

# Hifi Engineering: Improving Pipeline Monitoring Using Fiber Optic Sensors

ACAMP Seminar Series – Emerging Pipeline Technologies

September 29, 2014, Calgary, AB

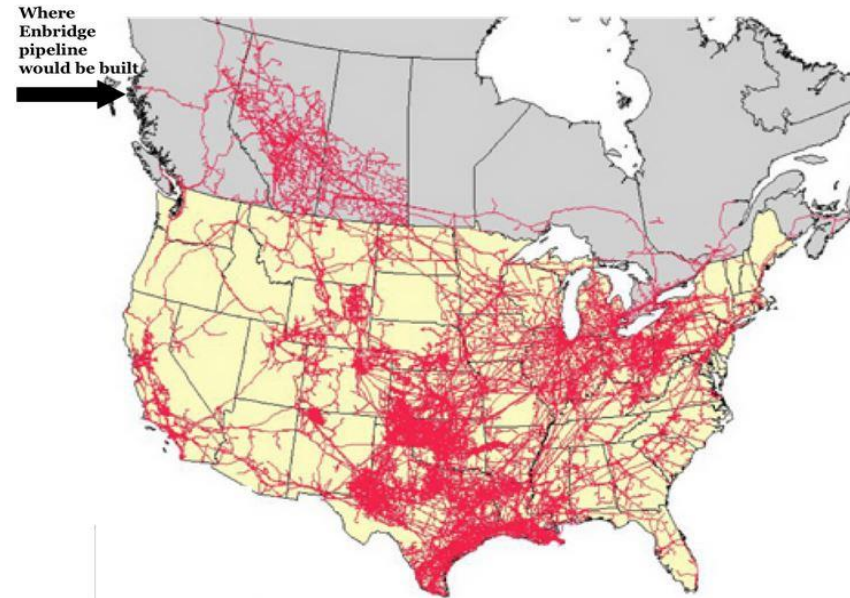
1. Criteria For Improved Pipeline Monitoring
2. Why Fiber Optics Offer A Viable Solution
3. Company Overview
4. Past Experience: Downhole Monitoring
5. Current Focus: Pipeline Monitoring



# Criteria For Improved Pipeline Monitoring

- **Distributed vs. point measurements**
- **24/7 real time vs. periodic survey**
- **Preventative**
  - Heaving, strain, early intrusion
- **Reactive**
  - Ability to detect even pinhole leaks,
- **Reliable – stable – trustworthy**
  - No false alarms
- **Needs to be economical / scalable**
  - Over 2000 high consequence areas Gateway Alone

Great, but realistically, is this possible, today?



Pipelines in North America (all commodities)

Source: The Globe & Mail, Feb. 19, 2011



Glennifer Lake

# Key Criteria Can Be Met Using Fiber Optic Distributed Sensors

## Data Transmission AND a Sensor

- strain, vibration, acoustics, temperature
- Photons 1000x increase in sensitivity over electronic sensors

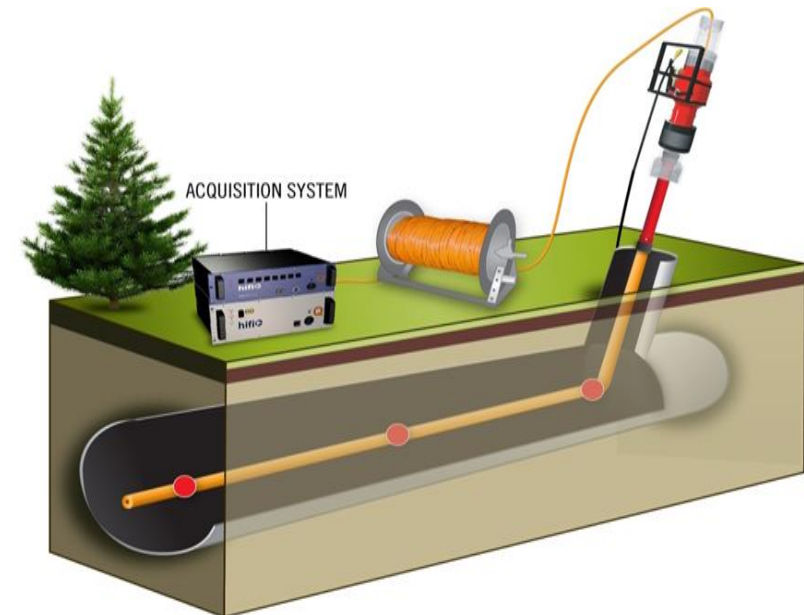
## 24/7 Continuous REAL TIME

- speed of light
- 40km, every cm of the fiber is sensing

## Efficient & Versatile

- Fiber is very cost effective
- Internal to the pipe, or external
- Extreme environments, 300degC

Cost effective way to monitor pipelines & wellbores for flow of fluids and gas, leaks, perimeter security, intrusion, seismic, and machinery analysis.



