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INTEGRATED PROCESSING SOLUTIONS IN THE METALLURGICAL AND INFORMATION FIELDS

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ABSTRACT: In this paper, we have defined and described the basic concepts of a management information system applied in the metallurgical and information fields. The characteristics of good information, namely, relevance, timeliness, accuracy, cost-effectiveness, reliability, usability, exhaustiveness, and aggregation level, have been described. The role of information systems in the process of decision making and the value of information have been explained. The advantages and disadvantages of centralized systems have been examined. Also, the need for organizing databases and their integration analysis to evolve a decision support system have been explained. The technical fields (such as the mechanical or metallurgical) handle large amounts of data, that are used by that domain experts for complex calculations needed for various technical operations, such as the heat treatment of steels used in the manufacture of parts. This paper provides information support for the most steel grades, so it can be extended and used for a wide range of steel grades and types of semi-finished products. The use of computer systems with these applications will greatly facilitate the calculations in metallurgical or mechanical field.

KEYWORDS: information support, steel, management information system

❖ INTRODUCTION

The collaboration between the metallurgical and information fields began to take shape in the recent years, and the request for applications to be solved by using computers and software is rapidly growing. This leads to search for integrated processing solutions, data storage and query, and the creation of applications with friendly interfaces, easily accessible and adapted to the new operating systems, providing solutions to the technical problems existing in the various fields, such as that of obtaining parts from different steel grades.

The technical fields (such as the mechanical or metallurgical) handle large amounts of data, that are used by that domain experts for complex calculations needed for various technical operations, such as the heat treatment of steels used in the manufacture of parts. An application programming interface is a particular set of rules and specifications that software programs can follow to communicate with each other. It serves as an interface between different software programs and facilitates their interaction, similar to the way the user interface facilitates interaction between humans and computers.

These calculations can be made today by using the databases and dedicated programming environments, called *database management systems*.

This paper provides information support for the most steel grades, so it can be extended and used for a wide range of steel grades and types of semi-finished products. The use of computer systems with these applications will greatly facilitate the calculations in metallurgical or mechanical field.

❖ BASIC CONCEPTS OF INFORMATION SYSTEMS DESIGN

The computer system is a coherent structure, made of computing and communication electronic equipments, programs, processes, automatic and manual procedures, used as a tool for automatic data processing in a field of activity.

Using computer to solve a homogeneous group of works or problems of the beneficiary is a computer application, but a computer system may include several applications.

These systems have a specific life cycle, which starts from the moment of concluding the design and implementation contract and ends in the moment when this system is replaced by another system. For this cycle there are two main periods:

- design and implementation of the operating system;
- use of the operating system.

The first period is that part of the existence cycle in which the computer system is designed, the related programs are made, and the design, operation and maintenance documentation is developed, for commissioning at the beneficiary company.

The second period is that part of the existence cycle that ensures the effective use of the system through the automatic processing of the data collected from the beneficiary company.

In the designing stage, the team that develop the computer system should take the following successive modelling processes:

- the information modelling system that provides critical description of the existing system and defines the functional requirements quantified through the objectives that the new system must meet;
- the conceptual modelling that describes the structure and the functional solution of the new system, to meet, in the best possible conditions, the required objectives, independent of the computer, operating system or data management system;
- The technical or detailed modelling, involving the transformation of the functional solution into an operational solution to a particular computer or data management system.

Information systems are implemented for the purpose of improving the effectiveness and efficiency of that organization. Capabilities of the information system and characteristics of the organization, its work systems, its people, and its development and implementation methodologies together determine the extent to which that purpose is achieved.

Analyzing the heat treatment process based on literature, were identified the main entities which will require data storage. These entities are divided into five categories:

- Steels (they store the information necessary for the technological process, according to the technological norms, about the types of steel).
- Characteristics (they store information about the chemical characteristics of the various steel grades);
- Semi-finished products and Profiles (types of semi-finished products and their standard sizes);
- Treatment (calculated information, required for the heat treatment of steel).
- Heating and Cooling Equipment (information related to the types of equipments used for the two stages of the heat treatment).

Data processing consists of identifying each item of data and systematically placing it within a scheme that categorizes data items on the basis of some common characteristic or feature. Data not organized into a meaningful pattern can serve almost no useful purpose to those who must use them to make decisions. A computer can help in processing the data effectively.

❖ APPLICATION INTERFACE. APPLICATION FORMS

In the applications with databases, the tables are updated through specialized models called forms. Tables comprise the fundamental building blocks of any database. The forms provide:

- User-friendly interface, realised by means of various controls (buttons, text boxes, etc.) or other incorporated graphic elements;
- Simultaneously update of more tables through subforms;
- Additional validation rules as defined in the tables.

