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# Irrigation technology

## Novelties at the Agritechnica 2005

*Once again, the Agritechnica 2005 was a showcase for new irrigation- and sprinkling technology. On the exhibition grounds, 31 different companies showed a wide variety of technical improvements and other remarkable activities in irrigation technology. The exhibition focused on techniques for centre pivot machines in combination with precision irrigation, improvements in communication technology for mobile irrigators and pumps, as well as novel pump drives which can be run with both diesel and rapeseed oil.*

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Commercial precision irrigation systems with centre pivot machines were offered by the companies Bauer/Austria and Schudzich/Burgdorf. In the machine manufactured by Bauer, the collector ring at the central tower is equipped with an absolute rotary encoder and CAN-bus transmission. This provides precise information about the position of the centre pivot machine and allows the irrigation limits, the sectors, and the turn-on / turn-off positions to be set precisely. The installation of additional CAN-bus circuit boards enables the controller to communicate with the individual mobile towers and the periphery via a two-wire system. This control provides the possibility of programming the maximum number of motors connected parallel. As a result, the peak currents in the central tower connection are defined exactly. Thus, all power supply lines and generators can be kept smaller.

For precise water supply to the plants, the company Schudzich is pursuing a different approach in cooperation with the Institute for Production Engineering and Building Research of the FAL. First, an application map of the area including the local determination of water storage capacity is drawn up. Afterwards, sensors for soil moisture measurement are installed at those points on the field where soil water storage capacity is different. The soil moisture measurement data are regularly radioed to the central tower of the centre pivot machine. With the aid of these data, the application map, and a position indicator, a small computer controls individual solenoid valves which admit irrigation water to each individual nozzle. The goal of irrigation is to always supply the plants with the water required for optimal plant growth despite different soil conditions.

### Upgrades for mobile irrigation machines

Meanwhile, remote data transmission for mobile irrigators is offered by all manufacturers. All machines send warning- and fault messages and indicate the end of irrigation. In addition, some manufacturers offer the

possibility of active irrigation machine- or pump control. The equipment of the individual machines differs with regard to the number of possible functions which are connected. For transmission, all manufacturers choose a GSM (mobile phone) connection with SMS.

For the set-up of large irrigation machines, oil hydraulics are being used more and more often for work facilitation. So far, oil has largely been supplied by the tractor. The company Beinlich/Ulmen developed an autonomous oil hydraulics system for mobile irrigators. The oil motor is driven by two 12V batteries, which are in turn supplied with tension by solar cells. The oil hydraulics drive the slewing ring including the lock of the rear supports, the lifting equipment for the irrigator carriage, and the front support for the hitch. To improve comfort for the farmer, the individual work steps can be controlled via remote radio control. If the system fails, the hydraulics of the irrigator can be supplied with oil via hydraulic hoses.

For large-area irrigators, a new jet disturber system is on the market. Different companies offer machines for more precise irrigation at the beginning and the end of the field. The jet disturber is controlled by means of distance measurement at the irrigator carriage. From the wheel to the irrigator, the information is transmitted to the mechanical jet disturber via a cable. With growing distance from the headland, jet disturbance dissolves automatically. When the irrigator hits the shut-off bar at the field's end, a second cable is pulled which re-starts mechanical jet disturbance. The Italian company Komet offers an irrigator which enables two different sector angles to be set electronically. At the beginning of irrigation, the irrigator carriage is pulled out up to the field's edge. Using the programme selection key, the irrigator sector angle is set such that the irrigator first irrigates the area in the direction of the machine. The automatic reversing function then turns the sector angle back in the direction of the field's edge when the programmed reversing time is reached. If necessary, the sector angle can



Fig. 1: Mobile pump unit

be altered during operation with the aid of radio remote control in order to adapt the irrigator sector to the possibly changed field conditions.

For stationary irrigation systems, the company BJ-Bewässerungstechnik in Lengfurt offers a small irrigator coated with silicone. The irrigator is equipped with two nozzles. One of them irrigates the near range and the other one the farther range. At an operating pressure of 2.5 bar, both nozzles give off 600 l/h. Given this small volume flow, irrigation intensity is very low. Due to the silicone coating at the turning shaft, the small irrigator rotates very evenly and distributes water within a radius of up to 11 m.

### Irrigation pumps

The steadily growing diesel prices promoted the idea of running diesel engines with rapeseed oil. The new Beam Plus system from Beinlich in Ulmen allows the engine to be run with either diesel or rapeseed oil. The additional kit for rapeseed oil feeding consists of stainless steel. Alterations to the injection system are not necessary. According to information provided by the manufacturer, the consumption values are no higher than those of diesel engines, and power output is equally good. In order to prevent rapeseed oil from remaining in the feeding pipes and the diesel filter in the winter, the pump should be run with diesel during the last irrigation pass. For the new technique, the manufacturer grants an engine warranty of two years.

The company Euromacchine showed another interesting new development (Fig. 1). This pump unit is equipped with a 50 to 150 kW diesel engine for electricity generation.

The submerged electric pump can be used in wells at depths from 5 to 50 m. The pump is lowered either manually or by an electric

crane attached to the pump unit. The electric cable is also rolled up and unrolled electrically. The pressure pipe consists of couplable pipes which are connected to the pump. Depending on the required quantity of water, pumps providing an output of 150 to 248 m<sup>3</sup>/h and 4 to 15 bar can be used. The advantage of these units lies in their mobility so that the pump can be used for several wells even at large water extraction depths. In addition, the electric unit cannot only supply electricity to the pump, but at the same time also to centre pivot machines.

### Irrigation management

Especially on sloped fields exposed to heavy precipitation and under high-intensity irrigation, potato ridges are in great danger due to running-off water and resulting soil erosion. Moreover, the water which runs off is not available to the potatoes for their growth. In order to retain the water on the potato field, the company Grimme/Damme offers its „Dyker“. Using the excavated soil from mini-dumpsters, little transversal ridges are raised in the furrows in order to store the water. The „Dyker“ is used in combination with a ridger or a rotary cutter (Fig. 2). The device consists of specially formed bucket wheels fitted behind the shaping board of the ridger or the rotary cutter. In addition to use in potato rows, the device can be used in other row cultures and adapted to mulch till applications. Tests of similar dibblers, which lasted several years, were carried out successfully by the Institute for Production Engineering and Building Research of the FAL. Runoff was able to be reduced significantly.

The brochure JOINATURE from the company LGRain Bewässerungstechnik provides a good overview of available irrigation

machines, specifications, and current prices. The brochure follows the model of the well-known Perrot booklet. It is clearly structured and easily understandable. The list of company-internal symbols and the marking of special characteristics allow the readers to gain a quick overview of the technical conditions and the material required for their own special needs.

### Conclusions and outlook

The Agritechnica showed once more that the irrigation industry is constantly working on new developments and upgrades which provide easier operation and improve operational reliability. In Germany, a wide range of irrigation machines will continue to be offered. In the south, where the farm structure is smaller, pipe irrigation and mobile irrigators will be predominant. On the medium-sized farms in north-western Germany, the mobile irrigator remains the standard irrigation technique, whereas centre pivot machines are slowly gaining in acceptance in eastern Germany, where field units are large.

In addition to machinery, irrigation management is going to establish itself more and more. Sometimes, the necessity of precise irrigation did not yet exist in the past. As a result of the energy price development, however, it has become unavoidable. Perhaps, one or the other irrigation pass could be dispensed with if this technique is applied. Given these considerations, energy-saving irrigation techniques and precision irrigation are being discussed repeatedly.



Fig. 2: Device for transversal ridging in potato furrows for better water storage