Pressure Transient Analysis = PTA

Interpretation workflow of pressure transitions in pressure test data in terms of well properties and formation properties of connected subsurface reservoirs.

It may refer to analysis of a stand-alone pressure transient or several pressure transients (MRST) and may also cover transitions in off-set wells (PIT).

Both downhole (BHP) and surface (THP) pressure records can be a source data to PTA.

The quantitative interpretation of pressure transitions is based on pressure diffusion model.

Formation pressure p_i, skin-factor S, transmissibility σ and pressure diffusivity χ are called basic diffusion model parameters as they are essential components of all diffusion models.

Below are the major types of PTA with abbreviation and indication of well flow status during the test:

Drawdown Test	Injection Test	Build-up Test	Fall off Test	Multirate Step Test	Pressure Interference Test
DD	INS	BUS	FOS	MRST	PIT
Producer	Injector	Producer	Injector	Producer / Injector	Producer / Injector Producer / Injector
FLOWING	FLOWING	SHUT-IN	SHUT-IN	FLOWING	FLOWING SHUT-IN

Objectives

Primary deliverables	Math Symbol	Conditional Deliverables	Math Symbol
Current Formation pressure	p_e	Initial formation pressure assuming no or little historical interference with offset wells	p_i
Skin-factor	S	Formation damage as permeability deterioration assuming damage penetration is known Formation damage penetration assuming damage value is known Fracture-network development around the well	

Formation transmissibility	σ	Permeability assuming flowing thickness h is known Flowing thickness assuming permeability k is known Water-oil column assuming permeability k and flowing thickness h are both known	k h h_{OWC}
Minimum drainable volume around the well	V_ϕ	Minimum hydrocarbon reserves around the well Drainage area around the well assuming flowing thickness h is known Flowing thickness assuming the drainage area A around the well is known Boundary proximity assuming the circular boundary	V_{hc} A_e h r_e
Minimum drainable area around the well	A_e	Half-size of drainage area r_e providing the shape of the drainable area is known	
Boundary type	$PSS,\ SS,\ BAFFLE$		
Effective horizontal section	L_f		
Hydraulic fracture size	X_f		
Dynamic fracture opening threshold	δP_{X_f}		
Proximity r_{ext} of the remote reservoir composition Transmissibility σ_{ext} of the remote reservoir composition	$W_{ch},\ D_{ch}$ R_{owf} R_{ogf}	Channel width and proximity to its nearest boundary Proximity to oil-water front Proximity to oil-gas front	
Scanning area around the well	A_{scan}	Scanning radius of the area r_{scan} around the well assuming radial isobaric propagation	

Interpretation

PTA Type Library	PTA Sensitivity Analysis	Type-Curve Matching

Samples

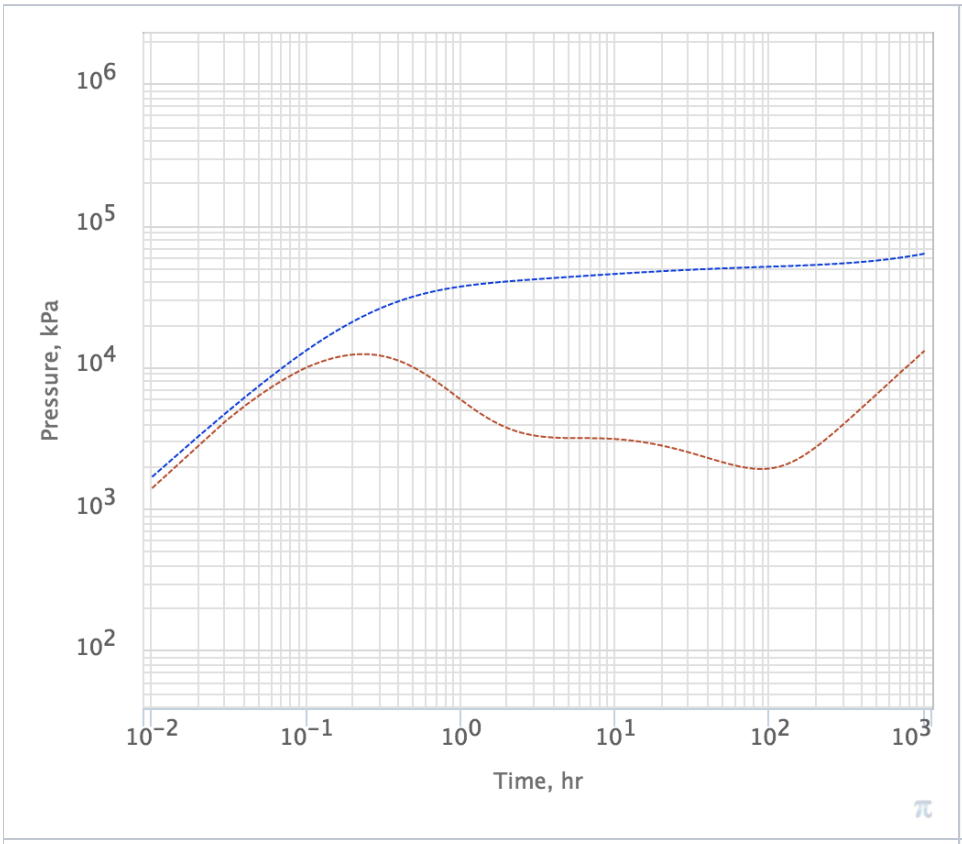

Fig. 1. Transient response in vertical well.

Pressure drop is in blue and log-derivate of Pressure drop is in red

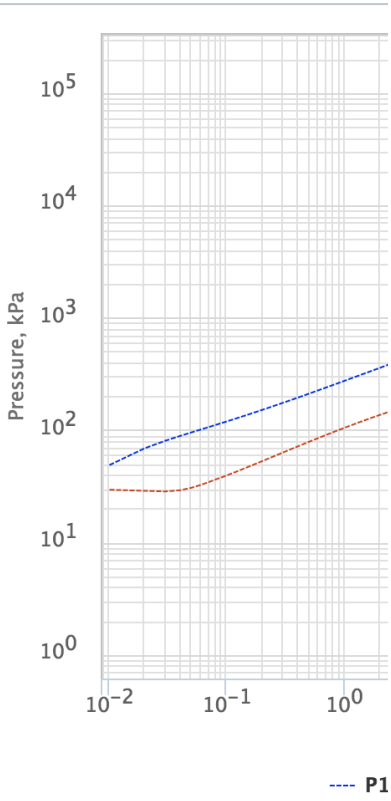

Fig. 2. Transient response in horizc

Pressure drop is in blue and log-de

See Also

Petroleum Industry / Upstream / Subsurface E&P Disciplines / Well Testing / Pressure Testing

[Well & Reservoir Surveillance] [PTA Diagnostic Plot]

[Rate Transient Analysis (RTA)]

References