/2016
Well documented value of driver assistance systems in the automotive industry

**Emergency braking assistant:** 28% fewer **collisions** resulting in personal injuries
(Studie der Unfallforschung der Versicherer, GDV, 2009)

**Distance control:** 17% fewer **serious accidents** resulting in personal injuries
(Bericht der Bundesanstalt für Straßenwesen, BASt Reihe Fahrzeugtechnik, Heft F60, 2006)

**Lane assistance:** 49% fewer **HGV accidents** when changing lanes on motorways
(Allianz Zentrum für Technik, AZT Wirkungspotentiale von ACC und Lane Guard System bei Nutzfahrzeugen, 2006)

**Road sign recognition:** 60% fewer **traffic offences** due to excessive speed
(Kraftfahrt-Bundesamt, KBA Verkehrsauffälligkeiten, 2007)

**Parking assistant:** 30% of insurance claims are a result of **parking manoeuvres**
(Allianz Zentrum für Technik, AZT 2008)
Prevalence of driver assistance systems: increase in Ø value per automobile*

1. 2003 > 2015 increase of ca. 30% p.a.
2. Anti-blocking systems, braking assistance, tyre pressure systems, distance controls, high beam assistant
3. Customer survey -> vehicle safety in 1st place
4. Demographic shift
5. Key drivers: mandatory introduction, standardisation & technical monitoring
   1. Installation, authenticity and functionality

Key drivers for growth of driver assistance systems in the material handling industry

- VDI – Technical committee, forklift trucks
- Conferences of professional health and safety associations
- EU maschine directive 2006/42/EG
- Systematic development/broadening of equipment specifications
- International adoption of national mandatory measures
  - Example: German regulation for the protection of workers in very narrow aisles operating environments
  - DIN 15185 Part 2
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Trends in R&D and new products

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R&D trends in the automotive industry of driver assistance systems

1. Continual improvement of the current, sensor based applications
2. Use of car-to-car communication
3. Use of car-to-infrastructure communication

Quelle: http://citycollision.ca
Assistance systems: Research and development

Important topics for ongoing development

• Improved performance of sensors
• Phase out varying sensor technologies and introduce subsequent data fusion
• Optimisation of control algorithms
• Technical integration of hardware and software across multiple components
• Miniaturisation of sensors, control units and actuators
• More context sensitive intervention, warnings and notifications
Co-operative systems: of high importance in material handling vehicle solutions

- Systems whereby vehicles communicate with each other in real time

**Advantages**
- More efficient use of the road network
- Improved road traffic safety

**Examples**
- Intersection and turning assistants identify vehicles on a collision course
- Local hazard alerts in real time prevent accidents and improve traffic flow

Source: https://www.car-2-car.org/
Ever more important: man-to-machine interfacing
What can we learn from the automotive industry?

Why?
• Distractions caused by assistance systems must be minimised
• Inappropriate use can have a negative impact on driving
• Operation and alerts should have minimal effect on the driver
• Car radio operation

Solutions:
• Introduction of touch sensitive screens
• Reduction in the number of specific operational controls
• Development of intuitive visual, acoustic and tactile responses
• Integration of mobile terminal devices
What will autonomous driving trends bring for material handling vehicle solutions?

Current focus is on the development of, for example:

• Dynamic environmental modelling with 360° data capture
• Behavioural prediction of pedestrians, cyclists and motorcycles
• Automatic collision avoidance
• Fully integrated lane guidance across all speed ranges
• Narrow lane assistance, e.g. through roadworks

Supplier <> OEMS = innovative products & solutions
Conclusion for the future of assistance systems in the material handling industry

- Assistance systems = **enhanced status** = faster prevalence
- Suppliers = **proof of advantages**
- **More intensive collaboration** for faster adoption – also on an international level
- Exploit **trends in R&D** from the automotive industry
- **Co-operative systems** = high level of development potential
Thank You!

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