

IPM 11

New Features and Software Enhancements

General – Across Tools (included within maintenance)

- **New Water Correlations**
 - Density based on IAWPS model
 - Dissolved gas based on Duan formulation
 - Viscosity based on modified method from Kestin
 - Thermal properties based on Laurence Livermore data
- **FastFlash – New calculation option to optimise speed**
- **Integration of the RESOLVE Path to Surface object into all tools**
 - This allows the path to surface used by an EOS model to be defined by a Path to Surface data object
 - This increases the flexibility of the processes which can be used when reporting standard condition rates throughout the tools

RESOLVE (included within maintenance)

- **Interface Enhancements**
 - New ‘home’ screen
 - Redevelopment of the system-view tab on main screen
- **New Data Objects**
 - Probabilistic Modelling – ‘Sybil’ and 3rd Party
 - Optimisation Engines –NMSimplex
 - GIRO – Integer Based Optimisation
 - History Matching
 - GAP – Transfer IPR
 - GAP – MatchIPRData
 - Data Analysis – WaveletAnalysis
 - Phase Envelope
 - DualStringGasLift
- **Enhancements to Existing Data Objects**
 - ESP Fluid Temperature added as match parameter for MWA
 - Choke Model selection in Choke RDOs
 - PSwarm uses a latin-hypercube approach to enforce a spread of the initial population
 - Unit support added to FlexDataStores
- **Visual Workflow Enhancements**
 - If...Elseif element replaces If..Else block
 - Enhancements to the Form Builder
 - Profiling tool
 - Workflow Difference tool
 - Improved ‘watch’ windows
 - Integration of unit system into workflows and formbuilder

- Operation and property browsers
- Variables – Division of variables by category and addition of comments
- Inline Functions
- On-screen Annotations
- Improved handling of DateAndTime workflow methods
- Workflows can dynamically add objects to an RDO system object
- Workflow method added to read/write a whole text file in one call
- Run can now be stopped from a Visual Workflow
- **Ability to control RESOLVE time-stepping from a workflow**
- **All RESOLVE file types (*.rsl and *.rsa) now selectable in file browser**
- **Numerical simulators compatible with Windows based clusters**
- **When publishing variables, Add To Plot is set on as default and new *Add to Workflow* option**
- **Import/Export on Connection Wizard**
- **Annotations can be added to RESOLVE's main screen**
- **Run a workflow by right clicking on it**
- **Development of IFM dump facility**
 - Allows direct transfer of workflows (including data objects and variables) from DOF to RESOLVE and visa-versa
- **Built-in Visual Workflows**
 - VLP Generation
 - PVT Transformation

PROSPER (included within maintenance)

- **Stimulation Screening Tool**
 - Scoping study used to identify possible candidates for stimulation
 - Options include
 - Hydraulic fracturing
 - Acid fracturing
 - Mud acid stimulation of sandstones
 - Acid stimulation of carbonates
- **Well Builder Visualisation**
 - Includes improved visualisation of the wellbore
 - Allows import to and export from the RESOLVE Well Builder Data Object
- **Interface enhancements**
 - PVT Input interface re-design
 - Gas Lift design screens
 - ESP design screens
 - Artificial Lift Input screens
- **Plotting enhancements**
- **Artificial Lift Enhancements**
 - Updated ESP database
 - Improved pump/motor/cable database
 - Improved Gas Lift design results
 - Consistent vocabulary between all the different Gas Lift calculations
 - Enhancements to ESP results
 - Improved transfer from single to multi point Quicklook
- **Export to Intersect lift curve format**
- **Upgraded Sulzer dll**
- **File comparison tool**
 - Allows two PROSPER models to be compared and differences noted
- **VLP/IPR Matching process enhancements**
 - Enhancement to visualisation of results
 - Ability to set VLP/IPR matching rate distribution method
- **Ability to choose variables to include in IPM VLP export (e.g. to reduce the VLP file size for large GAP models)**

GAP (included within maintenance)

