

Fiber Optic Sensors

OZ Optics Limited

October 2024





Company Background



- **Founded in 1985**
- **Corporate Headquarter Located in Ottawa, Canada**
- **Manufacturing Facility in Ottawa, Canada | Izmir, Türkiye | Jiaxing, China**
- **Ten Product Groups:**
 - Laser-to-Fiber Delivery Systems
 - High Power Fiber Optic Components
 - Polarization Maintaining Products
 - Attenuators
 - Opto-Electronic Packaging
 - Fiber Optic Test Equipment
 - Fiber Optic Sensor Systems
 - Fiber Optics Components for Gyroscope
 - OCT
 - BioPhotonics
 - Quantum
- **Sales Offices in Canada, USA, Europe, Türkiye and China**

➤ Ottawa, Canada



➤ Izmir, Türkiye



➤ Jiaxing, China



Corporate Statements and Quality Policy



Our Vision

- ✓ Capture and expand market share
- ✓ Be the preferred supplier of choice
- ✓ Maximize shareholder value

Our Mission

To become the leading provider of innovative optical products to telecom and non-telecom sectors

Our Core Values

- ✓ Leadership
- ✓ Teamwork
- ✓ Boldness
- ✓ Commitments
- ✓ Innovation
- ✓ Rewards

Our Quality Policy

Provide our Customers with a competitive advantage, leveraging performance, price and delivery, through a continuous process of Quality advancement in all areas of our Company.

Communicate effectively to our Customers, Suppliers and Shareholders our commitment to Quality, continuous improvement and to abide by any applicable requirements.

Promote opportunities of professional development for all members of our company through education, training and personal challenge.



Company Profile

Over 467 employees worldwide

OZ Canada



243+
Employees

OZ China



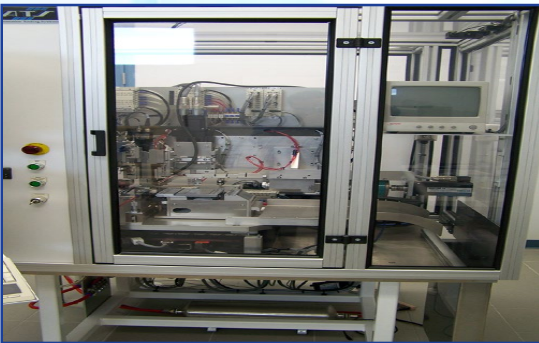
87+
Employees

OZ Türkiye



137+
Employees

Company Profile



Advanced Proprietary Processing Technology



**Canada
Certificate: FM 63463**



**China
Certificate: FM 577647**



**Turkey
Certificate: FM 601414**

ISO9001:2015 Certified



Broad Patent Portfolio



Company Profile

OZ Optics is Lead by an Experienced Team:

- **Ömür Sezerman, Chairman, President & CEO**
 - Founder and CEO since inception (40 years)
- **Zahide Sezerman, VP of Human Resources**
 - With OZ Optics since inception (40 years)
- **Garland Best, VP of Components Division**
 - 33 years at OZ Optics
- **Gordon Youle, VP of Test Equipment Division**
 - 26 years at OZ Optics
- **Saeed Pilevar, Senior VP of Business Development**
 - 3 months at OZ Optics
- **Onur Koca, General Manager of OZ Türkiye**
 - 3 year at OZ Optics
- **Bing Li, General Manager of OZ Optics China**
 - 21 years at OZ Optics



