QuakeWrap

SuperLaminate™ A No-Dig Point Repair Technology for Gas Transmission Pipes

Pipeline and Hazardous Materials Safety Administration (PHMSA) Workshop
May 5-6, 2021
Pipeline Safety: Pipeline Leak Detection, Leak Repair, and Methane Emission Reductions Public Meeting

Dr. Firat Sever, PE

Outline

01 THE COMPANY

QuakeWrap
Pipeline Division/Project Team

02 BACKGROUND/ INNOVATION

The SuperLaminate ® Technology for point repairs of hazardous fluid transmission lines

03 USDOT/PHMSA SBIR PROGRAM

Testing – proof of concept
Installation plan
Commercialization

04 Future Work (Phase II)

Contracting phase
3rd part testing
Installation
Long-term performance
Business model

About QuakeWrap

Founded in 1994 by Prof. Ehsani

World’s most innovative FRP Company

Proven record of taking a new technology to the market

More than 20 patents(including six in pipelines)

Received Congressional Recognition

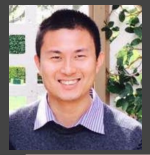
60+ employees (with FRP Construction)

KEY TEAM MEMBERS

QUAKEWRAP

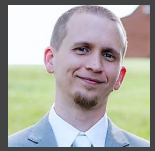
V. Firat Sever, PhD, PE
Pipeline Division Manager
Principal Investigator

Prof. Mo Ehsani, PhD, PE, SE
President
Co-Principal Investigator



Owen Yan, PhD
Technical Leader

Matthew Winn
Mechanical Engineer /
Lab Manager



SuperLaminate Advisory Board (SAB)

Jerry Rau (Jtrain, Inc.)
David McQuilling (Pacific Gas and Electric)
Bryce Brown (Rosen Group)
Wes Rowley (The Wesley Corporation)
Chris Alexander (ADV Integrity)

Commercialization Support

Foresight, Inc.

