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Ascertaining Working Time Requirements using the Example of Weighing Fattening Pigs

New process engineering solutions and improved production processes change also the working time requirements and hence the production costs, too. In order to quantify those effects fast and efficiently, KTBL is developing a calculation system, based on an object-relational database management system. This allows the modelling of recorded and processed target time standards according to the working time element method.

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Keywords

Working time requirement, time elements, data base management, fattening pigs

The differentiated transfer of fattening pigs at the end of the fattening period to get uniform groups of pigs for sale delivers first results of the KTBL-calculation-system and shows the benefits in labour economics and business management of a change of the production-procedures.

Method

The calculation of the working time requirements occurs with the help of recorded and processed target time standards which are available at the level of work elements normally. Work elements are defined as the smallest work-shares simply to be measured.

To establish the target time standards, the working time element-method, usually in form of work-observations, is used. Actual times and their influencing factors for every work element are collected in extensive measuring rows with several repetitions on different agricultural farms [1]. The measurement results are processed statistically and for every work element a target time standard or a target time function is formed. Furthermore the work elements are described with well-defined beginning and end-points as well as a range of validity.

For the calculation of the working time for a concrete working process it is necessary to make a work model. For this based on REFA [2] the work task is divided into total work, work process, work part process and work element [3, 4]. The work model is built up accordingly modular and can be easily adapted in the case of new processing developments for example by exchanging work elements or work part processes.

Another big advantage of the working time element method is that the data ascertainments can deal much more specific with innovations, because only the work elements affected in each case must be examined. This methodical procedure has asserted itself in Germany as well as in Austria and Switzerland. In Germany, the data are ascertained in the context of the KTBL Calculation Basis work programme [5].

The internal KTBL database application substitutes the calculation application of the KTBL for working time data for stable and yard work designed in the 80s and 90s and afterwards developed with the programming language Fortran. Due to the complex functions used in this system it was very time-consuming to adapt the sytsem to new processing developments. With the new system, the KTBL calculatons of working time requirements will be merged in one system. The calculation of the working time requirements for field work described by [6] are ex-

Table 1: Working time requirements in a pig fattening house with 1600 fattening places for differentiated and for pen stalling-out

Work process	unit	differentiated transfer in three sections				pen for pen transfer	difference
		1st weighing and loading	2nd weighing and loading	3rd weighing and loading	sum of all weighing and loading processes		
Weighing and marking of single animals	animals per pen	all 40 animals	remainig 30 animals	-	-	-	-
Single animals sorting out, weighing and loading in groups	animals per pen	10 animals ready for the slaughter	another 15 animals ready for the slaughter	-	-	-	-
Animals weighing and loading in groups	animals per pen	-	-	remainig 15 animals	-	all 40 animals	-
Working time requirements weighing and marking of single animals	MPmin[1)]	267	210	-	477	-	-
Working time requirements single animals sorting out, weighing and loading in groups	MPmin[1)]	163	242	178	583	400	-
Working time requirements whole work process	MPh[1)]	7,19	7,55	3,00	17,71	6,66	-
Working time requirements per pig	MPmin/animal[2)]	1,3	1,4	0,6	3,3	1,2	2,1
Labour costs per pig	€/animal[3)]	0,34	0,35	0,14	0,83	0,31	0,52

[1)] All work processes are executed with 2 workers.
[2)] Working time requirements related to 320 pigs of a run.
[3)] Labour costs 15 €/MPh.

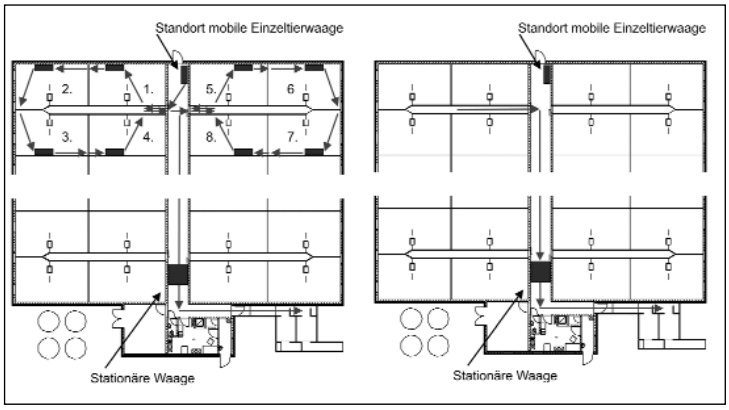

Fig. 1: Ground plan with scheduling for the work processes „weighing with mobile single animal scale" (left) and for „weighing with a fixed scale" (right) in a pig fattening house with 1600 fattening places, 10 compartments each with 4 pens and 40 pigs per pen [7]

tented on the basis of the database management system Oracle since the middle of the nineties.

