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GTP information management

Aachen-based IT company, XGraphic is deeply involved with the German coal mining industry. Gunter Heim[1], Johannes Lorbach[2] and Rainer Hünefeld[3] describe a multi-user system for mine planning and design.

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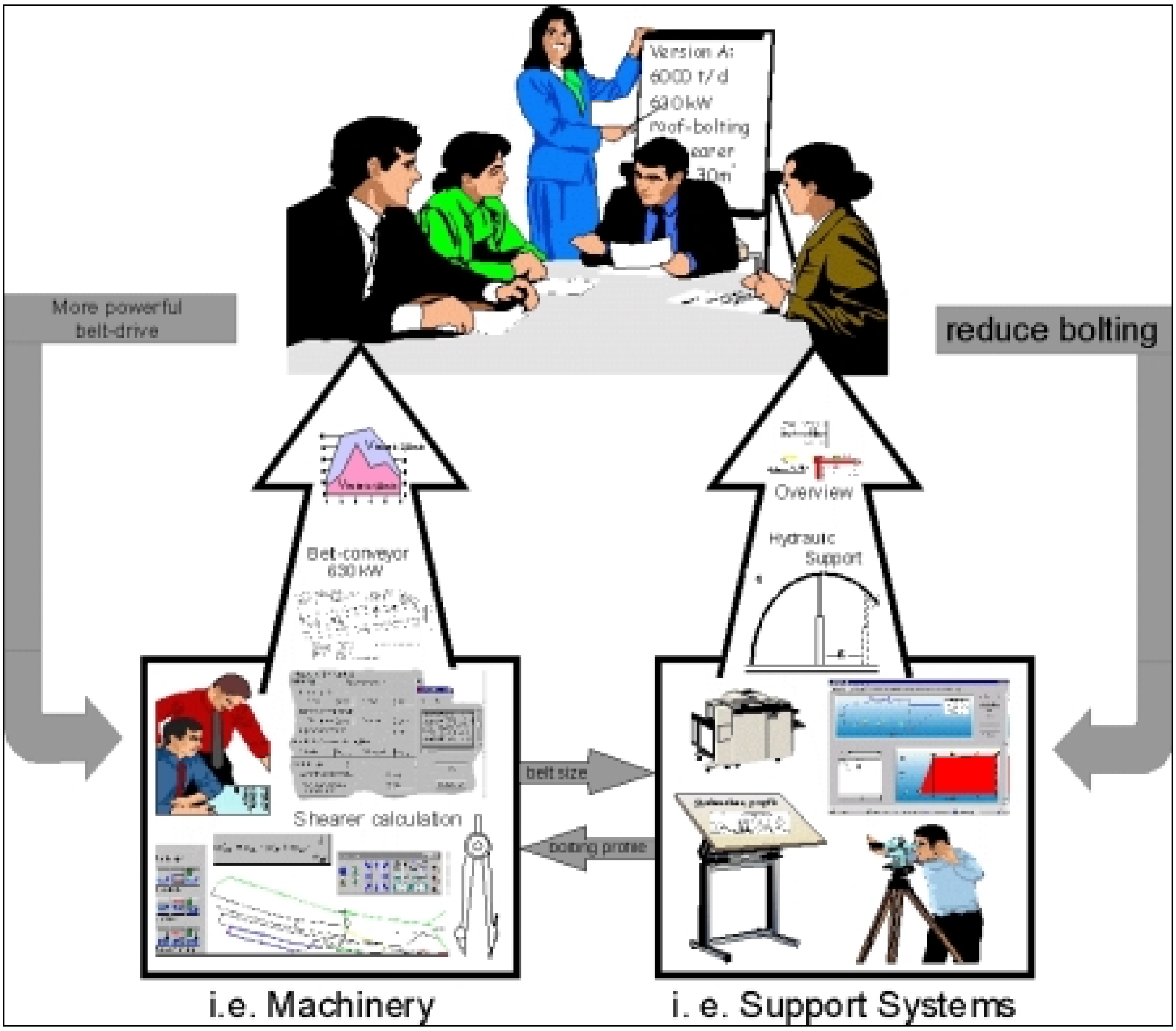
The 1980s saw the development of highly specialised software tailored to very specific needs. However, the software was generally incapable of communicating with other programmes and was limited to one platform only. A sophisticated routine, confined to a workstation, for calculating conveyor belt systems would have been a typical product of those days.

