

SGTPIPE / SGTFLOW VS PIPESIM benchmarking

**By the instrumentality of
EPTG Pipelines Team, BP Exploration**



Copyright © Dmitry Prytkov, R&D «SibGeoTech»
Sunbury on Thames (London), UK 09.04.2007



Examined oil gathering systems

"Oilfield 1"

(North America, USA)

- Actual state on 2005
- Prediction on 2012 year

"Oilfield 2"

(Western Siberia, Russia)

- Actual state on 2006

	"Oilfield 1"	"Oilfield 2"
Dead oil density, kg/m³	876-960	850
Water cut, %	1 - 99	78-96
Gas-Oil Ratio, nm³/m³	208 – 17810	88

All data are real. They are chosen and are provided by
EPTG Pipeline Systems Team, BP Exploration, Sunbury (London), UK.

Multiphase flow correlations

PIPESIM:

- Beggs-Brill Revised
- OLGA-S 2000

SGTPIPE / SGTFLOW:

- SGTFLOW correlation (developed on the base of VNIIGAS methodology)

Multiphase flow simulation

- oil physical properties in operating conditions
- single oil degassing in operating conditions
- natural gas physical properties in operating conditions
- oil-water mixture and physical properties in operating conditions
- actual estimated gas content and multiphase flow regime according to a pipeline relief in operating conditions
- hydrostatic and friction pressure losses in operating conditions

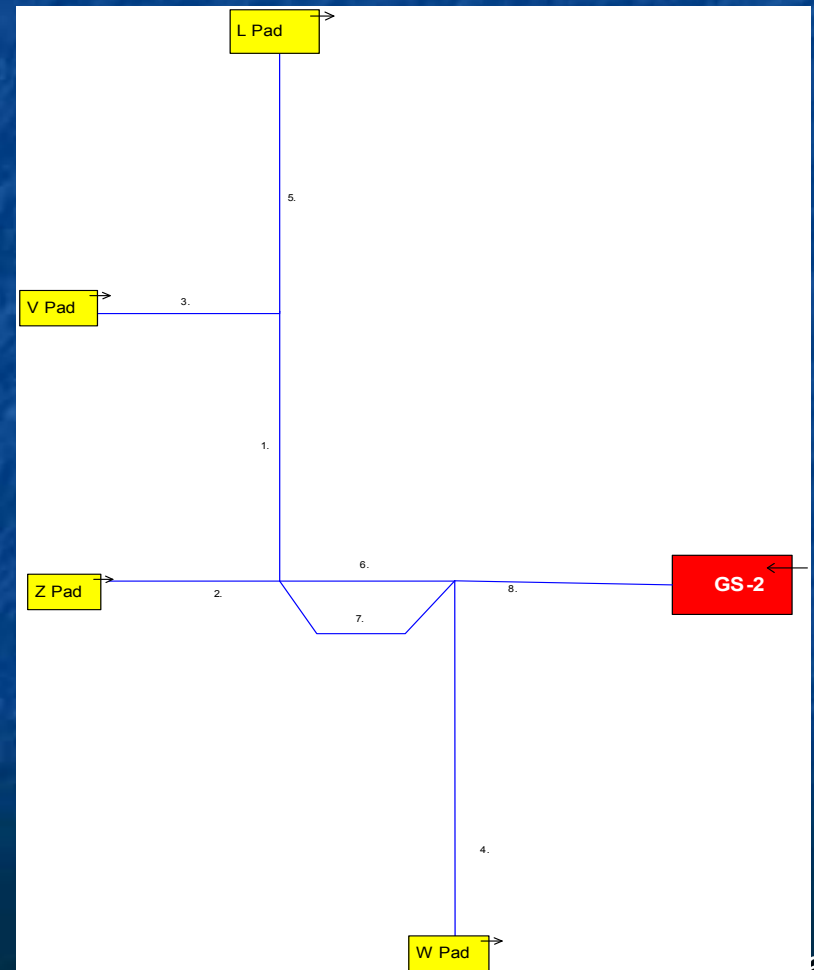
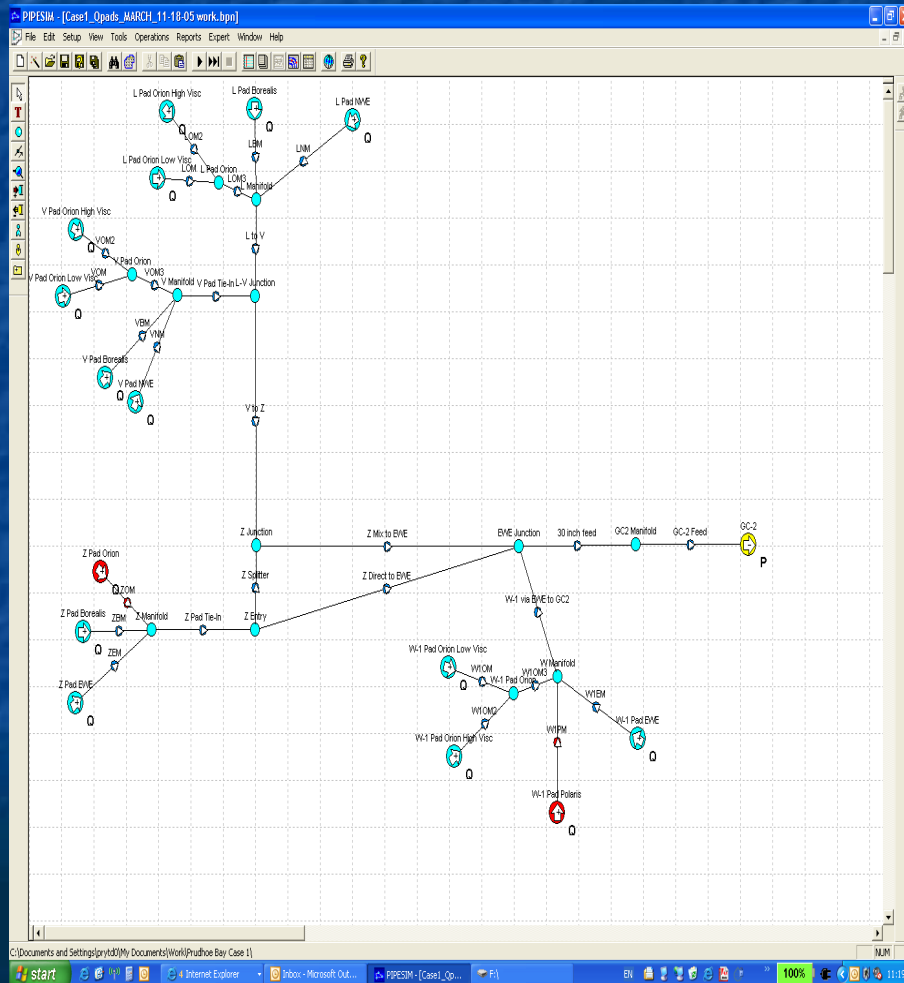
PIPESIM to SGTPIPE / SGTFLOW model moving

