Specific Aspects of Databases Used in the Romanian Oil&Gas Industry

Loredana Păunescu

Petroleum-Gas University of Ploieşti, Bd. Bucureşti 39, Ploieşti
 e-mail: loredana.paunescu@yahoo.com

Abstract

The work synthetically presents the author᾿s concern regarding the development and implementation of a feasible and secure data base system, in the context of creating a unitary and integrated informatics system for the Romanian oil industry entities.

There have been made general considerations concerning the essential aspects of entities which influence the general "design" of the informatics system and, of course, the database.

At the foundation of the elaboration of database must stand the systemic – process conception, according to which the given entity is considered as being a unitary economic system.

Both specific and general data are presented, with which the informatics system operates; these data are grouped into subsystems and macro-processes of the economic system.

Then, the steps of designing a DBMS are presented, in order to realize the general design and choose the type of database compatible with the oil entities requirements.

Finally, there are some considerations to be made regarding the security and protection of database.

Key words: *subsystem, security, architecture, entity, application, information, data*

General Aspects

Essential Aspects of the Organization from the Oil Industry Regarding the Implementation of Informatics Systems

The oil production is part of the national industry output and it is realized using a series of resources and a proper management; this being the result of macro-processes and specific, complex and interdependent processes.

Regarding the implementation of the informatics systems, in this organization (derricks, oil departments, national companies), a series of certain aspects must be taken into account, for example:

o Prospecting, extraction, transport, processing cover a large aria, represent processins that some of this in isolated and hard accessible zones;

o The distances between the working points and the leadership/ management and decision centers (production departments, derricks) are big, needing to be covered by proper logistic and requiring suitable expenses;

o The activities aren't for a long term for the extraction of a certain deposit (oil- bearing field, in such a way that after the economical out of stock/ the maximum point of economical limit of exploit), the activity ends;

o As a conclusion, for the aspects presented before, it appears to be necessary to present the conception of a hybrid /mixed/compound informative system: the informational system (non-computerized) and informatics (computerized), at least at the beginning, the computerized one (system) having, of course, an integrated character.

The Conception of the Systemic - Development in the Database Systems Elaboration

The elaboration, and afterwards, the implementation, of database systems and warehouses, part of the informatics system must be done with a systemic – development vision.

This concept includes the consideration of the analyzed entity as an economic system, based on a connection of macro-processes and technological processes and also, of various activities derived from them or collateral/indirect to these, but absolutely necessary in their development, in optimal and safe conditions.

In figure 1 we haves synthetically shown, the basic technological process for any oil entity, regardless of its size.
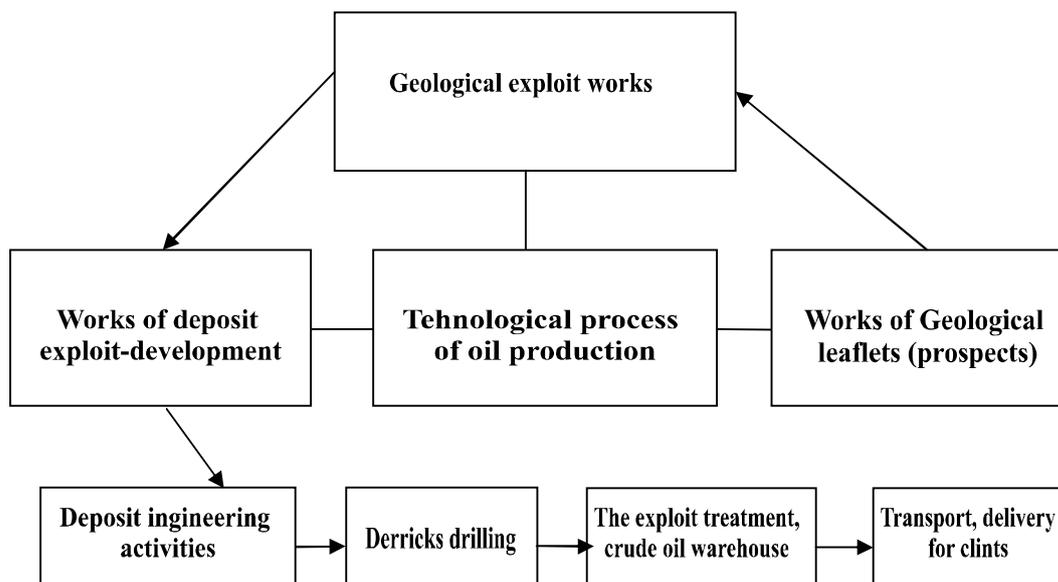

Fig. 1. The image of basic technological processes in connection with one another

Specific Data for General Use in Databases in Oil Field Industry

In the exploitation oilfield industry the data that need to be stored in databases can be grouped as:

o For the "research – design - development" subsystem, data for:

  o the oil - deposit administration;

