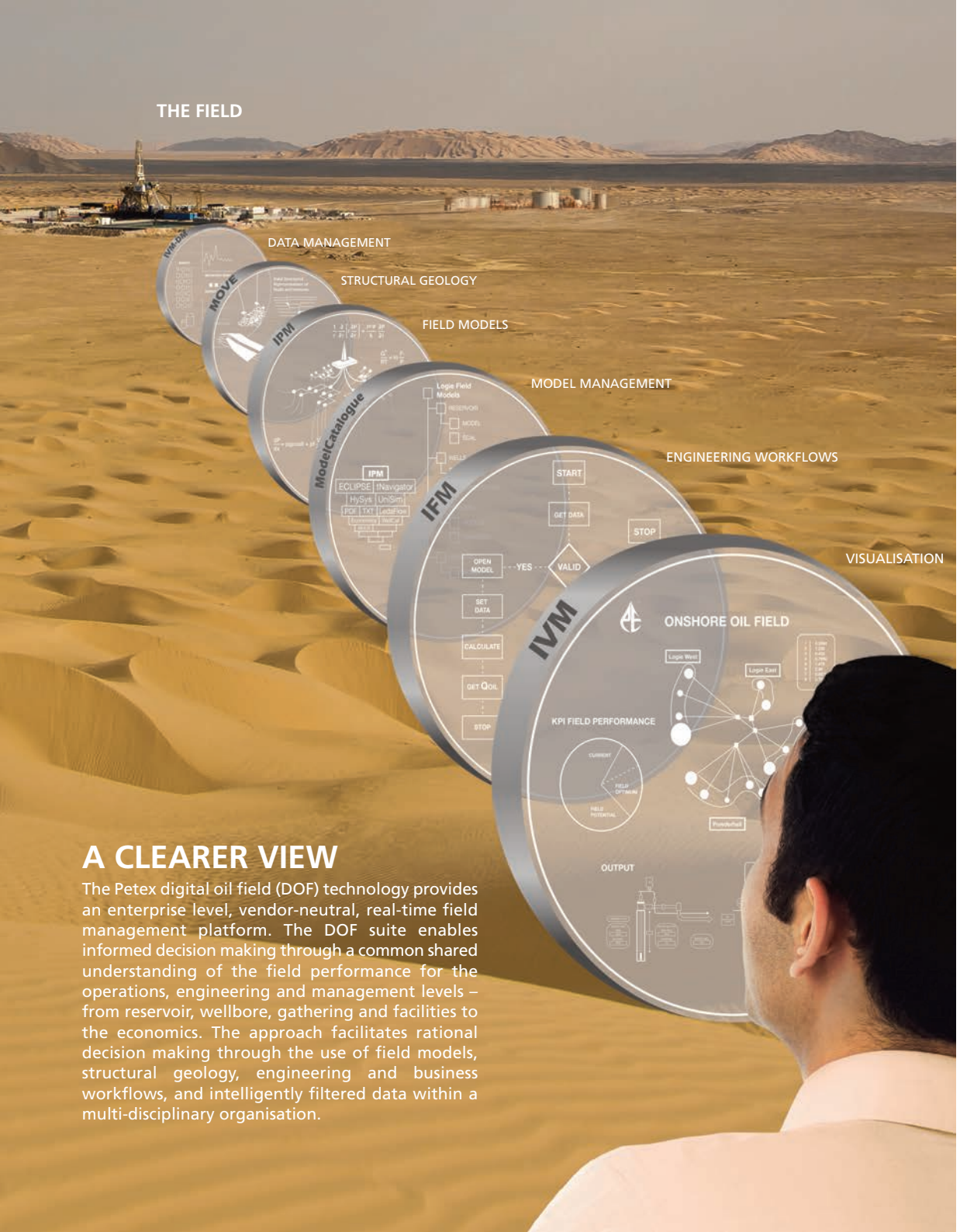


A CLEARER VIEW

The Petex digital oil field (DOF) technology provides an enterprise level, vendor-neutral, real-time field management platform. The DOF suite enables informed decision making through a common shared understanding of the field performance for the operations, engineering and management levels – from reservoir, wellbore, gathering and facilities to the economics. The approach facilitates rational decision making through the use of field models, structural geology, engineering and business workflows, and intelligently filtered data within a multi-disciplinary organisation.

Petex

Engineering Software Development

The Digital Oil Field

REAL TIME FIELD MANAGEMENT

Petex Digital Oil Field

Contents

Petex Digital Oil Field

The Digital Oil Field software applications replicate the behaviour of an oil or gas field on a computer, using workflows for automation and computer clusters to speed up calculations. The applications are used as an on-line field management system throughout the entire lifecycle of any asset.

The Petex DOF technology provides an enterprise-level, vendor-neutral approach that allows companies to extract maximum value from the available information relating to reservoirs, wellbores, and surface facilities.

This enables rational decision making through the use of models, workflows, and intelligently filtered data within a multi-disciplinary organisation of diverse capabilities and engineering skill sets.

Delivering Value through Consistent Decision Making Processes

Key Facts:

The solution is a customisable product (platform) upon which people can build their ideas in a very simple way:

- No programming required – Visual Workflows
- Straight forward to deploy (**only configuration required, no coding**)
- Technology is **upgradable, extensible**, **scalable**

Out of the box functionalities

- Over 100 workflows addressing:
  - Well Test Validation and diagnostics associated with PVT checks
  - Well Surveillance
  - Any equipment quality control
  - Total system quality control
  - Optimisation of different types
  - Forecasting, with and without optimisation
  - And many more…
- Workflows can be easily modified to achieve any engineering objective

Templates to reproduce any equipment easily

- Data objects created automatically to facilitate new equipment (**automatic**)

Petex Digital Oil Field

Traditional Challenges For Automated Systems

Looking at the historical evolution of automation initiatives in various companies around the world, it is straight forward to appreciate why certain approaches have been successful as compared to others that presented opportunities to improve the way automation was approached.

Traditionally, such systems have relied on bespoke creation of software programs that addressed specific needs of a particular asset. Such systems are by definition unique and require their own infrastructure, development and support teams that would have to be involved every time any enhancement or addition to the system was required. This led to projects that consumed vast amount of time, resources and money to complete. Often, companies were forced to abandon these efforts in light of escalating costs.

Changes to bespoke systems presented another challenge that companies were faced with. Fields grow and change over time, whereas automation systems that are bespoke are not able to reflect the changing nature of the field in a cost effective manner. The suppliers had to embed large numbers of consultants in the client's offices to maintain and expand the system. The teams that developed the system (coding) were often in different countries and as such difficult to communicate with. Any changes made took a very long time to make it to the production environment, making them obsolete before even being deployed.

Data and models need to be coupled according to the workflows that will deliver results (value). Bespoke systems created spaghetti junctions of information that were extremely difficult to maintain and rationalise. Having multiple people maintaining models added to the challenge, as the simple act of renaming a file after updating it led to the system not recognising the changes.

Ultimately, many automation initiatives offered only limited value to oil companies due to their bespoke nature and high cost of creating and maintaining them. There are examples where adding a well to such a system would cost hundreds of thousands of dollars in consulting fees. If engineers wanted to change calculation logics, software developers would have to code these modifications. Upgrading such systems became IT projects that would take months to complete.

The challenges presented above became the drivers for Petex to develop the Digital Oilfield platform. The system is composed of customisable products that require no coding (only configuration), are able to expand as the field changes over time with little intervention and involve workflows that can be written in visual form by engineers and can be changed easily. Governance and change management challenges are resolved through automation.

The strategy of creating customisable products has proven to be the only cost effective way that value can be extracted from field data.

