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Using big data to overcome subsurface challenges

The oil and gas industry would particularly like to use big data to improve production and drilling, said Pranaya Sangvai, Cauvery Basin Business Unit Head with Reliance Industries



"Business success is based on the quality of decisions that we make" - Pranaya Sangvai, Cauvery Basin Business Unit Head at Reliance Industries.

Reliance Industries' E&P venture is keenly studying Big Data Applicability, said Pranaya Sangvai, Cauvery Basin Business Unit Head at Reliance Industries, speaking at the Digital Energy Journal forum in Mumbai on February 4, "Doing More with E+P Data".

The intent is to find ways to optimise efficient drilling and enhance production. "What would be very useful, right now, would be tools to help detect well problems before they become serious, from analysing the data," he said.

"Business success is based on the quality of decisions that we make," he said.

"Huge data is gathered and acquired from exploration through appraisal to development of the discoveries. The proper integration and analysis of this data, with historical data, is of paramount importance to take crucial decisions of multimillion dollars to billions of dollars investments."

"We need to extract value from the growing volume of the data. If an organisation has no good strategy for big data, I think the company is going to be doomed."

The data which people really need to make decisions is often not available, he said. "When we look at data and want to take a decision, we generally find there's a gap," he said. "This gap either needs to be eradicated or really needs to be closed, that's what we feel today."

Big data strategy

At a corporate level, Reliance Industries has already taken note of Big Data, he said.

Reliance is developing data road maps for its various business and functional frameworks.

The company also has a very strong IT support to its oil and gas division. The proper blend of IT and subsurface knowledge base is an advantage in reaping the benefits of Big Data.

Mind-set

In any industry, the biggest challenge with implementing new data systems are changing people's mind-set, he said.

In every industry, people at a senior level often feel that they don't need anyone to advise them, or need proper analysis of the data, since in the past they have been successful without it to a certain extent, he said. "Today, if you want to change that attitude, it becomes a little difficult, but I believe it's possible," he said.

Getting new technology implemented in E&P is hard. "Most of the time there's a question mark, [people ask] has it really been used in other E+P companies. We are unsure about the technology or its benefits are yet to be proven. And so on."

Also, "we really lack the skills of big data," he said. "When we don't have a big data skillset, we try to avoid the change".

E&P people often look for return on investment (ROI) for implementing new technology.

Evaluating ROI can be as difficult and pointless as trying to calculate the ROI of buying chocolate for your child, he said. "If my son asks for a chocolate, I give it to him. It giving any ROI? I don't know," he said.

If we think IT can provide a benefit, and we can afford it, we could just implement it without trying to work out ROI, because of so much of uncertainty and crudeness involved in quantifying intangible benefits, he said.

Government restrictions

Legal restrictions about moving offshore seismic data outside the country can make life difficult. Getting permission to move data

can take 3-6 months.

"For approval of the proposed e-transfer of seismic data, the operators in India are still struggling to satisfy procedural quorum of various agencies involved. We need to overcome the procedural difficulties," he said.

Some people think seismic data "is very crucial data," he said. But the "raw data doesn't give any information for anybody to use."

There is a big gap of technological understanding between E&P operators and government authorities and lots of time is spent on education.

Sometimes, while doing so, technology changes, so we get approval on obsolete technology, he said.

"One such example is data storage. While we were discussing physical data storage (hardware), the emergence of cloud technology storage was seen more useful. But now we need to address how secure is cloud storage. Such things take toll on merit of the proposal," he said.

Managing data

Managing data is a big challenge. "We have data at rest, data in motion, and data in many forms, structured, unstructured, text, and multimedia. Unstructured data is 80 per cent of overall data volume," he said.

At one particular time Reliance used to generate 1.4tb data from internal sources, and 1.1tb per day from external sources. Raw data was over 2 terabytes per rig per day. Most rigs have over 40,000 sensors or data sources. He believes full data utilization is possible only if Big Data is put in practice.

For real time data, it would be useful to have something like a centralised clearing house, he said.

Reliance is fortunate not to have large amounts of legacy data and therefore Big Data Adoption will be at much faster pace than other companies, he said.

Watch Mr Sangvai's talk on video and download slides at www.d-e-j.com/video/1568.aspx

National data repository in India

India has a project to build a National Data Repository (NDR) - but is there enough support to make the project work?



Helping India build a National Data Repository: Chandan Kumar Bahman, Superintending Engineer (IT) with the India Directorate General of Hydrocarbons.

The government of India has provided funding for a National Data Repository (NDR), with a 6 year contract awarded to Halliburton on Feb 2014, covering one year to set the centre up, and five years for operation, said Chandan Kumar Bahman, Superintending Engineer (IT) with the Indian Directorate General of Hydrocarbons.

He was speaking at the Digital Energy Journal forum in Mumbai on February 4, "Doing More with E+P Data".

Over the five years, the NDR is expected to take 1008 2D surveys, 528 3D surveys, data for 8,400 wells, 16,800 well reports and 33,600 scanned logs.

