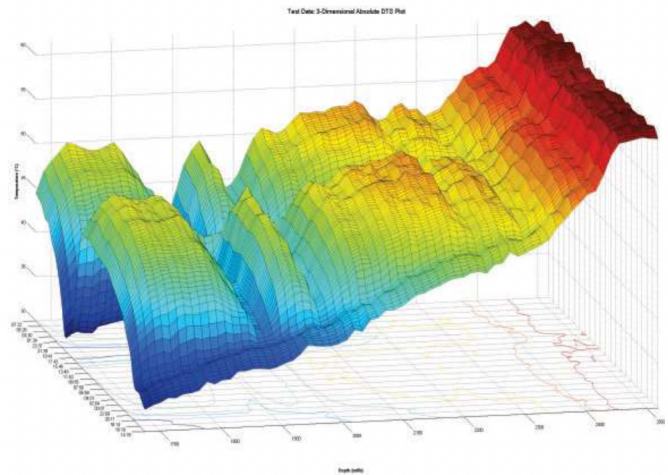


FIBER OPTICS: DTS - INJECTION PROFILE

Fiber optics provides continuous acquisition of distributed temperature and acoustics throughout the entire wellbore without utilizing downhole electronics. This is accomplished with state-of-the-art laser technology pulsed through the fiber positioned along the full length of the well or area of interest. The instantaneous acquisition of temperature and acoustics allows depth comparative analysis at the same time, over time.

Injection Profile Application:

- D51 compliant (Injection and Disposal Wells identification of hydraulic isolation)
- Quantitative analysis of individual multi-stage Horizontal water/polymer/gas Flood Management for EOR processes
- Full injection profiles are archived in both horizontal and vertical wells, even in low injection environments beyond the capabilities of conventional logging tools
- The unique ability of fiber to acquire temperature profiles across the entire length of the wellbore yields the ability to utilize **Wavefront Analysis** to derive temperature-based fluid velocities



Benefits:

- Full well profiles at singular points in time
- Eliminates the need for multiple passes in HZ wells
- Can be deployed by multiple conveyance methods
- Long-term monitoring allows for complete field optimization
- High-resolution temperature (0.1°C)

	Standard Coil	High Temp. Coil	Slickline	E-Line
OD	1 1/2"	1 1/2"	1/8"	1/4"
Length	3,500 m	2,500 m	5,000 m	7,500 m
Temperature	200°C	300°C	200°C	200°C
Temp. Resolution	0.1°C	0.1°C	0.1°C	0.1°C
Pressure	72 MPa	72MPa	103 MPa	103 MPa
Resolution	0.5 m	0.5 m	0.5 m	0.5 m
Sample Rate	30 sec	30 sec	30 sec	30 sec
H ₂ S / CO ₂	yes / yes	yes / yes	yes / yes	no / no
Hz Deployment	Coil	Coil	Pump Down	Tractor, Pump Down