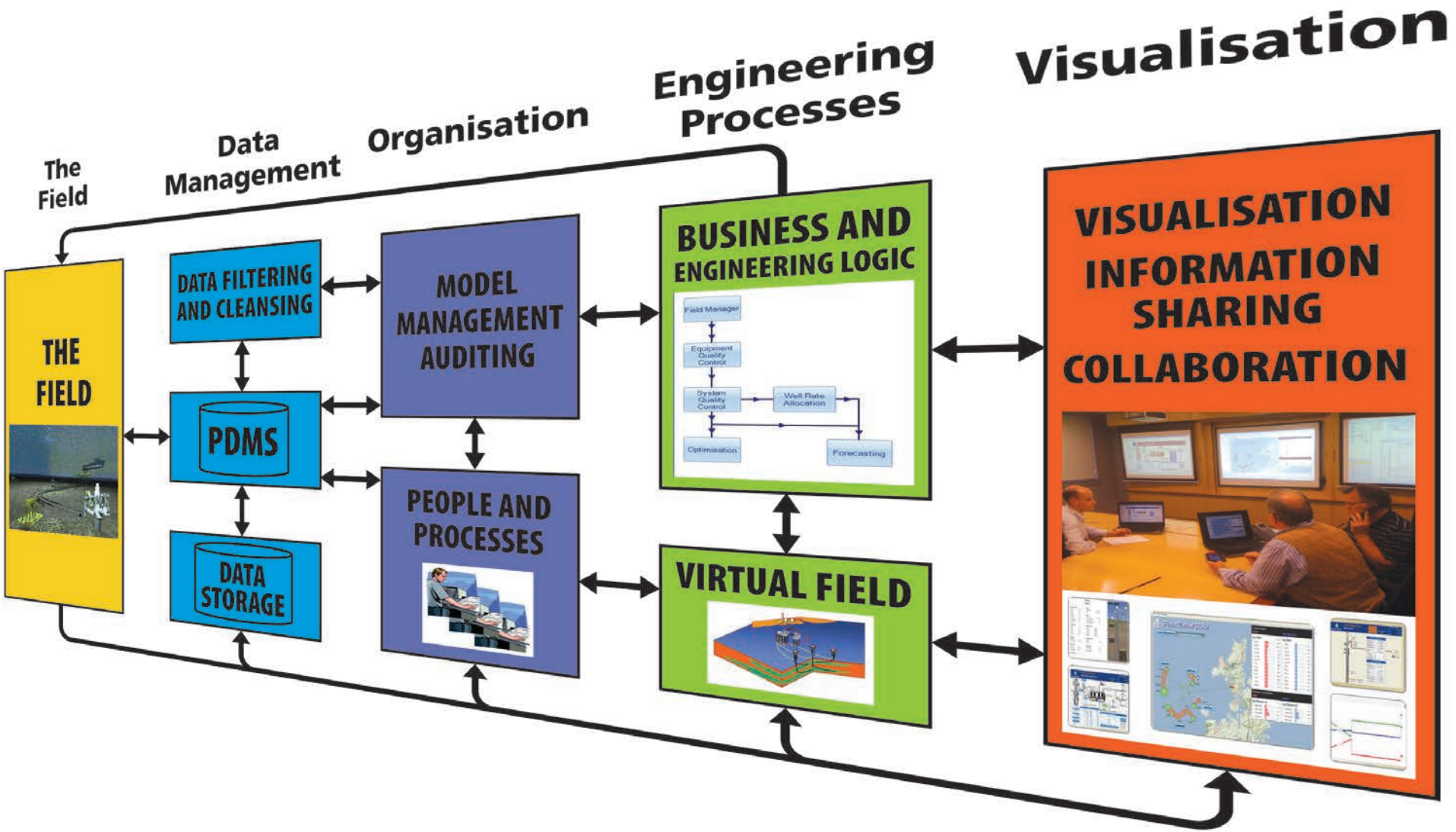
Key challenges of traditional systems

- Competing/contradictory demands in different disciplines
- Compartmentalised knowledge
- Geographic challenges
- Demographic challenges
- Access to information, efficient decision-making process
- Different timeline in activities
- Uncertainties associated with information
- Resources and difficulties in maintaining technology

Means by which the Petex DOF addresses these challenges

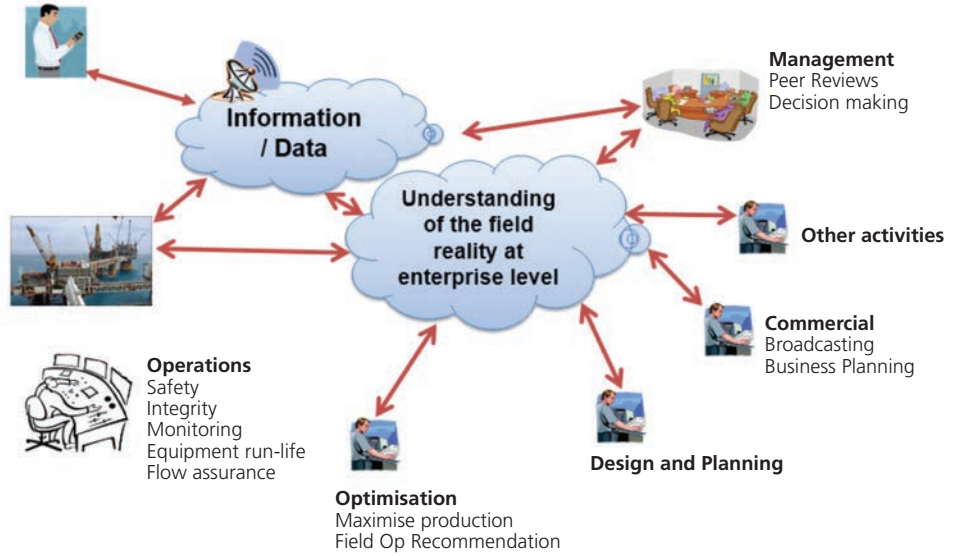
- Layered Enterprise Architecture that captures both company and discipline objectives
- Integrated Modelling
- Global access to information
- Workflows capture work processes and knowledge
- Visualisation based on objectives to be achieved
- Data management layer that rationalises data and information according to their use
- Out of the box workflows that ensure consistency across all disciplines
- Products are easy to install, straight forward to configure and able to expand with minimal intervention.

Petex Digital Oil Field



Organisation is the key to success

The overall objective of a company or an asset team is generally clear, i.e. the commercial and technical drivers are understood. However, an individual or a particular set of technical disciplines may often have a limited view and understanding of the field reality to make coherent decisions with respect to the overall objectives. This may be compounded by the lack of information (not readily available). The diagram below illustrates, in a simplistic way, the structure of successfully implementing the digital oil field.



Create Value through sharing understanding from input data and calculations to the decision making process and broadcast the whole chain from the sand face to the CEO in real time.

The Digital Oil Field architecture set out in these pages is an ecosystem of common data management, model management, standard workflows, and a visualisation system. These provide the technical framework for a **DOF** implementation. This framework is the enabler that will allow the organisation to better analyse, manage, and operate their field. This single view, the Virtual Field, is composed of the engineering models, reports, spread-sheets, and associated data accessed and maintained through a central repository. Most importantly, they can all be easily updated and maintained as the field is developed and expanded.

Knowledge Capture

Engineering know-how and experience are of paramount importance for the oil and gas companies. The growing scarcity of experienced workers is creating an experience gap that Integrated Field Management technology will help to bridge. Capturing the "expert knowledge" in an organised and structured manner and supporting collaboration reliably and securely in real time becomes key to increasing productivity and fuelling a company's ability to grow. The "expert knowledge" capture within the Petroleum Experts' **DOF** philosophy is supported by introduction of individuals' experience into workflows and analysis.

The technology described here has proven itself to be a powerful "enabler" - a catalyst – for the creation of the organisational thinking and transparency required for the successful implementation of the digital oil field vision.

The combined engagement of the organisations' management at all levels, as well as the asset team members will ensure actions are transparent, knowledge is shared, and decisions are made with all the available information. This will facilitate the achievement of the **DOF** added-value objectives.

Petex Digital Oil Field

Examples of value being delivered:

RasGas IPTC 17255:

System for creating production guidelines. Time to create guidelines drops from weeks to minutes. System delivered 8 months ahead of client's schedule.

Conclusions

- The new system has significantly improved the process of developing production guidelines for RasGas by well, based on the defined objectives and criteria of the company's strategy, as compared to the manual process which was cumbersome and limited.
- PROMPT is used as a real time monitoring tool for daily well management to ensure that wells are being operated within the guidelines set by reservoir management with "automatic alarm" functionality to indicate deviations.
- The PROMPT system allowed studying different scenarios for maximizing long term field recovery, along with meeting the short terms objectives of maximizing the condensate recovery, minimizing H2S content in the produced gas, controlling salinity in the pipelines, etc.
- The speed of the PROMPT tool allows additional flexibility to respond to unexpected short term scenarios.
- It also enables the engineer for prompt and effective decision making regarding well rate adjustments in the event of unexpected upsets, constraints, or sudden increases in demand. In the meantime it is used for creating production schedule for future planned/ intervention activities such as pigging operations, train turn-around, platform shut-ins, etc.

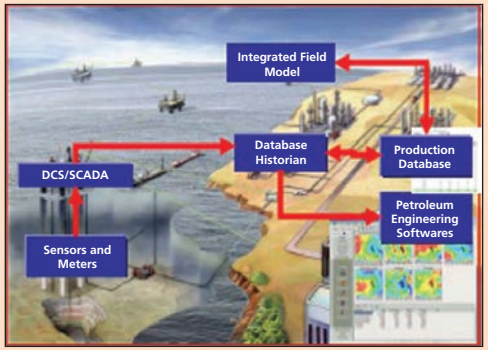
BG SPE Paper 113873:

Fast implementation of DOF system improves decision making and allows for maximum utilisation of available data to support asset management objectives.

Conclusions

The results from the *IFM* implementation show that it results in a streamlined process that allows updating models from reservoir to topsides using high frequency data with the following attributes:

- ***IFM*** system deployed with associated workflows and tested in this project in a relatively short time period. Further automation routines are being developed along with dashboards and smart alarms by the asset.
- The various database systems were connected as part of the PDMS refresh project/**IFM** to integrate short-term forecasting methods and production allocation.



As of the end of Phase I of the *IFM* implementation the asset have seen several initial benefits:

- The integrated approach allows for improved co-operation within the teams and the ability to work using the same data set.
- The time used update/calibrate models has been reduced with an expected reduction in the uncertainty and an increase in the accuracy in forecasting workflows.
- The automated workflows result in team time savings and will facilitate faster decision making within the asset.
- Linked **IFM** models provides an infrastructure that allows connecting people with real time data enabling optimisation of core business processes.