The NDR is defined as a "a government sponsored data bank to preserve and disseminate upstream oil and gas information and data in order to promote and regulate hydrocarbon exploration and development activities," he said.

The data can include seismic data, well logs, g+g data, cultural data (well header data, blocks, basins), production data and archives.

Efforts to develop the NDR started a number of years ago, but "many regions did not take off as expected," he said. "We did not get the kind of co-operation from the operators [we wanted]."

"If the basic work is not done, then the final work will be very difficult to achieve."

About DGH

DGH is the oil and gas regulatory body in India, established in 1993, under the admin-

istrative control of India's Ministry of Petroleum and Natural Gas.

It provides technical advice to the Ministry, reviews exploration programs and advises the government on offering acreage. It has a mandate is to regulate the "preservation, up-keep and storage of samples pertaining to petroleum exploration."

DGH's role includes preparing data, requesting bids, evaluating bids, awarding blocks, and keeping an eye during exploration and development. The bid evaluation aims to be as transparent as possible.

DGH manages all kinds of data including structured data (e.g. financial and production data), semi structured (field development programs, test results, regulatory clearances) and non-structured (correspondence, reports, documents and legal data).

The best way to build it

Ashok Tyagi, general manager of the Indian School of Petroleum and Energy, and a former General manager (Exploration), Oil & Natural Gas Corporation (ONGC), suggested four models the NDR could be built by.

Model 1 is where the government dictates and drives the project, forcing oil companies to provide data, which is then used in subsequent licensing rounds.

Model 2 is where the project is initiated by government but supported by oil companies, where some oil companies use it to share data between each other where they have sharing agreements.

Model 3 is where the system is driven both by oil companies and government, where the system is built in a similar way to oil companies' internal data management systems, and can rely on this system as a back-up if they lose their own data.

Model 4, Mr Tyagi's preferred solution, where the data is still stored by the oil companies but available on demand, but they submit metadata to the national data repository. This means that users of the NDR can easily search to see what is available, and retrieve what they need. Mr Tyagi said this was his preferred option, particularly as the security issues would be comparatively eas-

ier, and it would be easier to start.

This also means that the data is only stored in one place, so there is no complex data replication challenge.

Benefits

From an oil companies' perspective, a NDR will enable them to gain information on demand, reducing the time spent finding data. It will also help them to interact with other oil companies, service companies and the government, Mr Tyagi said.

From the government's point of view, a NDR will help the government make sure it is maximising its royalties, and also help attract investment to India, by being able to provide prospective oil companies with better information.

Challenges

Key issues to resolve are working out the specific objectives of government / regulators and also of the Indian upstream industry, Mr Tyagi said.

Oil companies might use it just as a place to send the required data, or they might use it more actively.

In order to make sure it works, oil companies need to accept that their data is a national asset, but also their perspectives need to be borne in mind, he said.

There could be a minimum 'core' service and additional services to meet companies' specific needs.

There needs to be a mutually worked out cost model. The project needs to be financed, and steps need to be taken to ensure it can work long term.

There should be a 'cost committee', with representation from operators, governments, the service provider and an independent financial institution, he said.

The companies involved need to decide on the legal, data security, commercial, operational and technical framework.

Someone needs to work out the data model, the data flows and the workflows, he said.

Mumbai conference

Data could be provided in Energetics standard formats, including WITSML, ProdML and RESQML.

The components of the NDR include a core data model, data loading / exporting tools, quality control tools, search engines and data integration tools.

The regulators should provide rules as a foundation for how the NDR is used, and then define the reporting schedules, reporting standards, routines for release of data, and how the system should be developed over time. There could be tax relief to oil companies which join the NDR.

Service organisations can have the role of

choosing the technology and processes for quality control, data storage, retrieval and data distribution, and develop procedures for data handling.

It would be useful to look at other examples from around the world, including Norway's DISKOS and the UK's Common Data Access, he said.

Pranaya Sangvai

Pranaya Sangvai, Cauvery Basin Business Unit Head with Reliance Industries Ltd, also at the conference, said he was very interested in India's Directorate General of Hydrocarbons (DGH) project to develop a national data repository (NDR).

But there still seems to be a lack of 'intent' to develop it, he said.

"The intent has to be there, and the intent is missing," he said.

Part of it is that companies are afraid of losing control of their data, something which they have just kept to themselves for decades, he said.



View Mr Barman's talk on video and download slides at www.d-e-j.com/video/1554.aspx

View Mr Tyagi's talk on video and download slides at www.d-e-j.com/video/1558.aspx

Managing drilling data at Reliance

Reliance Industries is building a central repository for its drilling data, and developing processes to ensure the data is high quality. Rashmi Bhangale, data manager with Reliance Industries in Mumbai, explained how it works



"Drilling offers maybe the best opportunity for improving cost performance" - Rashmi Bhangale, Data manager with Reliance Industries in Mumbai.

