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Trends in Plant Protection Technology

In this contribution, important trends in plant protection technology are presented which will manifest themselves in the machinery- and implement programme shown at the Agritechnica 2003. This preview only provides pre-information and cannot replace a trade fair visit. Completeness is not aimed for.

It is undisputed that in the future farmers must continue to be provided with sufficient possibilities of controlling pest organisms and non-parasitic damage to the plants in order to sustainably secure plant protection. The protection of the health of people and animals as well as the maintaining of natural balance, i.e. the lowest possible risk in the application of plant protection products, are goals of equal priority.

After the introduction of mandatory sprayer inspection, the market for plant protection implements has settled down at approximately 3,500 tractor-operated units (including self-propelled machines), which corresponds to a cost volume of approximately €50 million. At approximately 2,800 units, boom sprayers account for ~ 80% of the unit numbers (mounted implements: 64%; drawn implements: 35%; self-propelled machines: 1%).

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Keywords

Trends of development, plant protection technology, sprayers and atomisers

Development Tendencies in Detail

With regard to the number of units sold, mounted sprayers are still occupying first place. The mounting and dismounting of these sprayers is becoming more and more unproblematic because they are equipped with parking rests, rollers, etc. and generally provide sufficient space between the sprayer and the tractor or feature a quick coupling triangle. The operating terminal is designed such that it either remains on the implement or enables the unit to be remote-controlled from the closed cab. Given their working width (up to 27 m) and tank capacity (up to 1,500 l), mounted sprayers reach a size which often requires additional front-balancing on the tractors generally used in order to meet the road traffic regulations when the tank is filled. The tanks feature a compact design and are optimized with regard to residual quantities. In addition, they have internal cleaning systems as well as a smooth internal surface and are optimally equipped with a clear water tank and a detergent dispenser, which allows them to be cleaned on the field. Thus, all conditions are fulfilled for the prevention of punctual immissions through yard drains, which still occur in isolated cases, and for the avoidance of surface water contamination caused by them. The operating elements for filling, cleaning, and emptying are being integrated at one place on the sprayer more and more in order to facilitate the operation of the sprayers and to exclude operation errors.

The booms themselves feature package or lateral folding. In some cases, lateral folding may lead to problems with the cab. The booms are generally folded hydraulically, and slope compensation is either hydraulic or electro-hydraulic. The new pendulum systems largely keep the booms in a stable, balanced position, which enables distribution quality to be considered good even under practical conditions.

Drawn Sprayers

have shown the largest growth rates in sales in recent years. The range of offers includes machines with a tank size of up to 7,000 l and boom width of up to 45 m. In this kind of implement, the components required for

operation during the filling process as well as cleaning and emptying are housed on the left side of the machine in a so-called „operating centre“. These components are clearly structured and labelled unmistakably. In addition, the control elements relevant for the spraying process as well as measuring- and monitoring equipment must be easily accessible from the driver's seat and able to be read clearly. As a result, only drawn sprayers with remote-controlled operating terminals are sold.

The operating terminals of these sprayers are characterized by a dissolved design (control valve near the pump, switching of sections at the boom). The sprayers provide a low pressure loss between the valves and the nozzles, better lateral distribution, and a significantly smaller residual quantity. In addition, the nozzles of some implements can also be switched individually or in sections using compressed air. If the spraying pipe is designed as a ring pipe like in the larger sprayers of some manufacturers, full liquid concentration and the set spraying pressure are immediately available at all nozzles when spraying commences at the beginning of the field. This circulation system also has advantages with regard to implement cleaning.

Drawn sprayers are generally sold with a control system or at least with a field spraying monitor. Today, this equipment largely fulfills the requirements with regard to accuracy and control dynamics. Operating elements overloaded with functions and information like some of those offered in combination with the new bus system are often rather disadvantageous because the driver must first look for the right switch (softkey). If the electronic system fails, it is imperative that emergency operation allows the spraying session underway to be completed.

