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Information Technology (IT) as an Aid in Planning Stable Buildings

Planning buildings has become more complicated through the ever increasing number of documents needed to acquire a building permit. The planning phase needs to be shortened. For some time now efforts have been made to utilise information technology for planning, design, cost assessment and construction execution. Especially routine tasks can be performed easily and quickly with IT aid. By networking with partners and databases, information can be exchanged very quickly.

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Keywords

Building planning, building design, ascertaining construction costs, information technology, EDP

Literature

[1] *Gartung, J., und F. Preiß* : Baukostenermittlung mit dem elektronischen Kalkulationsblatt BAUKODA für Windows. KTBL-Arbeitspapier 237. Informationstechniken für das landwirtschaftliche Bauen. 1996, S. 23-46

[2] *Gartung, J., K. Uminski und C. Hoch* : Investitionsbedarf von Mastschweineställen. Landtechnik 62 (2007), H. 1, S. 42 - 43

For the field of cost calculations for farm buildings, the Institute of Production Engineering and Building Research of the German Federal Agricultural Research Centre (FAL) has developed special methods and electronic spreads sheets [1]. This relates above all to the documenting, processing and preparation of construction cost data with the construction cost network system.

In issue 1/2007 of LANDTECHNIK, current results on the investment needs of fattening pig stables were presented by the editors. Subsequently only some working steps were described which are necessary as background work for this type of cost calculations and which can be undertaken with the help of computers. The projection of stable models for research purposes does not differ from the approach and presentation form of actual buildings. Thus, it is subsequently shown how planners and builders can apply such information technology for different purposes.

As in all other parts of daily life, the electronic media have proven to be useful as a help in the planning, design, construction execution and in ascertaining the quantity and price structure for buildings and permanent constructions. Depending on the task, either standard or special software is used. It is important that data gathered once be made available to other users. The selection of a suitable vehicle is important. To communicate construction costs for farm buildings, for example, to farmers as well as business and construction consultants, spread sheet programs are much more suitable than special construction software as an aid in planning the framework of the preplanning. For the gathering of bids, assignment and settlement of costs for construction measures, in contrast, only products can be recommended that are based on a method in conformance with the assignments. Thus appropriate programs must be available for both the assigning parties as well as the offering parties. The research in the Institute for Production Engineering and Building Research of the FAL covers the whole spectrum from need planning through to the completion and payment of a completed construction project. That is why both solutions are needed.

Construction Planning

Many considerations must be made from the original construction idea through to the completion of the building. For this purpose, qualified professionals from a wide range of fields are necessary to meet the requirements from animal and environmental protection, work safety, economic viability, form and carrying out of construction.

Building deals are always initiated by the client, as are all steps in the planning and construction process. The client determines the size and characteristics of this construction and sets the framework conditions. The conversion of these wishes into realizable plans is the job of architects, professional planners and further specialists. The realization of the planning is carried out by a general contractor or several construction companies in different fields. Thus in the stage of planning, but also in the carrying out thereof, many participants and their services must be coordinated, organized and monitored.

At the outset is purpose-related planning. As a rule, this is within the scope of responsibility of the client. Here, in some cases, information is also drawn from text books, from the Internet as well as from public or private consulting agencies.

This early planning stage is especially important, because here the course of the whole construction project is set.

For this purpose a wide range of computer-aided systems and information are available to the farm manager and the consultants.

Depending on the planning task, first, very different computer programs and systems are used as working aids. In addition to branch software, such as CAD, AVA, and static, heat and sound insulation also require special solutions, such as, e.g. monitoring emissions from animal husbandry or to measuring the stable climate conditions.

The Institute for Production Engineering and Building Research used CAD, AVA and

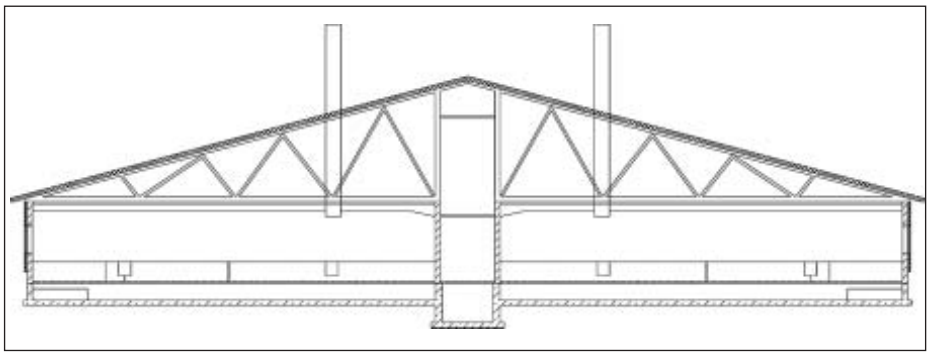

Fig. 1: Building profile of a pig fattening house

spread sheet programs for the systematic study of 25 fattening pig stables [2] of different sizes and equipment with regard to their planning factors, construction and cost structures.