Petex Digital Oil Field

WOODSIDE PAPER SPE 116519

Implementation of automated workflows for field management, delivered by small team using the DOF. Costs at a fraction of traditional systems and with multiple times the functionality.

All of the work in ***IFM*** in the past year was accomplished by a small team of up to six to eight people, most of whom were part-time. Their backgrounds included production engineering, production technology, reservoir engineering, data management, programming and computer support. The team started with little ***IFM*** type experience, but did have the ability to act quickly. Once the technology and workflows are developed for one asset they can be replicated much more easily, cheaply and quickly on other assets. As such, ***IFM*** type implementations can be done at a relatively low cost.

SAUDI ARAMCO SPE PAPER 112071

DOF implementation increases productivity through on-line engineering analysis, diagnostics and optimisation.

Overall Benefits

Application of the system has resulted in a number of benefits including improvement in the productivity of field management engineers. The system also ensures faster response and resolution to problems due to early problem detection. This can reduce problem detection and resolution time to a matter of hours, instead of days. It also allows the engineer to focus on exceptions rather than bulk and massive troubleshooting. Using a unified set of validated models the engineer can perform scenario-based process optimisation to improve field performance. The system also ensures the availability of up-to-date field models throughout the life of a field.

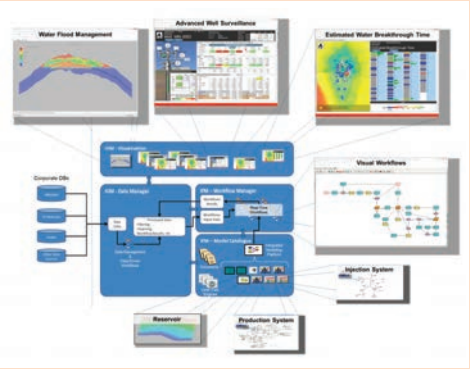
KOC ARTICLE IN PETROLEUM AND OFFSHORE TECHNOLOGY

Coupling of short term optimisation with recovery maximisation algorithms.

Conclusions

KOC West Kuwait KwIDF team has delivered a top class field management system to aid the decision-making process for the Minagish oil field. The unparalleled level of integration between subsurface and surface allowed the coverage of a broad range of field management activities from production surveillance and optimisation to reservoir performance monitoring and recovery optimisation.

The use of an off-the-shelf field management platform to deliver the necessary functionality allowed the solution to be deployed in record time, while also providing the required flexibility and extensibility to accommodate future requirements.



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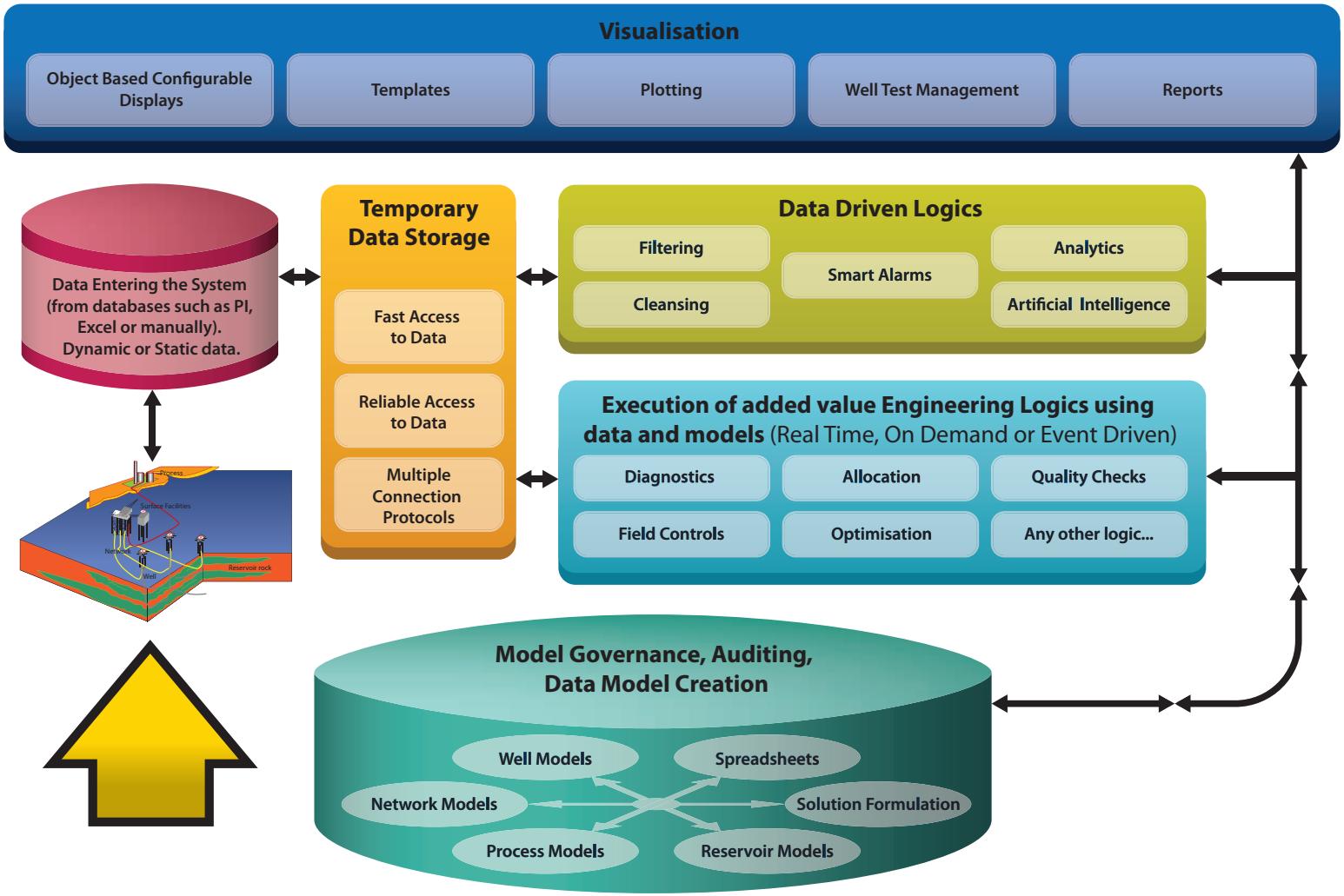
Petex Digital Oil Field

DOF Simplified Architecture



DOF – Overall System

Question: **Our team would like to optimise our production. A digital representation of our field and its controls would greatly help. Traditionally these projects take a life of their own. Can a Digital oilfield be deployed quickly and could we maintain it easily? Can the Petex DOF achieve that?**

Answer: The Petex **DOF** is based on configurable and customisable Products, it is not a development environment. Not a single line of code is needed to create or configure the **DOF** system. Many engineering logics come out of the box and are created on a visual interface. Once pre-requisites are in place, a Petex **DOF** system can be deployed in a matter of a few weeks. It is extensible and scalable by design.

Question: **Governance and Change Management are crucial for ensuring that our company extracts maximum value from new systems. How does Petex propose to facilitate this?**

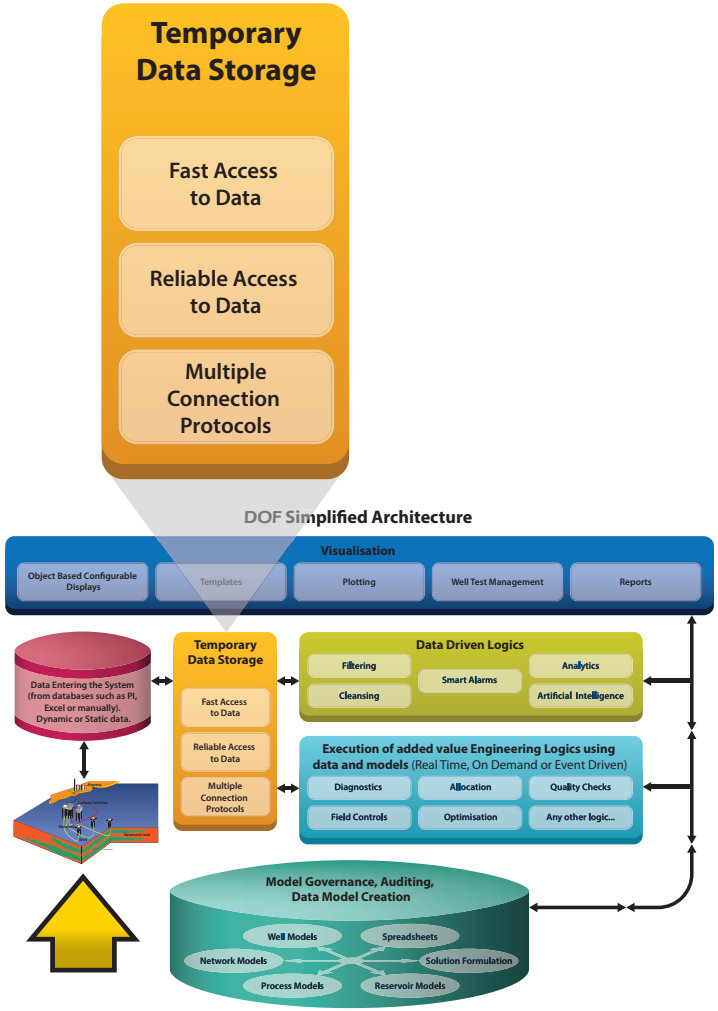
Answer: Both Governance and Change Management are automatically handled by the design of the **DOF**. Secure role based access to each part of the system is embedded in the design of the products, along with clear processes that govern Models (updates and changes), Logics, access to Data and Information. The **DOF** Products can be configured to fit within the company's business and processes.