- o natural resources (deposit) or its potential;
- o geological research;
- o deposit engineering;
- o drilling and equipment for derricks;
- o tests concerning derricks production;
- o methods for major derrick fixing;
- o attaining economical limit in deposit exploit;
- o the dynamics of deposit decline (for the subsystem);

o The proper oil – production:

- o the oil production out – put;
- o planning, supervising production;
- o the administration of oil stocks;
- o oil delivery for clients;
- o the production report and the final factor of deposit recovery (for the subsystem);
- o Financial – bookkeeping:
- o the budget of incomes and expenses;
- o stocks administration;
- o derrick immobilization;
- o staff/personnel remuneration;
- o financial bookkeeping;
- o purveyor's administration;
- o clients' administration;
- o financial resources;

o For the "personnel" subsystem:

- o the conscription/drafting, selection and employing of personnel;
- o personnel training;
- o personnel promotion;
- o personnel migration;

o For the "logistic" subsystem:

- o material resources;
- o maintenance;
- o work environment;

o For the "commercial" subsystem:

- o marketing.

After this data grouping, the process continues with the classification of data: in a restricted class for specific specialty, general use (unspecified), work secrets, state secrets, operational

(with a large range of use, for data bases and warehousing with a reduced range of use for warehouses).

The General Architectural Database for Oil Entity

The structure design of the warehouse consists in the following steps:

o   the choice for the database management system (DBMS);

   During this stage, the following activities are performed:

   1.   knowledge of the users' needs: the types of the wanted applications, the speed of reply, data confidentiality, data security, easiness in using;

   2.   knowledge of technical requirements: portable DBMS., meaning the possibility of using the DBMS on various calculation/estimation systems, portable collections of data and programmes, meaning that the data prepared with the help of a computer can be transferred directly on another type of computer, along with the proper programmes, without any other auxiliary operations; data conversion existing in the accepted format of DBMS.; loading facilities, exploit and database maintenance;

   3.   establishing economic needs: fitting the budget limits for making the database and, in the multiple restrictions imposed by the economic system;

   4.   The necessary time for preparing the users and passing to the current exploitation of the database.

   5.   the hierarchical requirements and the priority for it;

   6.   the comparative analysis of the DBMS available and/or possible to buy, according to its characteristics;

   7.   the choice of DBMS;

o   the concept/draft scheme design;

o   the external scheme design;

o   the internal scheme, meaning the way in which the data are memorized on the physical support.

This stage represents the step where the database is massively populated.

Figure 2 presents the steps for loading data in a compatible database within the analyzed oil entities.

The Best Type of Database for Oil Entities

According to the research and the comparative analysis of various types of databases (relational, object- oriented, distributed), the relational model of data for the database corresponds best to an oil entity requirement, regardless of its hierarchical level: production department, derricks, oil department, company/national firm.

The advantages of the chosen model for the oil entity are various and obvious:

o   the insurance of a big grade of interdependence of application programs in comparison with the internal representation way of data and in comparison with the data access methods;
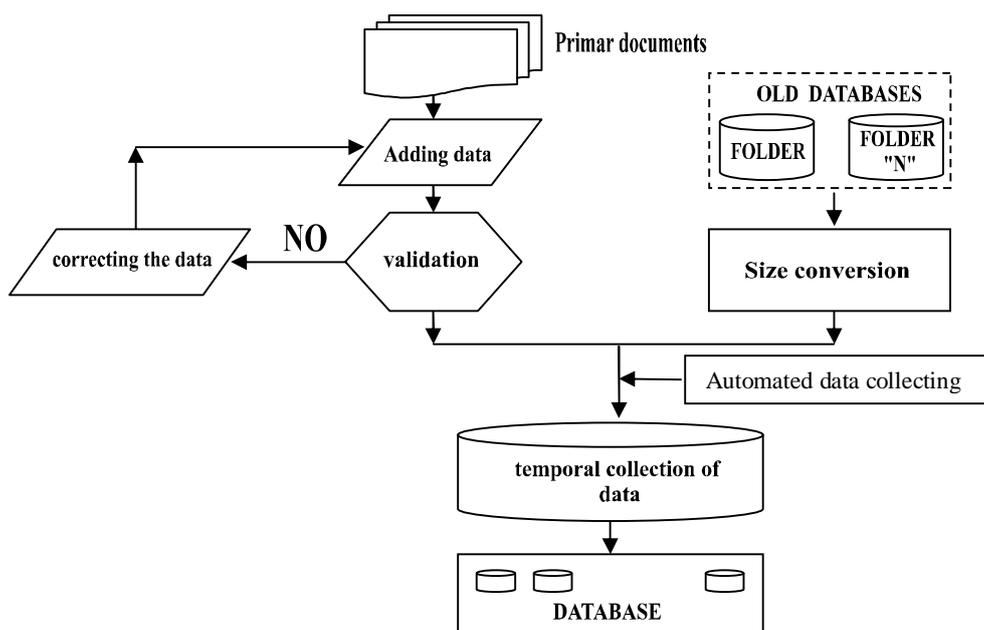
Fig. 2. The steps for loading data in the data base

o the supply for efficient methods and techniques of coherence control and data redundancy , with a good theoretical substantiation;

o the offer of multiple facilities of definition and data manipulation;

o the improvement of data integrity and confidentiality, through flexible and efficient mechanisms of specific and use of integrity restrictions and virtual relations.

