N472: Reservoir Surveillance: Field Development and Production Optimization and the Impact on Completion Design

Instructor(s): Dennis Dria

3 Days	Competence Level: Skilled
Classroom Course	

Summary

This course provides an understanding of monitoring technologies for conventional and unconventional reservoirs and how to apply them to optimize field development and optimally produce the reservoir. The technologies will be explained in sufficient detail to allow informed decisions regarding the most appropriate measurements to be made and how to integrate multiple measurements to best design key development parameters, such as well spacing and stimulation interval, as well as to optimize production operations and maximize asset value. Considerations for developing and operating single-reservoir fields as well as stacked reservoirs with horizontal wells ("cube development") will also be presented.

Learning Outcomes

1. Determine cases where diagnostic and surveillance measurements can provide data to optimize completion and stimulation design and improve hydrocarbon recovery.
2. Compare and contrast specific sensing technologies relative to other diagnostic and surveillance monitoring methods, to allow best technology choice.
3. Using surveillance techniques to evaluate actual well performance against predicted well production/injection performance, to assess efficacy of specific completion, stimulation, and production designs.
4. Screen well completion and reservoir development scenarios using technical and economic analyses.
5. Apply simple cost-benefit models for diagnostic and surveillance data acquisition in specific well types.
6. Design a high-level field surveillance plan.
7. Build a project plan outline for start-to-finish: data acquisition design, vendor and equipment selection, data management and interpretation.
8. For various development scenarios, assess where and when specific sensing technologies can provide appropriate diagnostic and surveillance data (i.e. when a particular technology/method works and when another technique has potential to provide superior results).
9. Select the most appropriate data acquisition systems to provide reservoir development model calibration and validation information, for various well placement and completion scenarios.
10. Design a plan/workflow (high-level) to effectively integrate various different surveillance data.
11. Select the sensing system appropriate for well type and surveillance need.
12. Specify completion hardware and data acquisition system components needed to accomplish surveillance and completion/stimulation diagnostic goals.
13. Modify completion designs to accommodate permanently installed monitoring systems.
14. Design data acquisition protocols for specific well types.
15. Assess permanently installed and intervention-based ("logging") options and recommend/justify when to use which options based on well type and information need.

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Duration and Training Method

This is a three-day classroom course, consisting of lectures along with multiple case studies, paper-based exercises and discussion. While not required, participants are encouraged to bring laptops or tablets.

Who Should Attend

This course is for completion, drilling, production, surveillance, and reservoir engineers. Geoscientists and asset managers involved in field development and production optimization will also find this course informative.

Prerequisites and Linking Courses

There are no prerequisites for this course.

Complementary courses include the Basic Application level class N481 (Fiber-Optic Sensing: Introduction to the Technology and In-Well Sensing Applications), as well as Skilled Application level classes N473 (Fiber-Optic Sensing: Diagnostic and Surveillance Applications and Deployment), N986 (Reservoir and Production Engineering of Resource Plays), N464 (Fractured Reservoir Assessment and Integration to Full Field Development (Montana, USA)), and N940 (Modern Completion and Production Enhancement Techniques).

Course Content

Topics covered in this course include:

- Commercial measurement technologies available for specific reservoir types and well designs, with a focus on those most applicable for unconventional reservoirs.
- Well and reservoir diagnostic measurements (completion diagnostics, optimization).
- Well and reservoir surveillance measurements (data acquisition for specific purposes, ongoing monitoring to provide “exception-based” information).
- Integration of multiple technologies for synergy and to fill the information gaps.
- Time-lapse measurements.
- What works and what doesn’t work for specific applications.
- Permanently installed sensors (e.g. optical fiber, P/T gauges, flowmeters)
- Wired and wireless technologies.
- Intervention-based measurements (wireline and slickline logs, “dip-in” fiber optic sensing).
- Seismic methods (including Vsp and microseismic).
- Tracers (liquid-phase and solid-phase tracers, RA & NRA, completion and stimulation diagnostics, production monitoring).
- “Fingerprinting” technologies: geochemical, DNA.