Question: **We do not have petroleum engineers in the field so modelling is not something that we do. Do we need to use physical models at all?**

Answer: Diagnostics and KPIs are a key part of field management and this can only be done by understanding the physics that takes place in an oil or gas field. Physics is what allows field management teams to troubleshoot problems or to ensure that decisions made are rational, quick and contribute to maximising value from the asset. As such, models and the capability they offer are a must. Models will reside on a model repository and will be available to anyone in the organisation with the right privileges to view them, use them, or update them accordingly. Engineers will be able to know the state of the models (and hence the field) on a minute by minute, hour by hour or day by day basis. This can only enhance the overall understanding of the field reality by all parties involved and facilitate more efficient field management to be done for the benefit of the company.

Petex Digital Oil Field

DOF – Temporary Data Store



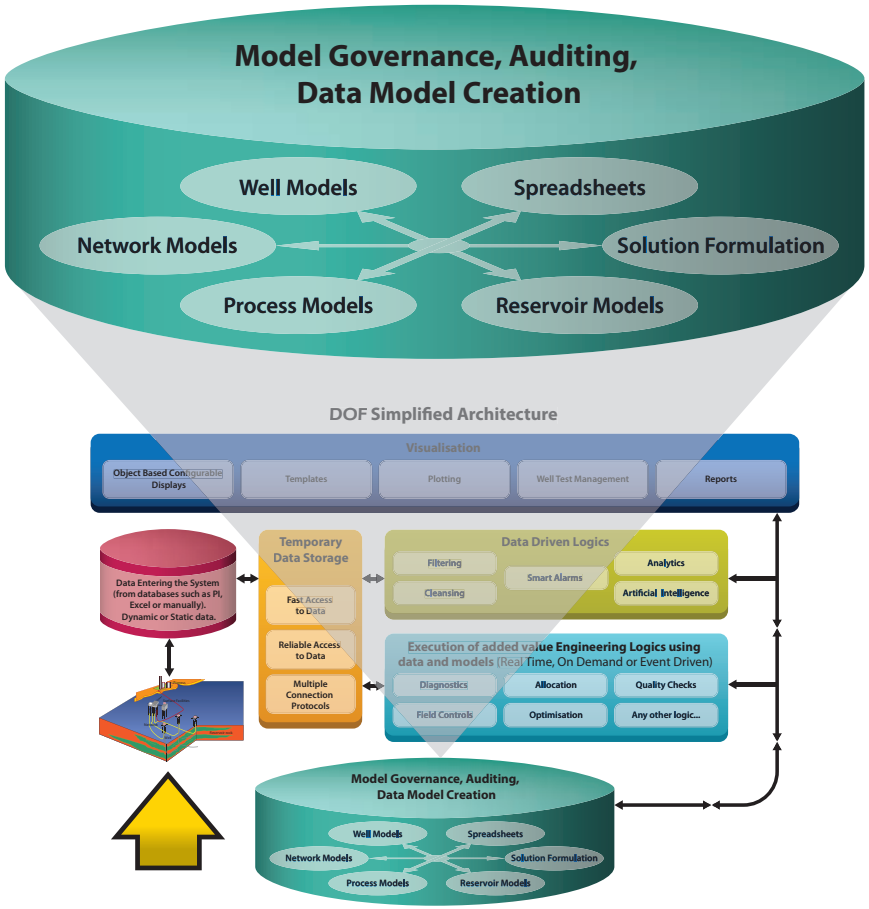
Question: **Communications with the field are limited due to availability of bandwidth and remote geographical locations. Will the DOF users experience delays in retrieving data from their day to day activities?**

Answer: The temporary data store that is embedded in the **DOF** system has been designed with precisely this challenge in mind. It continuously caches the necessary data for the calculations while other activities are going on. Millions of points can be plotted in seconds.

Question: **Our data reside in multiple databases that have historically been expanded. Would there be an issue with logics using information from different databases?**

Answer: By having a single point where data enters the system and then managed according to their use, the Petex **DOF** ensures that spaghetti junctions of data are never created. There is no practical limitation to connecting with a variety of databases and as all information and data are managed centrally by the system, maintenance is minimal and does not require constant and time consuming interventions.

DOF – Model Governance, Auditing, Data Model Creation

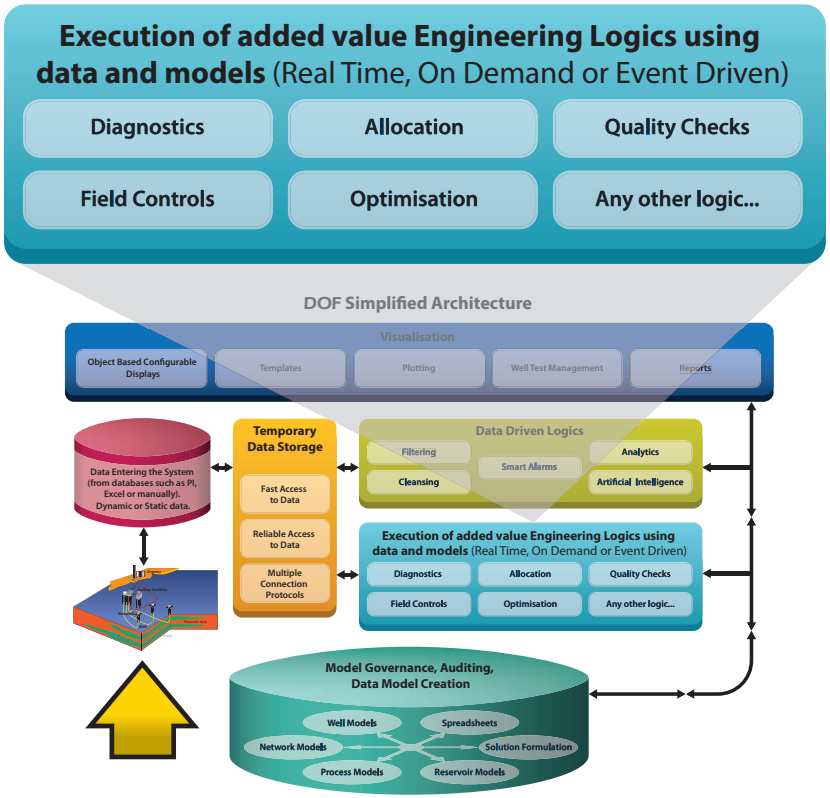


Question: **Our team works with models constantly and when changes are made, models are saved with different names so that we do not loose earlier states of these files. How can the DOF know which file we want it to use for automating calculations?**

Answer: The way models are being managed in the context of the **DOF** involves a system that has been constructed in a way that ensures full auditability in actions that are taken. The models are stored in a database that tracks who makes changes to them, for what purpose, when changes are made and what these changes are. All these are tracked over time and the concept of a valid model at a given point in time is introduced. Any model version from the past can be extracted and the system can be accessed by engineers through an interface, or by the rest of the **DOF** system programmatically. Users are assessed by their privileges and security along with roles and responsibilities that have been defined by an administrator is what enables them to perform tasks relevant to their role and position.

Petex Digital Oil Field

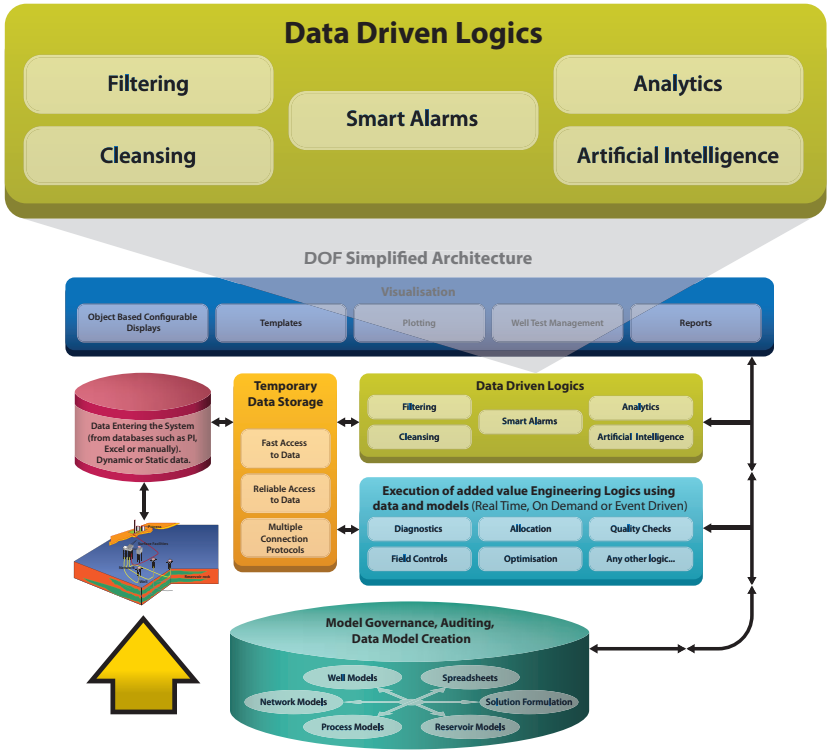
DOF – Engineering Logics



Question: **There is a need for a variety of logics and automation of repetitive calculations that our team would like to have as part of a DOF system. We are concerned that this would require specialist programmers to achieve. Can Petex provide these resources for us?**