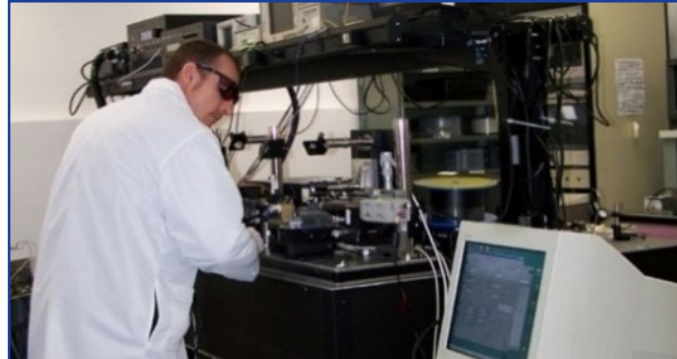
Company Profile

**Experienced and Well-Trained Staff in Following Fields:
Optical, Mechanical, Electronics & Software**

➤ CNC Machine Shop



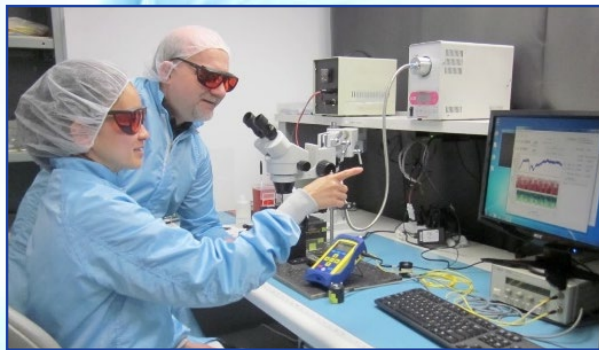
➤ Femto-Second Laser Lab



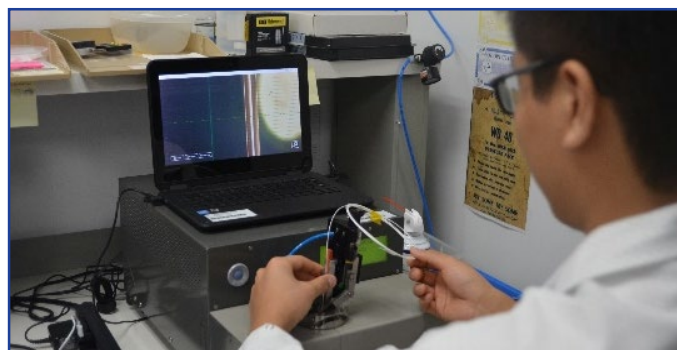
➤ AR Coating



➤ Clean Room



➤ Laser Conditioning/Cleaving





Core Competencies



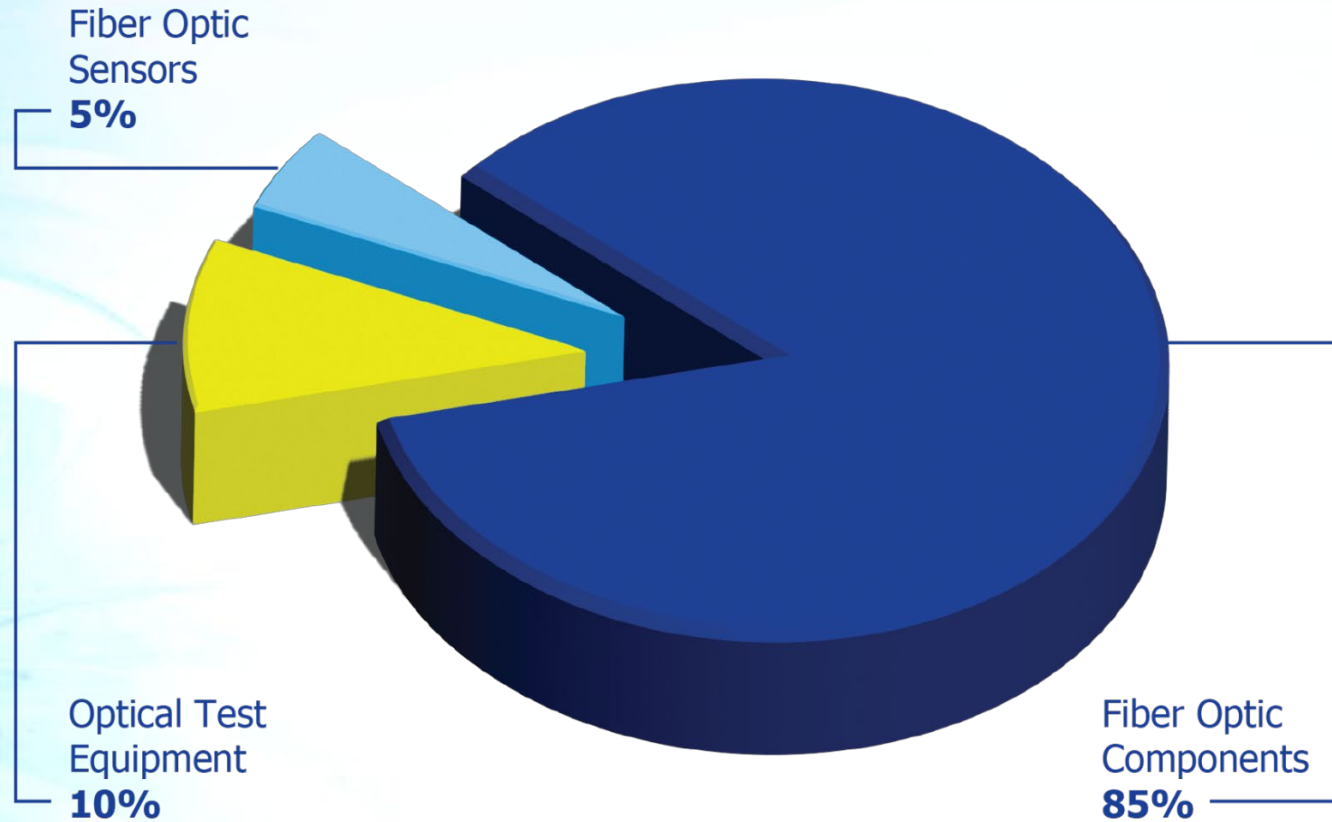
- **Pioneer in Polarization Maintaining (PM) Components & Custom Test Equipment, Including Polarization Test Equipment and FTTH Equipment**
- **Leader in Wavelength Flattened, High Power & Low PDL Components**
- **Leader in High Power Fiber Optic Delivery Systems**
- **Widest Range in Attenuator Product Offering**
- **Fiber Optic Distributed Strain and Temperature Sensors**
- **Complete product line for OCT, Gyroscope & BioPhotonics applications & 2 Micron**
- **Now available: Spectrometers and Quantum Light Sources**



Leading Technology



➤ **Three Product Groups** ➤ **Over 1,000 Products** ➤ **Leading Edge R&D**





Leading Technology

Featured Products

World's Largest Online Fiber Optic Catalog

Most Products are in Stock



Quantum Light Sources



Fiber Optic Products for Biophotonics Applications



Fiber Optic Products for Gyroscopes



Polarization Maintaining Components



Delivery Systems



High Power Components



Test Equipment




High and Low Power Patchcords

Polarization Maintaining Fiber Optic Components


Patent Numbers: USA 7058275, 7095931, 7295731, China 1672073



Polarization Maintaining Connectors and Patchcords



Polarization Maintaining and Polarizing Splitters / Combiners / Fused Couplers / Switches



All Fiber Manual and Electrically Driven Polarization Controllers / Seramblers



Polarization Dependent Loss Emulators



Fiber Pigtailed Polarizers



PM Fiber Directional Taps and PLC Splitters



Isolators



PM Fiber Pigtailed Circulators

Laser and Laser Diode to Fiber Delivery Systems



Laser to Fiber Couplers



Pigtail, Receptacle Style Collimators and Focusers



Bulkhead Receptacles



Bare Fiber Adaptors with Magnetic Clips



Wavelength Division Multiplexers(WDMs) and R&B Combiners



OCT Modules and 2 micron Components



Evanesence Based Variable Split Ratio Fiber Splitter/Coupler



OEM Laser Diode to Fiber Couplers

High Power Fiber Optic Components

Patent Numbers: Canada 2494133, USA 7058275, 7095931, 7295731, China 1672073



High Power, High Temperature Connectors and Patchcords



OZPEN™ CO-2 Fiber Optics Cleaning Unit for High Power Components



High Power Laser to Fiber Couplers, Collimators and Focusers



High Power Mode Field Adapters



High Power Optical Taps and Power Monitors



High Power Isolators



High Power Splitters and Wavelength Division Multiplexers (WDMs)



Shutters, Receptacles and Sleeve Thru Adapters with Sensors



Leading Technology

Featured Products

Fiber Optic Attenuators

Polarization Maintaining, Single Mode and Multi-Mode Fibers



Benchtop Digital

Variable Attenuators



Digital Variable Attenuators

Electrically Controlled Variable Attenuators

MEMS Variable Attenuators



PM, SM and MM Fiber Pigtailed Inline Variable Attenuators

Single and Multi Channel Miniature Variable Attenuators

Reflective Style Variable Attenuators



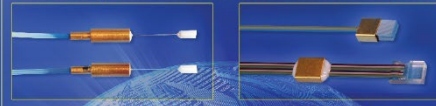
Air Gap Variable Attenuators

Plug Type Fixed Attenuators

Attenuating Fiber Patchcords

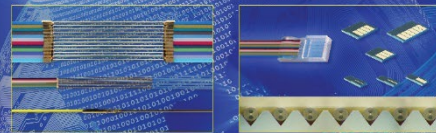
Fiber Optic Components for Optoelectronic Packaging

