



Leak detection technologies for the oil and gas industry

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Our company

Leek's most recent milestones

- Created as a division of Seacoast Science in 2013
- Spun-off February 2015
- Privately held CA C-Corp
- Focus on sensors for bulk oil and gas leak detection
- Finalist for Connect's Most Innovative New Product award



Why we created the new technology

Pulled by the market

- Enbridge Energy & Syscor Controls
- Hydrocarbon leaks often go undetected
- A real time leak detector is needed
- No viable suppliers
- Can we identify a suitable technology?
- Driving factor for Leek was massive market opportunity



Previous state of the art sensors

Polymer Absorptive Sensors (PAS)

- Polymer coated resistor
- Original patent in 1959
- Fuel leak detection
- Extensive EPA evaluation in 1980s
- Incorporated into safety systems
- Couldn't detect methane, fell out of favor
- Replaced by other technologies



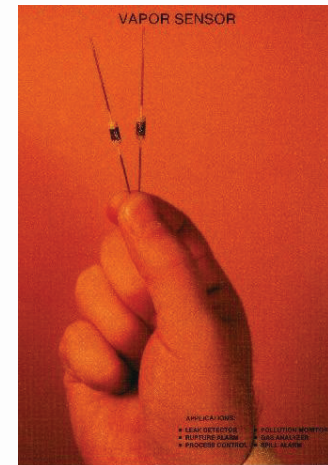
Technology Limitations

Adsistor Technologies

- Original developer
- Ultra low volume “production”
- Not positioned to evolve their technology

Alternative Technologies

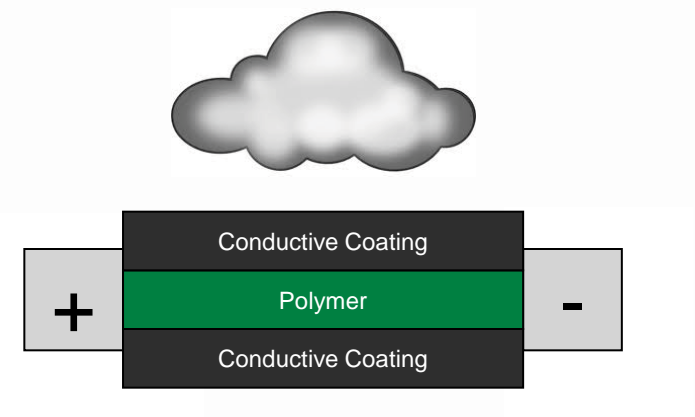
- Sensitive to water
- Not reversible or must be cleaned after detection
- Can only see liquid (not vapor)
- Expensive (>\$5k)
- Short lifespan (<2 years)



Concept of Operation

Chemiresistor-based Polymer Absorption Sensor

- Resistive placed platform (versus capacitive or others)
- Specialty coated polymer expands
- Conductive particles spread apart
- Resistance increases



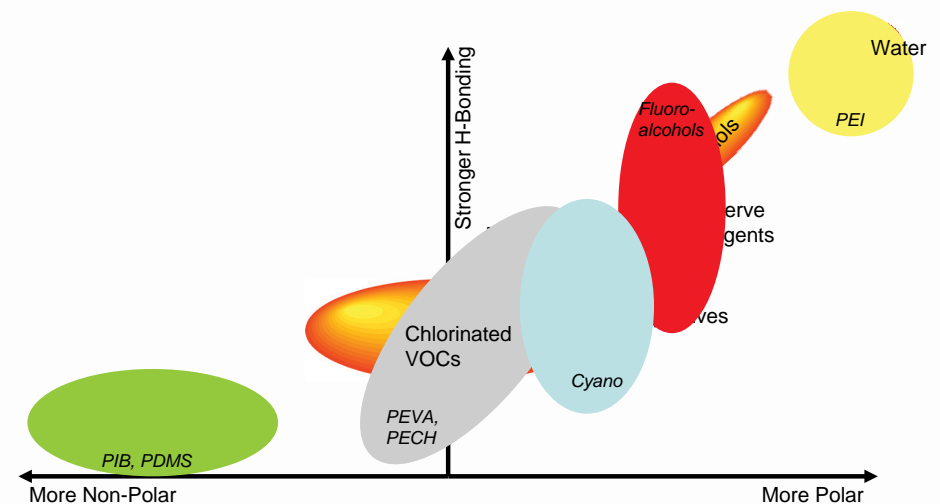
We are polymer experts!