Answer: The strategy that Petex has followed in creating the **DOF** is to have configurable products that require no programming at all, not a single line of code to construct and run the logics. In the area of logics construction, we have introduced an interface where logics can be built simply by dragging and dropping boxes from a pallet. These boxes can be configured to perform various tasks that the logic requires, either through drop down menus that have been embedded in them, or by introducing and configuring variables. Libraries of calculation engines are contained either in ***IFM*** or ***RESOLVE***, which encompass the vast majority of calculations that an engineer would like to perform. Over 100 of these logics come out of the box with the system and these perform the majority of tasks that engineers would need in managing a field. Other logics can be easily built by users simply by combining parts of these logics, or adding to them, or building them from scratch. These logics are plug and play in the system. All these functionalities require no specialist programmers to achieve and can be managed by the users themselves after some training.

DOF – Data Driven Logics

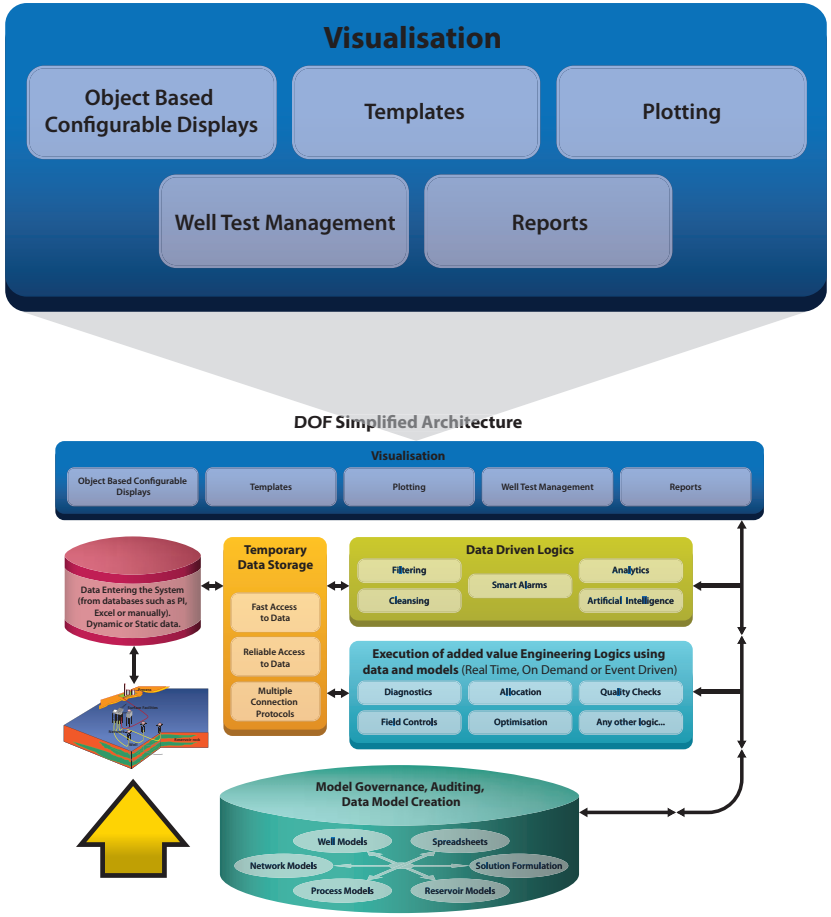


Question: **The data available for our field come at varying frequencies from sensors, some are automated and some are gathered manually. Can this data be used in automated calculations as part of a Digital Oilfield?**

Answer: For data to deliver value, they need to be used with context and knowledge of the purpose that they will achieve. For example, any database can provide an average of (for example) well head pressure over a 24 hour period. However, what does this number mean if the well was flowing for 12 hours and was shut for the rest? If the average would be used for estimating the rate of oil or gas, then this 24 hour average would not be suitable. This is one of many examples that make data management (filtering, cleansing and processing) essential to the success of any digital oilfield system. In the Petex **DOF**, the logics that manage the data can be easily constructed or come straight out of the box in order to ensure that data are used according to the context and engineering logics that will use them. Automatic event detection is only one of many logics that are in place to allow for context to be associated to the data.

Petex Digital Oil Field

DOF - Visualisation

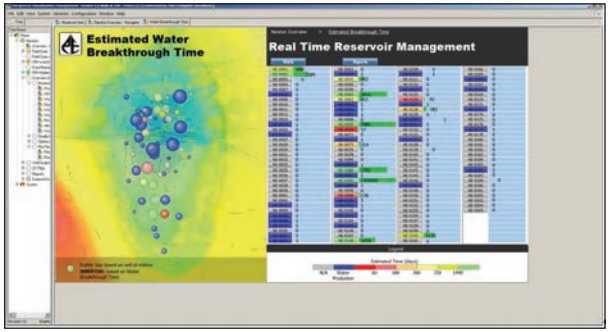


Question: **Dealing with various visualisation systems in the past, our team has had to deal with the high cost of expanding these when new equipment become available. Drilling campaigns are long and sometimes unpredictable. Would the Petex DOF need to be configured with all the well and visualisation screens from the very beginning? Would software developers be available from Petex to constantly update the screens?**

Answer: The experience being referred to above is not uncommon with traditional systems. Programmers would need to be involved in constructing visualisation screens and updating these or maintaining them has been a very costly exercise for the consumers of this technology. This is precisely one of the challenges that the Petex **DOF** was developed to overcome. The concept of visualisation templates exists to assign pre-defined screens for types of equipment. When a new piece of equipment is detected, the system is capable of automatically updating the whole system, put that equipment as part of the logics being executed and have a visualisation template assigned to it. No programming is required to achieve all of that. Screens are built with objects from a menu that can be configured (plots, gauges, buttons, vessels, pipes, pictures etc). Extending or maintaining the system can be done by company personnel with some training. Petex does not need to be involved directly, but is available to support company resources in this effort.

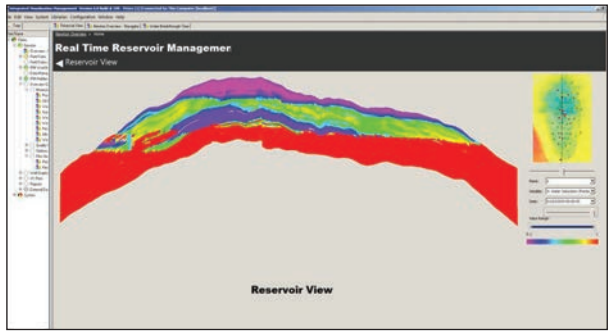
DOF - Examples of Visualisation:

