



Issue 18: March 2006.

## See you at AAPG 2006 in Houston

Badleys will once again have a presence at the exhibition and look forward to meeting many clients there. This year we will be sharing stand space with our alliance partners, Midland Valley and IES. Please come along to stand **644** where we will be pleased to show you the latest developments in our software.

We will be happy to discuss with you any issues relating to structural geology and tectonics in which we and our alliance partners may be of assistance. If you would like to arrange a demonstration of our TrapTester software please [contact us](#).

## TransGen 3.2 now released - advanced fault transmissibility prediction

We are pleased to announce the public release of TransGen 3, incorporating the latest techniques in fault transmissibility prediction from our long-standing partners the Fault Analysis Group at University College Dublin.

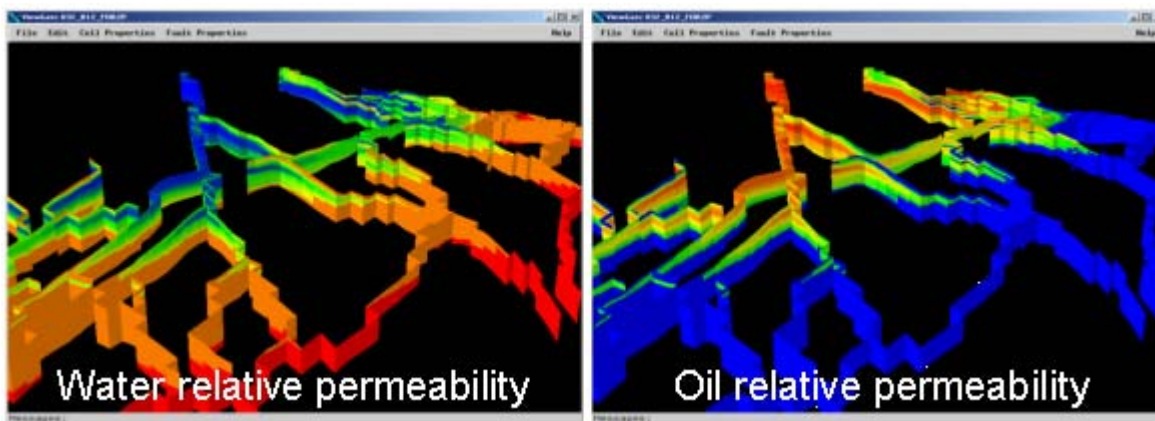
TransGen 3 is the result of three years of development funded by Shell UK, Statoil & Petrobras, and facilitated by the ITF in Aberdeen. Three new modules developed under the project have been tested on live assets by the sponsors, and the software is now publicly available. The modules provide:

1. complete flexibility in fault-rock property algorithms;
2. routine calculation of two-phase fault-rock properties;
3. implicit inclusion of sub-resolution fault-zone structure (e.g. drag and relays).

TransGen, first released in 1999, is an application that has pioneered the routine calculation of geologically-driven fault-transmissibilities. By focussing on the geological controls that determine flow through faults, development teams can be freed from the ad hoc adjustments to fault properties that have in the past been the engineering approach to history-matching in faulted reservoirs.

Starting from a standard corner-point-grid model, TransGen uses fault displacements, reservoir properties and geological history to compute a suite of fault-transmissibility multipliers which can then be included in reservoir simulation runs.

Widespread testing of TransGen on producing fields by our sponsor companies has shown that this approach often leads to an earlier history match - and, moreover, one that is better predictively because it doesn't simply compensate for other errors in the model.



(Above) Examples of water (left) and oil (right) relative permeabilities in fault rock, computed by the **2PhaseGen** model of TransGen.

### Modular structure

TransGen 3 is built with a modular structure to allow for varying degrees of complexity in the modelling. The novice user can use the software in 'Basic' mode, where sensible defaults control the calculation of fault-zone permeabilities and thicknesses, in a similar way to the previous TransGen 2 release. With just a little more experience, users soon progress to the first of the new modules.

### Flexible Fault-rock properties

A new generic algorithm termed "Fault Seal Potential" has been introduced which incorporates all the input variables from other published methods. Any other method such as SGR, CSP, SSF, etc, can be expressed by the Fault Seal Potential simply by changing a selection of input variables. And it's easy to implement your own favourite too, since TransGen allows you to write your "plugins" for any cell or fault properties.