# Company History

- Founded by Bill & John Hull, May 2007, Calgary
- Core technology is fiber optic sensor platform **HDAS** (high fidelity distributed acoustic sensor)
- We develop laser interrogators, sensor cables, interpretation software
- To date invested \$10M in R&D
- People
  - Board of Directors – 3 Independent, Cenovus, Enbridge
  - 11 employees: Steven Koles CEO, John Hull CTO & Founder, Ehsan Jalilian VP R&D, 7 Electrical Engineers, and Head of Finance
- 10 patents (2 granted / 8 pending), various trade secrets
- Strategic equity partners are Cenovus & Enbridge ~ 30%
- First Application (Cenovus) to improve downhole leak detection



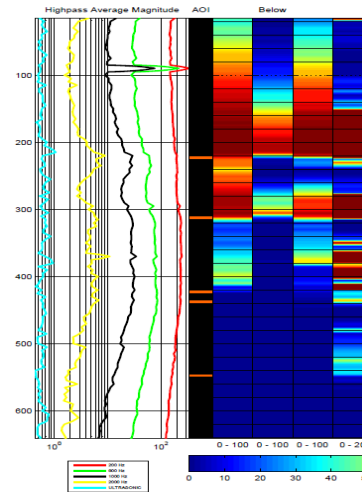
# How Hifi Started Out – Downhole Leak Detection

## Saw an Opportunity:

- Cement around casing is intended to keep high pressure in the ground. Problem is that it seldom does this perfectly.
- AER: 20% of all wells leak today, rest will likely leak at some point in time, problem is escalating
- Historically very little R&D for leak detection

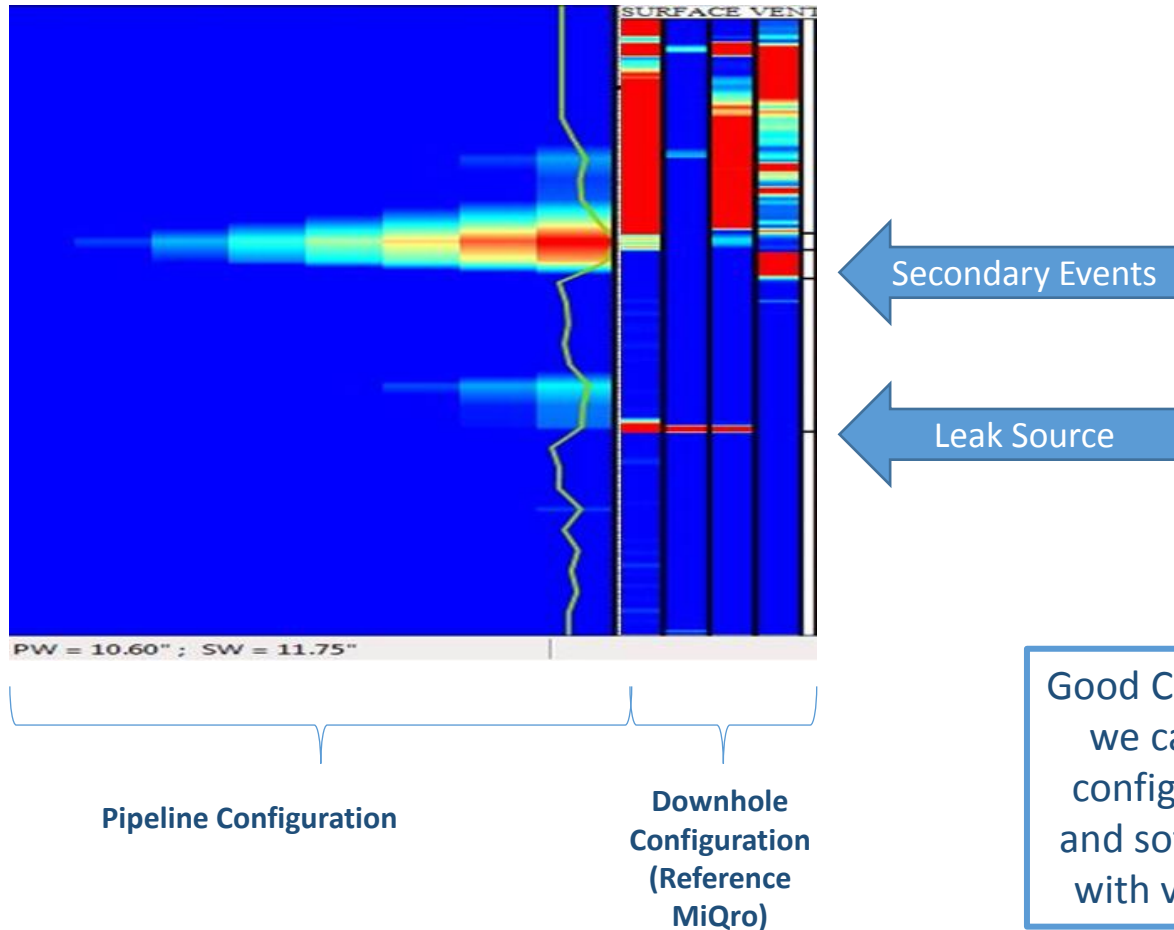
## Developed Hifi Platform (HDAS)