We've been developing polymers since 2003

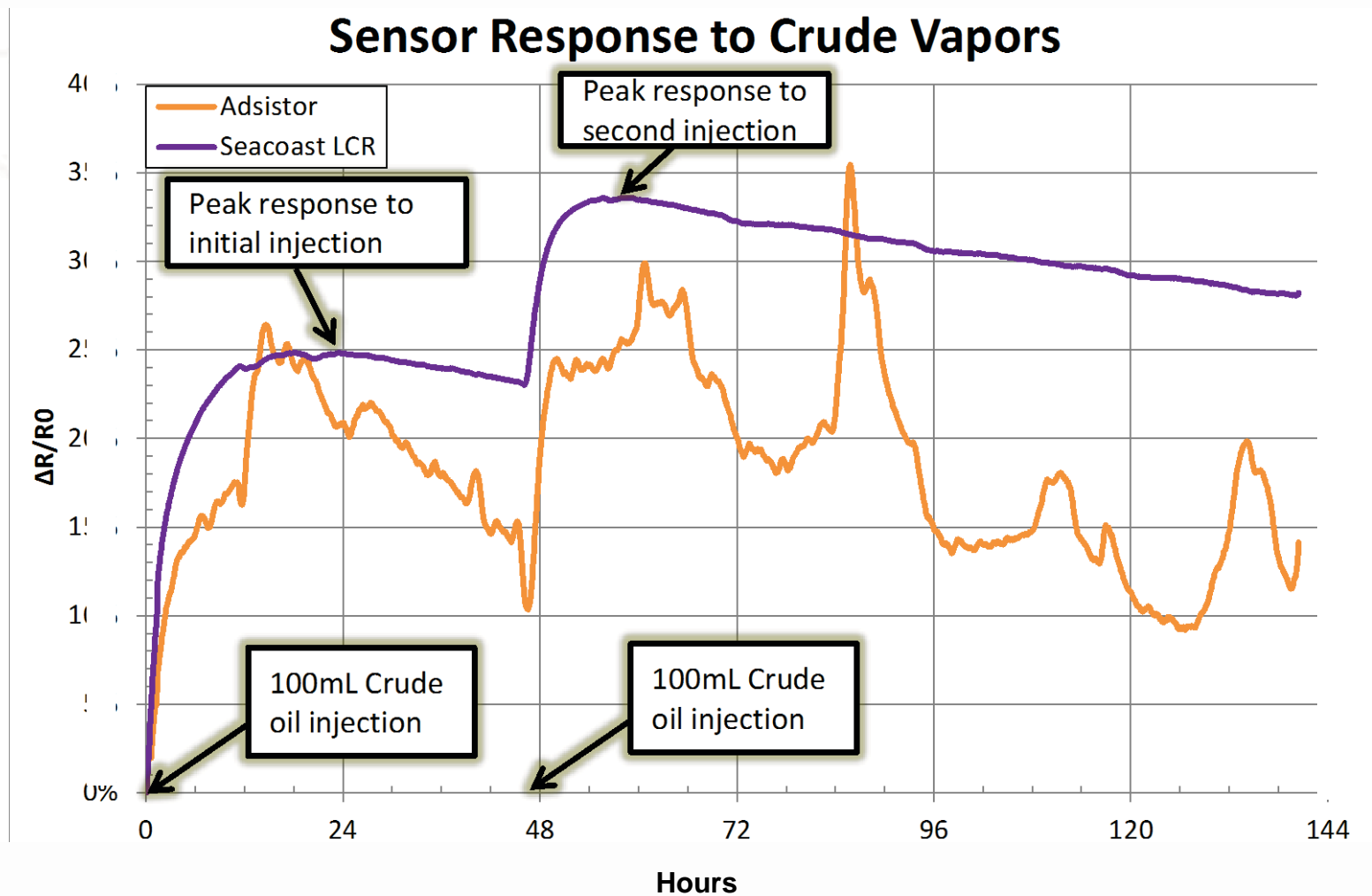
- Licensed from Naval Research Laboratories
- Proprietary in-house polymers

Adapting to a resistor

- Select and modify polymers for specific chemical classes (Secret Sauce)
- Completely reversible in vapor
- Immune to water



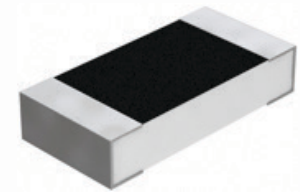
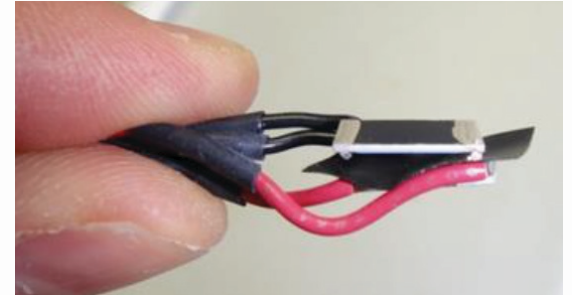
Our innovation increased performance



Our Polymer Absorptive Sensors (PAS)

Unique Capabilities

- Ultra low power
- Insusceptible to water
- Long term survivability
- PPM Sensitivity (low %LEL)
- False alarm immunity
- Low cost >\$1



Limitations

- Nonreversible when submerged in hydrocarbon liquids
- Low sensitivity at low hydrocarbon concentrations
- Difficulty detecting C1-C3

How do we test our sensors?