In drawn sprayers, there is a trend towards even larger working widths. Hydraulic folding is standard in this kind of sprayer. Studies on dynamic distribution accuracy have shown that the spraying booms rest in a very stable position and guarantee even higher quality of distribution than mounted sprayers - in particular at large boom widths.





Fig. 1: With its drift optimising system „Meteos AOS“ Dammann want to achieve considerable improvement in the application of plant protectives
Foto Dammann

Multiple nozzle holders are very useful because a nozzle change may otherwise require a lot of time. Some manufacturers offer electro-pneumatically switchable multiple nozzle holders which allow several nozzles to be operated simultaneously in the same position.

For the exterior cleaning of these sprayers, jet pipes with special nozzles are meanwhile available which can be run using the sprayer pump or a separate high-pressure fresh water pump.

Drawn sprayers must often cover larger distances on public roads, where a high permissible driving speed is important. For such rides, sprayers designed for speeds of up to 50 km/h are available. Of course, the frames, the tyres, and the brakes must be adapted to these high speeds. In general, such sprayers also feature sprung axles. In Germany, drawn sprayers are predominantly linked to the trailer hitch or the lower links of the three-point hydraulics. Linking to the trailer hitch guarantees stable ride behaviour even

at high driving speeds. For good tracking of a sprayer linked to the trailer hitch, the angular position of the drawbar in relation to the tractor must be determined, and the sprayer must be steered using an articulated drawbar or Ackerman steering. In the case of lower-link suspension, one articulation in the drawbar is sufficient. The disadvantage of this kind of linkage is that instabilities during road rides are more likely to occur.

Self-Propelled Sprayers

meanwhile account for almost 10% of the manufacturers' product range. These sprayers feature versatile technical equipment and can be optimally adapted to the conditions of application. The capacity of these sprayers (with regard to tank size, working widths, transport speed, ...) and operating comfort (comfort cab, computer-aided control and monitoring of almost all functions) leaves virtually nothing to be desired by the customers. Other performance characteristics which continue to deserve special interest are the greatest achievable area capacity, easy operation, good manoeuvrability, and the most even possible weight distribution on the wheels, which allows plant protection products to be applied precisely even under difficult terrain- and soil conditions while providing a high level of ride- and operating comfort. The purchase price of self-propelled sprayers is approximately twice as high as that of comparable drawn machines. Under economic aspects, the purchase of a self-propelled machine can only be justified if it is used to spray several thousand hectares per year. Progressing structural change in agriculture, increasing cooperative machinery use, and the tight time schedule for plant protection measures strengthen the trend to-

wards larger sprayers. The manufacturers of plant protection implements are taking this development into account by offering large, efficient, high-capacity self-propelled machines, which now feature a tank size of up to 6,000 l, a permissible driving speed of up to 50 km/h, and a working width of up to 45 m.

Loss-Reducing Plant Protection Implements

The list of „loss-reducing implements“ is increasingly gaining importance due to application regulations and investment promotion measures. This also manifests itself in the precipitous rise in entries, which have grown from 43 in the year 2001 to the current number of 171. One of the most important measures which enable a smaller minimum distance to be kept than the one determined in the instructions of application of the plant protection product for conventional sprayers is the use of drift-reducing plant protection implements which have been listed and published by the Federal Biological Research Centre as loss-reducing implements.

Boom sprayers reach the different drift-reduction classes with the aid of coarse-drop injector nozzles. Depending on nozzle size and distance from the target, reductions of 50 to more than 90% can be achieved. However, additional application regulations must be considered which govern maximum driving speed, maximum spraying pressure, or distance from the target, for example. The number of entries has meanwhile reached a point where even water requirements of 200 l/ha are considered loss-reducing. In addition, some of these nozzle types can already be used in all three drift-reduction classes if the spraying pressure is at least 1 bar.



Fig. 2: Small, low gravity centre containers are characteristic for modern mounted field sprayers. Here you see the new UF 01 by Amazone with 1800 l capacity and a working width up to 28 m.
Foto Amazone