THE USE OF DATABASES IN THE ASSESSMENT OF POWER TRANSFORMERS

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Abstract. Within the context of restructuring the energetically system management the reducing of the costs and the safety increase when delivering the electrical energy, represents a major objective for all producing, transportation and delivery enterprises of electrical energy. In this respect, the right exploitation and maintenance of the power transformers become more and more important because of their price. But it also involves a very good correlation between the constructive and functional particularities of the power transformers, their lifetime, working conditions, evaluation conditions of their momentary state, their supervision politics.

This paper presents an application that allows the supervision of the state and lifetime of the transformers. The mathematical model used is the sire model for the transformers exploited in similar environments. The purpose of building up this database and then of implementing the application, was to obtain the necessary data regarding the development of a model that should allow the analyze and diagnose of the transformers' state and lifetime according to the environment factors.

1. Introduction

The rationalization of the maintenance activity and administration of the transformer park implies the existence of a databank that should consist of the total amount of the necessary information to diagnose the state and the estimation of the lifetime of the transformers.

The database was designed to stock the information that might allow the calculation of the main extensions that can characterize the state and lifetime of a transformer: its resistance to isolation, the tangency of the loss angles, the relative thermic ageing factor, the thermic degradation, the lifetime. The administration systems of the database are the essential instruments in a variety of environments, starting with the traditional usage in business, research, teaching system contexts to more recent applications, such as the operation using the search engines on Internet. The use of the database is more and more frequent on a personal level as well, in order to stock some data resulting from genealogical research, the maintenance of certain collections etc.

The practical use of some complex models determines prohibitive costs because of the great calculation power requested, and by accomplishing the groundwork that is absolutely necessary when gathering and creating the database that stocks the required information for the calculation.

The existence of a database is absolutely necessary, both for a clear evidence within the field and for ensuring the information support for the phenomenon study. The database should contain information that respond to a large variety of requests from the user, requests that are materialized through applications that will work based on these information. The applications can either reach many objectives or can be focused on a particular issue.

2. Tn of the power transformers throught complex databases

The Electrica database concerning the administration of the conduct of the power transformers within SEEA, contains both data about transformers, and data regarding the measurements of the parameters that characterize the state of these transformers. This way, the created database offers the user the following: the evaluation of the individual conduct of each exploiting transformer, the centralization and visualization of the available data for the whole hierarchic system (the branch, exploiting centers, transformer stations, transformers). On the basis of the database the predictive and preventive maintenance can be established for each transformer from the database; the conduct of a transformer family can be evaluated, synthesis and detail reports can be created that will be the base of the decisional mechanism.

The informatics system Electrica provides the user interfaces that combine the simplicity of usage with high functionality and security level when using the information. This way we can include the following in the database:

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- The specific technical data for the power transforming units from exploitation;

- The distinguishing files of the events referring to the transformation units

  Their history as experiment reports, in the factory, at PIF or in exploitation;

  Their history as revisions, repairs or interventions;

  Their history as supervision files of the movement of a certain equipment in different transformer stations;

  The history of the incidents cause by equipments mentioned above/

Therefore, the administration system of the Electrica database provides the user dynamically the following:

- The creation of the database structure;

- The insertion of the data, that is adding, actualizing, validation, calculation where necessary;

- The analysis and the arrangement of the data using reports and suggestive graphics;

- The data base interrogation by many criteria;

- Surfing the database;

- Downloading and uploading files;

- The protection of the data by restricting access to the user's programmer, the access being differentiated by the user or administrator level.

3. The description of the informatics system

The Electrica database is created on 5 levels: centers, transformer station, cell, equipment, events. For each level the following operations are allowed: Centers:

- Adding - add a center

- Actualization - change the data of a center

- Deleting - deleting a center, which can be performed only by the system administrator

- Visualizing equipments, cells or dependant stations

- Searching by different criteria

- Generating reports with details about the center

The main objectives of the applications from the administrating area of the transformers that require the current information in the database could be the following:

- Estimating the transformer's lifetime;

- Evaluating the transformer's state;

- Creating of facilities in adapting and interpreting of data process;

- Organizing and supporting the exploitation;

- Creating facilities for the process of forecasting and decision

The objectives of the application from the administrating area, enumerated above, can refer to the transformers that concern the exploiting of the transformer stations and because of this the creation of the database was made for the transformers from the Poltura transformer station from Arad country.
The primary information refer to:

- identifying the transformer (The equipment code, factory, number, year of fabrication, type, etc), its ascendant (the type of equipment the stations belongs to, place (town);

- the features of the transformer (type, power, connection, high and low tension, etc)

