

Total Vibration™ Monitor Sensor

Providing real-time shock and vibration data that reveals downhole conditions and enables optimizing drilling parameters

Applications

- Real-time and post-run drilling optimization
- Damage prevention and root-cause analysis
- Stick-slip detection

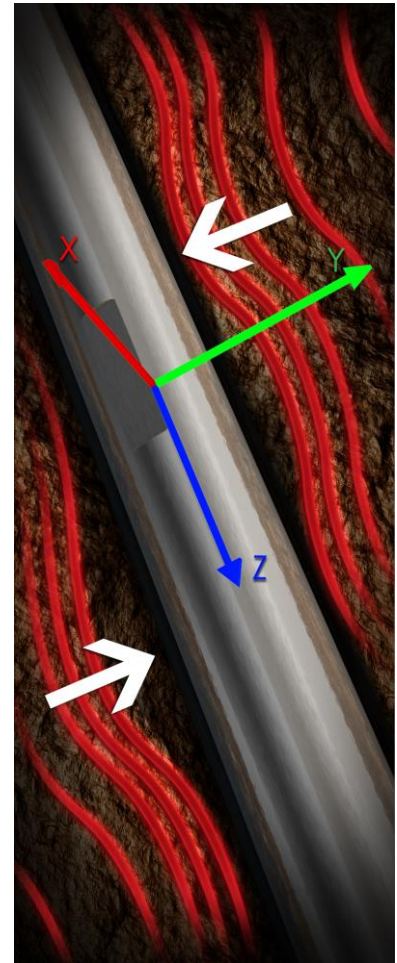
Features and Benefits

- Three-axis shock and vibration data enables the user to identify all vibration modes, isolate their source, and implement effective mitigation strategies.
- Color-coded severity levels enhance the accuracy of real-time and post-processed data interpretation.
- Magnetometers measure downhole rpm, which enables operators to detect damaging stick-slip and torsional oscillations.
- The memory log captures shock and vibration data continuously at a rate of one sample every 2 seconds.
- When combined with the hostile-environment-logging (HEL) system, the Total Vibration Monitor (TVM) sensor provides real-time shock and vibration data at the surface. To reduce telemetry bandwidth requirements, the HEL system can be configured to transmit shock, vibration, and stick-slip data only when levels exceed safe limits.
- The combination of surface and downhole data enables a more comprehensive analysis of the drilling environment.
- Data from the TVM sensor enables users to perform detailed post-run evaluations to better understand the sources of downhole shock and vibration and to improve overall drilling operations.

Tool Description

The TVM sensor is a logging-while-drilling tool that provides critical drilling dynamics data in both real-time and recorded formats. Data from the sensor enables drillers to determine downhole conditions and optimize drilling parameters to help prevent dangerous and costly drilling problems.

Two sets of three orthogonally arranged accelerometers enable the TVM sensor to make high-resolution vibration measurements in all three axes. Additionally, the sensor is equipped with a magnetometer that measures downhole rpm and stick-slip in wells with temperatures up to 356°F (180°C).



The Weatherford Total Vibration Monitor sensor provides critical drilling dynamics data used to prevent or mitigate drilling problems.



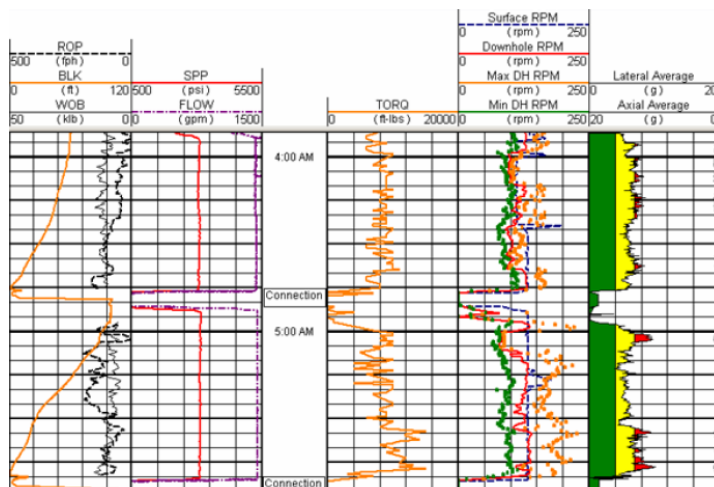
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Tool Description Continued

The TVM sensor has minimal effect on transmission bandwidth and real-time logging operations. To optimize its data-gathering capabilities, the sensor uses wellsite-programmable data triggers to signal when vibration data should be transmitted to surface.

Specifications

Sensors	25-G and 200-G accelerometers for radial (Y), tangential (X), and axial (Z) shock and vibration Magnetometers for downhole rpm
Measurement range	±200 G
Measurement resolution	25-G accelerometer: 0.1 G 200-G accelerometer: 0.8G
Sample rate	500 Hz
Logging rate, continuous	User-defined, ≥ 2 Hz
Maximum operating temperature	356°F (180°C)
Maximum operating pressure	30,000 psi (207 MPa)



Lateral and axial vibration data from the accelerometer in the TVM sensor (far right) is color-coded based on severity. Rpm (second from right) is measured by the magnetometer in the TVM sensor. This data can be combined with surface data (left three tracks) to provide a complete picture of drilling conditions. In the above example, the TVM data indicates that high stick-slip is inducing lateral vibrations—a fact that is reinforced by the erratic torque readings in the center track.