Hermetically Sealable Patchcords with Glass or Metal Solder



Single Channel

Multi Channel



Metalized Fibers

PM, SM and MM Fiber Pigtailed V-Groove Arrays



Polarization Measurement System for V-Grooves

Tapered, Lensed Fiber, Polished and Laser Shaped



Precision Collimator and Focuser Array

Fused Fiber Collimator

Fiber Optic Test Equipment



Quantum Entangled Photons Sources

High-Resolution Optical Spectrometers



Optical Fiber Length Meters

Back Reflection Meters

High-Speed Polarization Controller-Scrambler



Handheld and Benchtop Extinction Ratio Measurement Systems

Multichannel, Benchtop and Handheld Digital Variable Attenuators

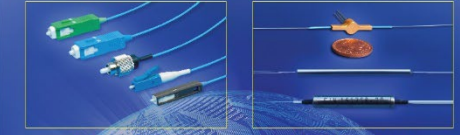


High Power Visual Fault Locators

Powermeters with Smart Detector Heads

Laser Diode Stable Sources

Fiber Optic Components for 2 Micron Wavelengths



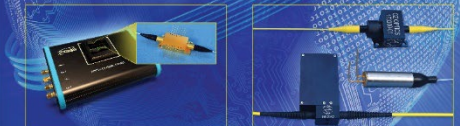
Fiber Optic Patchcords

Fused Couplers, Taps, Beam Splitters and Combiners



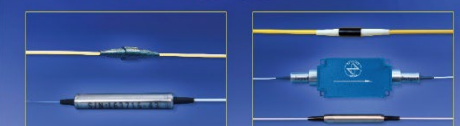
Fiber Pigtailed Laser Diode Sources

Pigtailed, Rectangular Style Collimators and Focusers



High Speed Electro-Optic Polarization Controllers and Scramblers

Manual and Electrically Controlled Variable Attenuators



Polarizers

Isolators



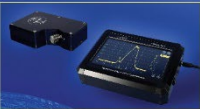
Leading Technology

Featured Products

New Fiber Optic Products



Polarization Entangled Photon Sources



High-Resolution Optical Spectrometers



High Speed Electro-Optic Polarization Controllers and Scramblers



Polarization Entanglement Tomography Analyzers



Fiber Optic Coils For Gyroscopes



Universal Optical DNA Band Detection Systems for Pathogens



Motor Driven Polarization Dependent Loss Emulators



Detector Heads and Optical Power Monitors



Fiber Optic Products for Gyroscopes



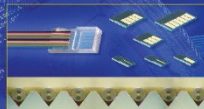
Fiber Optic Coils for Gyroscopes



ASE Sources



Wavelength Division Multiplexers



PM, SM and MM Fiber Pigtailed V-Groove Arrays



Fused Couplers, Taps, Beam Splitters and Combiners



Fiber Optic Polarizers



Fiber Optic Patchcords



SM and PM Fiber Pigtailed Circulators



Isolators

Quantum Entangled Photons Sources



Hyper-Entangled Photon Source Broadband Telecom



Polarization-Entangled Photon Source Broadband Telecom



Bright Polarization-Entangled Photon Source Broadband Telecom



Bright Polarization-Entangled Photon Source Narrowband Telecom



Correlated Photon Pair Sources



Polarization-Entangled Photon Source Narrowband at 610 nm



Polarization Entanglement Tomography Analyzer

Fiber Optic Products for OCT Applications



OCT Modules



Manual and Electrically Controlled Broadband Variable Attenuators



Manual and Electrically Controlled Fiber Optic Delay Lines



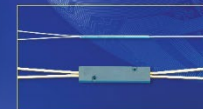
Manual and Electrically Controlled Polarization Controllers / Scramblers



Fiber Pigtailed Broadband SLED Sources



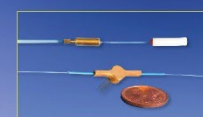
Fiber Collimators / Focusers



Broadband Fused Couplers



SM and PM Fiber Pigtailed Circulators





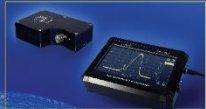
Leading Technology

Featured Products

Fiber Optic Products for Biophotonics Applications



Universal Optical DNA Rapid Detection Systems for Pathogens



High-Resolution Optical Spectrometers



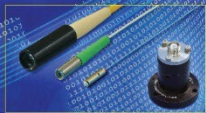
Fiber to Photodiode Couplers with Removable Filters



High and Low Power Patchcords



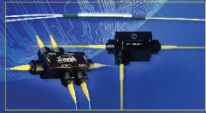
High Power Laser to Fiber Couplers



Pigtails, Rectenable Style Collimators and Focusers



Fiber Optic U-Bracket Assemblies



Wavelength Division Multiplexers and Beam Splitters



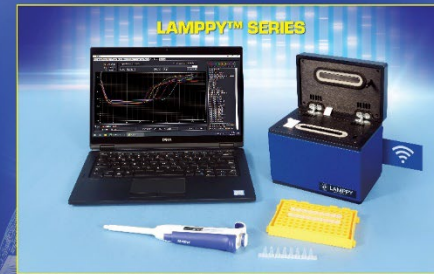
Turnkey, Ultra Stable Laser Modules



Pocket Optical Power Meter and Detectors

Universal Optical DNA Rapid Detection System

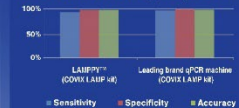
For Pathogens Including: COVID-19, SARS, EBOLA, CHOLERA, SALMONELLA, ETC.



Features:

- Use to detect viral, fungal, and bacterial DNA/RNA
- Rapid DNA/RNA detection (as little as 20 minutes)
- Highly sensitive and specific detection of low viral levels
- Intuitive software displays real time data during testing
- Melt analysis available with the included software
- Lid heater prevents evaporation and condensation
- Compact modular design allows for easy cleaning and maintenance
- Pair with an external battery for a portable and field-deployable system
- Test up to 8 samples simultaneously (higher throughput systems with up to 96 samples available upon request)
- Wireless communication with dual-band Wi-Fi and Bluetooth connectivity
- A fraction of the cost of qPCR based systems
- OZ Optics also offers private labelling for volume OEM applications

Clinical trial: LAMPPY™ vs. Leading brand qPCR machine

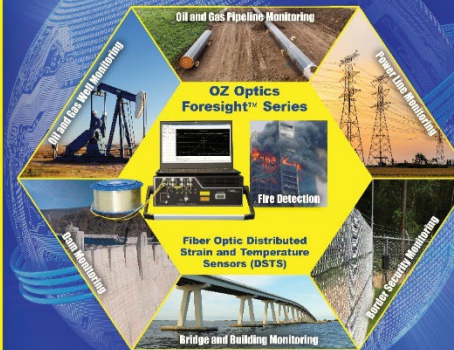


In a lab study done at Acibadem University using saliva samples taken from patients at the Acibadem Hospitals, LAMPPY was compared to a well-known conventional qPCR machine in performance and speed. The comparison study was carried out with a sample size of 262 using the COVID LAMP-based kit on both instruments and then verified with the KrosQuant SARS-COV-2 (2019 nCoV) Real Time PCR Diagnostic Kit on a leading brand conventional qPCR machine.