PROBLEM STATEMENT

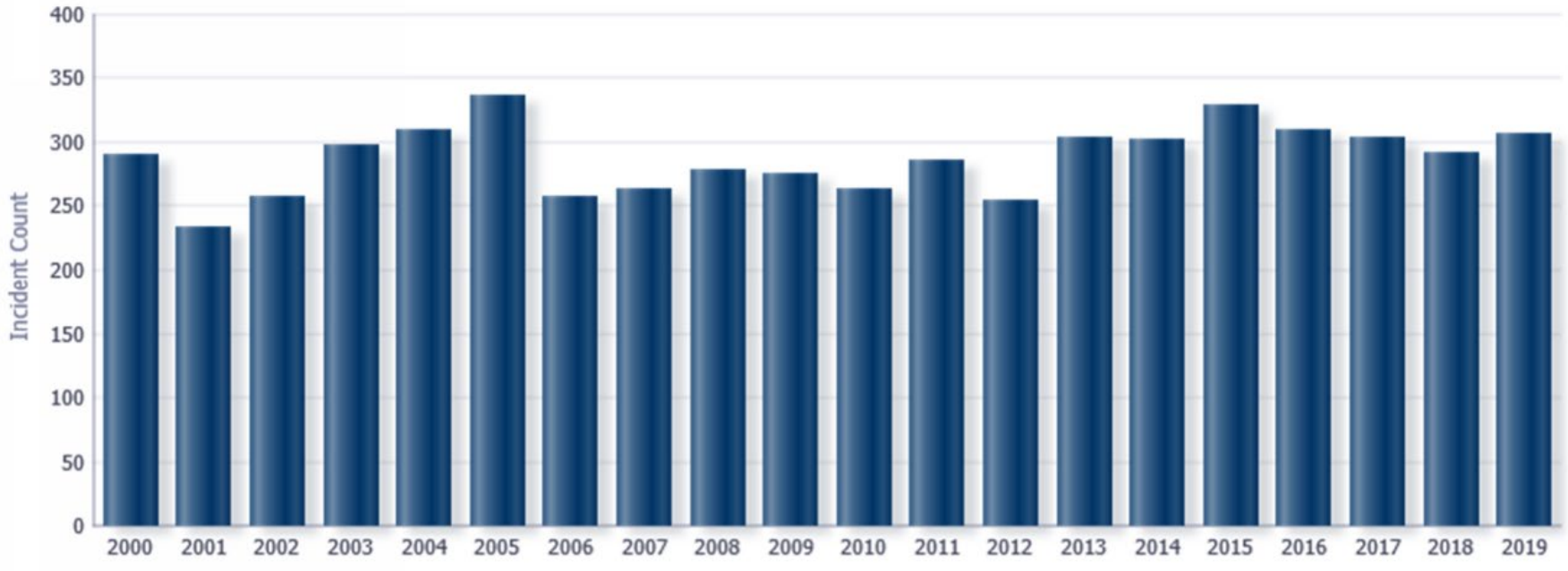


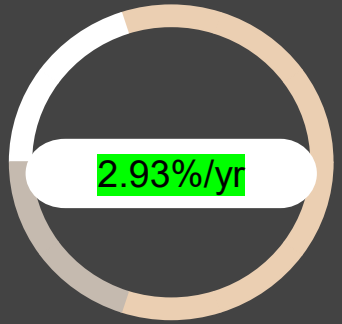
Figure 1. Number of pipeline incidents reported by PHMSA from 2000 through 2019.

Goal: Rehabilitate distressed pipes proactively before they fail in a feasible and economical manner with minimal impact to operations.

PROBLEM STATEMENT CONT'D

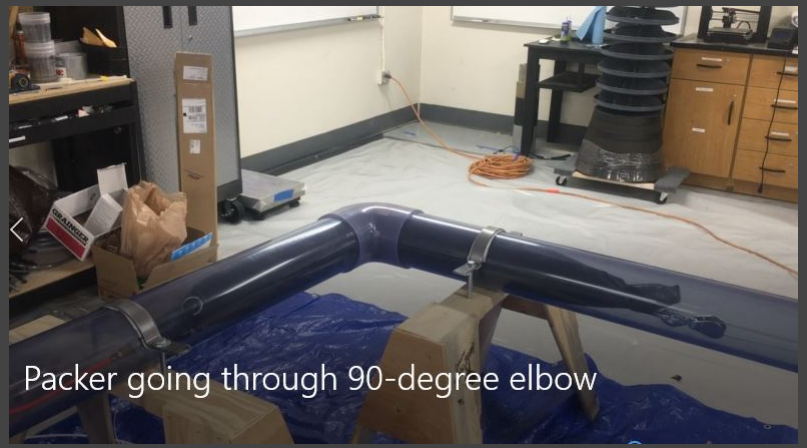
Mileage of existing gas gathering and transmission systems - PHMSA

Kinder Morgan's annual budget for capital projects



Anticipated growth in gas pipeline integrity management market (2019-2024) – Energy 360

