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Fleet Management with AGRO-COMBINE Online

Information and Documentation Data on Combine Harvester Operation and Performance

The changes in agriculture are obvious - on the one hand the number of farms is declining, and on the other hand, the size of the area managed is increasing. This trend follows a new generation of high-capacity machines. The consequences are clear: where earlier many machines and drivers were working, today only a few units suffice. Therefore, the optimised utilisation of each machine is of special importance.

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The entire logistics chain depends on one key resource - the combine harvester. Losses suffered as a result of below-optimum settings, breaks or other idle times are therefore disproportionately high, since they multiply throughout the harvesting process. Under poor conditions the system performance quickly drops to zero.

High demands are placed on farm managers and contractors at harvest time. They continually have to check and optimise machine operation, which is a huge challenge, especially when several high performance combine harvesters are in operation at the same time. The different levels of experience of the drivers make it even more difficult, as machines may be set differently. One solution is to give assistance in the driver's cabin itself but this is very time-consuming. Offering help via radio or mobile phone on the other hand relies on the availability of up-to-date and objective machine and performance data. Farm managers using one or two combines therefore constantly say they have problems using their machines optimally.

Communication is the solution

AGRO-COMBINE Online collects and collates essential information on combine harvester operation which can then be called up from a central point. This satisfies the demand of farm managers for up-to-date order and performance documentation and makes it possible to control the performance of several machines and drivers at the same time. The operations manager has the same data at his disposal as the driver in his cabin and can use this data to optimise performance. The data is recorded and collated via the onboard computer ACT (AGROCOM Computer Terminal), for example via CAN-Bus interfaces, transmitted at regular intervals via GSM and displayed on the screen in the form of tables and charts.

The operations manger has an overview of the entire fleet

Up to thirty different values are transmitted to the manager's computer per time interval and machine. These include speed, rate of work and sieve adjustment but also manual entries such as work status, breaks or breakdowns (see overview). The programme displays the data of one or several machines at the same time, as required, which can then be analysed or simply give an overview. They can then be evaluated so that recommended settings can be communicated to the drivers via radio or mobile phone. The operations manager does not necessarily have to be the

Table 1: Transmissible information with AGRO-COMBINE Online

Maschinennummer	Machine Number
Fahrer ID	Driver ID
Datum, Uhrzeit	Date, Time
GPS-Breite	GPS latitude
GPS-Länge	GPS longitude
GPS-Status	GPS Status
Geschwindigkeit	Speed
Durchsatz t/h	Feedrate t/h
Ertrag t/ha	Yield t/ha
Flächenleistung ha/h	Rate of Work ha/h
Drehzahl Dresch-trommel	Drum speed
Drehzahl Gebläse	Fan speed
Beerntete Fläche in ha (Auftrag)	Area/Job
Kornverluste Monitor Siebe	Grain loss monitor sieves
Kornverluste Monitor Schüttler / Rotor	Grain loss monitor walker / rotor
Einstellung Obersieb	upper sieve adjustment
Einstellung Untersieb	lower sieve adjustment
Tankfüllung in %	Fuel level %
Mittlere Feuchte (Auftrag)	Ø Moisture/Job
Rotordrehzahl	Rotor speed
Diverse Statusangaben (Pause, Reparatur etc.)	
Various status information (pause, repair,..)	
Weitere noch nicht festgelegte Werte	
Further not defined information	

