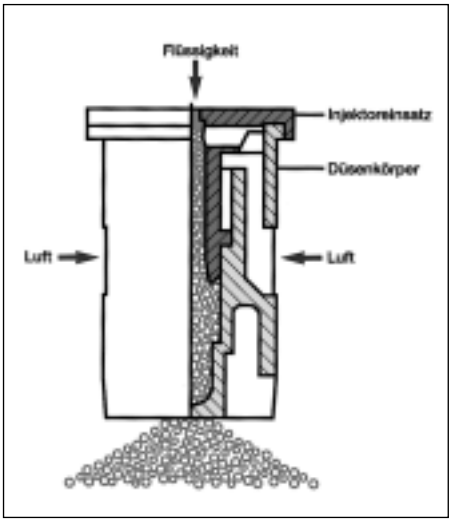
Heinz Ganzelmeier, Brunswick

Trends in plant protection technology

Presented here are important technical trends in plant protection technology as reflected in the machinery and equipment program at Agritechnica 2001. The preview cannot take the place of a visit to the event and instead only offers preliminary information and does not claim to be comprehensive.



Function diagram of Lechler IDK air injector compact jet

Prof. Dr.-Ing. Heinz Ganzelmeier is manager of the Procedural Technology Department, BBA, Brunswick and prepared the following report, further edited by Landtechnik, for the DLG.

Keywords

Trends of development, plant protection technology, sprayers and atomisers

The new agripolitical direction puts consumer protection and food safety in the foreground. This means that in future plant protection will involve conventional and integrated sectors and then, as a separate concept, also organic crop care.

Plant protection machinery comprises 1.5 to 2% of all farm machinery sold in Germany. In 1999 and 2000, German manufacturers achieved in each case an annual turnover of ~ 110 m DM. From the around 3500 new sprayers sold, ~ 40% were mounted and ~ 2% self-propelled.

Increasing capacity

Together with continuing structural changes in farming come bigger, larger-capacity implements such as trailed and self-propelled machinery. The early morning and late evening hours most suitable for spraying are in many cases not enough nowadays so that area performance is increased through higher operational speeds and nightwork. As shown by BBA investigations, boom suspension and pendulum systems with current mounted and self-propelled sprayers are so designed that a sufficiently consistent application quality, even at higher speeds, can still be achieved. These developments are important nowadays where basic principles of good management practice recognise as acceptable the use of injector jets at speeds of up to 10 km/h.

Injector jets have established themselves

This type is offered in the meantime by all important jet manufacturers and represents around 75% of current new sales. Fears that the rougher droplet spectrum might reduce the spray's biological efficacy have been vanquished by many trials in recent years. Advantages in practice for such jets include especially their reduced drift effect which allows a reduction in minimum distance from surface water bodies compared with that possible with former standard flat spray jets.

Border jets producing a half-fan spray, thus preferred as end-jets giving a sharp edge to sprayed areas, have hardly made any sales impression in Germany in contrast to other EU member countries.

Care in filling and cleaning

The highest proportion of spray material ending in surface water bodies escapes whilst filling and cleaning the sprayer. This means that precautions have to be met so that, when filling, the depositing of excess spray into the public drainage system or surface waters can be avoided in every case. Investigations in recent years have shown that improper cleaning of sprayers on-farm leads to up to 70 (90) % of total spray leakage into surface waters.

Sprayers must therefore be equipped with additional water containers and an interior rinsing system as well as an attachment point for an external cleaning system. A canister-rinsing system for cleaning empty spray containers must comply with DIN 11218. With this urgently recommended technical equipment, the cleaning of the complete sprayer is possible without any great problems. The only alternative is a specially equipped, and therefore more expensive, wash stand.

Mobile agri-computer

The armatures and control systems of current sprayers must be so designed and sited that they can be easily seen and operated from the driver position. For this, hand operated armatures (preferred for mounted implements), mechanically or electrically remote-controlled armatures and electronic regulating systems are used with displays or terminals. The electronic equipment is widely applied in the meantime and range from simple monitors to mobile agri-computers. Computers assume increasingly the control of functions and switches and of their monitoring (e.g. automatically operating sprayer cleaning through press-button from the tractor seat). Chip cards are available for reducing documentation of spatially-specific data through their use for data transmission between farm PC and tractor terminal. Farmers often complain about poor compatibility between electronic equipment from different manufacturers usually making impossible information exchange between differently-sourced equipment. The German and international standard prepared in the meantime for standardisation of the different

Individually operative jets for intelligent nozzle operation incorporating a three-jet cluster earned Amazone a DLG silver medal

interfaces will hopefully help this problem to disappear. To be seen as long term aim of computer application is computer-supported spatially-specific spaying.

Spraying according to requirement

Spray applications are usually adjusted for uniform treatment per field. Thus it is unavoidable that where, e.g., weed population is heterogeneous in a field, large areas of that field receive more spray than necessary. Spatially-specific spraying enables the saving of around 25 to 30 DM/ha in spray costs. Through this it can be expected that rapid payback of the bought technology is possible on large farms with large heterogeneous fields.

In arable farming the application of opto-electronic sensors for plant identification with signals simultaneously used for controlling the spray application is still currently in the initial phase with this online system only being applied viably for pre-drilling or pre-emergence applications in non-plough cereal production.

The difficulty lies with the sensors used up until now which enabled differentiation between plants and soil but not between crop plant and weeds. A pendulum sensor is currently being developed for application of growth regulator and fungicide in grain production.

In such cases the off-line system will be used where detection of weed, disease or pest variability needs more time than is available in a single pass. In such cases a treatment recommendation plan with differing applications based on location coordinates should be one of the initial steps. This application card is then fed into the tractor terminal at treatment time. The respective location coordinates of the sprayer are received by the terminal via tractor-mounted DGPS receiver. In this way, predetermined spatial differences can be acted upon during spraying. In mineral fertiliser application this spatially-specific technique has been developed more than for plant production in practice. One reason is certainly the non-availability so far of economically viable assessment or detection systems in plant protection. A further ground could be the unavailability of technical solutions for direct in-feeding of spray details which, in the matching of the spray amounts applied, are sufficiently dynamic and can cope with the standard practice of tank mixes. A few important manufacturers will certainly be offering technical solutions for plant protection which go a long way towards this at Agritechnica 2001.

Sensor steering for sprayers in wine and fruit

Sensor controlling of atomisers in viticulture and fruit production can recognise holes in the foliage wall and switch off or on one or several jets to accommodate these. The sensor equipment was tested years ago and is recognised by the BBA. Currently the high purchase cost of such equipment limits a great expansion of their use. Spray savings averaging 30 % were achieved in trials. Drift, however, cannot be reduced by this approach to the extent that it would earn an entry as „loss-minimising implement“ in the report.