The SuperLaminate™ Technology

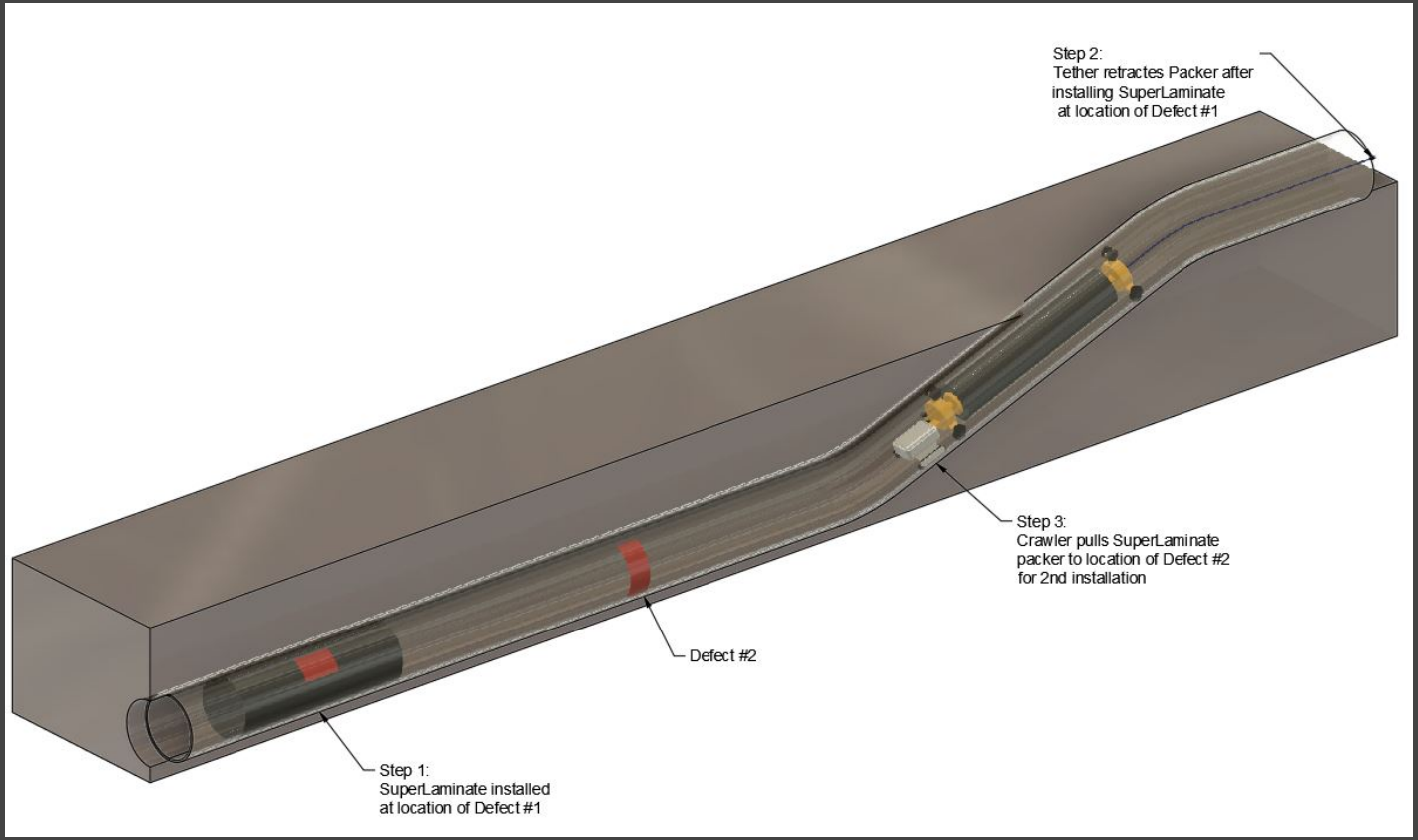


Originally developed as a hard liner to span drip pots in gas distribution lines

Was a part of the project (by PSE&G) that won the trenchless project of the year award by TT Magazine

Now transitioning to soft laminae for better adhesion to rugged surfaces and ability to navigate bends (vertical and horizontal)

The SuperLaminate™ Technology - Contd.



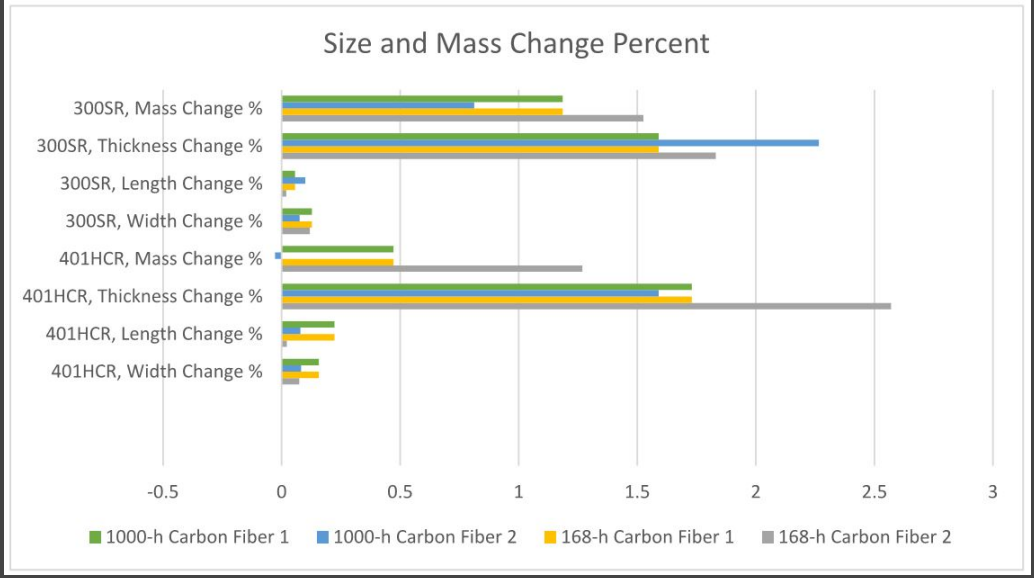
Deployment through launch pads to long distance

