Development of Intelligent Planning & Integrated Office Management System for Drilling Operations in South Azadagan

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Abstract—Due to the distance limitation between the drilling department in Iran and the head office in China, it is necessary to improve the management level of the south Azadagan drilling department in the south of Iran. According to the drilling operation characteristics of Iran south Azadagan department, we design and develop an Intelligent Planning & Integrated Office Management System (IPIOMS) including design management, work report, planning and cost control, operation management, statistical query and logistics support.

1. Introduction
Iran South Azadagan project is a block of CNPC’s foreign cooperation. According to the requirements of the cooperation contract, all operation information should be submitted to Iran national oil company at the end of the project. In order to improve the efficiency of information collection and office work, the Drilling Operations Intelligent Planning & Integrated Office Management System is developed. Its purpose is to solve the following problems. Automated report distributions can reduce resource requirements for this manpower intensive task. Integrated engineering workflows within the engineer's Desk Top system save time and add value for drilling and completion engineering teams[1]. Users have easy access to all reporting and related data in a single data store by accumulating the engineering team’s well planning, operations and production information. It is necessary to improve rig to office reporting efficiency[2]. Regular reports can be e-mailed directly from the IPIOMS database in PDF format to appointed personnel. IPIOMS can support business analysis and well planning.
2. Intelligent Planning & Integrated Office Management System (IPIOMS) Design

The system shall be a working platform with different interfaces for managerial staff to work on line for data creating, updating, storing, and retrieving by limited authorization of access levels. The potential users of the drilling office management system include all the staff such as the managers, engineers and secretaries. It is divided into 11 parts including program management, well site data, inquiry and analysis, job report, document control, contract management, planning and cost control, logistic support, operation management, system administration and system configuration. The structure chart of the system is as follows:

![Structure Chart of Office Working System](image)

**Figure 1** Structure Chart of Office Working System

3. Intelligent Planning & Integrated Office Management System (IPIOMS) development

(1) Program Management

Program management subsystem includes the storage, update and maintenance of the geological design, drilling design and well completion design, as well as the entry and affirmation of the revision proposals of the drilling and completion design provided by the engineers of the drilling department. The affirmed revision will be stored in the system as the design change file. Both the well site drilling supervisor and the engineers of the drilling department have access to the query of the design book and the design change file.

![Procedures of Program Management](image)

**Figure 2** Procedures of Program Management
The design engineers upload the drilling design, well completion design and geological design in Word or PDF files to the IPIOMS, which will be issued after the approval of the design by the manager of the drilling department or the authorized user. Other users such as well site drilling supervisors, drilling engineers and material engineers can only inquire and browse the issued design. The browse authority of the design document can be divided into categories like single-well, multi-well and whole-well etc.

The engineers of the drilling department are authorized to propose changes of the issued design books. The proposal, if adopted by the manager of the drilling department, will be issued as the design changed file. The un-adopted proposals will be stored as Un-adopted Proposals in IPIOMS. Adopted or not, the design change proposal will not be executive, and only the manager of the drilling department, design engineers and the proposer have access to the query of the changed proposal.

The design engineer submits the change requirement in the drilling and completion design to the superior (the manager of the drilling department) as a design change file which will be issued after the superior’s approval. The changes file is equally executive with the design book. When the design book is conflict with the changed file, the latter will prevail. The query and browse authority of the design change file agree with the design book.

(2) Well Site Data

Well Site Data is a subsystem providing a formatted data browsing function to all the office work stuffs after the supervisor has input well site data into the system. According to the requirement of Iran, it is designed to include 7 main categories data: general data, daily operational data, operation data, well completion data, complication and accident, HSE management, highlight & lessons learnt.

(3) Query and analysis

Query and Analysis is a subsystem that can extract the required well data according to the searching requirement selected by the office users. It can provide contrastive analysis of drill bit, BHA, drill time, drill fluid, complication and accident data from different wells.
(4) Job Report

Job reports subsystem include the daily, monthly and annual reports of individuals and departments, which will be stored as department files for the internal personnel to query and browse. Each employee enters his/her personal summary into the system according to the prescriptive format on time each week. Un-completed summary can be stored as DRAFT and be revised before submission. No change will be allowed to the submitted reports. The subsequent department report will be completed based on the personal reports. The content of the department summary reports, including weekly, monthly and annual reports, will be integrated on the personal reports by specific individual and submitted to the company.