- Average of black oil properties
- Average of fluid temperature by pipeline network («Oilfield 1»)
- Summarize of well flow rates by pads («Oilfield 1»)
- Refine upon free gas flow rates

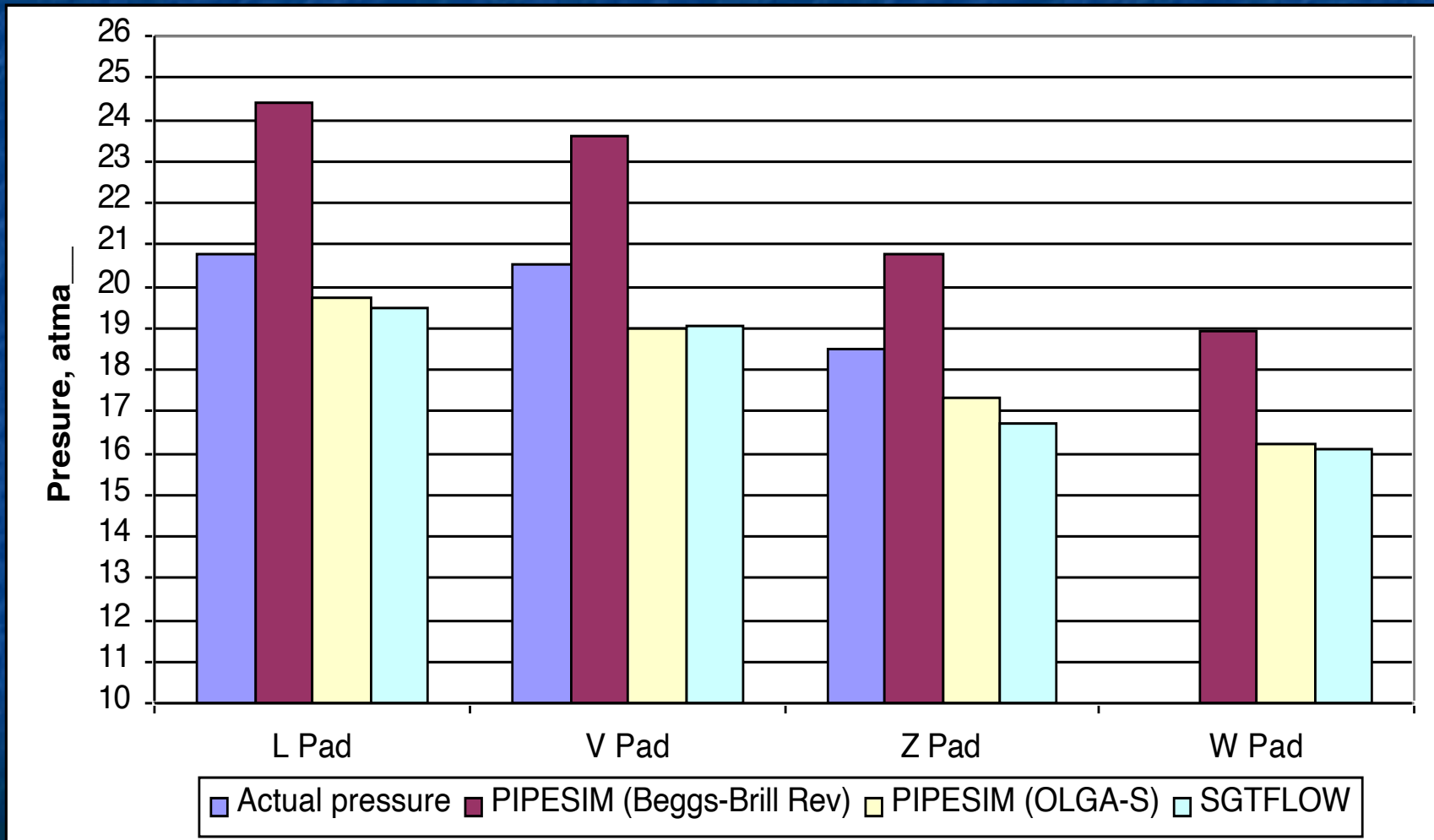
Oil gathering system of "Oilfield 1" (actual state at 18.04.2005)