- Specifically designed to locate leaks
- Pushed us to raise the bar for fiber optic sensing
- Becoming the standard
  - Verified with Alberta Innovates (ARC). Over 800 wells logged
  - Meeting high global demand through new partners



# From Downhole To Pipelines Needed To Address Several Key Technical Challenges:

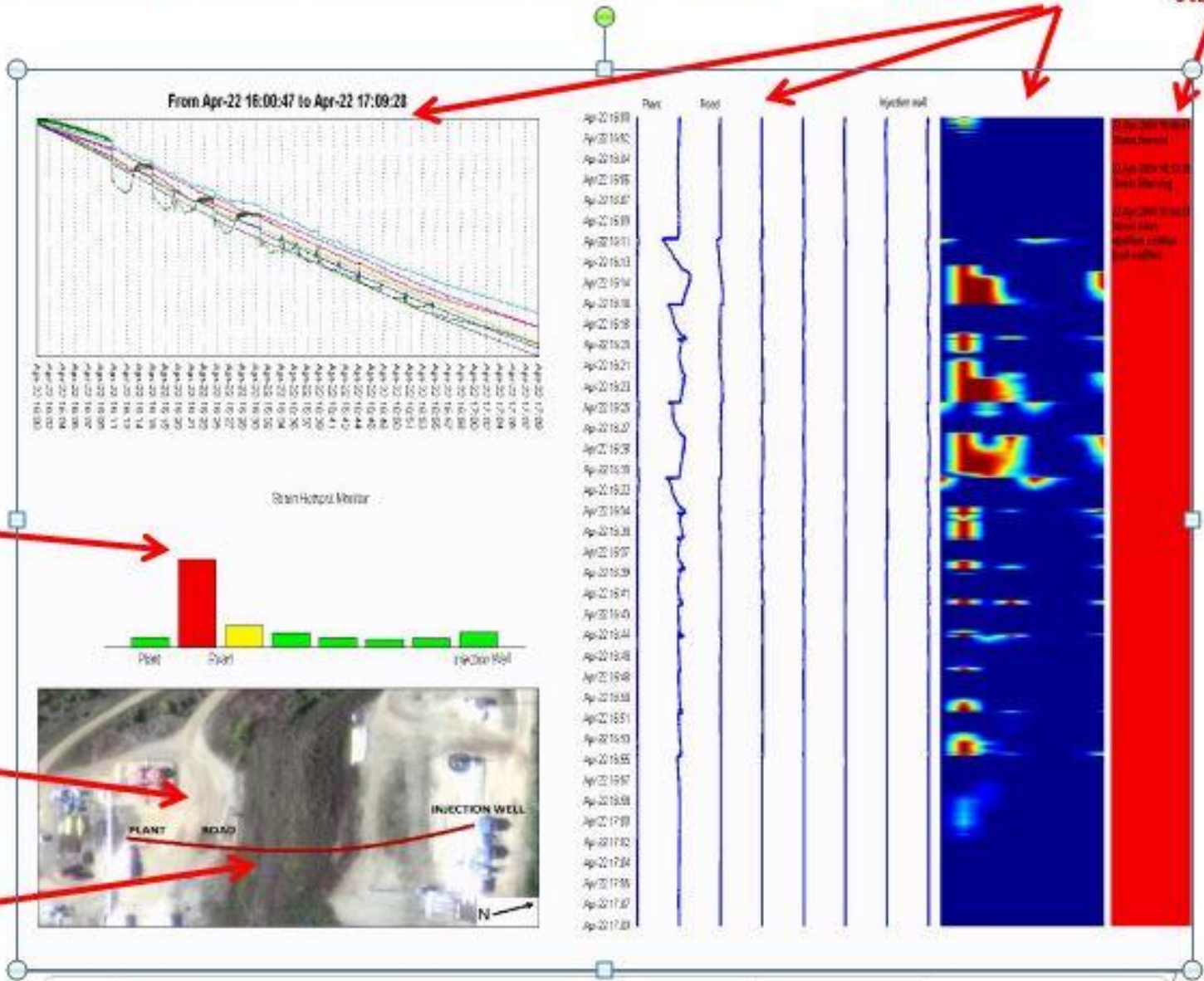
Test #1 – Scale Up To Several Km's without losing ability to detect leaks?



# Test #2 – Monitoring Strain Hotspots On Actual Buried Pipeline

Raw Strain Data

Alarm Status



# Proven We Can Meet The Criteria

- Goal now: Optimize further via \$8M funding with specific goals:
  - Prevention
  - Instant leak detection, reduce reaction time
  - Deploy inside existing pipelines, and outside new lines, offshore risers.
- Continuing to provide higher fidelity sensing technology than any other player in the industry
- Work with world class business partners to market and generate penetration / adoption, secure IP

**“We believe that Hifi has the potential to help the energy industry’s future and our goal of 100% safety”** - Senior Project Manager, Enbridge





# Thank You

## Q&A