The forms found in Access create the user interface for tables, with the advantage of presenting the data in an attractive and organized way. The forms are composed of a collection of individual structural elements, called *controls* or *control objects*. The forms can also contain subforms.

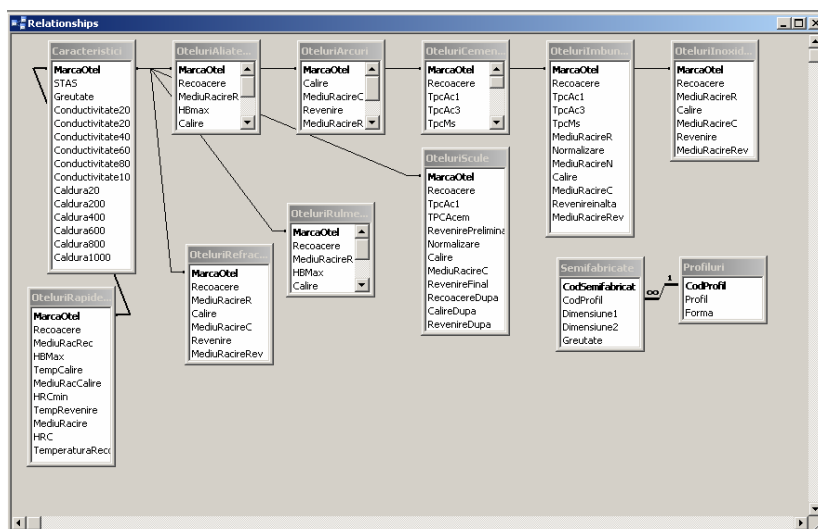


Figure 1. Collection of individual structural elements

The first form is the authentication one, and allows the selection of the work level (administrator or client). The specific elements of the security system will be explained in a later paragraph. The second form of the Application is called *Interface* and is intended to allow the launch of the other forms. In other words, the main options of the application are accessed through the interface.

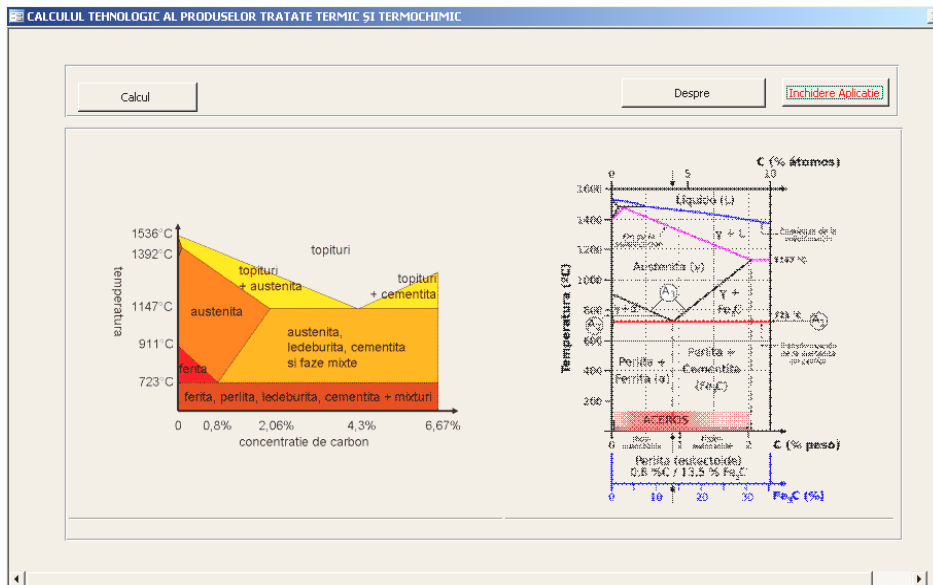


Figure 2. The application interface

The options existing on the interface form are grouped as follows:

- The option “Calculation”, located on the left side, allows the computerized technology calculation for thermal treatments, for various semi-finished products made of steel (a form containing pages for the calculation steps is required to obtain the heat treatment times for semi-finished products)
- The option “Calculation”, located on the right side, allows the displaying of information about the various equipment and machinery used for the heat and thermo-chemical treatment.