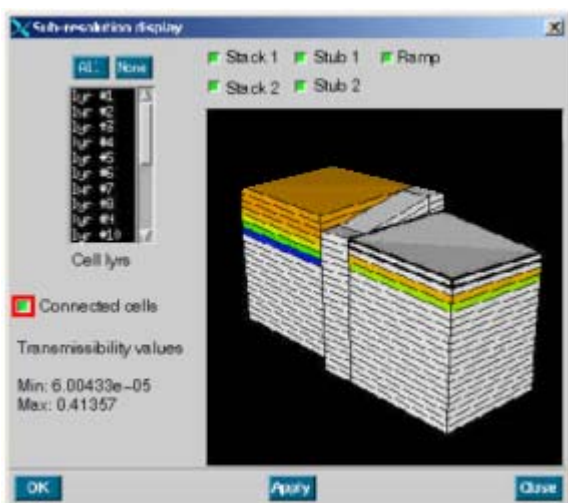
The other two optional modules address fluid issues and structural issues respectively.

### 2PhaseGen

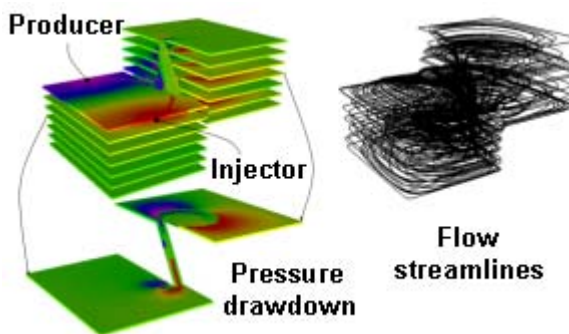
**2PhaseGen** calculates the effect of fault-rock relative permeability and capillary pressure, which are neglected in conventional transmissibility multipliers. By using across-fault flow-rates or pressure data from a conventional single-phase simulation, 2PhaseGen employs a novel new technique to determine pseudo-relative permeability and capillary pressure tables for groups of faulted blocks (Manzocchi *et al.* 2002, *Petroleum.Geoscience*, 8, 119-132).

The output for the simulator comprises rel-perm tables and index keywords (SWOF & KRNUM, for those who know) which attach these properties to upstream grid blocks.

Tests with theoretical models and also on real fields by our sponsoring companies have shown that incorporating these 2-phase effects can be significant in many circumstances.



(Above) Example TransGen 'mini-model' of a relay-zone between two cell stacks.



(Above) Illustration of flow through a small-scale relay zone.

## Sub-resolution structure

The third new module addresses **Sub-resolution Structure**. It is well known that standard corner-point-grid models are severely compromised in their ability to include details of the fault network because of the restrictions imposed by the cell sizes and geometries. Probably the most critical aspect is that small-scale relay zones, and near-fault drag, cannot be represented.

TransGen now provides a solution to this problem with a new modelling workflow. Starting with the initial model, the effect of drag at the faults can be computed by varying all fault offsets by user-defined amounts, either deterministically or statistically.

New realisations of transmissibility multipliers can then be output for sensitivity studies in the simulator. Of possibly even greater significance is the building of small-scale relay zones into the model.

A relay zone can potentially create connections between all reservoir layers that are otherwise offset by a large fault. For each relay zone, TransGen builds a separate 'mini-model' which explicitly includes all these connections, and then their effect is then aliased back to the coarse cell geometry of the original model. Relay zones can be built deterministically (e.g. to match features noted on seismic) or statistically to predict possible effects of sub-seismic structures.

Further technical details of the TransGen 3 functionality are provided in a poster by Manzocchi et al, presented at the Structurally Complex Reservoirs Conference, Geological Society, February 2006. You can download a copy of this poster from <http://www.badleys.co.uk/download/TGposter.zip>

If you would like to see what TransGen 3 can do for you, why not [get in touch with us](#). We'd be happy to send you an installation CD and provide you with a free evaluation licence. TransGen comes with an extensive online help system, and further support is available by phone-call or email.

---

*If you are unable to view images in this newsletter, a .pdf is available [from our website](#).*

*Please send us your [feedback and comments](#).*

[To Unsubscribe to this newsletter please click here](#)



SOFTWARE • CONSULTANCY • TRAINING

TrapTester, TransGen, Ttriangle, Stretch, FlexDecomp

[info@badleys.co.uk](mailto:info@badleys.co.uk)

Tel: +44(0)1790 753472

[www.badleys.co.uk](http://www.badleys.co.uk)

Fax: +44(0)1790 753527

---