Building Construction with the Help of CAD Systems

The use of computers in construction and cost calculations will be described in the following as an example of how they are used in the Institute for Production Engineering and Building Research of the FAL.

A program is available for designing buildings, which supports the planning service fro buildings with combined 3D/2D functions. Through the 3D effects, one creates spatial models that make possible the automatic creation of views, cross cuts and perspective presentations.

The so-called transparent foil technology is used. It is an important part of the planning systematic. The foils are ordered with the same classification system as used in the cost calculations – according to DIN 276 "Costs in Construction." At the floor plan level, first a division of the building into subterranean, ground floor, upper floor and attic are created. In stable buildings this includes as a rule only the levels of the slurry channels and the ground floor. This approach has the advantage of permitting an indefinite number of foils to be created, processed and combined.

The course of the 3-D construction can be seen on the basis of the example of a fattening pig stable for 1000 animals in *Figures 1 and 2*.

The program provides a catalogue of construction element macros for the basic construction parts such as foundation, walls, ceilings or roofs. The catalogue is generally not adequate for agricultural building parts and equipment. For this reason it is necessary to incorporate specific construction parts for own special use and to compile them into an additional catalogue of macros. This process is sometimes very complicated, since every point must be mathematically defined. The input of the necessary parameters for every construction part is necessary for the subsequent calculation of amounts needed.

Input of a parameter on the basis of the example of an exterior wall

The construction of the wall comprised of cement plan elements, insulation and an exterior covering with profiled metal sheeting is considered by the program with all individual positions in the construction. Apart from the wall construction, parameters like the lower edge of the wall, its height and thickness are requested for the floor plan and an according position is included. The construction part parameters must be established and classified on each foil for all building elements, similar as for the wall.

In a controlled plan compilation, the layering and linking of the foils result in a three dimensional building model. Floor plans, cross cuts, views and perspectives (*Figs. 1 and 2*) can be created from this model.

Materials and Cost Calculation

Since all building component measures in the construction are already entered, the amounts of building materials needed and individual positions can be determined directly from the building model and with the help of a program for requesting bids, for the assignment of tasks and for the calculation of costs (AVA).

To calculate costs, all service positions are entered in a mother-service directory with according unit prices. In the next working step, the cost data for elements and large elements of the individual stable models are compiled and aggregated to cost groups of total costs.

In the Institute of Production Engineering and Building Research of the FAL, construction costs are furthermore calculated on the basis of the BB construction cost network from the finely classified level of unit prices for building services through to the building elements and then through to the general classification of the cost bocks with computers. The systematic documentation of individual data requires an extensive database, which is regularly cared for and updated. Here the coding by cost groups, large elements and building elements is recommended as set out in the DIN 276 "Costs in Construction."

Summary

From the first planning considerations through to the first use of the finished building a large amount of information is exchanged between the participants. The goal must be to make data obtained once for the use phase, in some cases for the entire life cycle, through to the demolition of the building.

Today networks like Business to Business (B2B) are available for the exchange of data and information. The manufacture and processing of construction parts in the finishing and production facilities is automated in many companies. Software for construction site logistics supports the on-site work.

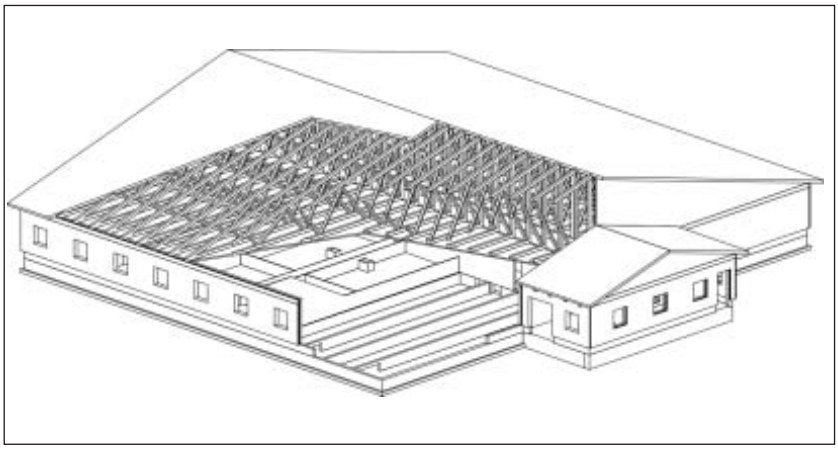

Fig. 2: Volume model of a pig fattening house