Ullrich Hoppe and Henning J. Meyer, Berlin

Causes of Tractor Accidents

Increasing stress and higher travelling speeds pose an increased risk of accidents with agricultural tractors. In the following the development of accident statistics in Europe is presented, the causes of accidents identified and recommendations for avoiding accidents in the future are given.

Due to the increasing competition in agriculture, there is the necessity of more effectively using resources. This can be done by increasing the level of mechanisation and the work pace at the same time. In agricultural work it is mainly the transport tasks that serve to save time by effecting higher driving speeds of the agricultural vehicles (AV). This leads to a considerable pressure regarding time and human work which, together with the constantly increasing maximum speeds of agricultural vehicles, causes a serious risk of accidents.

Due to their relatively small percentage in the overall traffic accidents number, there has only been done little research work on the subject of „accidents with agricultural vehicles". However, there are often very serious results from such accidents, so that engineers are more and more concerned about reducing the number of accidents by focussing safety aspects in tractor construction.

It has been the subject of a research work [1] done in the TU Berlin area of „Konstruktion von Maschinensystemen" to reveal the number of accidents with agricultural vehicles in Europe, to identify their causes and to point out the results of these accidents in order to find out how to avoid them in future. The central data bank of CARE (Community database on Accidents on the Roads in Europe) [2], established by the transport branch of the EU authorities, is the main source delivering information on the accident situation. In 1993, the EU set up the guideline 93/704/EC [3] to found CARE which is to represent a basis for accident data. CARE exclusively registers data about accidents with injuries to persons. Additional information can be received from statistical offices, professional associations, regional authorities as well as from individual surveys.

Accidents number development

Accidents in Germany

Figure 1 shows the development of the numbers of accidents and injuries in Germany from 1992 to 2002. There is a uniform and regular course of the number of accidents with agricultural vehicles and that of the resulting consequences (number of injured persons). In both cases there is a variation of less than 10 %. The development does not show a definite trend although there has been a slight decline since the year 2000.

A more detailed consideration of the varieties of injuries shows that there is a declining number of seriously injured persons (in 1992: 1056, in 2002: 834) but a stagnating number of slightly injured persons and deaths. From 1992 to 2002, the overall number of deaths slightly decreased from 115 to 104. The percentage of agricultural vehicles passengers remained the same with 25 % in these years. When considering a longer term, the number of agricultural vehicles passengers killed in accidents has halved. Furthermore we can see that the majority of injuries to persons (more than 60 %) happens out of town.

Dipl.-Ing. Ullrich Hoppe studied vehicle technology at the TU Berlin and has been working as a scientific employee since 2000 in the institute for agricultural machinery and oil hydraulics, since 2002 at the newly-created branch of machinery system design (Head: Prof. Dr.-Ing. Henning J. Meyer), Zoppoter Str. 35, 14199 Berlin. He has concentrated on tractor suspension and multiple body simulation since 1999; e-mail: *Ullrich.Hoppe@tu-berlin.de*.

Keywords

Tractors, tractor accidents, safety, accident, causes of accidents, road casualties, break, ride dynamic

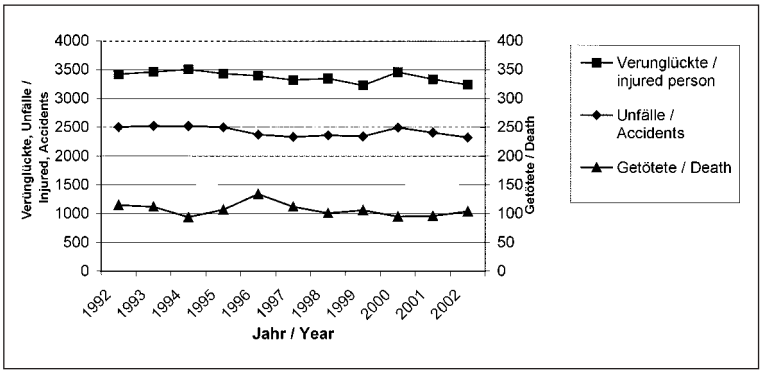

Fig. 1: Development of accidents and injured persons with participation of agricultural vehicles in Germany