- **Improved Validation and Warnings**
 - More descriptive messages where possible
- **Additional Constraints**
 - Max C-Factor, GVF at ESP Inlet, Max Torque (compressors), Max Temp (nodes)
- **DCQ Control added to RBNS**
- **Inline Injection Element constraints/controls added to RBNS**
- **Improved Thermal Models – calculation of U values for pipelines**
 - Similar to the Enthalpy Balance model in PROSPER, this calculates the heat transfer coefficient taking into consideration the heat transfer mechanisms and pipeline environment
- **Group Controls**
 - Allows for a group of elements to be controlled with the same value
 - For example, if two different compressors are modelled but they are on the same shaft, the group control can be used to ensure that they are kept at the same speed
- **Compressor Wear Factor**
 - Acts like the wear factor for ESPs but applied to compressors
- **PVT Matching imported from PROSPER**
 - Ability to bring in PVT matching from PROSPER if a consistent correlation is selected throughout the model
- **OLGAS 3P EXT Viscosity Match Parameters (Pal & Rhodes parameters)**
- **Plotting Package Enhancements**
- **Plot pipeline gradient between two selected nodes**
- **Playback of VLP/IPR intersection of a well for a prediction**
 - Allows the predict results of a well to be viewed in terms of the VLP/IPR curves over time
- **Improvements to emulsion modelling UI – Select injection fluid to consider for plotting**
- **Add Compressor Curves from Test Data**
- **OPENSERVICES variables wizard**
- **In-situ rates reported as result at nodes downstream of wells**

GAP Transient (not included with maintenance)

- **New Transient Flow Simulator**
 - Used with GAP to model transient flow within the wells and surface network
 - Gives the user the ability to quickly and easily transform an existing steady-state GAP model into a transient model
- **Flexible Model Setup**
 - Allows the entire network of wells and pipelines to be modelled transiently or alternatively a smaller subset of the network can be modelled using transient calculations while the other elements remain steady state
- **Robust IPR Modelling**
 - Allows integration with Transient IPR models for more realistic inflow response
 - Allows integration with numerical simulators through RESOLVE
- **3D visualisation of the results**
- **Visualisation of results over time**

REVEAL (included within maintenance)

The main developments implemented in REVEAL version 8.0 are detailed below:

- **Geomechanics and fracturing**
 - Minimum fracture conductivity
 - Permeability changes for stress, strain, friction angle and pre-consolidation stress
 - Permeability change hysteresis
 - Stress region for interpolation schemes
 - Shields number solid transport
 - Fracture stress shadowing
 - Far field stress varies with fracture size
 - Improved transition from propagating to fixed fracture size (injection to production)
 - New fracture stress and FE/FD grid coupling options
 - Minimum principal stress direction changes
- **Fluids/ Compositional**
 - Fast flash option set as default under EOS setup
 - Performance improvements
- **Water chemistry**
 - New sodium silicate polymer model formulation based on SPE 143836
 - Mineral component saturation index can be set
- **Wells**
 - Export of tpd added under Edit |View Project
 - Non return ICD option added
 - Hydro 2P flow correlation added
 - Gaslift valve database added to well builder (tubing and casing sensitive)
 - Halliburton AICD database added
 - Transient well flow
 - Water density modifier (mud)
 - New wellbore heater model
 - Venturi chokes
 - Inline dynamically controllable chokes
- **Visualisation**
 - New User Interface when opening up new REVEAL instance
 - Thumbnail view to recently saved projects
 - Time format can be modified in the 3D visualisation
 - 3D text scaling can be modified
 - 2D plotting playback control
 - Show hide legend option for 2D plotting
 - 2D plot rotation, stairs
 - Auto scale option for 2D plotting (fit all to window)
 - 3D synchronise playback views for multiple realisations of 3D grid results
 - 3D vector plotting (speed of oil, water and gas in addition to minimum principal stress direction)
 - Core grid geometry grid added
 - Per fracture reporting and additional properties reporting on FE 3D fracture
 - Extended well results plotting

