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CATALOGUE OF HYDRAULIC COMPONENTS INTEGRATED WITH THE PROGRAM FOR DETERMINING THEIR STATIC AND DYNAMIC CHARACTERISTICS

1. Introduction

While designing hydraulic drive systems it is necessary to find information about system components. Apart from traditional catalogues, one may use computer catalogues on CD or find information directly, via Internet. Thus obtained information has to be further processed and updated. The paper presents a partly finished program to process catalogue information and to generate the static and dynamic characteristics. The program was written in Delphi system for Windows.

The catalogue data are treated as resources and the relevant module processes these for the design purposes. While analysing computer catalogues attention was given to the solutions offered by manufacturers of hydraulic components, such as Ponar Wadowice, Vickers, Festo and other. Each company has a different approach to catalogue - making. The only common feature are the data saving formats: drawings of elements and symbols (dxf, wmf, bmp), text files (txt, pdf) and tables (dbf, mdb). The design process also requires that the data obtained in the course of designer's experience be included as well.

Characteristics of hydraulic elements may be determined either experimentally or theoretically; thus obtained characteristics may be included in the catalogue. Other solution involves storing the mathematical model in the database and generating the characteristics after selecting the element whose model is stored. This solution will be presented using the example of an indirectly-operated control overflow proportional valve whose mathematical model is to be used in simulation of valve response to rapid volumetric flow rate change at the inlet. The calculation model was developed basing on modified procedures for solving the Rungege - Kutta differential equations of the IV order.

2. Processing of the Catalogue Data

The outline of program structure with applied method of data interchange is given in Fig 1.

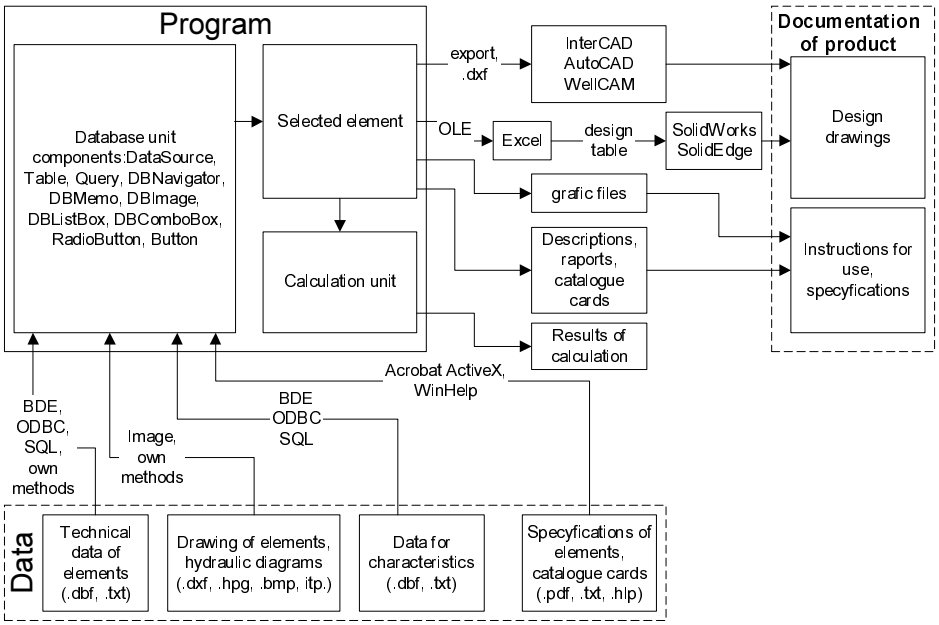

Fig. 1. Conceptual design of the program

Data Source, table, Query, DBNavigator and SQL language were utilised to develop the program. Image and BDImage components were used to display raster drawings. Vector drawings were developed using the modules created by the authors. The program allows to find the element which meets the specified criteria. Each element might be supplemented with other data, such as tables of characteristics parameters, static and dynamic characteristics, drawings and operation manual. Interaction with the user is effected via a system of windows. When the program is on, the main window appears on the screen. It consists of the upper menu, keys enabling the choice of a given element, a picture of the element and the lower section of keys. While the data window is displayed, the user may can make other windows active using upper menu or function keys in the lower section. The browsing window is shown in Fig 2. Using the overlaps in the upper section of the window, the user may pass on to the browsing window.