Screen displaying multi-rate information

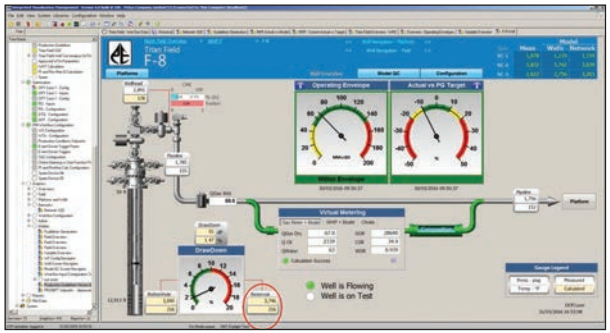


Template with breakthrough time results

ICV Optimisation results per zone



Reservoir results viewer



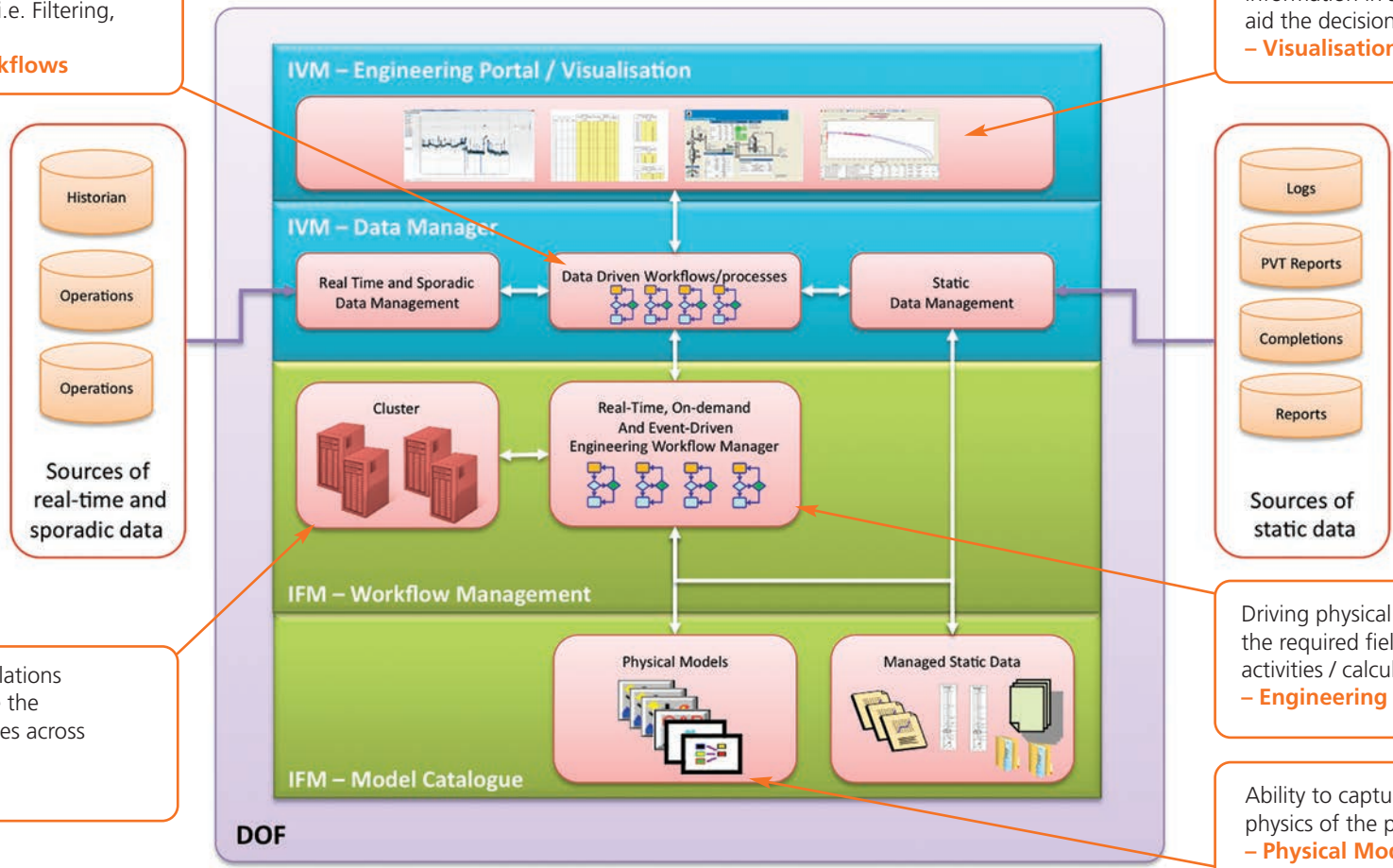
Well screen highlighting reservoir pressure and temperature

Petex Digital Oil Field

DOF Structure

Preparing the data for engineering workflows as well as perform data driven calculations (i.e. Filtering, Event detection etc.)
– Data Driven Workflows

Expose/Integrate data and information in suitable formats to aid the decision making process
– Visualisation



Distribution of calculations necessary to achieve the engineering objectives across various resources
– Clustering

Driving physical models to carry out the required field management activities / calculations
– Engineering Workflows

Ability to capture all the relevant physics of the production system
– Physical Models

Native ability to determine optimum field controls to maximise production
– Optimisation algorithms

DOF Structure

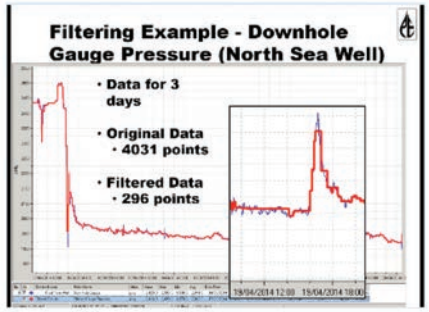
Designed to capture:

- Continuous changes in the field (e.g. new wells)
  Automatic Data Model Update
- Various disciplines/groups accessing the system
  Enterprise system
- Different disciplines/groups 'owning' different models/processes
  Fully controlled access
- Potential competing/contradictory demands
  Integration
- Organisational challenges (e.g. resources)
  Self-Sustained, upgradeable, scalable

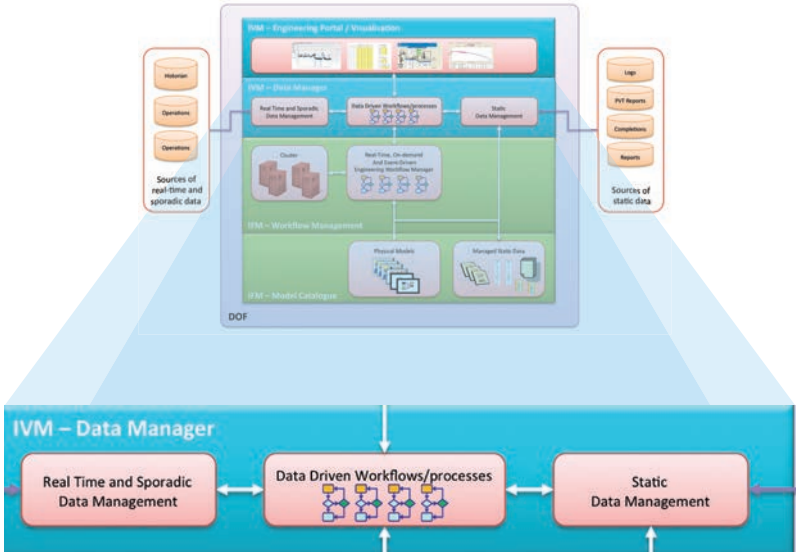
Petex Digital Oil Field

DOF – Data Management

Role - Manage all the data that the workflows (data driven or physics based) require.

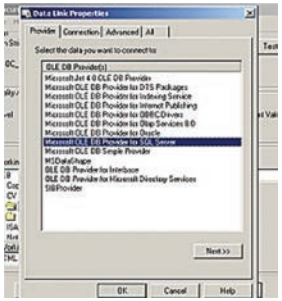


Smart Filtering



Visual Workflows for
Data Management and Analytics

Data Replication



Multiple connection protocols

Connections to multiple data sources

Secure Data Cache
– Quick Access to data

Unified Asset Data Model

One of the biggest challenges for any automated system relates to the handling of data requirements for multiple applications and users. Traditionally, this requires data to be obtained from several repositories and matching of data to workflows has been a bespoke connection. This lead to spaghetti junctions of data transfers, making these very cumbersome to maintain and scale up.

Petex has based the DOF on one single data model, which is propagated throughout the system, i.e. if a well or a piece of equipment is added, the information is automatically made available for each part of the DOF system to use. Moreover, the same concept is used to link the external PDMS and Historians systems using data wizards to configure the tags and required links.

The wizards follow a step-by-step pattern to meet the objective of establishing and testing connections to the external data sources, through to tag mapping and configuration of data retrieval. Any new tag mappings, modifications to existing tag mappings, field measurements or equipment can be easily added and managed through the built-in wizards.

Key Facts:

- Surveillance of the raw data, engineering calculations and analysis all depend on valid data.

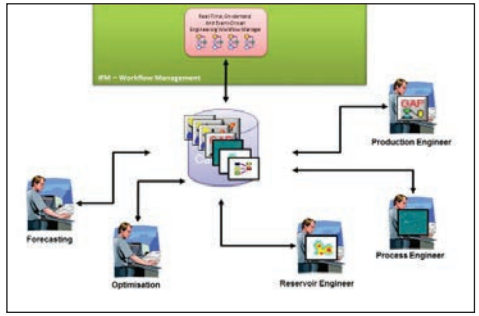
- Data Management Functions:
  - Data Acquisition (real time, sporadic and static) from numerous data sources (PI, EC, Access, etc.)
  - Ability to compute missing values (i.e. a well flowing status)
  - Validation
  - Filtering/Data Cleansing
  - Event Detection
  - Alarming
  - Orchestration of the data across the various calculations in the system

- Visual Workflows facilitate data management in an easy, user friendly and transparent fashion – **no coding required**

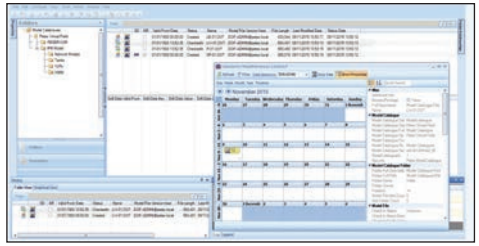
Petex Digital Oil Field

DOF – Model Management

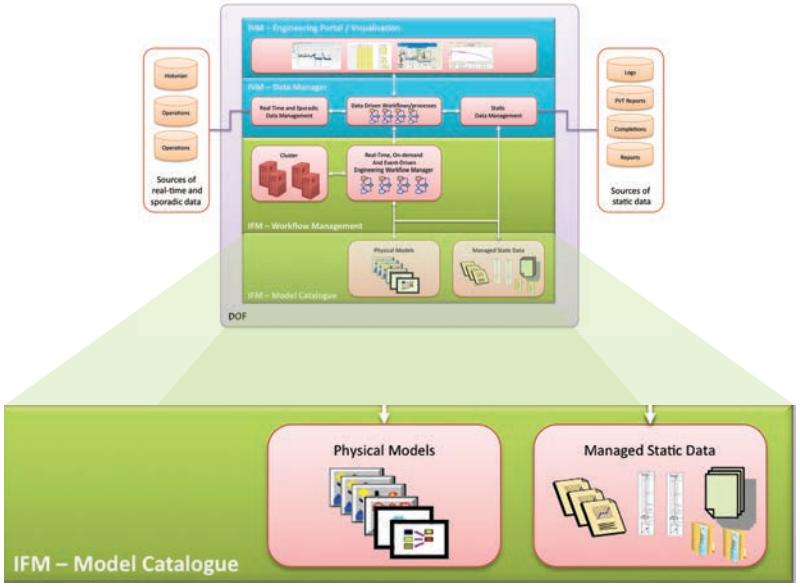
Role: To manage all the associated physical models responsible for the underlying calculations, as well as the static data (Completion reports, PVT reports etc.). Creates the Data Model that is then propagated through the rest of the DOF system.