PIPESIM

SGTPIPE



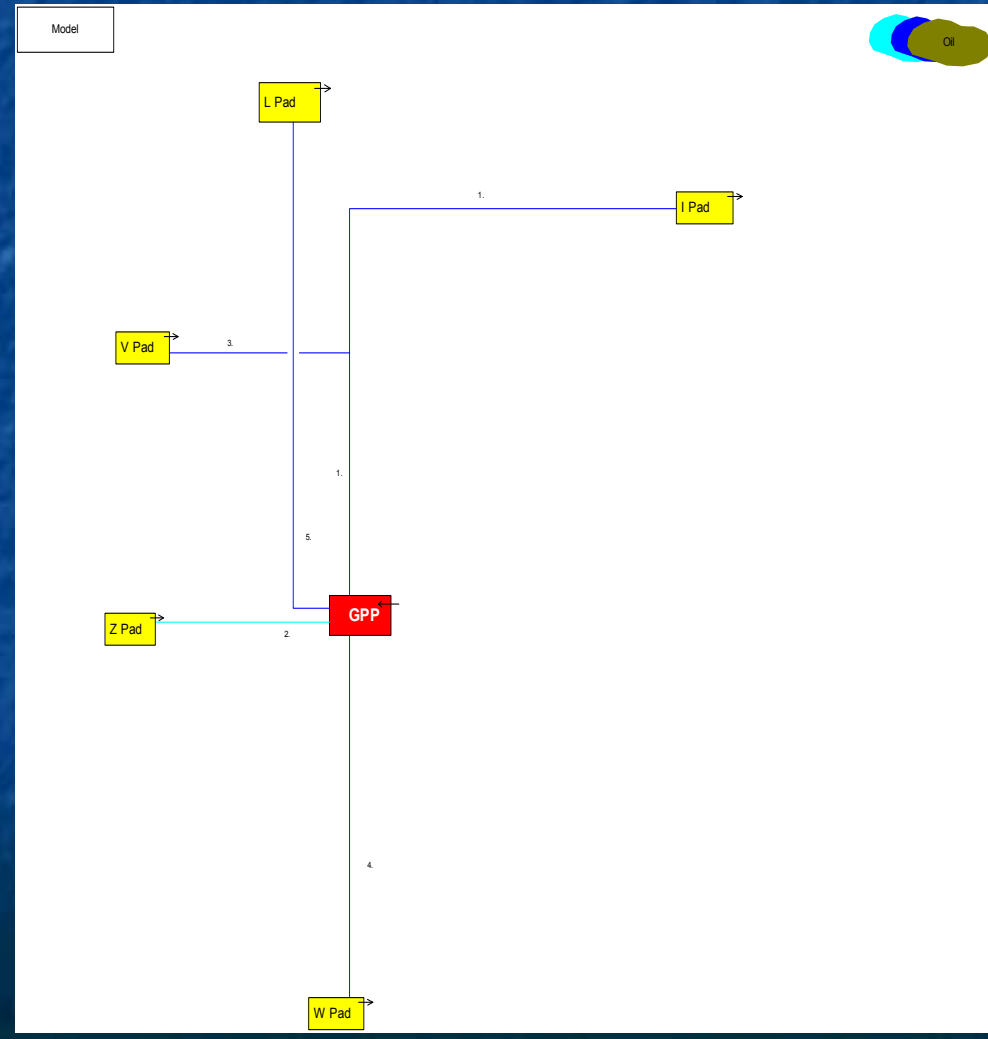
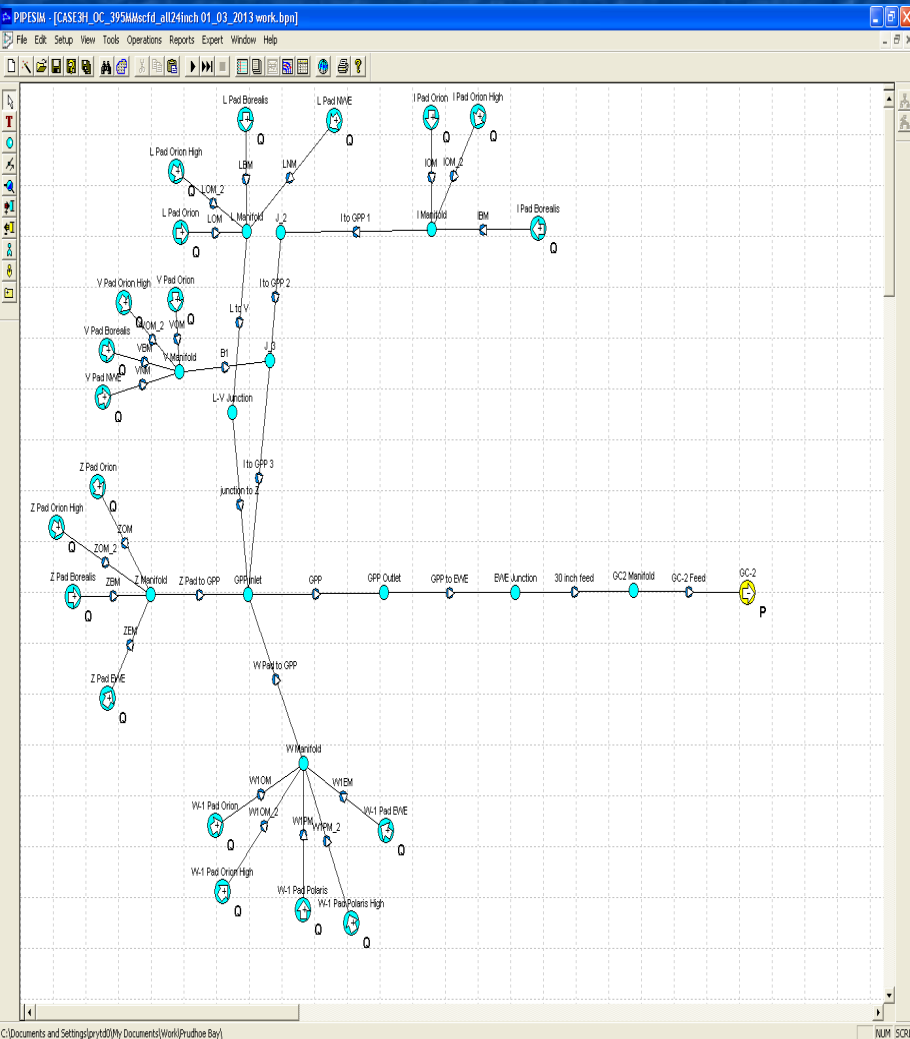
Oil gathering system of "Oilfield 1" (actual state at 18.04.2005)