Fiber Optic Distributed Strain and Temperature Sensors

USA Patent Numbers: 7499151, 7599047, and 9568307

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 200 km sensing range
- Uses standard telecommunications fibers to minimize costs



Fiber Optic Sensors for Pipeline Monitoring

USA Patent Numbers: 7499151, 7599047, and 9568307

- Pipeline leakage detection
- Sensitive detection of corrosion / erosion, cracks and buckling
- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 200 km sensing range
- Uses standard telecommunication fiber to minimize costs





Leading Technology

Featured Products



Fiber Optic Sensors for Fire Detection

USA Patent Numbers: 7499151, 7599047, and 9568307

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 200 km sensing range
- Uses standard telecommunications fiber to minimize costs



Fiber Optic Sensors for Bridges, Dams and Buildings

USA Patent Numbers: 7499151, 7599047, and 9568307

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 200 km sensing range
- Uses standard telecommunications fibers to minimize costs



Bridge Monitoring



Dam Monitoring



Building Fire Detection

Fiber Optic Sensors for Power Line and Smart Power Generator Monitoring

USA Patent Numbers: 7499151, 7599047, and 9568307

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 200 km sensing range
- Uses standard telecommunication fiber to minimize costs



Underground Power Line Monitoring



Power Line Monitoring



Optical Ground Wire (OPGW)



Construction of OPGW



Gas Generator Monitoring

Fiber Optic Sensors for Security Monitoring

USA Patent Numbers: 7499151, 7599047, and 9568307

- BOTDA only, BOTDR only, or both BOTDA and BOTDR modules in one unit
- Simultaneous measurement of strain and temperature
- Fast, dynamic measurement of strain and/or temperature up to 200 km sensing range
- Uses standard telecommunication fiber to minimize costs



Border Security Monitoring



Highway Health Monitoring



Industry Standards

All Products Manufactured are in Strict Accordance with International Industry Standards:

- **ISO 9001:2015 Certified (Canada, China and Türkiye)**
- **REACH Compliance**
- **RoHS Compliance**
- **CE Compliance**
- **Telecordia Compliance**
- **Controlled Goods Directorate Registered**
- **Critical supplier for F35 and F18 Project**
- **TSCA (Toxic Substance Control Act) Compliance**
- **CHEMSHERPA Compliance**
- **IEC 61010 Compliance**



Marketing Strategy

Application Market

Using our strong direct sales and distributors, we address the following markets:

- **Energy – Oil and Gas**
- **Military and Homeland Security**
- **Educational**
- **Industrial**
- **Telecom / Datacom**
- **Medical & Pharmaceutical**





Marketing Strategy

Application Market



By leveraging the technology and expertise gained since its inception, OZ Optics has attracted a broad range of customers in the telecom / datacom, medical, military, security, industrial, construction, aerospace, power utilities, petrochemical and educational sectors.





Marketing Strategy

Global Sales Network

OZ Optics has resellers and distributors in over 30 Countries and Regions with over 10,000 customers worldwide:



