

Introduction

The System of automated control and management of resources and assets (the SAKURA) is a centralized automated system, intended for consolidation, storage and analysis of production data and technical-and-economic indicators, obtained in implementation of oil and gas projects with the purpose to increase the effectiveness of the operational and strategic management.

The SAKURA allows to you solve the following tasks:

Control tasks	Management tasks
Operational data analysis at all stages of life cycle of production field	Maintenance of well stock
Assessment of performance	Lookback data analysis with the aim of reservoir new engineering planning
Storage of all information, including archives, in a single informational space	Planning of manufacturing activities at all stages of production field life cycle
Quality control of information, coming from production facilities	Planning of capital investments for the construction of production facilities (wellsite, skids of production operation, product pipelines etc.)
	Preparation of materials for tender documents

Informational and analytical support of production field life cycle

There are a number of unpleasant and difficult moments faced by managers and employees of oil and gas companies in the management of production resources.

Firstly, it is poor quality information. Operational reporting from production facilities can be done anyhow very often: untimely; each report has its own form and it is very difficult to orient between them; different reports data contradict each other...A lot of time is spent on checking or re-checking of operational data because of this. Informal approach of data collection from production facilities leads to difficulties in interpretation of this information and, as a consequence, causes delays in operational management decisions making, which leads to financial losses in most cases.

Secondarily, it is low availability of information. Any specialist evaluates the situation (for example, drilling site incident) and makes decisions based on his own experience and available data. If you spend too much time for a necessary information

searching (in e-mail, network resource, multiple software systems, archives), it affects the timing, quality of decisions making and performance as a whole.

Thirdly, lack of single standard for information consolidation and reporting, that may lead to discrepancies and contradictions in interpretation of the obtained data. The consequences of this situation - is predictable and unpleasant - choosing a less efficient solution, loss of time, resources and money.

We took all these points by creating the System of automated control and management of resources and assets, therefore, the main idea of the SAKURA - is to get maximum of necessary information in minimum time (of course, in accordance with the authority of the employee).

Data factory

Data factory - is the basis of the SAKURA, it provides using of uniform control standard and information management.

Data factory includes the following tools:

- unified data model (unified description of the parameters);
- centralized store;
- integration and data collection tools;
- data control tools;
- database mining tools (Business intelligence);
- set of methodologies and algorithms for processing of structured and unstructured information;
- data visualization tools.

Data factory. Unified data model and Centralized Store

Unified Data model (UDM) – a unified description of the parameters, common to all oil and gas projects - in fact, the standard of data storage, was developed for uniform information processing, coming at different stages of oil and gas projects development. Unstructured or structured data, different from the corporate standards is discounted to a Unified data model with a help of System tools, by loading in the Centralized Store (CS).

Each production process has its own set of parameters: for example, «Boring», «Activity duration», «Weight of BHA» etc. - the parameters of the drilling process; «Wellhead temperature», «Bottomhole temperature», «Volume of produced gas» etc. - the parameters of production operation process. Data model - is a description of these parameters, their dependencies, and the hierarchy, controls and measures.

Unification is necessary for the further analysis and interpretation of collected data, because you can only operate the parameters, summarized in overall structure, to obtain a complete picture.

UDM - is a flexible entity, constantly developing - its expansion or improvement it is not excluded during the operation of the System. Currently UDM contains 1250 settings, describing the different stages of operation of production field.

Data factory. Unified data model and central storage

An extension mechanism of unified data model, allowing adding of UDM entities without interference in the program code, is the one of the features the SACMRA.

In addition, this mechanism allows you to keep the same indicators in several units of measure – depending on using units on a project or in a specific country. For example, the volume of produced gas can be specified in cubic meters and cubic feet, etc. All indicators are also stored in "base" units – to perform a comparative analysis for different production fields and projects. The conversion done automatically, when saving the data in the SAKURA, all the conversion formulas are configured once – by creating a new parameter.

Data factory. Data collection and integration

Data collection and integration tools allow you to connect any data sources to the data factory– both internal and external.