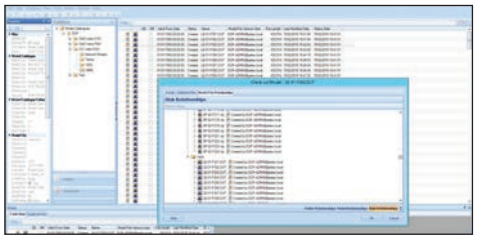


Secure Enterprise Architecture

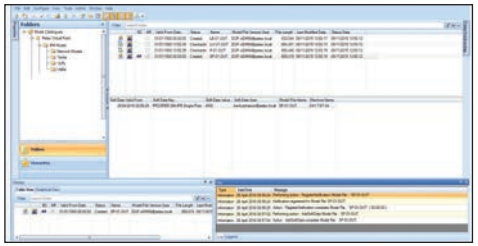


Calendar of Events

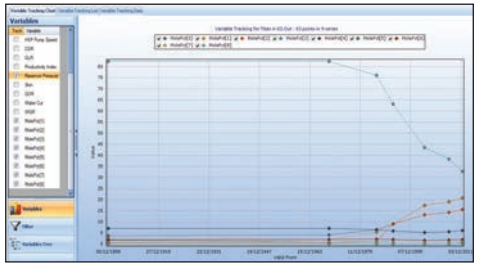




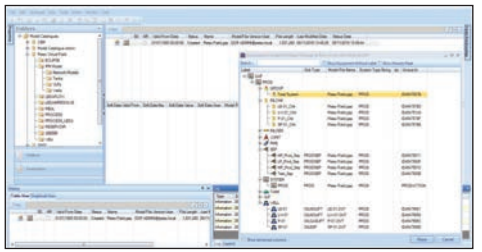
Check In/Check Out/Copy/etc.



Distinction between Soft and Hard data



Variable Tracking



Provider of Data Models for the DOF

DOF – Model Management

Objectives:

– Provide the correct model at any time
– Manage and audit any model update that is carried out
– Vendor neutral
– Keeps the source of information upon which the models are built

Principal Functionality:

– Track changes made to the models/files with corresponding validity dates
– Provide Model/File Access functionality
  - Add / Check In / Check Out / Copy
– Users privileges and security
– Processing of the Models/Files through providers (Open Architecture)
– Interfaces for externally driven actions
– Source of **DOF** Data Model

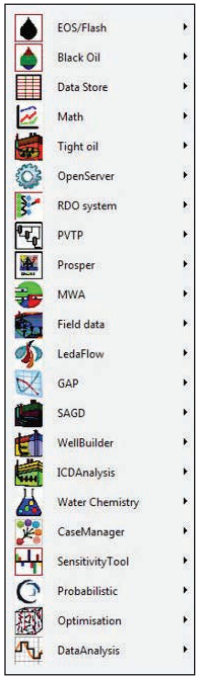
Key Facts:

- Management of models and related information taken care of by ***Model Catalogue***.
- Workflows can have access to the required model(s) and related information in an organised fashion.
- Any update carried out by an engineer will immediately become available to the system.
- Any change carried out either by an engineer or by an automated workflow is tracked, and hence easily audited.
- Exists as a standalone application and is currently used as a corporate file management system in various companies.

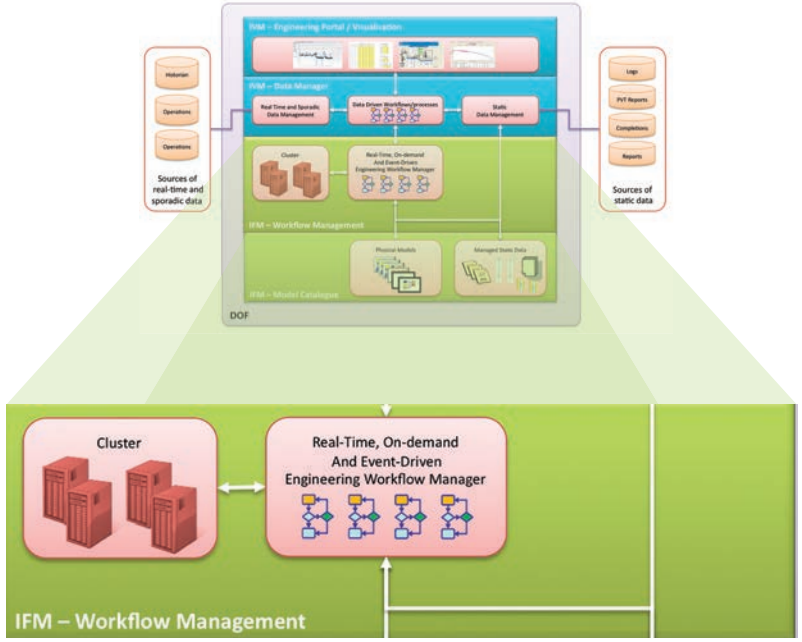
Petex Digital Oil Field

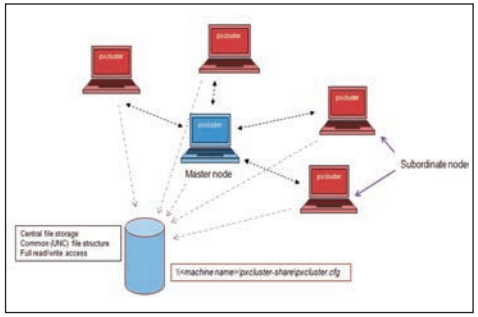
DOF – Workflow Management

Role: To orchestrate the execution of engineering workflow (interdependent) on clusters.

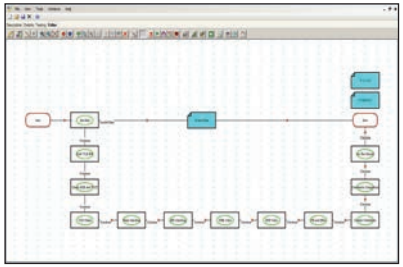


Calculators that perform specific tasks exist in RESOLVE and IFM





Native Clustering Capability



Workflows constructed from visual interface

Over 100 Workflows out of the box

DOF – Workflow Management

Engineering Workflows

Over 100 workflows in the DOF system come straight out of the box and cover the vast majority of tasks that would be needed for surveillance, diagnostics, validation and optimisation (short and long term).

All workflows are provided in Visual form, based on the Visual Workflow platform that Petex has created. This requires no coding at all and all workflows are plug and play.

Digital Oil Field Workflows

Since the Digital Oil Field (**DOF**) is extensible, workflows can be designed and added at any time. The **DOF** has a purpose-built visual workflow builder interface which allows engineers to design and build workflows quickly. As well as providing a tool set for building workflows, the **DOF** is supplied with a set of pre-built engineering workflows. The list of pre-built workflows includes the following:

Field Surveillance Workflows
AWS (Advanced Well Surveillance) – multiple workflows for well surveillance:
Real Time well production estimation
- VLP/IPR rate calculation
- VLP rate calculation
- IPR rate calculation
- Choke rate calculation
- ESP rate calculation
- CHP rate calculation

Real Time well production estimation
- VLP/IPR gradient calculation
- VLP gradient calculation
- IPR gradient calculation
- Choke gradient calculation
- ESP gradient calculation
- CHP gradient calculation
- External rate gradient calculation

Real Time rate sensitivity calculations
- VLP/IPR rate sensitivity calculation
- VLP rate sensitivity calculation
- IPR rate sensitivity calculation
- Choke rate sensitivity calculation
- ESP rate sensitivity calculation
- CHP rate sensitivity calculation

Choke Calculations – estimate flowline pressure and temperature
- VLP/IPR choke calculation
- VLP choke calculation
- IPR choke calculation
- ESP choke calculation
- CHP choke calculation
- External Rate

IPR Sensitivity Calculations
- IPR sensitivity based on VLP method
- IPR sensitivity based on Choke method
- IPR sensitivity based on ESP method
- IPR sensitivity based on CHP method
- IPR sensitivity based on External Rate method

Real Time production conditions estimation (e.g. WC, GOR, Reservoir Pressure, etc.)
- Real time WC/WGR estimation
- Real time GOR/CGR estimation
- Real time reservoir pressure estimation
- Real time productivity index estimation