Austria



Germany



Luxembourg



Sweden



Belgium



Greece



Netherlands



Switzerland



Brazil



Hong Kong



Norway



Taiwan



Canada



India



Poland



Thailand



China



Ireland



Portugal



Türkiye



Denmark



Italy



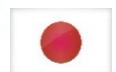
Singapore



United Kingdom



France



Japan



South Korea

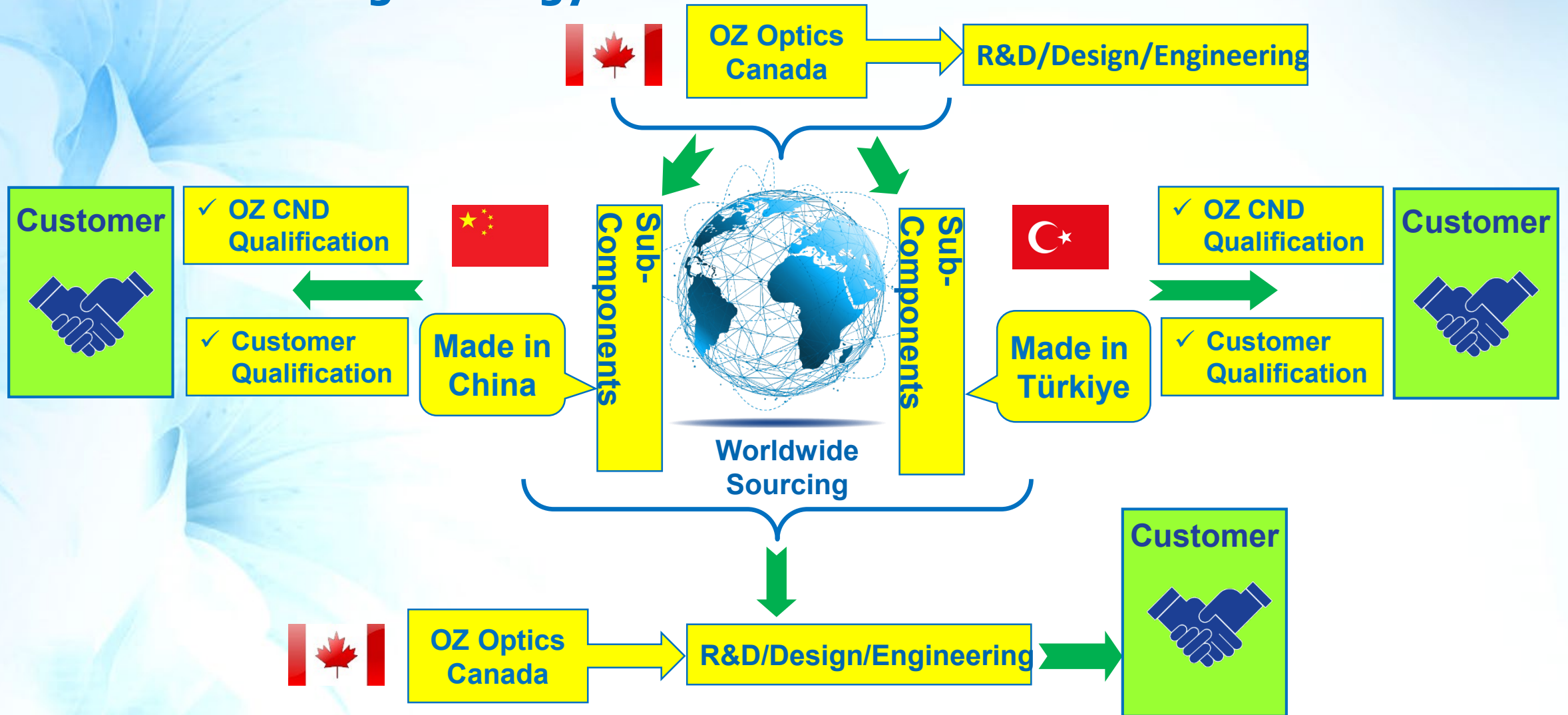


United States



Operation Strategy

Manufacturing Strategy





Marketing & Operation Strategy

Competitive Advantage

- Superior Technology
Innovative Engineering
- Competitive Pricing
- Global Presence
- Extensive Experience
in Fiber Optics Manufacturing
- Exceptional Quality and Service



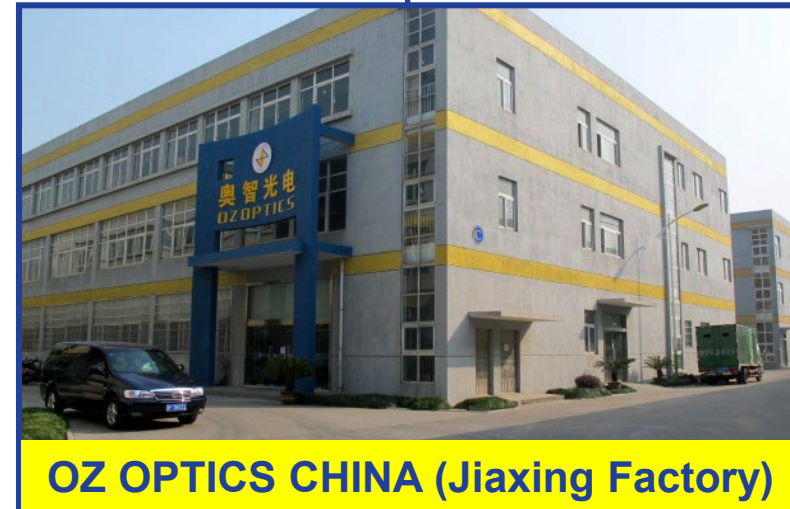
Branch Network



OZ OPTICS CANADA (Headquarters)



OZ OPTICS TÜRKIYE (Türkiye Factory)



OZ OPTICS CHINA (Jiaxing Factory)



Branch Network

Facility - Ottawa Headquarters

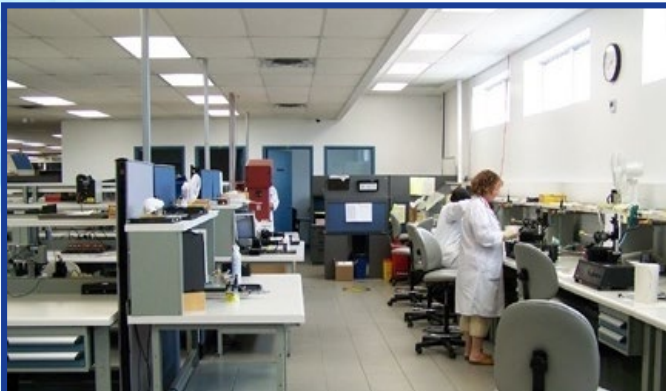
- 60,000 sq ft. - Manufacturing and R&D Facilities
- 15,000 sq ft. - Admin, Sales and Marketing
- 15,000 sq ft. - Training and Fitness Facilities





Branch Network

Facility - Ottawa Headquarters



Production Area



Training Centre Building



Meeting Room



Swimming Pool



Branch Network

Facility - Türkiye Factory (Izmir, Türkiye)

- Operational since 2000
- 33,000 sq ft. Manufacturing Facility
- Located in Free Trade Zone
- Low Tax Rates
- Sub Component Parts Manufacturing
- High Quality Labor
- AR Coating Machine & Clean Room onsite





Branch Network

Facility - China Factory (Jiaxing, China)

- Operational since June 2010
- Wholly Foreign Owned Enterprise
- Cost Effective Manufacturing
- High Quality Labor
- Supply Chain Integration





Branch Network

Facility - China Factory (Jiaxing, China)

- Located in Economic Development Zone
- 4000+ sq meters - Total Area
 - 500 sq meters – Admin, Sales and Marketing
 - 3500 sq meters – Manufacturing Area
 - √ 500 sq meter – Class 10,000 Clean Room
 - √ 300 sq meter – ESD Working Area





OZ Optics China

Zhejiang OZ Optics Technologies Co., Ltd

- Operational since June 2010
- Wholly Foreign Owned Enterprise
- NPI & Production Line Setup
- On-site Training by OZ CND
- Began Mass Production in September 2010
- Completed Main Facility Expansion in 2019



Foresight™ DSTS Awards & Patents



USA Patent # 7499151 on March 3, 2009
USA Patent # 7599047 on October 6, 2009



Applications – Innovative Solutions



Oil and Gas Pipeline Monitoring



Dam Monitoring



Oil and Gas Well Monitoring



Bridge and Building Monitoring



Power Line Monitoring



Border Security Monitoring



Fiber Optic Distributed Strain and Temperature Sensor (DSTS)