Implementation in an object-relational database management system

KTBL use the database management system Oracle for administration of work elements and work models. Work elements, work part processes and work processes are stored in relational tables.

For building up work models work processes will be defined, which consist of one or more work part processes. The models of work processes are carried out on level of work part processes. Due to real time scheduling in a production process, the work elements will be arranged in the work part process. The technical description of work processes, work part processes and the compositions as well as complete technical description of work elements are stored in relational tables. For each element and work part process one or many production lines and work processes are given as scope of application. The building of multifarious work models should be simplified by this. As a basic principle elements and work part processes can be used in different work processes and can be reapplied in one work processes. The modular design give the possibility to apply changes in a production process with less afford. In addition it enables to transmit a complete work processes into a similar production process.

The parameters of total working time are quantities, number of day of procedure, time frequency, iterations of complex processes and other parts of work processes. The parameters are available on the levels of work process, work part process and work element. Number and quantities can bie with a frequency can be given in each case. The value of parameters can be set for each production process; therefore it is possible to establish an individual prognosis of the whole working time requirements. Work processes are mapped to a certain period in the run of a production process. For example fattening time and service time are periods of a production process fattening pigs. On each level it is possible to give quantities and portions. Recurrences of work part processes or working elements in a complex work processes can be treated as the parameter of the work part process or work element. For example in a pig fattening house the work part process 'cleaning drinking trough' is repeated in every pen of a compartment as well as in every compartment. If not every drinking trough have to be cleaned daily, this can be regarded as a portion of daily cleaned drinking troughs. The portion will be assigned to the element.

Exemplary application

On the basis of the work process "weighing" with differentiated transfer of finished fattening pigs compared with the pen for pen transfer the result of an application of the data base management system is shown.

The differentiated transfer of fattening pigs has as a goal to arrange portions of pigs for slaughter with uniform weight in order to obtain higher proceeds of sale, compared with inhomogeneous groups with pen for pen transfer. For the calculation a fattening pig house with 1600 places is regarded, in which 320 fattening pigs of a run are placed in two compartments subdivided in pens with 40 animals (*Fig. 1*). The transfer takes place in three sections. For the composition of the first group all animals of a pen are weighed with a mobile single animal scale and the slaughter pigs are marked. About ten animals from each pen are sorted on the following day, weighed as a group on a fixed scale in the alley and loaded. For the second group the remaining averaged 30 animals in each pen are weighed again individually. About 15 animals for each pen are sorted as finished to slaughter, weighed and loaded. At least all remaining 15 animals of a pen are stalled out, weighed as a group and loaded.

The work process appears laboriously, the calculation of the working time requirements shows however that the effort is economically. That is also substantially because the topical technology makes the work more easy. A mobile single animal scale is used, which can be well raised on roles in the compartments and pens. Turned off on the floor it determines automatically the weight of an animal over cradle staffs and shows it on a display.

Folding doors in front and back of the scale make it possible to pass the animals in a one way direction. The front door can be served over a lever comfortably from the back. The animals can be marked simply by spraying on a number or a symbol. In groups with more than 20 fattening pigs it recommends to work with two persons and large driving boards. While one person is weighing and marking, the second person already drives the next fattening pig near to the scale. The scale has only a weight of 50 kg and can therefore be lifted by two persons over the pen partition.

Thus in relation to ranking from pen to pen over the alley with the opening of the pen partitions labour is saved. The determined working time requirements for the differentiated transfer with single animal weighing and loading in three sorting groups results in 3.3 MPmin for each fattening pig related to all 320 animals of the fattening run (*Table 1*). Opposite the transfer of all animals in two portions without single animal weighing results additional work time requirements of 2.1 MPmin for each fattening pig. Resulting extra costs of 52 eurocents for each fattening pig are easily realised by higher butchersolve.

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