

Proper Selection of Multiphase Flow Correlations

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ABSTRACT

A study was carried out to try and establish criteria to select flow correlations in the absence of test data. The data comprised of 3200 measured pressure points taken from 879 wells with a wide variety of flowing conditions.

The methodology of investigation was as follows;

1. Setup the PROSPER files for the wells, test the response of the flow correlations/models available within PROSPER against the data available.
2. Classified the test data into clusters based on fluid type, well type, depth and tubing ID.

Results

Total

Using the total oil and gas test points, the following correlations performed the best in descending order (absolute error percentage);

1. Petroleum Experts 2 (11.34%)
2. Petroleum Experts 3 (11.77%)
3. Petroleum Experts 5 (11.89%)
4. Petroleum Experts (12.24%)
5. Hagedorn and Brown (12.99%)

Clustering

The test data was clustered into groups dependent on fluid type, well type, depth and tubing ID.

For oil wells, the following results were found;

Type of Well	Production type	Qo BBL/D	WC %	GOR scf/stb	Best Correlation
Vertical	Tubular	$\leq 10,000$	<5	<1000	GRE & PE5
		$<2,500$	5-30		ORK
		$<2,500$	30-70		MB & BEGG
	Annular	$\geq 2,500$	<5	<1000	DRM
Deviated	Tubular	$\leq 10,000$	<5	<1000	FB & ORK
		$<2,500$	30-70	<1000	DRO
		$<2,500$	<5	1000-5000	DRM
		2,500-10,000	<5	1000-5000	HB
		<2500	30-70	1000-5000	FB

However, note, that during a prediction, the conditions of the well will change through time and hence this should be considered when picking a correlation.

Other Conclusions of note

- PVT of the fluid dominates the selection of the correlation
- GOR has an important effect on low rate oil wells and hence accurate gas rate measurement is crucial
- Tubing roughness had a significant impact on gas wells but not on oil wells.