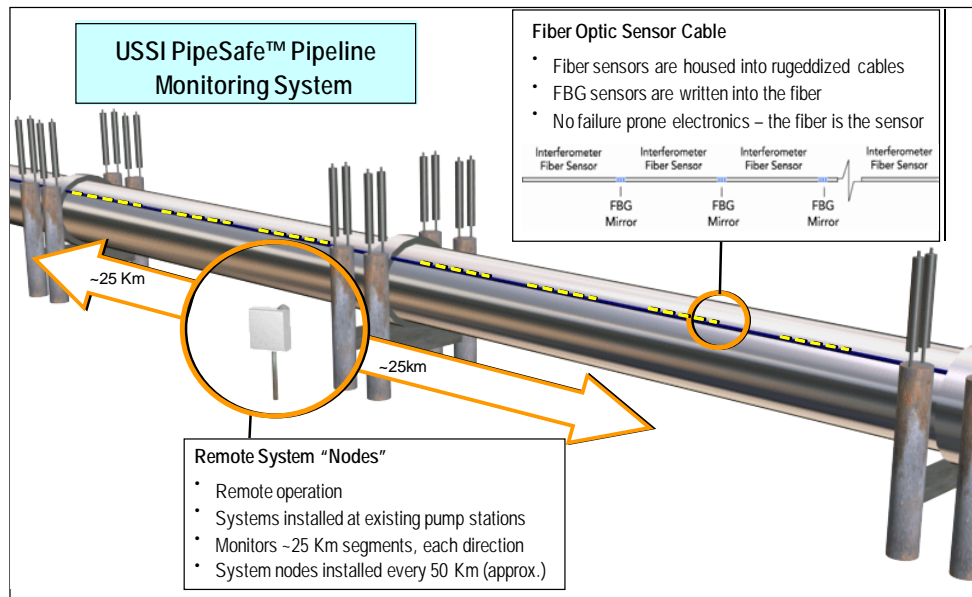


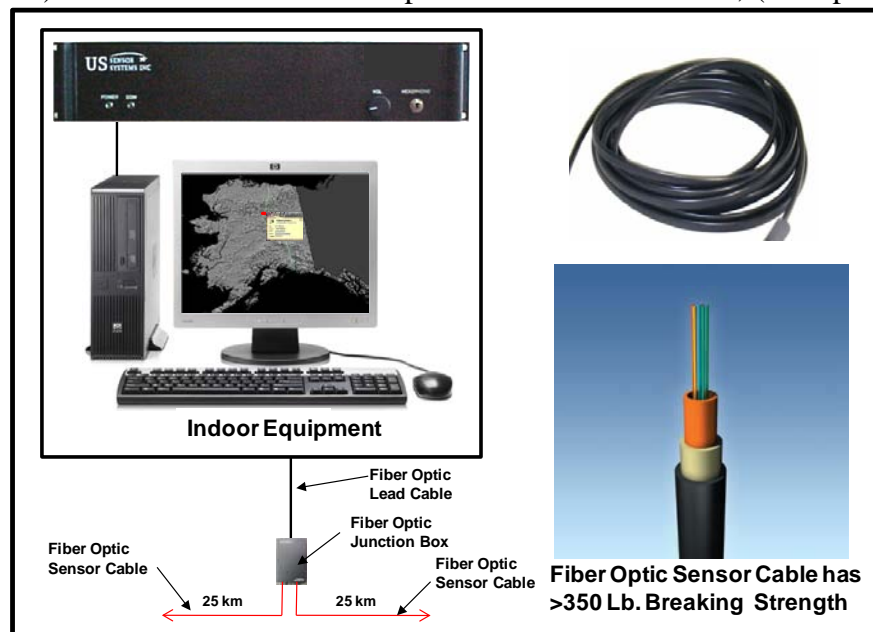
PipeSafe™ Fiber Optic Pipeline Monitoring System

Monitors for Leaks and Tampering/Theft

The USSI PipeSafe™ is an inherently safe, all fiber optic monitoring system for high-value oil or gas pipelines. The highly sensitive, yet unobtrusive fiber optic microphonic sensing cable placed on or near the pipeline automatically detects and localizes leaks as well as tampering (digging, cutting, operation of a drill motor, etc.). The sensor cable is the most sensitive microphonic cable on the market. Every inch of the sensor cable is acoustically sensitive ensuring that there are no gaps in coverage. The PipeSafe™ system is the only fiber optic system available that provides a clean, high fidelity reproduction of all detected events. This enables



PipeSafe™ to employ sophisticated automatic signal processing techniques for event classification and the rejection of false alarms. The system consists of a rugged, low cost all-optical sensor cable and a Central Processor Unit (CPU). The CPU can monitor up to 128 individual zones, (multiple CPUs can be linked/networked to handle pipelines greater than 50 km) and individual zones can be up to 500 meters in length. The detection zones are installed into the fiber optic cable at the factory, based upon the zone lengths specified by the customer. The PipeSafe™ system is all-optical, the sensing cable contains no electronics. The rugged, outdoor-rated fiber optic sensor cable serves as both the sensor as well as the signal path back to the control



center. The sensing cable can be mounted directly to a pipeline using standard metal band clamps or buried underground adjacent to the pipeline. It requires no electrical grounding, and is unaffected by EMI/RFI, lightning storms, hot/cold temperatures, or flooding. The system includes the following key features:

1. The same fiber optic cable serves as both the sensor and the path for data flow.
2. Sensor cable, lead cable, and optical junction boxes are all optical, requiring no periodic maintenance or calibration.
3. No electronics in the field. All electronics are in a 19-inch rack in the monitoring station.
4. Any adjustments for individual zones can be made via pull-down menus at the CPU/operator console in the monitoring station.
5. System is completely unaffected by electromagnetic or radio frequency interference.
6. Uses sophisticated narrow band acoustic signal processing techniques to detect tampering while screening out noise.
7. The system can detect “*Multiple Simultaneous Events*”.
8. System automatically adjusts alarm setpoints based upon environmental conditions such as wind, rain, hail, etc.
9. Can adjust gain/alarm setpoints for individual zones located near noisy equipment from the operator console.
10. Automatically archives data from each zone for review at a later time.
11. Operator can select and listen to any desired zone via headphones or speakers.
12. System continuously self-monitors vital functions and alerts operator of problems.

System Specifications

Parameter	Units	Value	Comments
Zone Length	meters	Up to 500	Selectable by Customer
Maximum Number of Zones per Central Processor Unit	#	128	
System Noise Floor	dB:μPa	75	
Total Harmonic Distortion	%	<1.0	
Maximum Data Rate	Hz	16000	
Data Interface Type		RS232/422/USB	
Input Voltage (CPU)	VAC	120	240 available
Input Power (CPU)	watts	45	
Operating Temperature Cables (Outdoor)	°C	-40 to +70	
Operating Temperature Central Processor Unit (Indoor)	°C	0 to +50	
Humidity (Outdoor Equipment)	%	0-100	Fully submersible to 10 feet
Humidity (Indoor Equipment)	% RH	10 – 95	Non-Condensing
Optical Connector Type		FC/APC	
Cable Break Strength	Lbs.	>350	