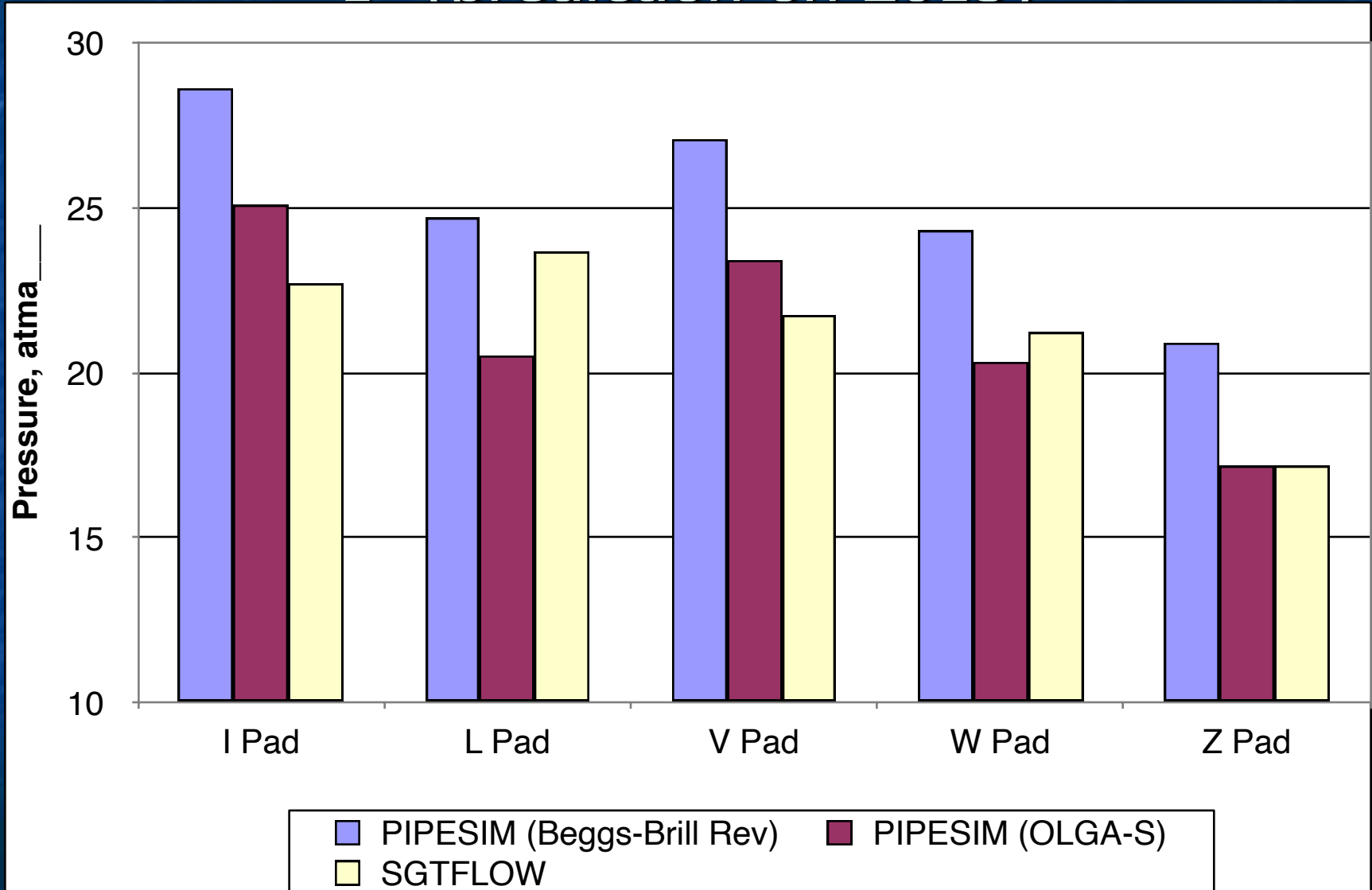
Oil gathering system of "Oilfield 1" (prediction on 2013)