The SAKURA data modules are the internal sources for data factory. Data can be downloaded directly to CS, or received from offline application of data preparation and collection, being a part of the SAKURA.

Information and automated systems developed by third-party vendors, as well as data from the sensors of GES station, are external data sources for data Factory,

Data from external sources loaded into data factory, comes to a unified data model and can be saved in the database in a unified type.

Connection of new sources – for example, GES stations – allows you to develop a unified data model and provides wide opportunities for analysis of project status, designing and budgeting of new facilities.

Other functions of data collection and integration tools – are:

1. Enabling external systems – for example, to use the collected and reduced to unified model data for engineering calculations systems in data factory.
2. Loading of historical data of production facilities and its reconstruction to UDM.

Data factory. Data control tools

First of all Data control tools insure against mistakes (typos, messed up fields and so on), ensuring their accuracy and consistency.

Maximum control is provided by data collection via the data collection module, for example:

- control of depth of operation (the depth cannot be reduced during drilling and etc.),
- control of daily time balance (you cannot enter more than 24 hours of works per day),
- min-max control,
- control of fields dependence (for example, entering of BHA parameters is necessary, if the drilling-related works are specified),
- fields autocompletion.

Thus, the tools of the production facility level provide:

- control of format, type and association of parameters,
- control of insistency of parameters etc.

The tools of central database level provide:

- control of data timeliness,
- form control of entered data (control of consistency of the same parameters, received from different sources, etc.),
- ability of data adjustment,
- details of the received data,
- entering of additional information.
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Data factory. BI Tolls

Tools of intelligent data analysis as part of the data factory provide:

- ability of individual report settings for each project,
- reports formation , issuance and delivery on the form of the approved procedure
- creation of custom analytical reports.

Tools of intelligent data analysis allow you to create custom analytical reports without any code changes.

An intermediate middleware of business concept is created between the information in the data factory and tools of intelligent data analysis for the convenience of users, allowing formulating queries to the data in the industry-based and not the technical terms.

- middleware of the business concept consists of three groups of indicators: measurement – parameters that serve for the aggregation of indicators (for example, months, years, sections),
- basic indicators – indicators used by data analysis "as it is» (for example, boring per day),
- derived indicators and formulas for its calculation based on basic indicators.

At this moment, the middleware of the business concept contains of 850 indicators, their number will increase with the development of a unified data model.

Pre-configured analytical reports created, based on the business middleware concepts – a saved set of queries to the data in the data factory with the given measurements (period, object etc.) and method of display.

Data factory. Methodology and algorithms of processing of structured and unstructured information

Methodology and algorithms of processing of structured and unstructured information were created during the development of data factory, they allow:

- provide a joint analysis of structured and unstructured information;
- search for functional and logical patterns in the accumulated data;
- group and summarize data in any form necessary for further analysis;
- create mathematical models, predicting development and identifying "bottlenecks" in processes;
- receive high quality processes analysis, despite errors in source data.

Methodologies and algorithms of information processing are growing and improving with the development of data factory.

Data factory. Data visualization

Data factory allows you to configure the so-called dashboards, depending on user roles and functional requirements.

Dashboards – are directory display or desktops in the SAKURA, containing basic information of the project, production field, the object of the enterprise as a whole or in any other section.

The main purpose of dashboards is to provide a maximum of necessary and useful information in a convenient way.

Dashboards can be customized for functional roles - for example, desktop of the employee of drilling department, desktop of the employee of production operation department, desktop of project manager; and address, for a specific user - it will be convenient for heads of departments and the director of facility.

Dashboards combine information in different views: graphs and charts, information tables, images, photos, video from the object, GES station data, etc.

Dashboards are not static - their data updated constantly. In addition, if it is necessary, You can obtain detailed information by clicking on targeted "report" and the screen will display the details.

Functional capabilities. Planning of investments in development of production field

The SAKURA allows you to perform the pre-assessment and budgeting of the development of a new production field and construction of new objects (wellsite, skids of production operation, etc.) on active production fields.

The SAKURA allows you to create multiple budget options and to compare them between different groups of indicators at the stage of preliminary assessment (cost, duration, technological aspects).