- the measurements performed by the operator (the measurement of the quantity of water dissolved in oil, the isolation resistance of the reeling, the measurement of the dialectical loss of the reeling isolation, as well as the measurement of the returning tension of the reeling isolation, etc)
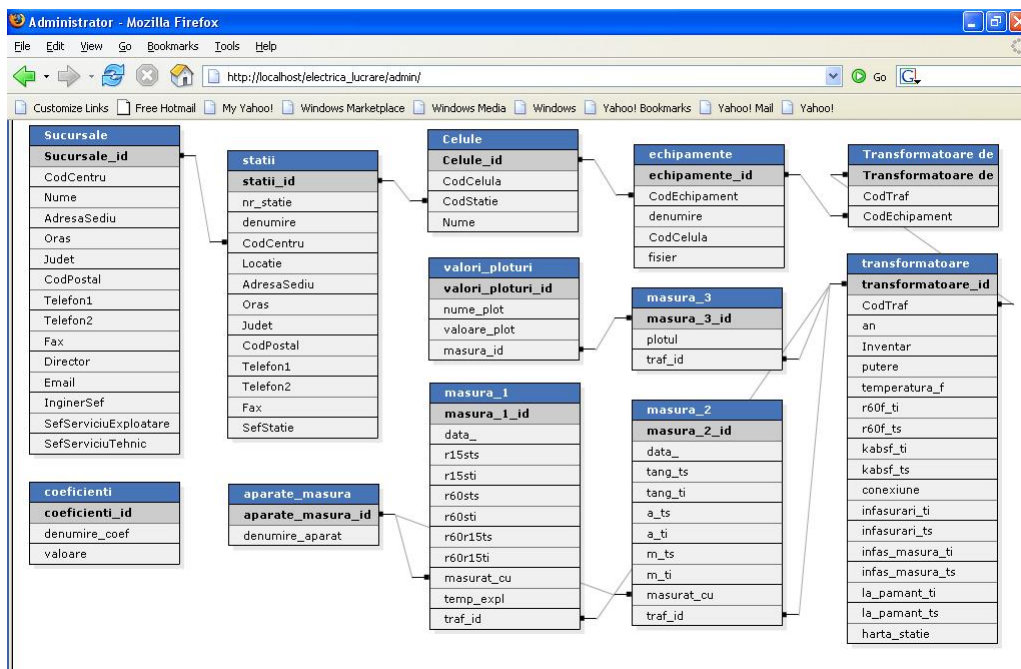
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Figure 1: The structure of application Electrica

- The establishment of the database structure represented the first phase in designing the database. It was accomplished as a result of an accurate analysis of the targeted activities that would be realized in the application as well as a preparation for the future applications.

The structure of the database with the related tables is presented in figure 2:

The user is provided with an interface that, by an arborescent structure can introduce data about centers, stations and equipments. The particularization was made for the power transformers from the current stations in Arad county. The interface with the user is presented in figure 3:

For each station you can visualize related equipments, the position of the geographical station within Arad county being signaled by an optical mark

For each transformer you can trace the variation of the main parameters that characterize the ageing of the transformers: the resistance to isolations and the tangency of the loss angles. For each parameter you can chose the data

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Figure 2: The structure of Electrica database

of every inspection certificate and the results obtained through that inspection certificate.

At present the centralization in the computer of the activities performed within the Electrica Company is a major request for the increase of the activities, both as far as maintaining the best parameters of the electrical energy and the assurance of the permanence of energy supply as well as in the area of economical efficiency.

4.Conclusions

As a consequence, the following conclusions can be drawn: The applications of the state administration within the transformer stations and the development of new techniques have become one of the most important tasks for most of the energetically companies from the beginning of the 90s;