PIPESIM

SGTPIPE

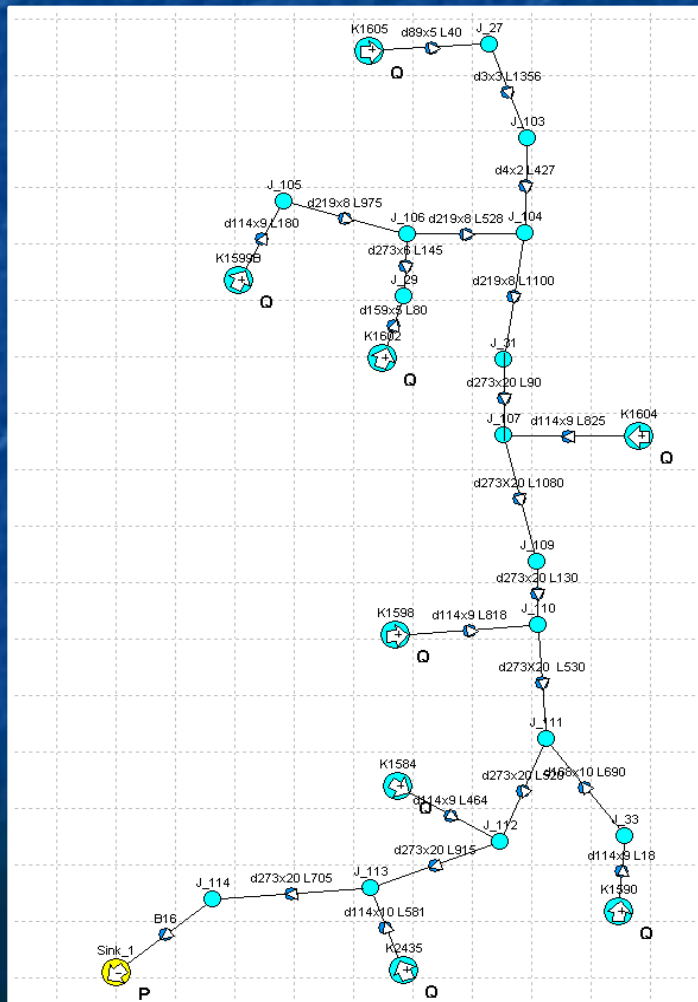


Oil gathering system of "Oilfield 1" (prediction on 2013)

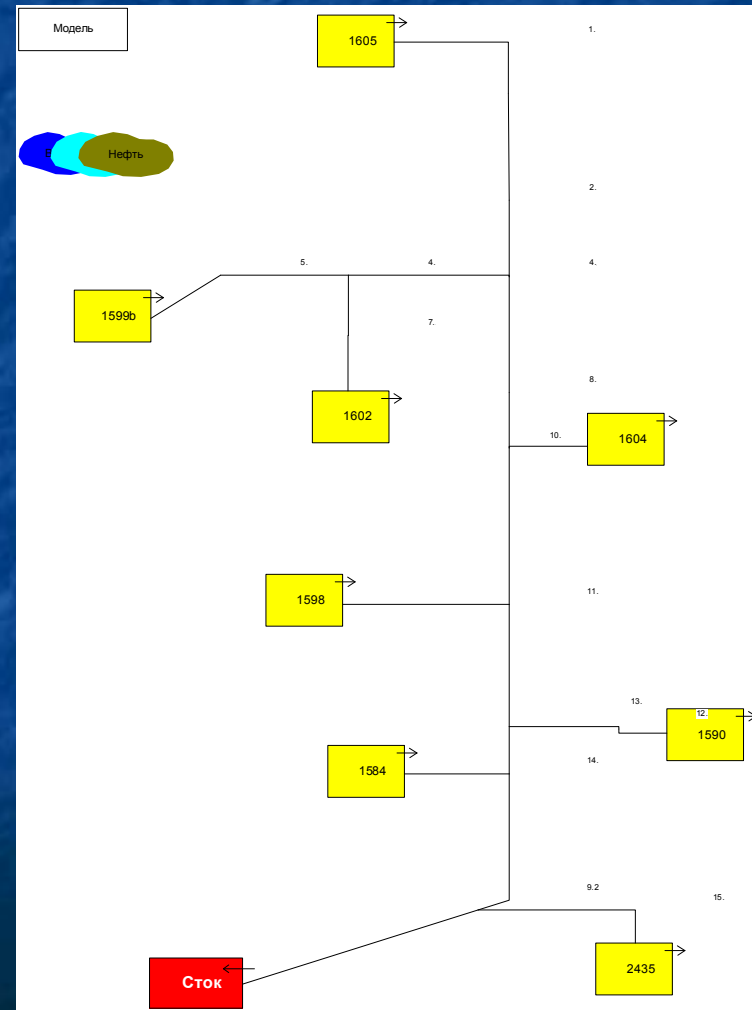


Oil gathering system of "Oilfield 2"