During the 1990s, the focus moved towards the integration of different software tools. The demand for compatibility and standardised handling was one reason for the success of the MS Office product line, SAP and HTML. During this period, the conveyor belt example referred to above would have migrated to a PC environment, offering advanced Windows features. Today, ever increasing amounts of information are technically available to most standardised software products. The focus of the problems are now shifting, therefore, from a scarcity of information to an overabundance of information.

Together with Deutsche Steinkohle (formerly Ruhrkohle), Germany's largest hard coal producer, Aachen-based XGraphic has developed the GTP system to fully implement inter-departmental data exchange. This information management system merges Windows Office and HTML documents with databases and specialised calculation applications, afforded the technical planner a much facilitated availability of correlated data, reflecting the latest status of planning activities within a number of departments.

Last year, Germany produced around 38 Mt of hard coal from 15 major mines. The fact that 30 new longwalls came into operation during that period shows that the planning of new workings is a continuous and ongoing process. Such planning is carried out in a highly interactive manner between various departments, usually representing different technological aspects, such as machinery, electrics, surveying, ventilation, support systems and so on. It is within these departments that the visible work is done – calculations, modelling, technical drawings, statistics, equipment selection, interaction with SAP and so forth.



An abstract representation of the planning process in German hard coal mines. Mine planning is carried out in a highly interactive manner between various departments, usually representing different technological aspects of an operation.

Cross-departmental information flow is usually limited to very specific data such as ordering lists, tables of isolated technical data, and key numbers used in controlling systems. This information is often highly standardised and barely comprehensible to non-specialists. Information relevant to decisions of wider inter-departmental importance does not usually take this form.

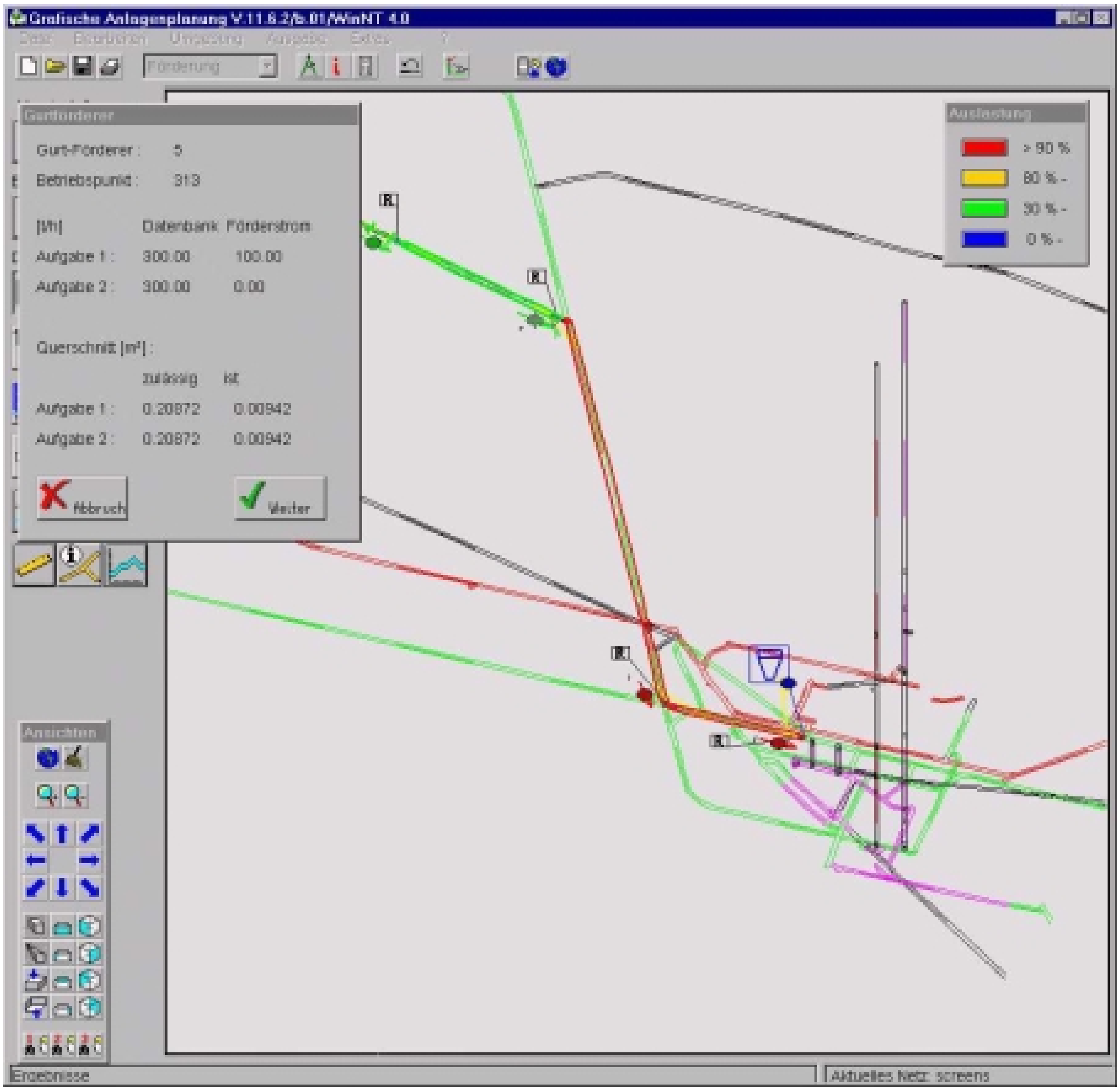
The results of departmental planning activities are most often represented in a descriptive way using tables and drawings. This information is highly condensed and tailored to the needs of inter-departmental meetings.