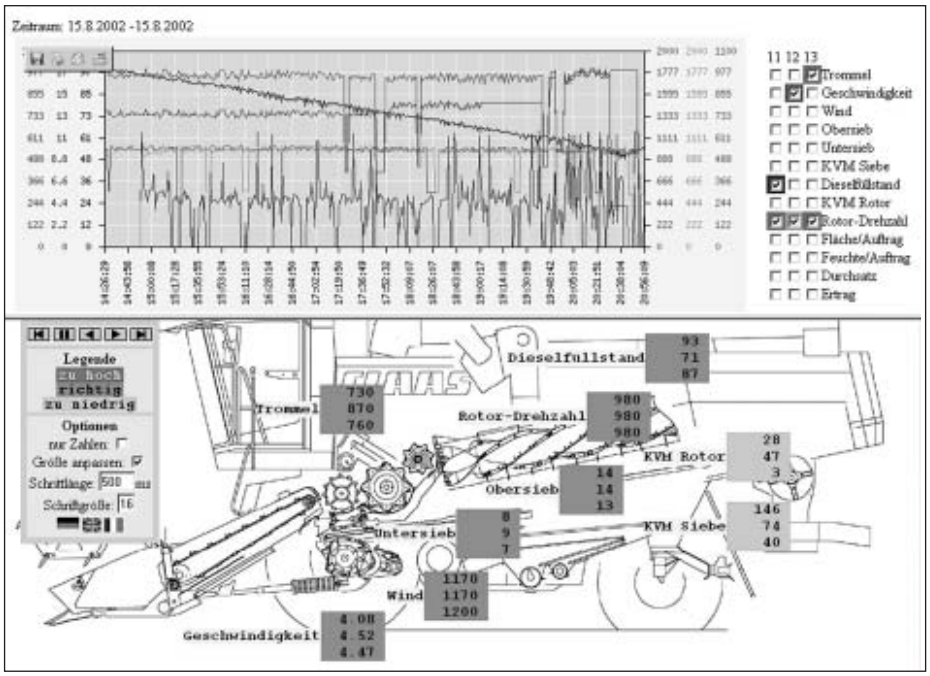

Fig. 1: Valid data are the basis for informed decision making

person with the most specialised expertise. He may simply act as a mediator between the variously skilled employees. Once recorded in a database, other analyses can be carried out later, such as analyses of work quality, idle times and performance data (distances travelled, hectares harvested, set-up work etc.) as well as mapping of losses and other values, for example.

The system is designed to make optimum use of Internet technology, considerably reducing expenditure on software installation and maintenance on the farm manager's computer. The data can also be managed centrally by a service provider or in a group farming enterprise. The only running costs are the transmission charges of approximately 7 cents per operating hour. The system is operated solely from the farm computer so that the driver has no extra work except perhaps entering status information (e.g. breaks).

Once the farm has been selected in the software, the relevant machine data are then deposited. The farm manager can select up to three combines and request that the data for all three is displayed simultaneously. A further option enables the user to request the latest data or historical data. "Map presentation" opens another window and marks the position of a combine on a map or, if available on a geo-referenced image.

The development of values over the period requested (current date) is presented in a diagram. The individual data for each combine is highlighted in different colours and can be selected by clicking the functional area on the sectional view of the combine.

Changing harvest conditions demand quick decisions

Green, amber or red? The sectional view of the combine shows at a glance whether the data on display are within the defined tolerances, which of course the user can define himself. If the values are too high, they appear red, too low is shown up in amber and everything else is marked green. The driver is then contacted and assistance given via radio or mobile phone. If the user wants to observe other values or different values, then the software and the terminal on the combine can be adjusted accordingly.

The control menu can be freely positioned and names the current data stock. It also includes function buttons for navigational purposes: forwards, back, back to beginning, forward to end and pause (stops animation). In the field "Step length" the speed with which the data stock is changed can be defined.

Communication and Transparency are the cornerstones of successful teamwork

AGRO-COMBINE ONLINE links the processes of analysis and evaluation directly with the harvesting process. In this way the system acts as a quality control instrument while harvesting. Combine harvesting, data control and evaluation all run in parallel. The operations manager can check all the data on the screen and pass on any relevant information to the driver. The result of this system, based on control, comparison and action, is optimum exploitation of machine capacity towards optimum harvest yield, even if the combine harvester are manned by inexperienced or less qualified drivers. Thanks to the "expert on board", the entire range of adjustments can be used and optimised.

The winner: farmers, agricultural supply agencies and drivers

Farmers and agricultural supply agencies reap the rewards. They can optimise machine and personnel deployment as well as being able to view all the machines at once and compare them directly in order to achieve better harvest results. The drivers benefit too: they gain support and safety of their operations as well as learning on the job. This leads to a new dimension in cooperation. An unfiltered flow of data and a direct exchange between the executors and the decision makers helps to guarantee and improve the harvest result.

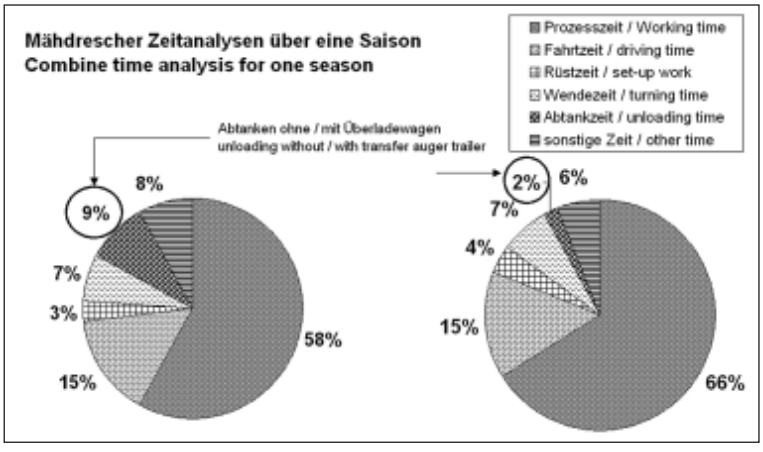

Fig. 2: Time analyses show the potentials of different harvesting strategies