Development of a PA Sensor Evaluation Method

- Pipeline Research Council project PL-1H
- Evaluates sensitivity and durability of PAS after manufacturing
- Sets performance requirements that must be met

Method includes

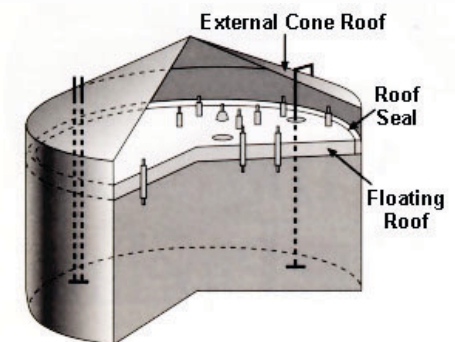
- Sensor to sensor reproducibility
- Temperature dependence
- Sensitivity to target chemicals & select interferents
- Sensor saturation and fatigue



Our first product

Monitoring Above Ground Storage Tanks

- Floating roof seals fail and vapors escape
- Rooftop detection system deployed by Syscor
- Monitor explosive vapors as %LEL
- CSA Intrinsic Safety Certification
- Kinder Morgan field trials



Monitoring oil on water

Point detection of oil leaks and spills

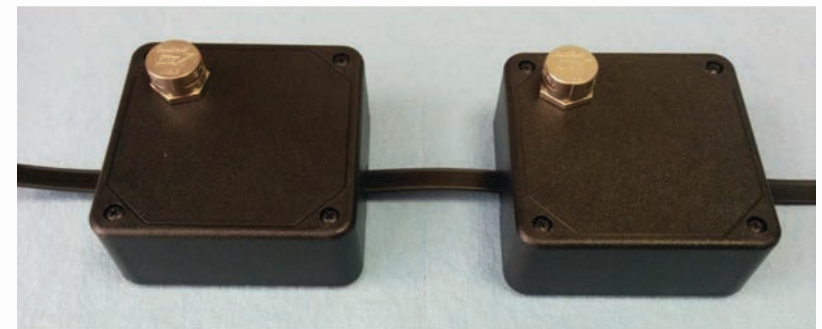
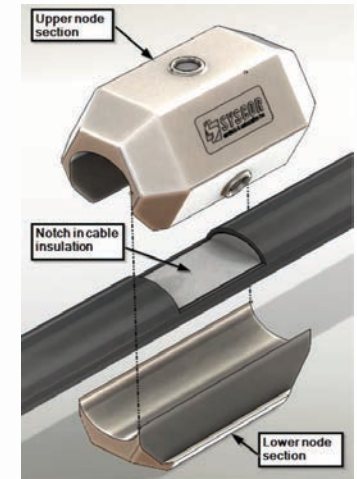
- Market pull specifically for oil on water detection
- Low cost alternative to existing infrastructure technologies
- Real time detection of hydrocarbons
- Works on water and in ice
- Proof of principle prototype completed by Xylem
- Current field trials by Enbridge Energy



Monitoring oil pipelines

Pipelines leak a lot of oil

- Bury a sensing cable along pipelines
- Real time leak detection
- Includes vibration, humidity and temperature sensors
- Phase 2 of PRCI Program PL-1H
- Sensors tuned for crude oil
- Sensitive to >1bbl crude
- Validated in TransCanada's ELDER test