(5) Document Control

The contents of document control include regulations issued by the company and departments, operation documents, management procedures, business letters, MOM etc. Document controllers are authorized to add, delete or update all the files in the document control system. Based on the setting of the system, the edition, update, publishing and deletion of the important content will be valid after the affirmation by the drilling department manager.
Various documents issued by the company are classified and put into files. Users can query and browse them via key words or sentences and the document controller are authorized to update, delete or edit such files. These documents are uploaded, updated and deleted by relative business principal, and all users have access to them. All the letters will be classified and filed respectively. They can be classified into partial sharing and complete sharing. The former will be browsed by authorized users while the latter can be browsed by all the users. Memos are required in all meetings. The contents include information of the time, place, participants, subject and content of the meeting. Once submitted, a memo cannot be revised and all users will have access to it. The format and content of a job description will be determined on the current post. The format will be any one of PDF/WORD/EXCEL. All users can have access to it, but no one except the document controllers can edit or delete it.

(6) Contract Management

Contract management subsystem includes MRs, SRs, Tender documents, Contracts, POs Record, Completion certificate. The procedure chart of the contract management is as follows.

A preliminary MR/SR is put forward by the material engineer and submitted to the contract management section leader after the superior’s approval. The superior will prepare MR/SR program in the system[3].

Tender documents include reports, ITB, clarifications, MOM etc. which will be named according to the internal file encoding requirements and uploaded to IPIOMS by the contract management staff. Users can query them via the project name and the subsequent contract number. These files can be in WORD or PDF format.

The content of the contract and the order form records will be entered by the contract management staff and association among the contract, order forms and their performance will be set up according to the internal control file number and the contract number. The performance of a specific order form can be inquired via the number or name of the contract.

The manager of the drilling department will issue the contract completion acceptance according to the completion of the contract and only the project issued with the completion acceptance will be issued the final statement[4].

Figure 9  Interface of Document Control Procedures

Figure 10  Procedures of Contract Management Procedure
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(7) Planning and Cost Control

The contents of document control include regulations issued by the company and departments, operation documents, management procedures, business letters, MOM etc. Document controllers are authorized to add, delete or update all the files in the document control system. Based on the setting of the system, the edition, update, publishing and deletion of the important content will be valid after the affirmation by the drilling department manager.

The planning engineer inputs AEF in the system, which requires scanning to save as PDF file. Cost will be calculated according to the actual expenditure, for example, the actual cost of a single well can be calculated through the equivalent cost of a meter and the actual material consumption. Cost statistics can be done per well, per month, or per year. The cost summary will be compared to AFE and warning will be provided when the cost exceeds the proportion value set in AFE\textsuperscript{[5]}. The module provides work procedures, the budget and working platform. The module provides a working platform and file storage. The module can help avoid exceeding contract amount or contract term and provides source information from Contract/PO record. After receiving the invoice from the contractor and approving its correctness, the drilling department will prepare the payment request, submit it to the financial department and request the payment.

Figure 11 Interface of Contract Management Procedure

Figure 12 Interface of Planning and Cost Control interface

The module, based on the actual and scheduled emplacement of the drilling rig, will arrange the date of spud-in and completion of the drilling of each well so as to deploy reasonable running of the rigs, demonstrate the actual and target progress of the drilling in chart, calculate the numbers of the actual and target spud-in and completion of the drilling, and provide data support for the material calls. It can also provide computer aided simulation to calculate the optimized rig running sequence under the user setting.
4. conclusions
Based on LAN of South Azadagan project department, Intelligent planning & integrated office management system adopts the mode of collaborative work under the unified network environment. It uses abundant drilling operation data and office documents to realize the processing of uncertain drilling data information. At the same time, It solves the problems in drilling information management caused by incomplete and inconsistent information. It makes the drilling operation management information system of South Azadagan project department from a single, non-open and internal closed-loop system transformed into a diversified, more open and cross departmental system, which further expands the data processing capacity of the drilling management information system. As a result, It provides strong support for the drilling integrated management and decision-making for South Azadagan project department.

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