Innovative and Complete Solution for Monitoring Tiny Cracks





OPGW Monitoring



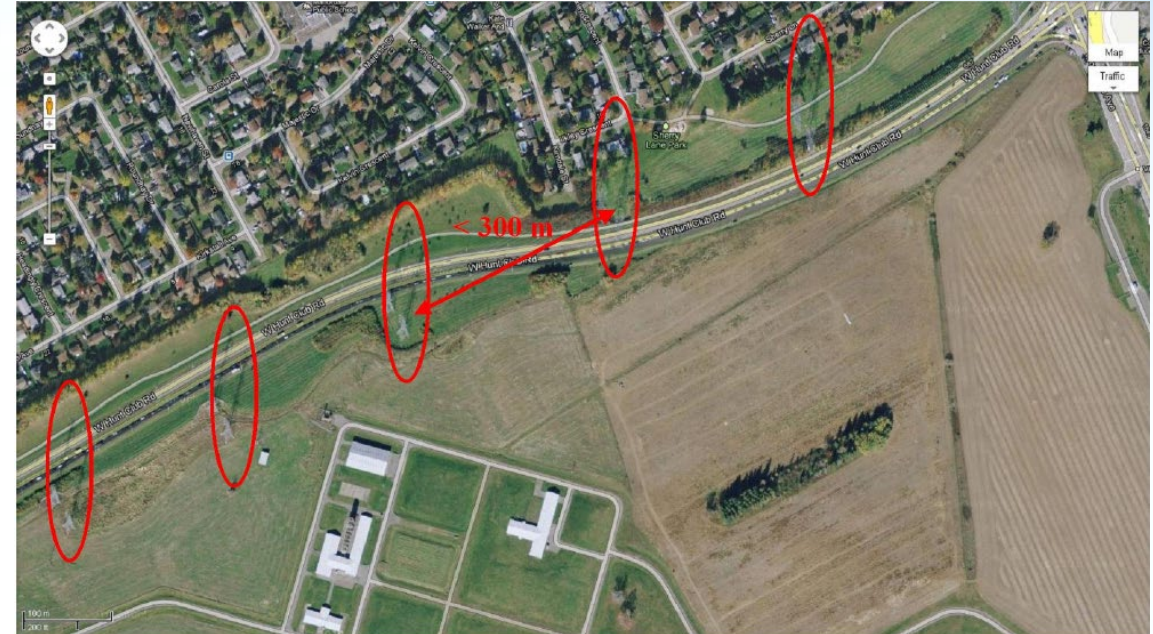
- **Monitoring the working status of OPGW**
- **Abnormal event found and located**
- **Event caused by broken strand, lightning, frost covering, change of strain, etc..**



OPGW Status Monitoring



- The OPGW is located from Smith Falls to Merivale-Ottawa, Ontario, Canada.
- The total fiber length was close to 140 km.
- The BOTDA located in Merivale-Ottawa made measurements as often as once every 60 minutes starting in June 2012 and continuing till July 2013.





The Costs of Catastrophic Failure



- **Example: Druzhba Pipeline July 2006**
- **Small 50 cubic meter leak results in:**
 - **Interruption of \$100M/day pipeline**
 - **Global spike in oil prices**
 - **Report of environmental catastrophe**
 - **Months of investigation and ecological monitoring**
- **Single point of failure in 3000 km pipeline**



OZ Optics Foresight™ DSTS Benefits



Total System Solution Provides

- **Reduced Operating Expenses**
 - **Centralized monitoring**
- **Reduced Danger of Catastrophic Failure**
 - **Real-time continuous monitoring**
 - **Corrosion and leak detection**
- **Optimized Field Engineering Resources**
 - **Automated dispatch with GPS coordinates**