Decisions of wider importance affecting more than one department are usually taken at inter-departmental meetings, each department being represented by one or more delegates who often carry with them documentations made by their respective departments. It is here where alternative layouts of a working are discussed in their wider perspective and where final decisions are taken.

The decision making process outlined here usually starts two to three years before production is scheduled to commence and lasts for about a year. The process is triggered by the demands of strategic mine planning – the required output from a particular working, its anticipated life, its geometry and perhaps some aspects of the general layout of the working are defined as input-targets of the technical planning process. This planning of a working then results in a variety of alternative layouts.

This process is highly interactive – inter-departmental meetings are usually held monthly, facts and suggestions provided by each department are viewed against a background of inter-departmental interdependencies, and new knowledge may be gained from outside the planning process. The planning process, which should be completed some 18 months before scheduled production to allow sufficient time for the realisation of the project, culminates with the production of a 150-page final document (Betriebspunkteinrichtungsmappe).

The 1990s saw the development of a number of large scale projects and the implementation of computer applications on various platforms. One such application was graphical computer-based mine design (GRUBE), which was aimed at both envisaging a larger concept for handling an inter-departmental planning process, as well as the development of self-sufficient applications. A salient feature of this particular project was the use of a 3D mine model to aid navigation through all the data, and GRUBE applications now form part of a whole array of different applications in use, generating data in different formats.



GRUBE bulk flow analysis carried out on a 3D mine model.

A shift in attention

When GRUBE (and other software products) had provided sufficient data-generating applications, as well as a sound theoretical basis for an inter-departmental data exchange, two major strategic decisions were taken by the German hard coal mining industry in the Ruhr – the implementation of SAP and, at a lower level, the migration of all applications and data from workstations to a PC environment. Thus GRUBE was re-christened GTP (geometrical technical planning systems) to better reflect the more general scope of the project – data consistency with SAP and the full implementation of inter-departmental data exchange.

Much of the data referred to above is dealt with at the inter-departmental level and the information is used by someone other that the originator of the data. This data must fulfil, therefore, two overriding demands:

- It must be highly self-explanatory, being intelligible even to outsiders; and
- It must be easily traced and found with the knowledge of specific file systems, name conversions or database structures.

The demand for intelligibility is already sufficiently met today, albeit at the expense of much manual work. Most planning results are clearly documented in the form of standardised lists or drawings, time consuming work which is usually carried out using non-specialised office applications. This process must be further assisted by existing and future applications.

Consider a mine manager in the office late on a Friday afternoon wishing to review the current planning activities of a certain working point. But which directory should be accessed to find the most current model of the haulage system? Which conveyor belt calculation is related to which calculation of a longwall mining system? Where can a drawing of the proposed belt drive be found? What are the assumptions/criteria which have led to the current planning? Has the new directive concerning methane measurements been considered in the ventilation plans? Didn't a similar situation exist some years ago in the southern field?

The mine manager would be far happier if he could select documents using key words. He would be even happier if related documents were linked together, similar to pages on the Internet. He would be in near heaven if all the documents could be visualised within a 3D mine model.