Security of Databases Used in the Oil Industry

The oil industry operates with data, information which, in most cases, have a confidential character, work secret, state secret, (like, for example, the location of oil deposits, its potential, the economical exploitation limit, their decline etc.).

In this context, the database security together with its feasibility and the whole informatics system are requirements which must be fulfilled with a real sense of responsibility.

The protection of databases, in oil industry, consists in a set of human measures and facilities offered by the DBMS and by which data integrity can be achieved, defined as being the correct data introduced and manipulate, as well as the security of data, which doesn't allow the data access for the persons who have no ability in using them.

There are two directions in which the used methods realize the protection of data, namely:

o the protection against some accidental errors and,

o the complete protections, which realize, in addition, the protection against willing illicit actions.

The insurance of database security involves the forbidden, unauthorized access to data. This can be done by using a set of measures of human protection, software and hardware, like, for example:

o the isolation of the calculus system in rooms in which the access of persons is allowed only by identity cards or by other forms of identification;

o establishing passwords and, this way, gaining access to the calculus system resources;

o the checking of the user, if he has the right to execute a certain type of operation included in the DBMS ;

o the data transfer only in certain arias controlled by the DBMS;

o the codification of data during the saving (warehousing) or transfer.

References

1. A l t e r , S . - *Decision Support System; Curent Practice and Continuing Challenges Reading*, Addison-Wesley Publishing Company - U.S.A., 1980
2. D e a c , M . , L a c r ă m ă , D . L . - *Baze de date in aplicatii comerciale*, Editura Mirton, Timisoara, 2004
3. D e s p i , I . , L u c a , L . - *Baze de date*, Editura Mirton, Timisoara, 2003
4. F l o r e s c u , V., N ă s t a s e , P., B e r b e c , F. ş.a. - *Baze de date. Fundamente teoretice şi practice*, Editura Infomega, Bucuresti, 2002
5. G o r g a n , V . - Depozite de date şi asistarea deciziei, *Revista Contabilitate şi Informatică de Gestiune*, nr. 1/2002
6. G r i g o r e , I . , P o p a , C . - *Exploatarea zăcămintelor de ţiţei*, Editura Bucureşti, 1979
7. H a t c h , K . - *Management Information System*, Mc Graw-Hill, Watsonville U.S.A., 1994
8. I n m o n , W . H . - *Building the Data Warehouse*, John Wiley and Sons, U.S.A., 1996
9. L a c r ă m ă , D . L . - *Securitatea bazelor de date*, Editura Teora, Bucuresti, 2003
10. N a b i l , R . A , D o g r a m a c i , O . , G a n g o p a d h y a y , A . , Y e s h a , Y . - *Electronic Commerce - Technical, Business and Legal Issues,* Prentice Hall PTR, 1999
11. P o p e s c u , S . - *Procese informaţionale şi decizionale în management*, Editura Inig, Bucureşti, 1994
12. P o s t ă v a r u , N . , G h i a u s , C . - *Managementul integrat şi al sistemelor informaţionale*, Editura Matrix-Rom, Bucureşti, 2001

Aspecte specifice pentru bazele de date folosite în industria de petrol din România

Rezumat

Articolul prezintă, în mod sintetic, preocupările autorului privind elaborarea şi implementarea unui sistem fiabil şi securizat de baze de date în contextul satisfacerii necesităţii de a crea un sistem informatic unitar şi integrat pentru entităţile industriei de petrol din România.

Sunt efectuate consideraţii generale privind particularităţile esenţiale ale entităţilor, particularităţi care influenţează "arhitectura" generală a sistemului informatic şi, desigur, bazele de date. La baza elaborării sistemului de baze de date trebuie să stea concepţia procesual – sistemică de elaborare, potrivit căreia entitatea respectivă este considerată ca un sistem economic unitar.

Sunt prezentate, suficient de detaliat, datele specifice şi de uz general cu care se operează în sistemul informatic; aceste date sunt grupate pe subsisteme şi macroprocese ale sistemului economic. În continuare sunt prezentate etapele proiectării unui SGBD în vederea conturării arhitecturii generale a acestuia şi alegerii tipului de bază de date compatibil cerinţelor entităţilor de petrol.

În final, se fac unele consideraţii privind protecţia şi securitatea bazelor de date.