"Drilling is the most expensive and challenging part of the [E&P] business," said Rashmi Bhangale, Data manager with Reliance Industries, speaking at the Digital Energy Journal forum in Mumbai on February 4, "Doing More with E+P Data".

This means that drilling offers maybe the best opportunity for improving cost performance, she said.

And by having drilling data better organised and structured, it should be possible to identify ways to reduce costs and improve performance, she said.

Once you have good data, "you can derive business value out of it," she said. "You can make faster and better informed decisions. You can plan your future wells."

Reliance set an objective to have a central database, which would provide good quality drilling data to people in accordance with the requirements of their role.

"All this data will help us for statistical analysis and benchmarking," she said. "One truth, one data. You can ensure the data is trusted. It will help us to track operational efficiency, and also prepare for the future. You have the consistent data in the office."

The central database can generate drilling reports and statistics, to be sent to the government to meet regulatory requirements, and also to be used within the company.

Reliance is using Landmark's Engineer's Data Model (EDM) as a centralised data repository.

The reporting and analysis done by Halliburton Landmark's OpenWells operations reporting system.

Data capture

Data would be captured as it is generated at the rig.

The database will include data from drilling operations, completions, well testing, and quality control reports.

It gathers data about causes of non-productive time (NPT) and lessons learned.

The most important aspect of drilling reporting is the Daily Drilling Report, "which everybody looks forward to," she said.

The data is automatically replicated to the central server as soon as it is gathered. So

the information is made available to authorised interpreters immediately after it is entered.

Integration

Integrating data together when it is in different data formats is difficult.

"Every contractor has their own way of storing the data," she said. "Large volumes of complex data in different proprietary formats are generated."

"If data sources and formats are different it is very difficult to correlate the data."

Reliance has a project underway to standardise the nomenclature which is being used in drilling, so everybody uses the same terminology and vocabulary.

Quality control

The data will have consistent quality control, with defined best practises, workflows and procedures, units of measure, activity and cost codes, she said.

It is then validated for correctness and completeness. The quality control would be done both by drilling engineers in rig and office and the petroleum data management team. The quality control is done manually.



View Rashmi's talk on video and download slides at www.d-e-j.com/video/1573.aspx

What data managers do

Nalin Jena, Upstream Data Manager with Indian oil company Reliance Industries Ltd, gives his views on the best way to do E&P data management and what data managers do. *By Nalin Jena*

Good data management leads to better and faster decision making, leading to improved asset performance.

Good data management aims to improve the productivity of geoscientists by reducing the time they spend on accessing data, improving data quality, creating an integrated working environment in which the data, systems and applications function as a single unit.

Poor data management means you're reinventing the wheel again. Something that's been done before, gets done again, so you've just completely wasted resources.

The cost of data management is so small compared to all the other expenditures, like drilling of wells that it isn't a cost constraint, it's a people constraint, recognizing what should be done and having the resources in terms of people to actually do it.

Good data management usually aims to develop a centralized database which helps geoscientists to have all data at their fingertips.

The data manager will decide where the data is to be stored; define the naming convention and the guidelines to be followed once the user has finished with the data.

The data being managed needs to include digital images, structured technical data, unstructured emails, spreadsheets and video files.

The data manager needs to define the most

appropriate architecture and operational environment to store and retrieve the data effectively and efficiently.

Discipline

Many exploration and production companies are building a data management discipline that competes with the geoscience and engineering disciplines.

Earlier E&P data management used to be focused on only geology and geophysics domain, but now it is broadening out to cover all of the functions like drilling, production and reservoir.

The data management team can consist of geologists, geophysicists and IT people.

Data managers need domain skills, such as understanding of seismic, well log, geology, drilling and production.

They also need IT skills such as data modeling, database development, data integration / reporting /migration, project management and analytics.

So geologists and geophysicists are provided with all kinds of IT training, and the IT people are trained in geosciences domain.

Working with the 'business'

The data management team is still struggling to capture the added value created by the interpreters, such as horizons, markers, faults,

geological models, reservoir models, analysis and reports.

The data management team cannot decide which model, horizon or report is the correct one to store.

So it is important to have a close working relationship between the data managers and the business functions.

Another challenge is the link between the static data and the dynamic data. Static data (e.g. geological or geophysical) needs a different approach than reservoir data that is more dynamic over time.

It is important to manage the relationships at a number of levels within the organization like data manager meet with various users of the data, where issues are brought up and solved.

The data management team should adopt a proactive approach to raise issues and propose new solutions without expecting the business to tell them what they need.

Too often, the data management community is waiting for the business to tell them what they need and the domains are waiting for the data management to come up with solutions.

Audit

Apart from defining policy, procedure and naming conventions there should be periodic audit to ensure that the policy and procedure are followed by the user.

The audit should check availability of data, to see if it is getting to the right people, right data and right time.

It should check on redundant data stores.

It should check on appropriate use of data, taking into account business sensitivity, confidentiality, retention.

It should check the documentation of what data is added to which data repository and when.

It should check the documentation of data sources used for data processing and publishing.