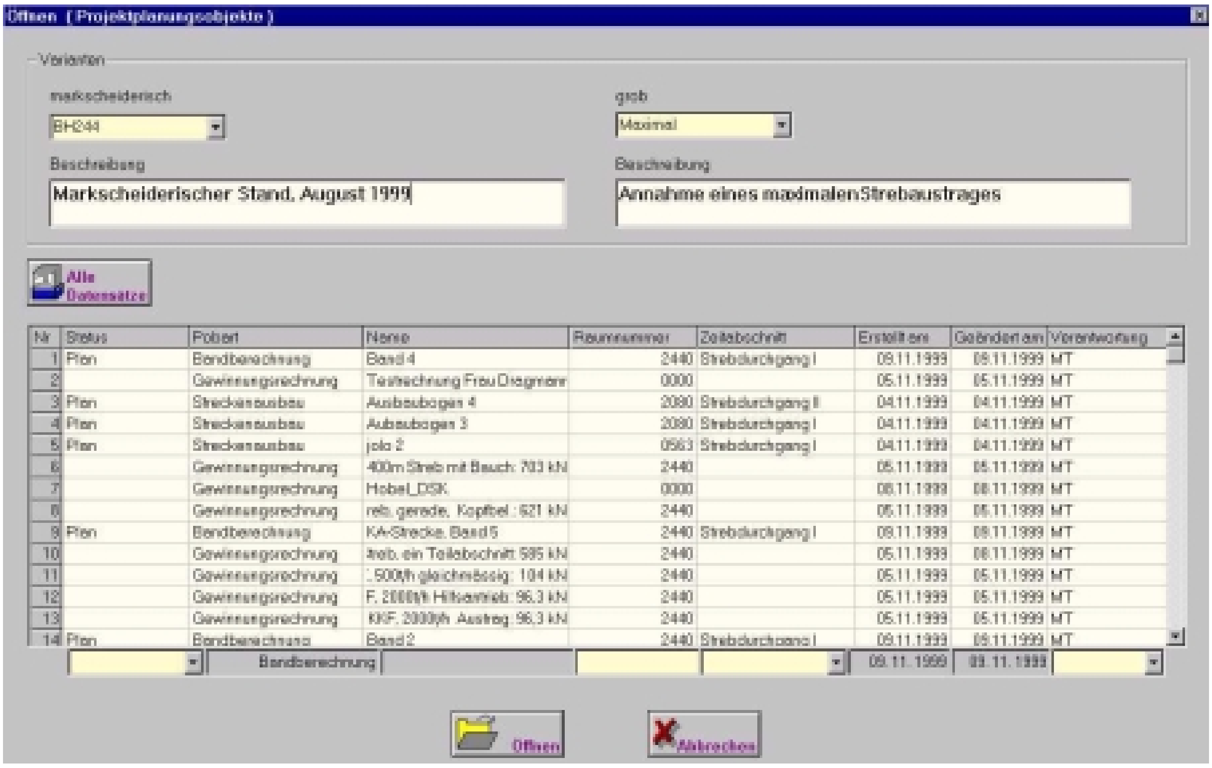
The basic idea of the GTP 'info-manager' is to force the originator of a GTP document to enter a number of key words. The originator can then optionally attach any other type of office document to this 'information carrier', enabling the system to group together all sorts of documents and make them accessible through Internet-like search procedures.

When trying to save a certain document, each user is forced to describe the document in the following way:

- Name of the 3D mine model used;
- The technical version of the document (used to group together documents according to inter-departmental versions to be planned an which is identical with one specific working-point document);
- The status of the document (which describes whether the document refers to a planning process, a project in operation or a past project);
- The document type (such as a conveyor belt calculation);

- An identifying name to be chosen by the user according to his/her needs;
- Official numerical identification of working points (also used by the SAP system);
- A description of the project phase relating to the document (such as preparation, production);
- The date the document was originally created and filed by the system;
- The date the document was last amended; and
- The originator of the document.

Thus, with easy-to-use mouse operations, the documents can be filtered, readily showing all documents that were updated yesterday, for example, or relating to a certain working point, or relating to a planning version assuming a maximum longwall output and so forth. Furthermore, the possibility of entering descriptive text rather than having to rely solely on actual file names is considered to be particularly helpful for operators.



Using the GTP protocol, planning documents have readily identifiable parameters such as name of the 3D model used (Markscheiderische), status, document type (Pobart), date the document was created (Erstellt am), and the creator of the document (Verantwortung).

Navigation through data structures can also be carried out via the 3D mine model. Each type of information carrier is represented by a graphical symbol and can be freely placed in the 3D model by the user. Such a symbol then serves to indicate the presence of further information which can be accessed using the mouse.

In summary, the GTP system provides a means of structuring information at the very moment of its creation by enforcing the use of strict protocols when saving documents and by enabling users to link related documents to one another. GTP also provides easy-to-use tools for arranging, filtering, visualising and editing any type of document. In particular, it is hoped that less specialist users such as managers of the hierarchical level above the actual planners will use the GTP-information management as a source of coherent and up to date information on the planning processes.