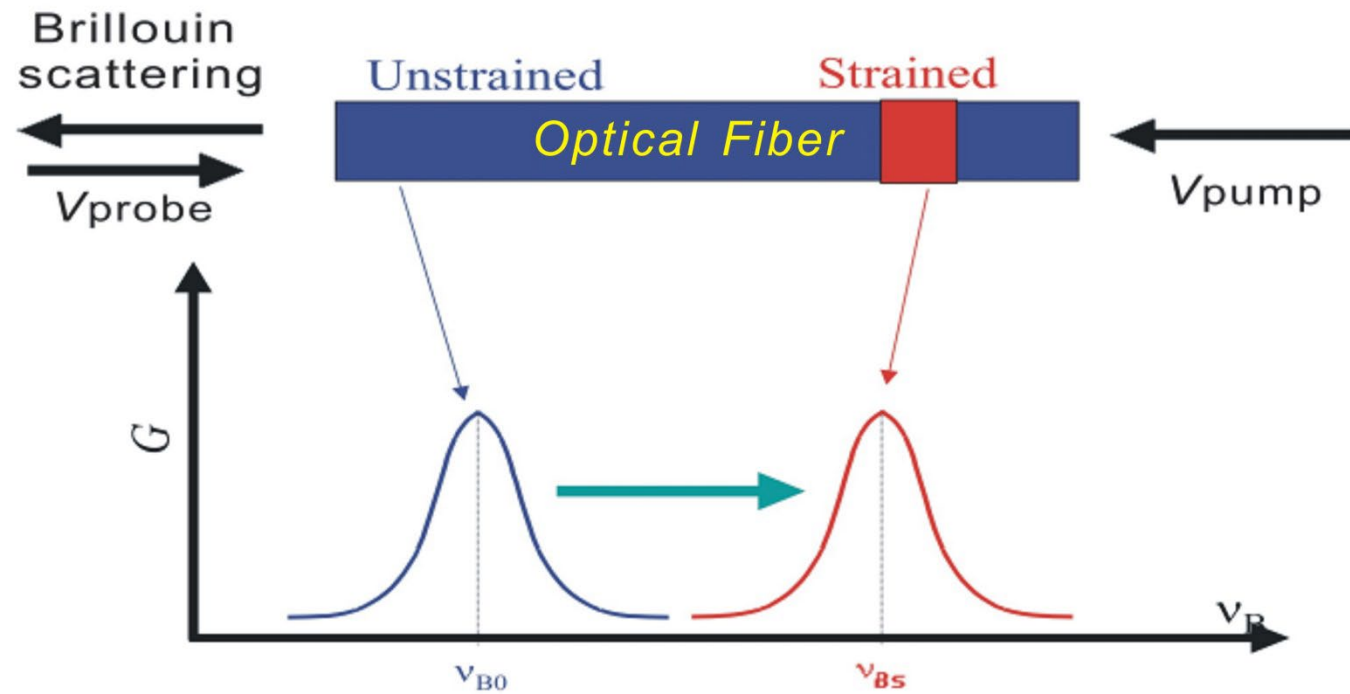


OZ Optics Foresight™ DSTS Features



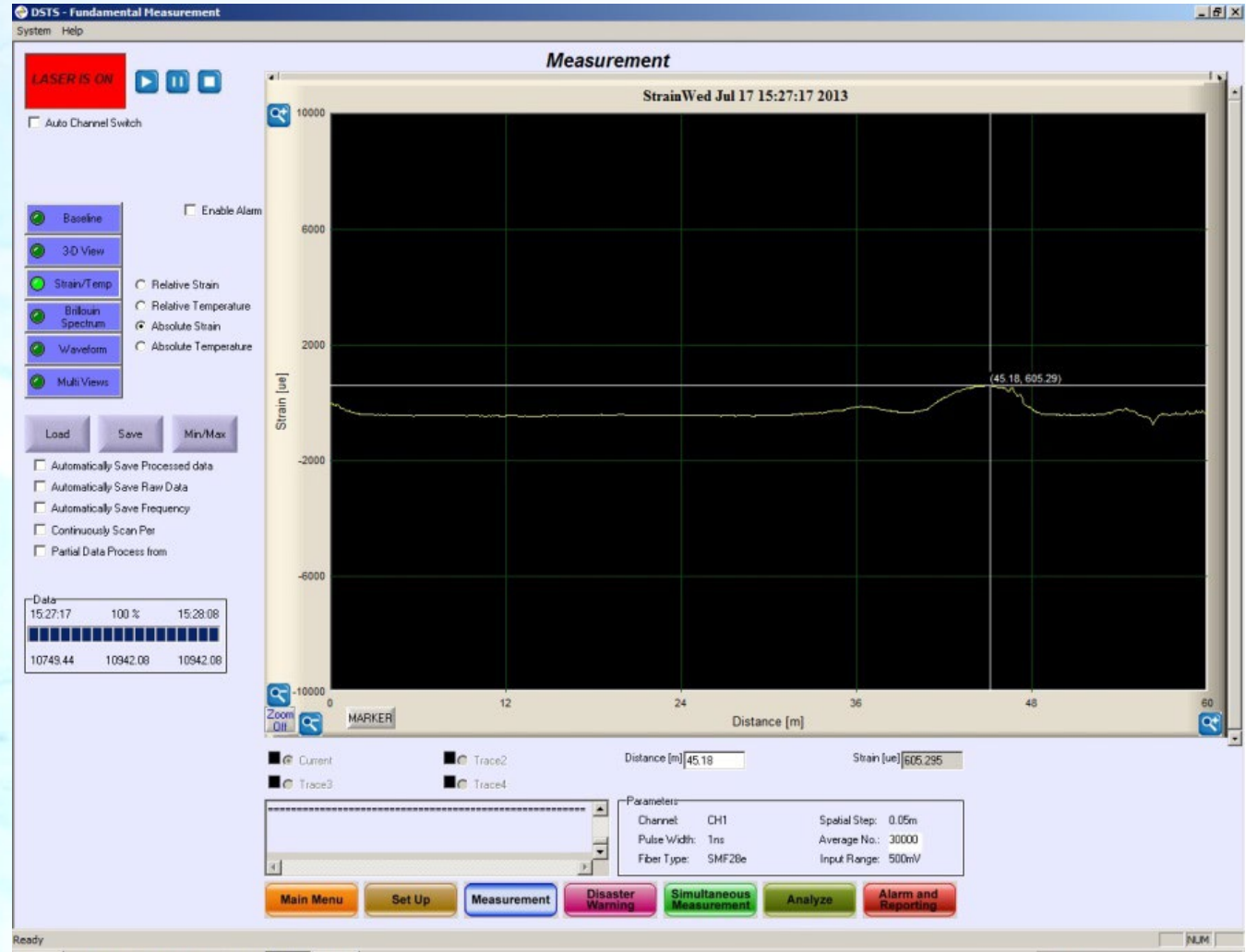
- **Temperature and strain in a single telecom fiber**
- **High resolution over lengths up to 100 km/sensor**
- **Sends time and location stamped alerts**
- **Escalates alarms until problem solved**

Working Principle — BOTDA



$$\nu_B = \nu_{B0} + C_T (T - T_0) + C_\epsilon (\epsilon - \epsilon_0)$$

OZ Software Translates Raw Data...






...Into Service Calls




Distributed Strain and Temperature Sensors



Repair Archive Tree

- DSTS ID:1002
 - 06-16 13:23 ID:103 - 1416M - R
 - 06-16 13:24 ID:104 - 3420M - R
 - 06-06 11:40 ID:101 - 1329M - R
 - 06-06 11:45 ID:102 - 2762M - R

Connect
Settings
Exit
Clear DB



All Repairs (4 repair/s)