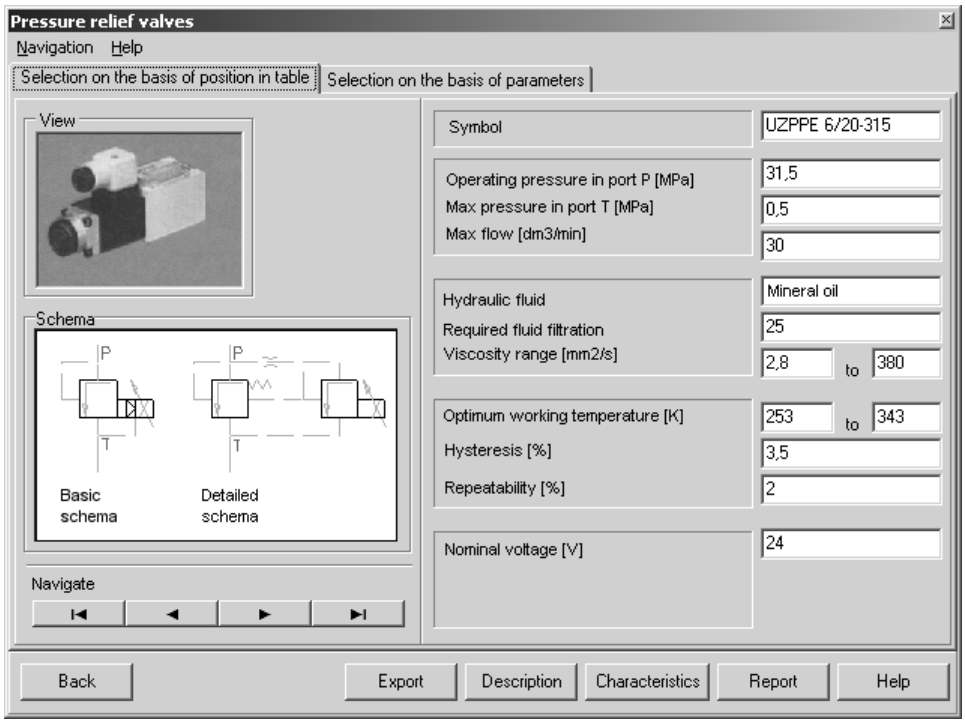

Fig. 2. The Window for Data Browsing

The search is completed when the element meeting the specified criteria is found. Process end is automatically displayed on all the windows related to the data window; that is report, export and description windows. Thus obtained information can be displayed in relevant windows or summarised as a report and printed. Drawings of the elements may be transferred to CAD programs together with the technical data.

Static characteristics of the elements in the new database were developed on the basis of manufacturers' data. Dynamic characteristics were found as the response to dynamic excitation in the form of rapid changes of volumetric flow rate at the valve inlet. They were obtained with the use of the calculation module based on mathematical models for individual elements. The data obtained from simulation may be graphed as in Fig 3 or written in the file for further analyses.

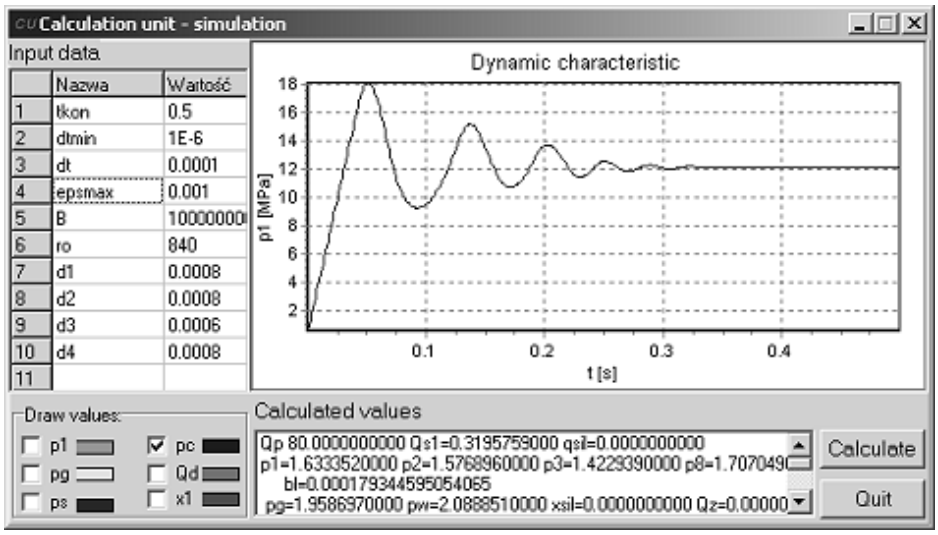

Fig. 3. Pressure Inside the Valve as the Response to Rapid Change of Volumetric Flow Rate at the Inlet

3. Conclusions

The program presented here provides vital information about hydraulic elements: the technical data, static and dynamic characteristics, design drawings and hydraulic symbols. These information and drawings may be transferred to CAD systems using standard files. Developing programs combining the tasks of a database and simulation is rather difficult. The programming environment Delphi allowed to complete the task in terms of its objectives, while the functions of the Windows systems allowed for development of an effective user interface and data interchange with CAD systems.

Literature

1. Beynon-Davies “Systemy baz danych” WNT, Warszawa 1998
2. T. Miller. D. Powell “ Delphi 3 Księga eksperta” tom 1 i 2
3. Ponar Wadowice S.A: “Multimedialny katalog wyrobów”, Media Service Wydawnictwa Multimedialne, Warszawa 1999