Prediction and budgeting of construction (repairs) of certain objects can be performed with different level of details: stages of works, individual works and services and taking into account the materials cost and rental equipment.

Implemented methods of capital investments assessment allow you to estimate any object with minimum further adjustment of SAKURA.

Functional capabilities. Planning of manufacturing activities

The SAKURA allows you to perform the production plans at all stages of development and production run of production field.

The SAKURA allows the following types of plans at any stage, involves the performance of work in the production field (construction, drilling wellsite, total overhaul):

- Activity duration,
- Cost of works,
- Technological parameters of work.

At the stage of hydrocarbons production operation; the system enables you to plan the production operation – as for the production field in a whole, both for the separate wellsites.

Functional capabilities. Production facilities data collection and control of production activity

The SAKURA allows you to perform the data collection (both technological and financial) and monitoring of wellsite and skids of production operation conditions at the following stages of oil and gas projects implementation:

- Construction of platforms for drilling wells,
- Mobilization of equipment and drilling rig-up,
- Drilling (dry and sea),
- Testing and development of wells
- Hydrocarbon extraction,
- Construction of separate objects (skid of hydrocarbon extraction, skid of hydrocarbon refinery, product pipeline, offplots – roads, settlements, landing runways etc.),
- Total overhaul of objects,
- Reconstruction of geological and engineering operations on the wellsite,
- Retirement of facilities,

In addition, the SAKURA allows you to perform data downloading and storing on the already implemented projects in the same structures and by the same storage methodology.

Functional capabilities. Data preparation and entry on production facility

A standalone application that collects data from production facilities is the one of the tools of data collection.

An Application of data preparation and data entry provides:

- collection of actual operational production data in standalone mode (in the absence of a stable Internet connection);
- primary data normalization (Reconstruction to UDM) for further analytics;
- primary data control, directly by entering on the facility.

An application has an intuitive interface and does not require specialized technical knowledge in the installation and using.

Functional capabilities. Analysis of production activities performance assessment

The SAKURA allows you to perform operational and lookback analysis of production activities as for the project of reservoir engineering as a whole, and for the certain stages of its implementation.

Operational analysis is performed on the basis of data from production facilities during the monitoring of their activities. These are all kinds of plan / actual comparison, and analysis deviation from the prescribed technological parameters.

Lookback analysis is performed based on data already passed the stages of the project – for example, analysis of cost and duration of works and efficiency of the applied technologies or risk assessment (technological, geological, regional) when entering a new project.

Security

All data, stored and processed in the SAKURA, are well protected against loss, damage and unauthorized access.

The SAKURA security is provided on several levels:

- Restricting data access in terms of objects, documents and functionality,
- Audit of all users activity in the system.
- Data storage on customers servers – no one else has an access to them!
- Encryption of data, sent by Internet.
- Secure connection by https Protocol.
- Compliance with the most stringent password policies.

The SAKURA can be easily integrated into the technical infrastructure of the Customer and ensures compliance with all intra-corporate safety requirements.

Summary

Deployment of the System of automated control and management of resources and assets will ensure the accumulation of oil and gas projects information and the possibility of its use in daily operating business. All information is stored on the servers of the company - unlike other software solutions, where all information is stored on servers of the vendor.

Deployment и development the SAKURA allows to:

1. Create and fill the knowledge database of all the fields from the beginning of their reservoir engineering.
2. Unitize the data from different projects and countries independent of lapse of action on a single methodology of data storage.
3. Control the operating expenditures at each stage of the project.
4. Budget new stages with the use of accumulated retrospective knowledge database.
5. Evaluate the operational efficiency of contractor organizations.
6. Evaluate the applied technologies and risk assessment (technological, geological, regional) when entering a new project with the use of analytical tools, including predictive Analytics tools.
7. To narrow the boundaries of uncertainty in the adoption of technological, tactical and strategic decisions independent of the generated data amount in the project - due to its processing in Centralized store.
8. Implement a single standard for the storage, processing and coordination of information.