Continuous artificial lift performance monitoring (ESP wear, Gas Lift allocation, etc.)
- Real time gas lift gas estimation
- Real time ESP wear estimation
- Real time reservoir pressure estimation
- Real time productivity index estimation

Field Surveillance Workflows
AWS (Advanced Well Surveillance) – multiple workflows for well surveillance: Well Surveillance KPI
- Analyses the convergence/divergence of the various rate methods

Auto Rate Method: Calculates the 'best rate' by evaluating the following scenarios (i.e. variable combinations to be regressed upon). Once the best case is determined, the gradient, flowline pressure and temperature, and IPR sensitivity calculations are carried out for that rate.
- Rate
- Rate & WC/WGR
- Rate & GOR/CGR
- Rate & WC/WGR & GOR/OGR
- Rate & gas lift gas
- Rate & gas lift gas & WC/WGR
- Rate & gas lift gas & GOR/CGR
- Rate & gas lift gas & GOR/CGR
- Rate & gas lift gas & WC/WGR & GOR/CGR
- Rate & ESPwearfactor
- Rate & ESPwearfactor & WC/WGR
- Rate & ESPwearfactor & GOR/CGR
- Rate & ESPwearfactor & WC/WGR & GOR/CGR

Analytics: Continuous calculation of confidence of the following scenarios. For each scenario the gradient, flowline pressure and temperature, and IPR sensitivity calculations are carried out for that rate:
- Rate
- Rate & WC/WGR
- Rate & GOR/CGR
- Rate & WC/WGR & GOR/CGR
- Rate & gas lift gas
- Rate & gas lift gas & WC/WGR
- Rate & gas lift gas & GOR/CGR
- Rate & gas lift gas & WC/WGR & GOR/CGR
- Rate & ESPwearfactor
- Rate & ESPwearfactor & WC/WGR
- Rate & ESPwearfactor & GOR/CGR
- Rate & ESPwearfactor & WC/WGR & GOR/CGR

- MWA (Multi-Well Allocation)
- Multiphase flow meter validation
- Dynamic gradient calculation
- Dynamic VLP/IPR calculation
- System quality control
- Oil detailed well test analysis
- Gas detailed well test analysis
- Condensate detailed well test analysis
- Dual string well test analysis
- Dual string well surveillance

Field Surveillance Workflows
- Well test validation
- Performance curve generation
- Gas-lift quicklook analysis
- ESP quicklook analysis
- ESP performance
- PVT correction
- Mobility analysis
- Multi-rate gas well analysis
- Multi-rate oil well analysis
- Gas reservoir pressure match
- Condensate reservoir pressure match
- Generate IPR
- IPR skin matching for oil wells
- Smart well test validation
- Smart well rate estimation
- Gas-lift allocation

Reservoir Workflows
- Reservoir production history update
- Real time reservoir pressure estimation
- Real time reservoir simulation
- Reservoir simulation QC
- Production allocation
- Average rates for cumulative production

Full-field Optimisation Workflows
- Waterflood management optimisation
- Routing optimisation
- Short-term optimisation
- Long-term optimisation

Full-field Forecasting Workflows
- Full field forecast of the filed based on operational data and planning information

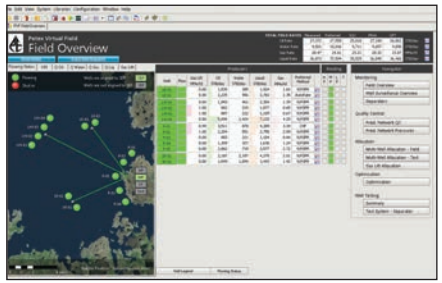
Well Test Generation
- Generate well tests automatically based on wells routed to the test separator.

More than 100 out of the box workflows supplied with the DOF

Petex Digital Oil Field

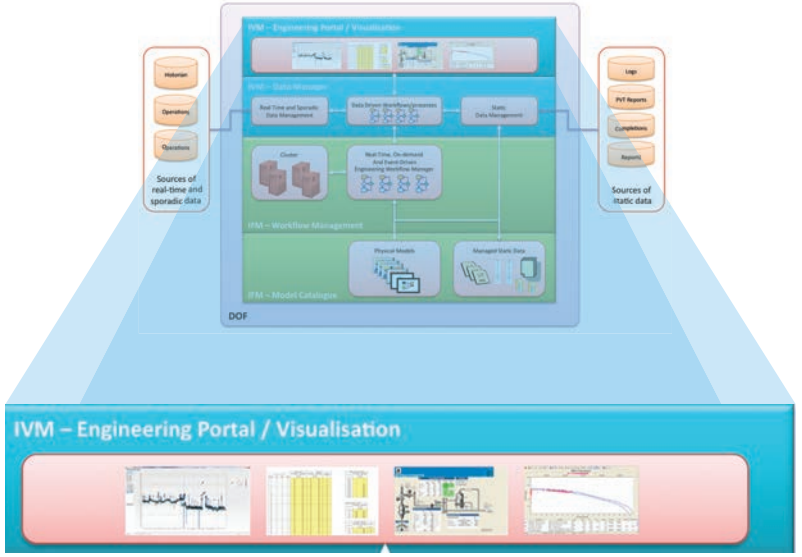
DOF – ENGINEERING PORTAL / Visualisation

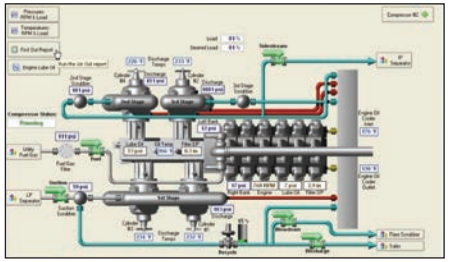
Role: To expose all data (raw, processed, calculated) and information to users, as well as provide interface to interact with workflows.



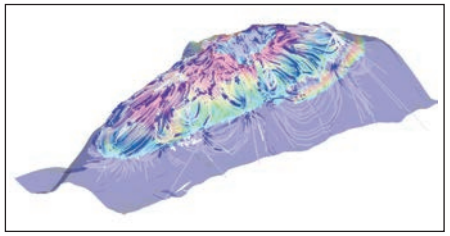
Configurable displays
(object based, no coding needed)

Configurable Report Generation

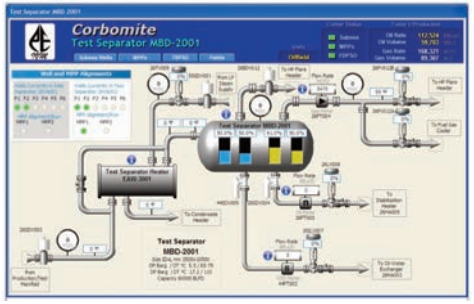




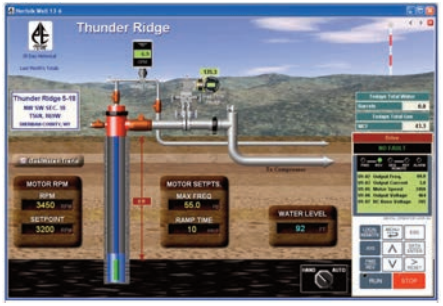
Screens can have as much detail as
needed depending on requirements



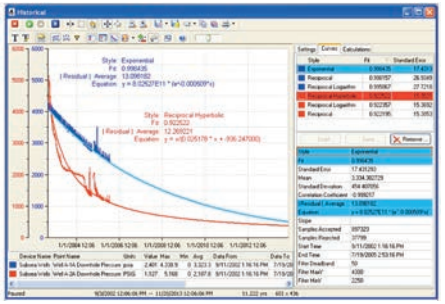
Reservoir Visualisation capabilities



Well Test Management System



Fit for purpose templates out of the
box



Broad range of plotting
and fitting functionalities

DOF – ENGINEERING PORTAL / Visualisation

Engineering Portal

Interactions with workflows are essential in a DOF system. They allow engineers to manage fields more efficiently by fine tuning calculations, compensate for lack of quality in certain data sources and ensure that the calculations done reflect the reality of the field. The tight link among the applications that make up a DOF system allows for IVM to interact with IFM in ensuring that the above objectives are met.

Key Facts:

- Out of the box templates for results of standard workflows
- Pre-configured screens controlling workflows such as AWS (Advanced Well Surveillance) and MWA (Multi Well Allocation) among others.
- Vendor neutral (can interact with workflows controlling products from multiple vendors, not only from Petex)
- Built in functionality for diagnostics and statistics on data sources

Visualisation

Provides a coherent view of an oil field. Data sets are integrated, including the engineering models and production and economics information with visualisation capability in an organised way. The power of a single asset and data model permit, with a push of a button, the visual screens to be upgraded and extended automatically as the field develops.

Key Facts:

- Templates are configurable and are built based on a library of objects (**no coding required**)
- Extensive plotting functionalities can address any requirement
- Comprehensive reporting module
- Alarming capabilities

DOF Suite: ***IFM. IVM, ModelCatalogue***
IPM® Suite: ***PROSPER, GAP, PVTP, MBAL, RESOLVE, REVEAL, OpenServer***

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