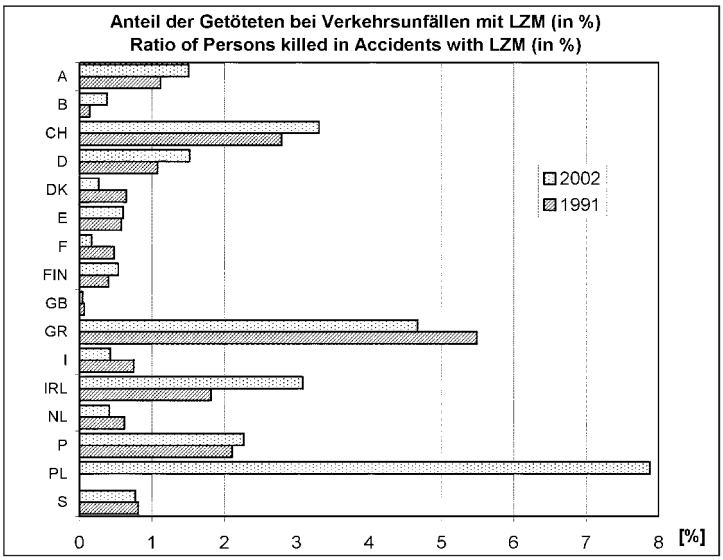

Fig. 2: Comparing the ratio of accidents with participation of agricultural vehicles in Europe (partly no recent figures are available, for Poland e.g. no figures exist for 1991)

Development in Europe

There is only partial data material from the other European countries - above all, there is almost no useful material from those states that did not join the EU during the considered period of time. It is just from Poland and Switzerland that we do have numbers which again confirm the general tendencies. Considering the fleet development, all European countries show a clear decline of the accident numbers with constantly large numbers of killed and seriously injured persons at the same time. A good comparability is achieved by relating the number of agricultural vehicle accident deaths to the overall number of accident deaths in some European countries (*Fig. 2*). As is shown in the figure, the percentage of persons killed in agricultural vehicle accidents has remained almost the same or has slightly increased whereas there has been a considerable decline of the overall number of persons killed in traffic accidents (by 30 % on average). The statistics do not contain a large estimated number of accidents happening on non-public roads. In most cases these are categorised as industrial accidents, and their percentage is about 30 %. There are varying agricultural vehicle fleets in the examined countries.

In any case of accidents with injuries to persons, the accident causes are also examined in Germany [4]. About 13 % to 15 % of all agricultural vehicles involved in accidents show technical defects. It is not possible to definitely state whether these defects have caused the accidents. 8 % of all accidents are due to high speeds, and the majority (more than 50%) of accidents are caused by wrong turning or ignored priority (*Fig. 3*).

In collisions of two vehicles, agricultural vehicle drivers are bearing the main blame (with 61 % altogether) in as well as out of town within the researched period.

Results

Every road user is responsible for avoiding traffic accidents or to minimise their consequences. Therefore, it basically is possible for any involved person to take preventing measures to minimise the number of accidents. These measures can be effective e.g. by using driver assistant systems or attending driving courses. However, it will depend on the road usersí willingness whether those systems are applied or whether a driving safety course will be attended.

From the vehicle driverís point of view, the benefit ratio of the technical solutions will be decisive for their marketability with new agricultural vehicle development. Although there has been an enormous technological push in the field of conventional tractor construction over the last 20 years, it is a fact that nearly all development aims are closely related to an increasing efficiency of the agricultural vehicles product, facing an improved work function.

It is true that the safety demands have been fulfilled by keeping in line with the legal requirements. But since the driver's cabin was set as a standard in tractor construction, there has never again been a comparable safety issue to be utilised as an advantage in customer competition. Measures designed to increase traffic safety will more or less affect the vehiclesí conception. There are solutions such as improved vehicle lights that show positive consequences, not being cost-intensive. However, driver assistant systems influencing the ride dynamics (electronic stability program, antiskid system, break assistant, electronic chassis management etc.) often have a considerable impact on the tractor concept, thus causing high costs.

Literature

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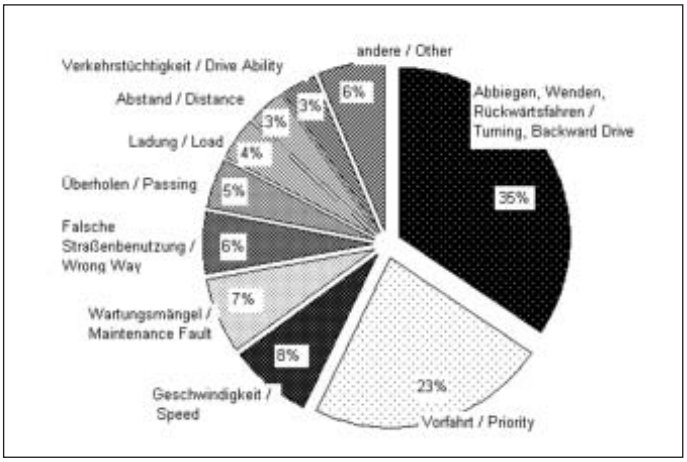

Fig. 3: Causes of traffic accidents with participation of agricultural vehicles [5]