- *User OpenServer variables for plotting*
- *History import extended*
- **Water Chemistry**
 - *Component SI can be set*
 - *Region data for souring*
 - *New sodium silicate polymer model formulation*
 - *Bulk and porous shear model (new polymer shear correlation)*
 - *New polymer degradation (shear and temperature) model*
 - *Polymer hydrolysis model*
- **Surfactants**
 - *Soap salinity phase regions*
 - *Surfactant phase boundary variation with surfactant concentration*
 - *Acidic oil sulphase ion exchange*
- **Steam**
 - *Steam vapour equilibration*
- **Resolve data objects (using Reveal functionality)**
 - *Multi tubing surface connection*
 - *SAGD surface coupling (constraint passing)*
 - *Multi-tubing surface connection*
- **Sector model**
 - *Define and create sector models*
 - *Time varying boundary conditions*
- **Parallel Solver**
 - *New parallel solver*
 - *Memory handling improved to run significantly larger models*

MBAL (included within maintenance)

- **Water from common aquifer included in Energy Plot**
 - If the aquifer is being modelled as a separate tank (so that it can be connected to multiple reservoirs) the influx from the common aquifer into each tank will be included in each tank's Energy Plot
- **Undo facility added for addition/deletion etc of tanks/wells/transmissibilities**
- **Improved Paste functionality into tables**
- **Auto-save feature**
- **Flying Brick Plot**
- **Comments associated with production history points now displayed in all relevant plots**
- **Association of history and prediction wells for quick transfer of relative permeability curves**
- **Phase correction for tight reservoir calculations**
- **Change unit type with right click**
- **VLP/IPR tolerances stored per file instead of per PC**
- **More plots updated to use new format**

PVTp (included within maintenance)

- **Integration of Path to Surface Object**

DOF - List of Enhancements

DOF – General (included within maintenance)

- **Improved Scenario Management**
 - New configuration override functionality allows inputs for real time workflows to be over written by user defined values for a given run
 - This allows users to run different scenarios more efficiently

IVM 8 (included within maintenance)

- **Configuration Transfer**
 - Enables users to package up parts of an existing system and then export the ‘package’ so it can be imported into another system
 - The contents of this ‘package’ are completely configurable by the user and could contain Graphic Templates (with or without references), poll groups, datasets etc.
 - Uses a wizard in the IVM interface to select the elements to be transferred
 - This is envisaged to help in tasks such as propagating a standard setup, adding a new workflow, extending an existing workflow and even building a seed system from scratch
- **Integration of ArcGIS**
 - IVM 8 graphics screens have the ability to integrate directly with ArcGIS
 - This allows data stored in ArcGIS servers and geodatabases to be displayed in IVM along with data and calculation results
- **Improved PI Provider**
- **On-demand Workflow Execution**
 - Execute a visual workflow from the IVM interface including a button on a screen
- **IFM and IVM data exchange performance and configuration improvements**
- **Visual Filter control testing**
- **Control IFM task schedule from IVM**

IFM 5 (included within maintenance)

- **Security Enhancements**
 - Remove need for users to be setup in the SQL Server logins
 - Application access will be controlled from Model Catalogue
 - Simplifies the setup and ongoing maintenance going forward
 - Same security model as IVM
 - Additional Kerberos configurations no longer required
 - Easier backup and restore of database and no SQL logins to remap
- **Visual Workflow Debugging**
 - Results can be viewed in a graphical way (i.e. line and bar plots)
 - Results from more than one run in the Editor can be plotted
 - Results can be compared with results previously saved in the database
- **Ability to save and load Visual Workflow inputs and set them to execute a workflow**
 - Inputs are saved in EXCEL file format and are fully editable
 - This allows importing of inputs from a different system
- **IFM Task Scheduler plugin in IVM**
 - Adds ability to monitor the status of IFM schedules from both IFM and IVM

- **Extension of service oriented architecture for Model Catalogue**
- **Development of IFM/RESOLVE dump facility**
 - Allows direct transfer of workflows (including data objects and variables) from DOF to RESOLVE and visa-versa
- **Additional Visual Workflow operations and functionality**