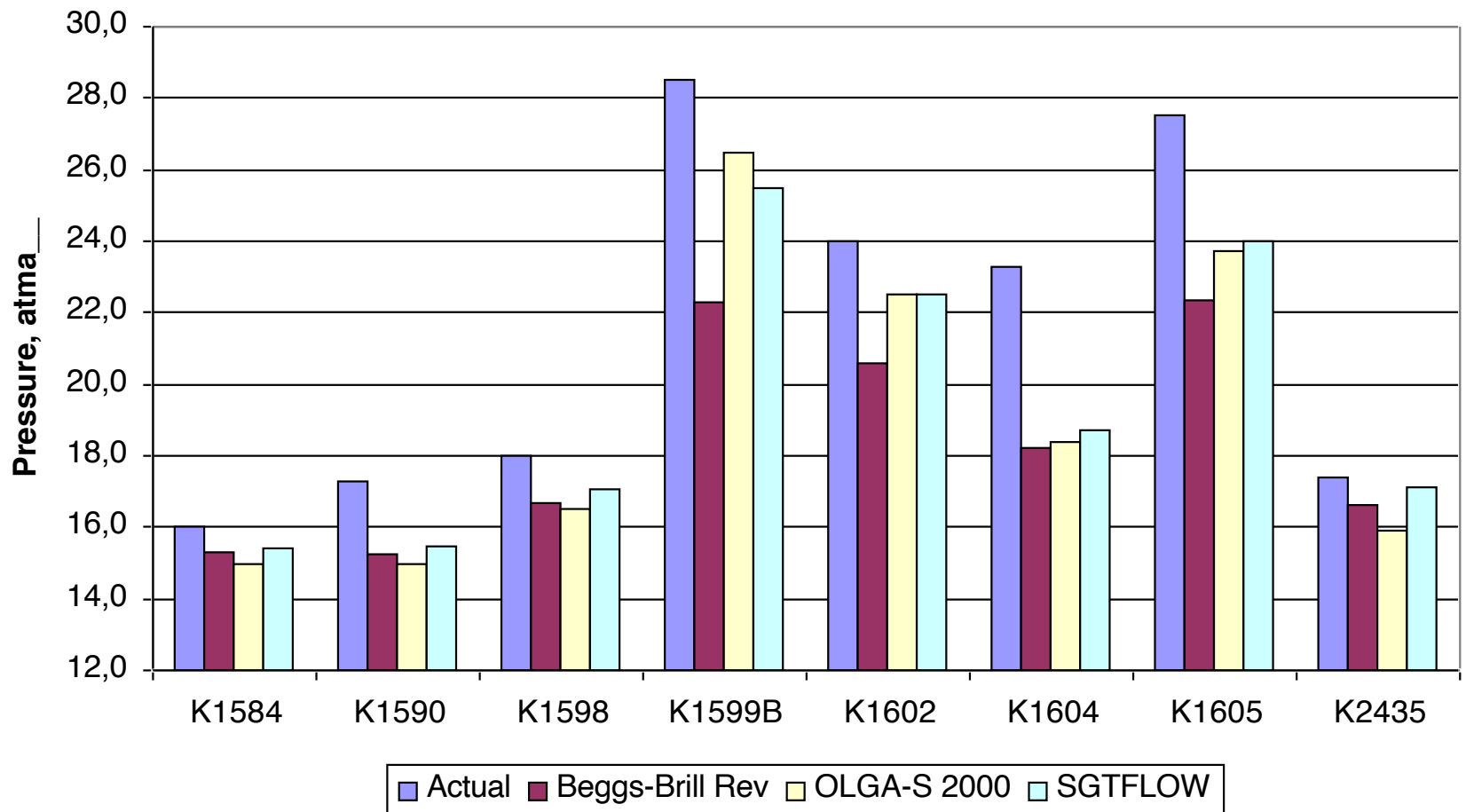
PIPESIM



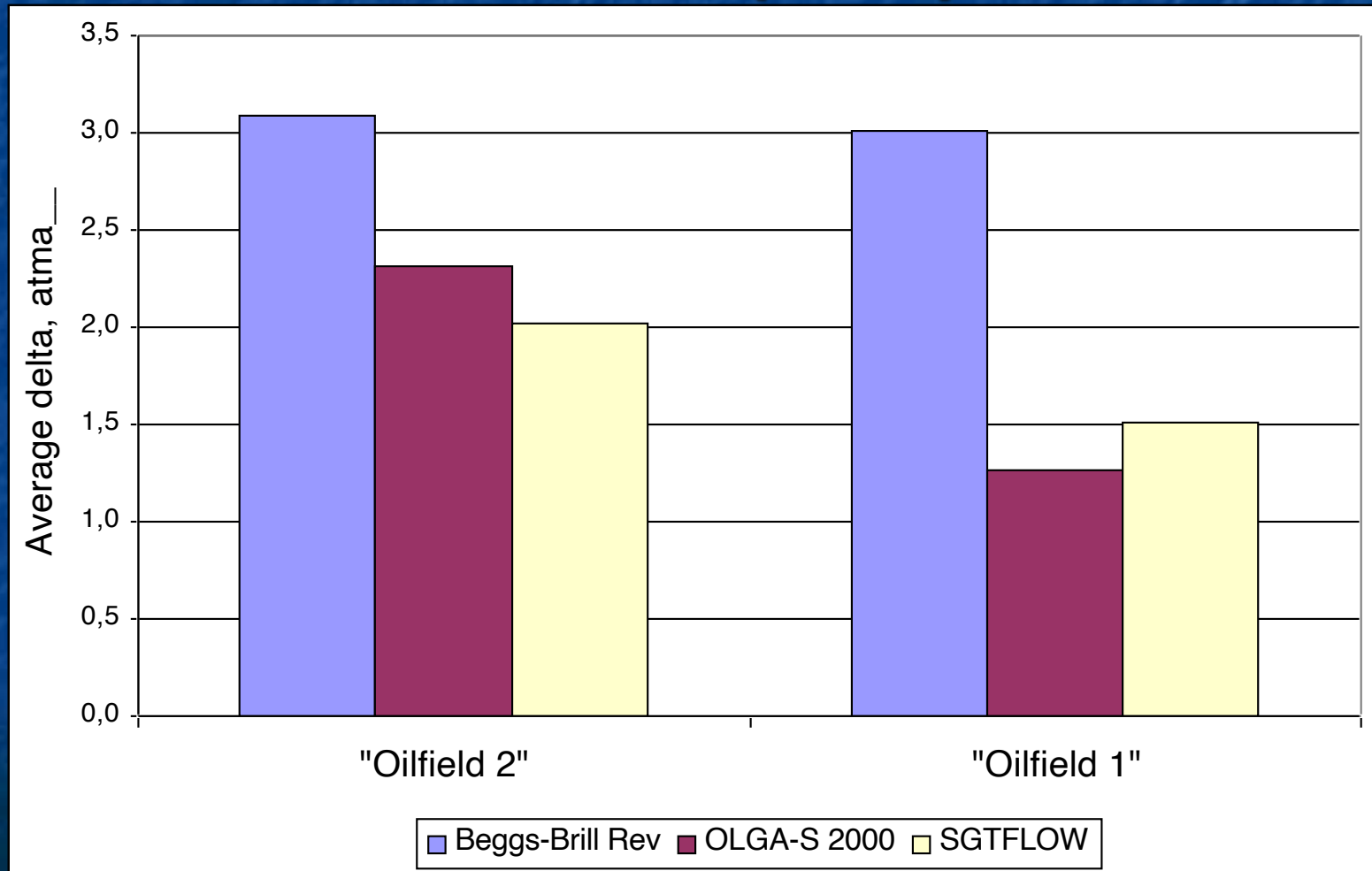
SGTPIPE



Comparison between predicted and actual pressure by pads of "Oilfield 2" (with OLGA-S correlation)



Average difference between actual and estimated pad pressure



Conclusions

- PIPESIM with Beggs-Brill Revised correlation shows the worst convergence with actual data in case of elevation pipelines with high gas-liquid ratio and/or low flow rate. In this case it is not recommended to use Beggs-Brill Revised correlation for calculation of such systems
- SGTFLOW and PIPESIM with OLGA-S 2000 correlation shows similar simulation result in all examined cases of the oil gathering systems
- SGTPIPE / SGTFLOW can be effectively used to simulate of complex on-shore pipeline networks (including elevation and/or high gas-liquid ratio cases)

The study results were discussed during BP Pipeline Systems Team technical meetings and accepted by them.



Dmitry Prytkov

R&D «SibGeoTech»
Nizhnevarvosk, Russia

tel: +7(3466)614499
e-mail: pdv@sgt.ru
www.oil-info.ru

EPTG Pipelines Team

BP Exploration
Sunbury(London), UK

tel: +44 (0)1932 775666
e-mail: Olga.Morrison@bp.com
www.bp.com

