THERMAL FLOW TOOL

The Thermal Flow Tool (TFT) works on the principle of a thermal anemometer: the TFT sensor is heated-up by the battery current to a temperature higher than the temperature of the surrounding fluid. The fluid flow cools the sensor and thereby changes its active resistance, which is inversely proportional to the average linear fluid velocity. Based on the recorded data, as well as additional TFT calibration passes performed for each well with different rates, it becomes possible to calculate the flow rate and build detailed wellbore-oriented production/injection profile.

Applications

- Precise determination of fluid flow zones in vertical, deviated, and horizontal wells
- Construction of detailed production/injection profiles related to wellbore flow (spinner replacement)

Advantages

- No mechanical (rotating) parts
- Data quality does not depend on wellbore trajectory and conditions
- Qualitative and quantitative analysis of wellbore fluid flow
- Optionally, High Precision Temperature (HPT), Pressure, GR, and CCL sensors could be added to TFT module

Tool Specifications	
Thermal anemometer sensor sensitivity	0.003 degC
Heat-up level	8 degC and above
Minimum detectable fluid velocity	1.4 ft/min (0.4 m/min)
Maximum detectable fluid velocity	96 ft/min (30 m/min)
Maximum operating pressure	14500 PSI (100 MPa)
Maximum operating temperature	150 DegC
Tool OD	1.65 inch (42.0 mm)
Tool length	3.6 ft (1.1 m)
Tool weight	5.2 kg
Connections	15/16 SR
Operational time	Over 100 hrs

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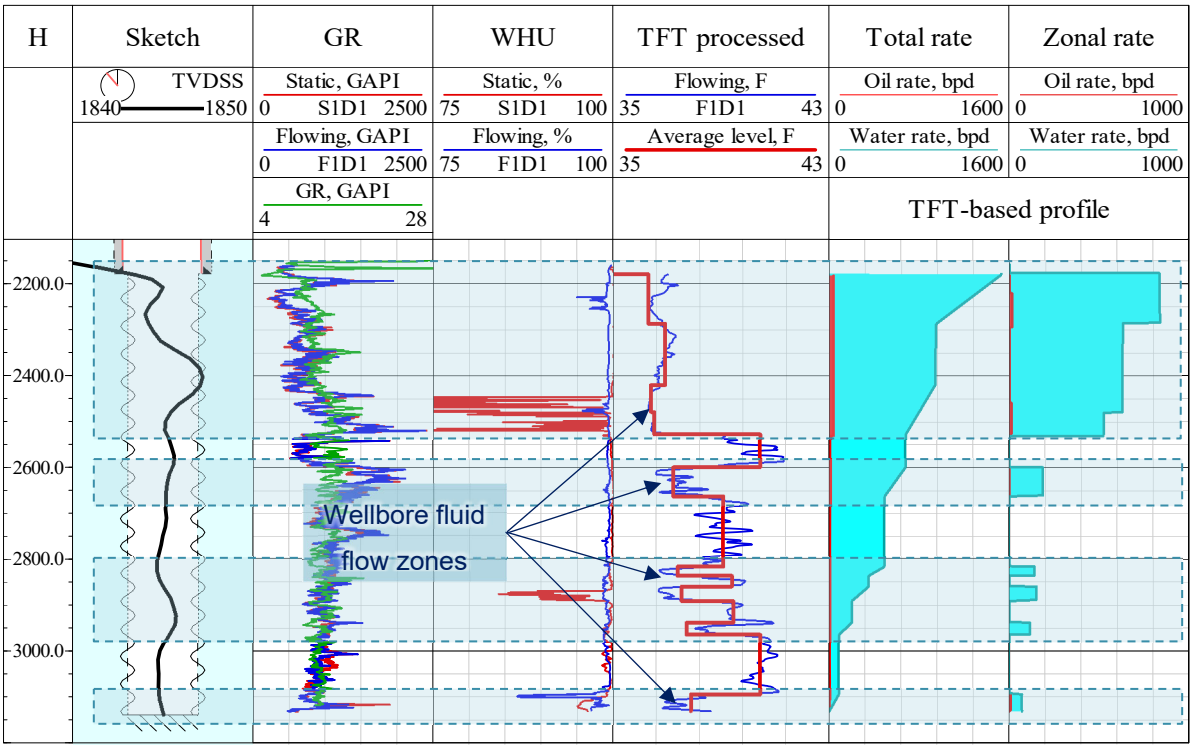
The main advantage of the tool is the absence of rotating elements, making the technology a reliable alternative to conventional spinner-based methods for production logging.

The TFT could be used in polymer injection wells to obtain quality injection profiles, hence conformance.



The principle of TFT data interpretation is similar to the spinner-based method where the apparent velocity curve (same as a TFT-processed curve in the chart above) allows to distinguish zones of fluid flow and construct the production or injection profile.