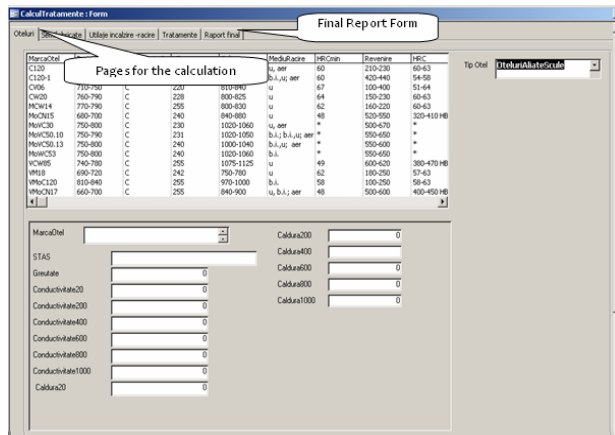


Figure 3. Pages for the calculation steps

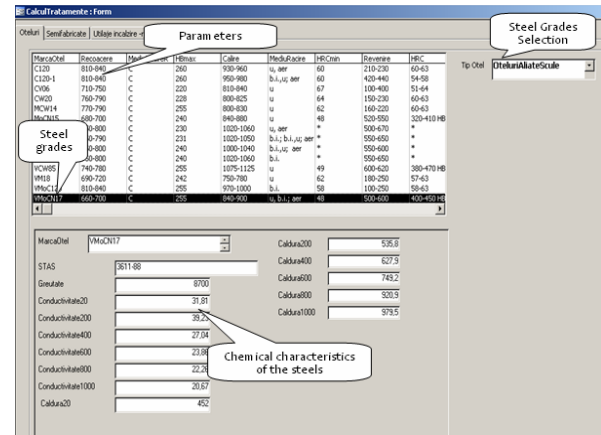


Figure 4. Selection the parameters

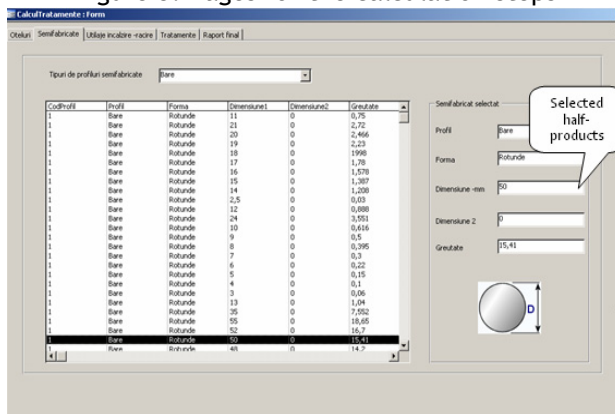


Figure 5. Selection the half-products

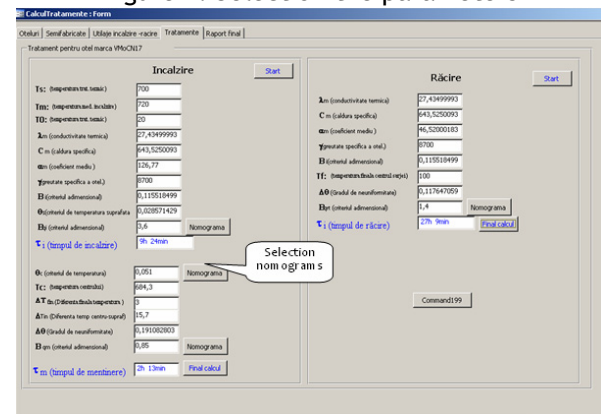


Figure 6. Selection the nomograms

The proposed system design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements in the metallurgical and information fields. One could see it as the application of systems theory to product (or half-products from metallurgical area) development. There is some overlap with the disciplines of systems analysis, systems architecture and systems engineering applied in this area. The integrated systems design is therefore the process of defining and developing systems to satisfy specified requirements of the metallurgical areas users.

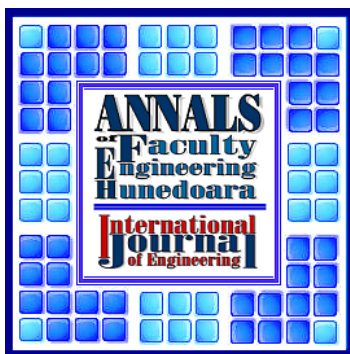
❖ CONCLUSIONS

The computer application presented in this paper is intended for a technologist wishing to make the technological calculation of the heat-treated products. This calculation is to determine the heat parameters, i.e. the heating duration, the maintenance duration and the cooling time required for that semi-finished product. In the past, this calculation was made by hand, involving the consultation of nomenclatures specific to metallurgy, the technologist having to determine the time of annealing, maintenance and cooling.

The Computer Information Systems involves the design and maintenance of information systems that enable organizations to gather, process, store, and use information for planning, control and operations. Emphasis is placed on the analysis, configuration, programming, security, and database aspects of the design and implementation of a computerized business information system. The application allows the automation of this calculation, eliminating the routine and the possible mistakes.

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