Pressure Pulse Test

A specific implementation of Well Testing based on recording and interpretation of borehole (downhole or THP) pressure response to the pre-designed sequence of increasing and decreasing flow rate variations (also called "cycles" or "pulses") at one or more wells (called "generators" or "pulsers") inducing pressure pulse propagation across the field.

The usual practice is to create 5 – 10 pulses.

It splits into two categories:

Pressure Self-Pulse Test (SPT)	Pressure Pulse Interference Test (PIT)
The pressure response to rate variation are both recorded in the same well	The pressure response to rate variation is recorded in the offset wells

Workflow

1	Designing flowrate variation pulse sequence for disturbing wells (also called generators) based on the field primary data
2	Field operations on suspending the downhole gauges (if PDG is not available)
3	Performing flowrate variations according to the PCT design
4	Retrieving the downhole gauges
5	Downloading the data from the downhole and surface gauges
6	Primary data processing (gauge syncronization and filtering)
7	Implementing pressure pulse-code decomposition (PCD)
8	Recognising the PTA type-library diffusion models for decomposed DTR/CTR and type-curve fitting them with analytical and/or numerical pressure diffusion models

Data Processing

In case of harmonic pressure pulsations and sufficiently long pressure-rate delay and a simple diffusion model (single-bed homogeneous reservoir without boundary) the pressure response can be approximated by analytical model. In this case the pressure data at receiving wells are being detrended and then matched to analytical model.

In case of periodic but non-harmonic pulsations one can use top-hat Fourier filter to isolate the harmonic components from total response and then apply harmonic pulsations interpretation models.

In case of non-periodic pressure pulsations with pressure contamination caused by interference with routine production and maintenance field activity, the complexity of pressure variation at receiving end maybe very high and the concept of "cycles" may not apply at all.

In this case the actual pressure responses should be decoded from pressure data records at receiving well using specialised pressure pulse-code decomposition algorithms and then decomposed DTR/CTR is recongised PTA type-library diffusion models and matched by diffusion models.

This type of tests is called Pressure Pulse-Code Test but this approach is equally applicable to simple periodic pulsations.

Interpretation

See Also

Petroleum Industry / Upstream / Subsurface E&P Disciplines / Well Testing / Pressure Testing / Cased-Hole Pressure Transient Test / Pressure Interference Test (PIT)

[Well & Reservoir Surveillance] [Unit-rate transient response (UTR)] [Pressure Pulse Propagation]

References

SPE-189258-MS – Carbonate Reservoir Waterflood Efficiency Monitoring with Cross-Well Pulse-Code Pressure Testing
SPE-181555-MS – Application of Multi-Well Pressure Pulse-Code Testing for 3D Model Calibration
SPE-187927-MS – Verifying Reserves Opportunities with Multi-Well Pressure Pulse-Code Testing
SPE-187927-MS – Assessing Macroscopic Dynamic Permeability Through Pressure and Noise Analysis