Methane detection

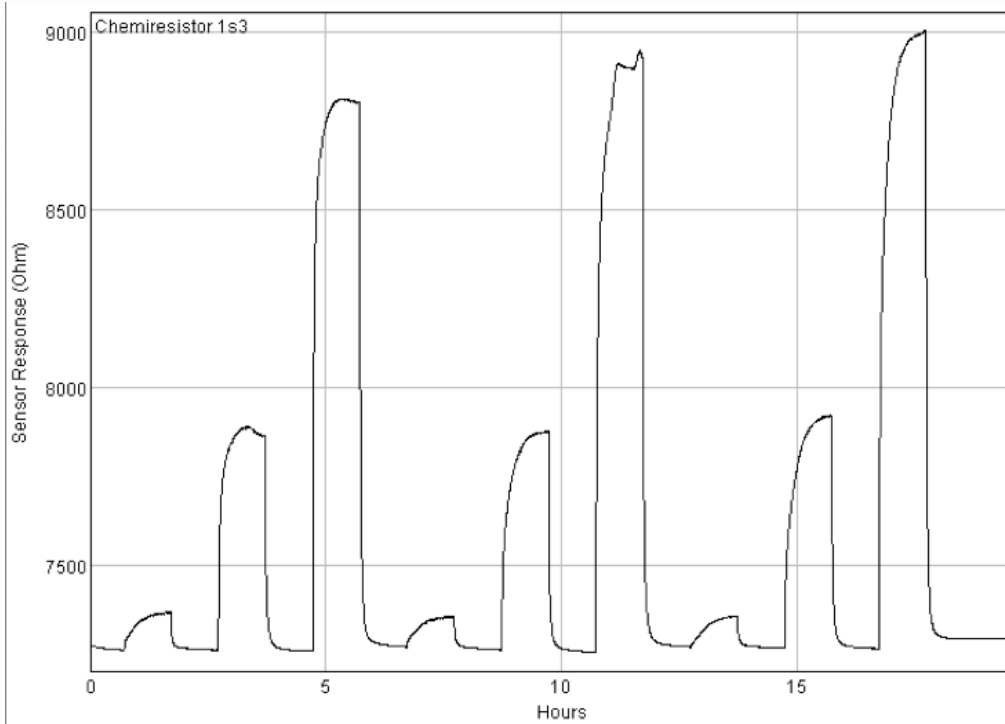
Another market that we're seeing pull from

- Detecting leaks from methane pipelines
- Methane produced by organic decomposition
- Tends to be ubiquitous and is a source of false alarms
- Small leaks typically associated with elevated LEL
- Low concentration sensitivity (<5% LEL) not always critical
- Market dominated by catalytic and IR detectors
- Modified our polymers and it works!

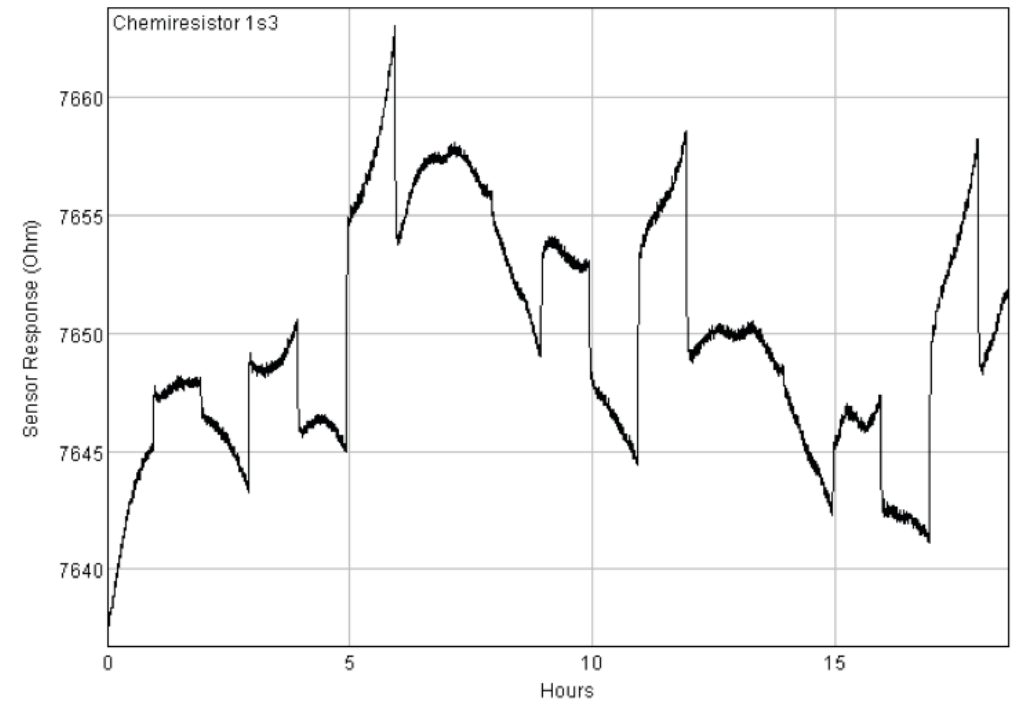


We can see methane

Heptane



Methane



Next steps for methane

Critical Milestones

- Continue sensor development
- Cable vs. Node?
- Modify evaluation methods
- Perform accelerated aging studies
- Identify commercialization partners within the industry



Thanks for listening!

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