

Long-distance optical transceiver for oil pipeline monitoring 200G



Overview

An improved DOFS for long-distance buried oil pipeline leakage and third-party intrusion detection is presented.

Key Takeaways

FIBERSTAMP 200G CFP2 DCO transceivers provide long-distance, high-capacity optical links suitable for integrating with distributed fiber optic sensing systems for pipeline monitoring. Overview of Pipeline Monitoring Requirements

Oil pipelines require continuous, real-time monitoring to detect leaks, third-party intrusions, and operational anomalies. Distributed fiber optic sensing (DFOS) technologies, such as Brillouin, Raman, and acoustic-based sensing, allow measurement of temperature, strain, and vibration along the entire pipeline length, often covering tens of kilometers from a single interrogation unit (). These systems generate high volumes of data that must be transmitted reliably to control centers, making high-speed optical transceivers essential.

200G Optical Transceiver Capabilities

The FIBERSTAMP 100G/200G CFP2 DCO transceivers are designed for long-distance transmission, supporting 100/200GE and OTN links over distances ranging from 80 km up to 600 km (). Key features include:



- Full C-band tunable DWDM operation with 50 GHz channel spacing, enabling up to 96 channels on a single fiber, which maximizes fiber utilization and reduces infrastructure costs.
- Coherent detection technology (DCO), which improves signal integrity over long distances and harsh environmental conditions.
- High data rate support (200G), sufficient for transmitting multi-parameter DFOS data streams in real time.
- Compatibility with OTN networks, allowing integration with existing telecom-grade infrastructure for pipeline monitoring.

Integration with Pipeline Monitoring Systems

When combined with DFOS platforms like FEBUS FOpipe or NETL's multi-parameter fiber sensors, 200G transceivers can:

- Transmit real-time sensor data over long distances without signal degradation.
- Support centralized monitoring of pipelines in remote or harsh environments, including deserts, forests, and offshore locations ().
- Enable multi-parameter monitoring (temperature, strain, vibration) on a single fiber, reducing the need for multiple fibers and interrogators ().

Practical Considerations

- Distance and amplification: For pipelines exceeding 80 km, optical amplifiers or repeaters may be required to maintain signal quality.
- Environmental resilience: Transceivers and fiber cables should be rated for temperature extremes, mechanical stress, and potential chemical exposure.
- Network design: DWDM channel planning ensures multiple sensing fibers or pipelines can share the same fiber infrastructure efficiently.

Conclusion

For long-distance oil pipeline monitoring, integrating distributed fiber optic sensing with 200G CFP2 DCO transceivers provides a robust solution. This combination ensures high-speed, reliable data transmission, supports multi-parameter sensing, and enables real-time monitoring and alerting across pipelines spanning hundreds of kilometers, optimizing both safety and operational efficiency ().

Article Content

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including temperature, strain and vibration over long distances. The system combines two complementary sensing methods with a

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ABSTRACT Distributed fiber optic sensing presents unique features that have no match in conventional sensing techniques. The

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A system of distributed optical fiber sensor has presented based on the optical fiber sensor technology and detected

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Huawei Optical Fiber Sensing for Pipeline Inspection Solution

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