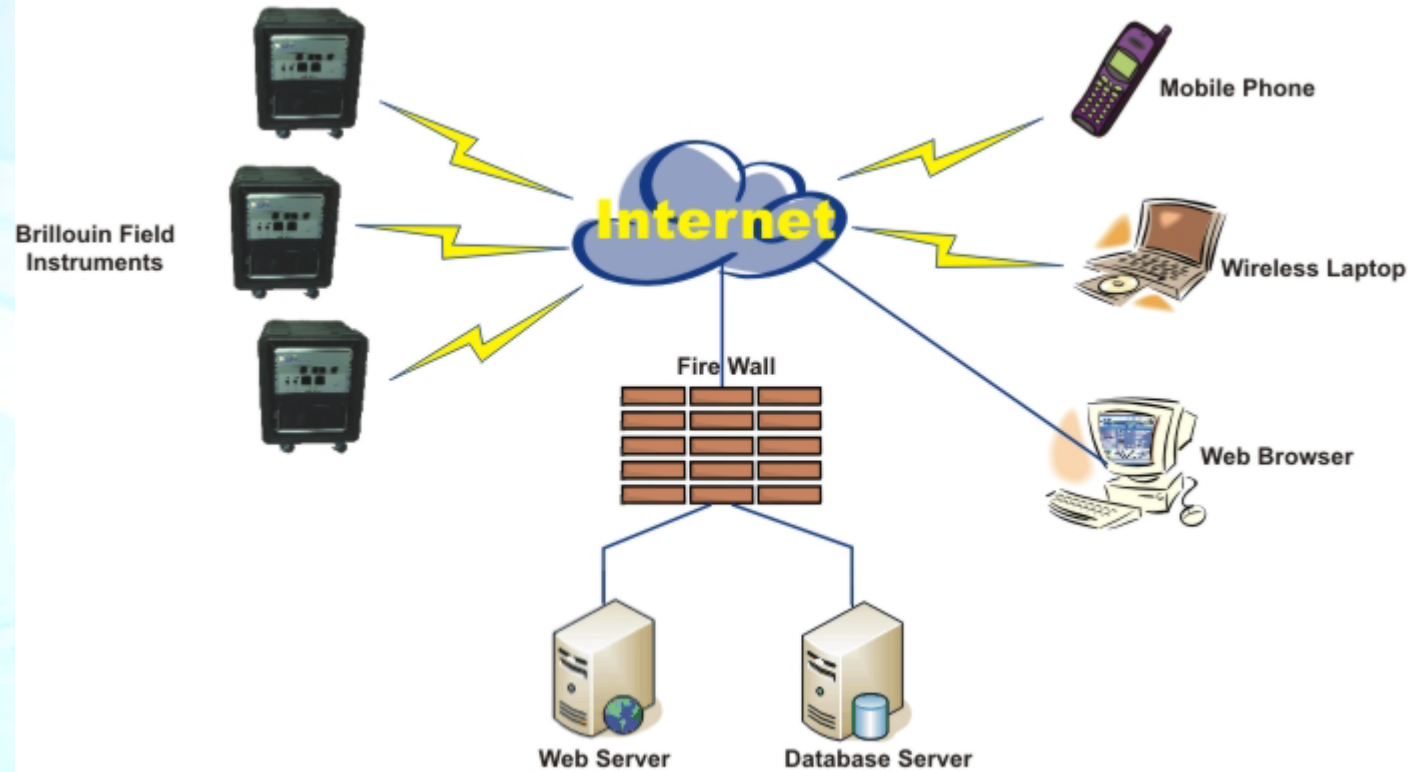
Repairs Bulletin Board

Event		Status			Repair		
Repair ID	Ocurrence Time	Detail	Action	Elapsed	Person	Time	Report
103	06-16 13:23	DSTS:1002 - 1416m - R	Sent 4 service calls	0h-02':50"			
104	06-16 13:24	DSTS:1002 - 3420m - R	Sent 2 service calls	0h-01':55"			

Copyright© OZ Optics Limited 1985-2006 All Rights Reserved v1.01.14 Current DSTS Id: 1002 Automatic mode

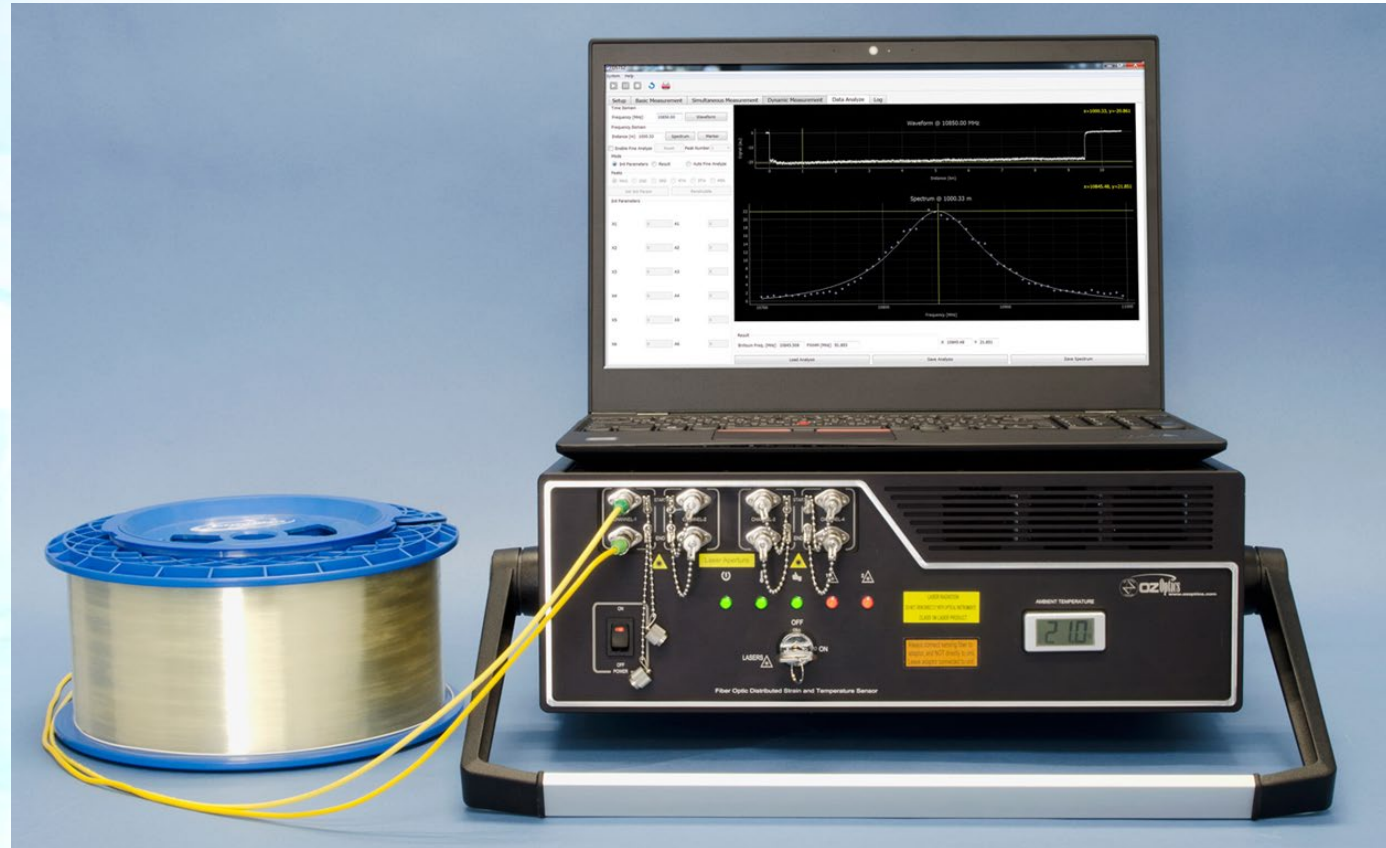


OZ Monitoring System Architecture





Compact 3ULT Model Package





Quantifiable Value Proposition (QVP)



- **Example 1: Druzhba Pipeline**
- **10 hour service interruption = \$43M**
- **Clean-up, repair & site surveys = \$3M**
- **Fines and penalties (Unknown)**
- **Brillouin installation < \$2/meter**
- **Single 50 cubic meter spill costs much more than sensor installation.**



QVP Continued



- **Example 2: Nigerian Pipeline July 2006**
- **Accidental leak**
- **180,000 barrels / day shutdown**
- **$180,000 * \$74 = \13M per day**
- **10-day shutdown = \$130M**
- **Brillouin operation \ll \$1/m/year**
- **Single production shutdown far exceeds lifetime sensor operating costs.**



Getting Started with DSTS



- Review OZ Optics reference material
- Contact OZ with your needs
- Consult with OZ on system design
- Request customized QVP estimate
- Receive OZ system quotation



The OZ Optics Commitment



OZ Optics is committed to providing a complete solution, lab evaluation, and field trial to meet your structural health monitoring requirements

Thank You for Choosing OZ Optics

Please Contact Our Sales Department:

Tel: 613-831-0981 ext. 3370

Toll Free: 1-800-361-5415

Email: sales@ozoptics.com

