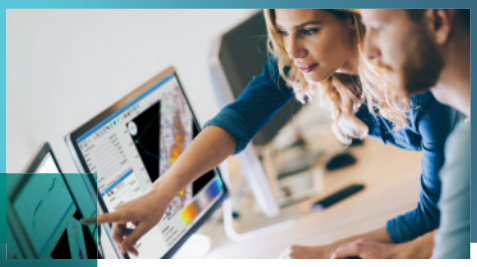
4D

4D Time-Lapse



Track fluid movement and identify bypassed reservoir sections

4D seismic reservoir monitoring is used to track temporal changes in seismic response related to hydrocarbon production. 4D results help to optimize production, enhance recovery, and improve overall reservoir management in large oil and gas fields. Time-lapse is also important in screening the long-term integrity of CO2 storage reservoirs. Results can be used to track injected CO2 plumes and monitor cap rock integrity.

Frequent monitoring helps pinpoint remaining drilling opportunities in producing fields. Fast-track analysis techniques and tight collaboration between processors and interpreters is required to ensure rapid turnaround of time-lapse results.

The Sharp Reflections **4D Time-Lapse** toolkit dramatically shortens analysis cycle time with a unique, multivintage approach. Angle stacks, 4D attributes and horizon maps are all treated as multivintage objects. Data from all vintages are analyzed in memory, to accelerate computation and simplify visualization of 4D differences. Dedicated multivintage workflows automate repetitive tasks to reduce analysis time.

Key capabilities

Core functionality for analysis and interpretation

- Vintage axis in 5D data model facilitates efficient time-lapse data processing, analysis, visualization and data management
- Multivintage tools and workflows allow concurrent gather conditioning, cross-equalization, analysis and interpretation of multivintage seismic data
- Automated comparison tools facilitate comparisons between monitor surveys and a user-defined baseline survey
- Horizon decks create a collection of interpreted horizons and infill ghost horizons, enabling simultaneous extraction and storage of horizon and layer attributes for each horizon and layer in the deck
- Efficient viewers and spin-box controls support browsing along all five data dimensions of the vintage data, and show on-the-fly time-lapse differences
- Amplitude variation with angle (AVA) analysis and 4D inversion analyze and evaluate the time-lapse amplitude-vs-angle signal for reservoir pressure and saturation changes
- Map-based time-lapse attribute analysis creates and enables examination of horizon and interval based time-lapse attributes, using map displays and linked cross plots

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Dedicated tools for time-lapse processing, modeling, inversion and analysis

- 4D data quality metrics measure and report repeatability between vintages, also after gather conditioning and cross-equalization of multivintage data
- Time-lapse cross-equalization corrects frequency, amplitude, phase and arrival time differences between vintages using trace-by-trace or global matching of time-lapse datasets
- Time-lapse time-shift estimation and correction tools to measure, correct and analyze production induced time lapses, time shifts and time strains
- What-if scenario modeling of the expected time-lapse seismic signal from blocky models or well-log scenarios of fluid and pressure substituted subsurface models

All the data for the best decisions

Sharp Reflections is the industry's only software platform built on a powerful compute and display engine designed specifically for HPC, for use on your premises or in the cloud.

Our integrated platform enables you to start analyzing and interpreting seismic data as soon as post-migration processing begins. No information is wasted as you reduce uncertainty and fine tune your reservoir characterization to help achieve trustable exploration, drilling and production decisions.

PRO — **Prestack data enhancement**

QAI — **Quantitative amplitude interpretation**

INV — **Inversion**

AZI — **Azimuthal**

4D — **4D time-lapse**

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