CERANET – INTERACTIVE TOOL FOR FAULT DIAGNOSIS

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1. ABSTRACT

This paper presents a method, how to create an interactive fault database for ceramics on the web, called CeraNet. This method can be adapted to other products. CeraNet does not only contain descriptions of faults and remedies, but also detailed information on machinery, references to literature, description of raw materials etc. The data are stored in graphs. The structure of all stored data and documents was developed carefully in order to provide a simple but efficient search in the database. The data can be accessed by any conventional Internet-browser. An editor software to enter the data into CeraNet and to maintain the database was created.

2. INTRODUCTION

Because of growing costs in ceramic industries more jobs are taken by staff, who are not skilled in ceramics and ceramic production. Even simple and basic fundamentals and working methods are not known to them. The Forschungsinstitut für anorganische Werkstoffe -Glas/Keramik- GmbH (FGK; translation: Research Institute of Inorganic Materials - Glass/Ceramics) is often confronted with problems, which could be easily solved by skilled staff in companies. Therefore, the idea came up to produce a collection of production faults, that can be made available to the companies via the Internet. The use of Internet-technologies has several advantages: The data is always up-to-date. The presentation is not restricted to text and pictures, but can contain video-clips, animations or sounds. All information is available on every PC by using any Internet-browser. All information in the database is linked to similar topics or further information, which allows fast and effective investigations.

A search on the availability of collections of ceramic production faults showed, that most collections are only available as printed books.

The CeraNet fault database is intended to be used by persons with only some basic knowledge about the production of ceramics. There are three groups of potential users:

- Technical staff in production management are supported by CeraNet in tracking faults by its interactive search methods. If the exact cause of a fault is not available in the database, the examination of similar cases will help to find the solution. Their view on the databases is filtered by selection of the machines and the production plants used.
- Laboratory staff concerned with quality management and product development uses the knowledge about new production methods and analysis methods and the links to further publications.
- Students and trainees in the field of ceramics get a specially developed guided tour on selected parts but no full access to the database.

3. STRUCTURE OF THE DATABASE AND REALISATION OF THE INFORMATION SYSTEM

The information in CeraNet is stored in different linked databases. The overall connecting elements are the presentations of the production processes by a „Phase-Model of Production“[1]. This model is easy to understand without any further introduction. In this model circles represent products. Rectangles stand for production steps. These production steps can lead to further, detailed presentations of a production step by another Phase-Model. This leads to a clear structure, where only relevant information is presented.

The huge amount of production faults and the varying ways of manufacturing require a system of efficient filtering to reduce the amount of information presented to the user. The first mode of filtering is created by choosing a product group. The product groups were developed from a general taxonomy of ceramic products. These product groups are distinguished by the main product type (tiles, sanitary ware, pipes) and the way of forming (dry pressing, extruding etc.). The choice of the product group (i.e. dry pressed tiles, split-tiles, etc.) and some more selection of details in the production (for

example: single firing or twice firing, firing in a tunnel, shuttle or roller hearth kiln etc.) lead to a first filtering of documents presented to the user.

The production faults are stored in the reference fault database, where pictures and other fault descriptions, descriptions of the fault's cause and remedies are stored. From this point, the database of analytical methods (including relevant references) and the process database can be accessed directly at the relevant topics.

Database management is done by a specially developed editing program. This editor cannot be accessed over the Internet. The information on products, processes, production plants/machinery and faults is linked automatically during insertion into the databases. After that, the Internet-compatible HTML-documents are generated.

The editor software is realised as an application of the MetaCASE system JKogge[2] that was developed at the Institute for Software Technology (IST, University of Koblenz-Landau). The central component of the software is a visual editor for Phase-Model diagrams. This editor is supplemented by components for manipulation of all other information and a component that generates HTML documents using XML technology.

As internal data structure graphs[3] are used. All relevant objects are represented by nodes, and their relationships are represented by edges. The modelling approach used permits easy consistency control and fast adaptation of the software to new external requirements. Using this technology the generation of consistent HTML documents can be guaranteed – in contrast to manual creation.

The access to the database starts at the homepage of CeraNet (http://www.ceranet.de). It is possible to access the documents by alphabetical order, by the type of the documents or by the product group, to browse through a gallery of pictures, or to start with a Phase-Model of Production. Since all the information is connected by hyperlinks, it is possible to read more about analytical methods after finding a fault in the database or to find further information about a production step that caused a fault.

4. CONCLUSION

The authors want to emphasise, that CeraNet will not become a new educational book on ceramics as far as the completeness of the information is concerned. But the way of presenting the information could lead to a new approach in educational work.

The newly developed software can easily be adapted or expanded to other fields of production. During the funded CeraNet project it was only possible to work on the field of dry pressed tiles because of budget restrictions. But it is also possible to use the system in other areas of industry, such as food, rubber, or textile production or in the chemical industry. The basic software is independent of the contents of the database.

Besides the use via Internet, there is also the possibility of using CeraNet in a company Intranet. It is recommended to train one or more employees of the company on how to structure and how to add information using the CeraNet-editors, as well as on how to maintain the database. In such a case, the assistance of FGK and IST is limited to

methodical support, all contents of the database can be kept confidential. The only requirement for all users connected to the company's Intranet is an Internet-browser, which is already available in most PCs.

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5. REFERENCES

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