

# Understanding Well Productivity: Completion Practices and Skin

## Aims

Flow restrictions into the wellbore create additional pressure drops (skin) and reduce well productivity. It is essential to understand the various causes of skin - either those implicit in the completion design or arising from formation damage in drilling, completion and production - to diagnose and remediate well productivity problems and in predicting well performance.

The objective of this course is to review how reservoir and well performance and skin are handled in various nodal analysis calculations and in turn how these are affected by various completion and well intervention methods.

The course also provides the attendees with a firm foundation for well performance modelling applied in nodal analysis software applications commonly used in the industry.

## Benefits

In this course you will learn:

- 🕒 the basics of transient and steady state flow modelling from the reservoir into the wellbore
- 🕒 the development of common inflow performance relationships and their application to oil, gas and condensate wells
- 🕒 the various components of skin, their causes and how they affect well performance
- 🕒 recognising and diagnosing skin
- 🕒 how various completion and treatment methods cause skin and impact reservoir performance: perforating, sand control, matrix acidising
- 🕒 inflow performance from hydraulically fractured and horizontal wells

Illustrative examples will be made with reference to a common commercial nodal analysis software package.



## Who should attend?

The course is intended for petroleum, reservoir and production engineers interested in understanding the flow of hydrocarbons from the reservoir into the wellbore and the management of skin for maximising well productivity.

## Duration

🕒 3 days

## Course Instructor

Dr. Rick Lemanczyk is Principal Petroleum Engineer for the Production Technology and Formation Integrity product lines in Senergy's Asia Pacific region. He has over 30 years' of oilfield experience, gained in a wide range of engineering, research, technical support, consulting, business development and training roles for a variety of service companies such as Schlumberger, Dowell, Weatherford/EPs, and now Senergy. Rick has been working in the Asia Pacific region since 2000.

Rick's areas of expertise are production optimisation, well and network modelling, artificial lift, well stimulation and formation damage, sand prediction and mitigation, production chemistry, and rock and fluid mechanics.

## Course Description

### Inflow performance relationships (½ day)

- reservoir performance (IPR) in oil wells; steady state, pseudo-steady state and transient flow
- Darcy's equation and productivity index (PI); skin effect
- non linear IPR relationships; effects of phase behaviour
- gas flow, different pressure formulations; gas pseudo pressure; non-Darcy flow
- multiphase pseudo pressure

### Skin components and characterisation (½ day)

- skin component identification and analysis
- mechanical skin: drilling, completion and production
- geometric skin: well deviation, partial penetration
- skin evaluation from well test analysis

### Skin mitigation at the sandface (1 day)

- perforations: geometry and penetration, flow profiles, perforation skin modelling
- overbalanced and underbalanced perforating
- sand control: sand and fines production; effects of sand control completions on skin; skin and non-Darcy skin; screen applications and skin; lab testing

- removing skin: formation damage mechanisms; chemical damage removal treatments; fines stabilisation treatments; matrix acidising; lab testing

### Hydraulic fracture and well performance (½ day)

- IPR for a fractured well (steady state and transient); stimulation candidate selection
- basic rock mechanics, earth stresses and fracture geometry; height containment
- fracturing treatment design
- fracture conductivity and fracture skin; dimensionless frac conductivity (FCD); fluid and proppant effects on fracture conductivity and reservoir performance
- acid fracturing of carbonate reservoirs
- produced water re-injection: thermoelastic effects and thermal fractures; fracture skin

### Horizontal well performance (½ day)

- horizontal well IPR: flow regimes; steady state and pseudo-steady state flow
- performance prediction for multilateral completions
- relative skin contributions in horizontal completions

To book this course, please contact **Sarah McPhee** - Training Co-ordinator

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