The creation of an administrating system was imposed for two reasons: in the transformer stations, the functionality without shocks of the electrical
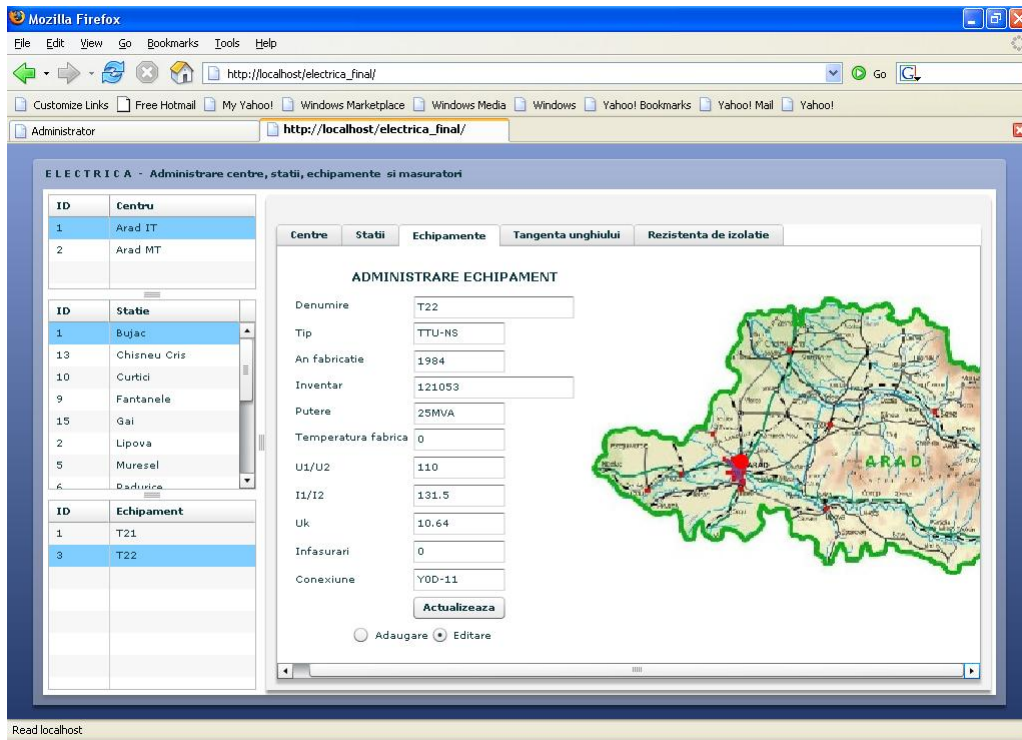
Figure 3: The interface of the user for Electrica database

equipments as well as of the power transformer is extremely important because the unpredictable cut-offs or shut-downs can lead to accidents and can have repercussions on the entire enterprise activity, and on the other side the power transformers represent costly actives and therefore large maintenance costs are required.

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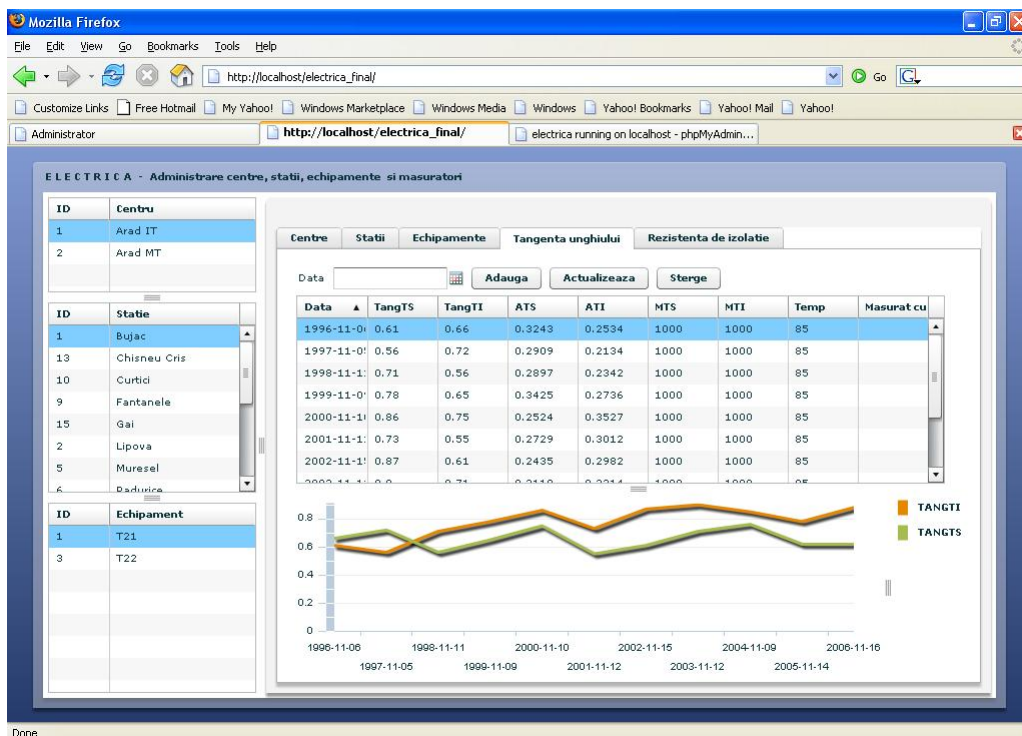
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Figure 4: The interface for monitoring tangent of delta

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