Multiple repairs in same mobilization

No excavation needed

Higher pressure capacity, better leak sealing with internal lining

TESTING



Mock installations in lab
High pressure test
Chemical resistance tests

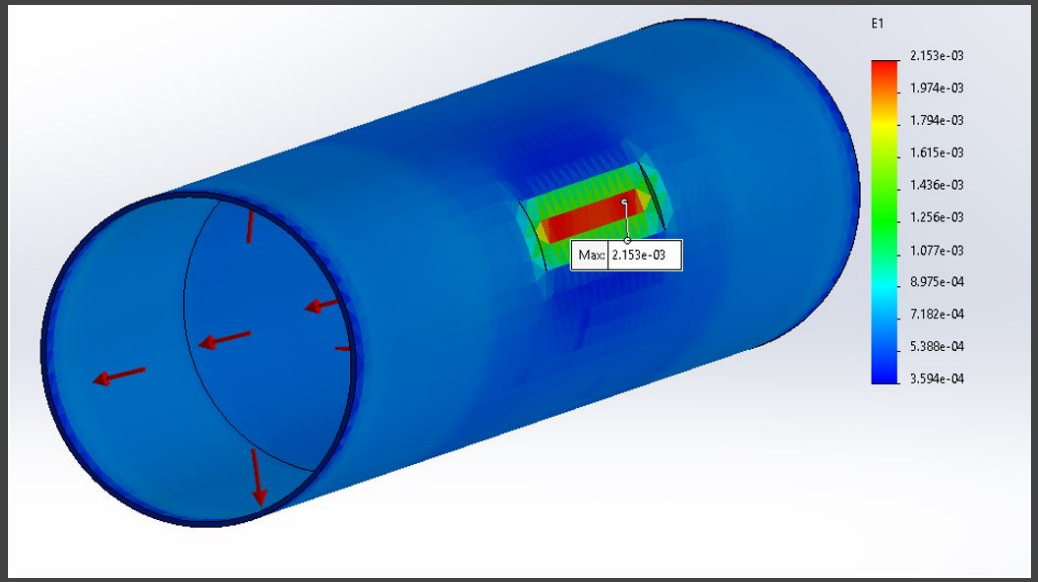
USDA/PHMSA SBIR PROGRAM

- Through Volpe Center of USDOT
- Phase I:
  Proof of concept
  Technology assessment report by 3rd party
- Phase II
  Additional in-house testing
  3rd Party testing/certification
  Deployment design and testing
  Commercialization (with support from Foresight)

Design

- Modified PCC2 Part 4 for internal lining
- Computational modeling with the FEA
- Validation with testing
- To be further improved after 3rd party tests

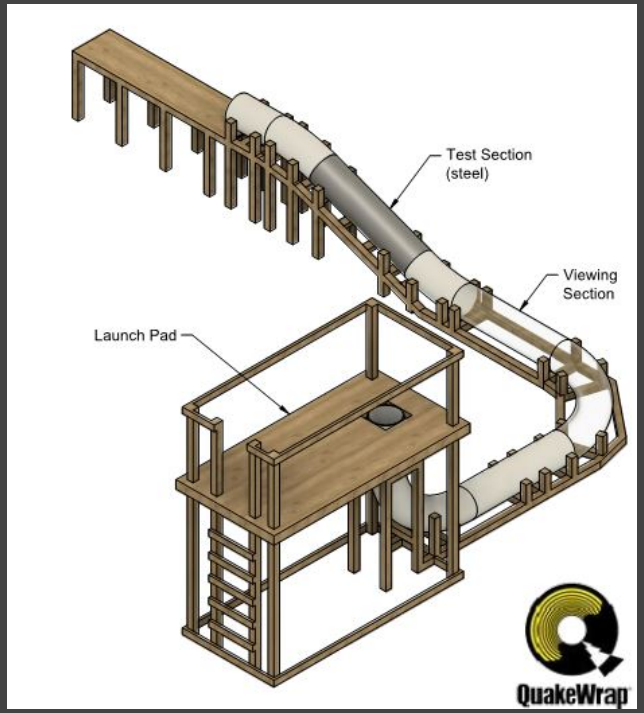
$$t_{min} = \left(\frac{PD}{2} - t_s * s\right) * \left(\frac{1}{f * s_{lt}}\right)$$



INSTALLATION OF SUPERLAMINATE™

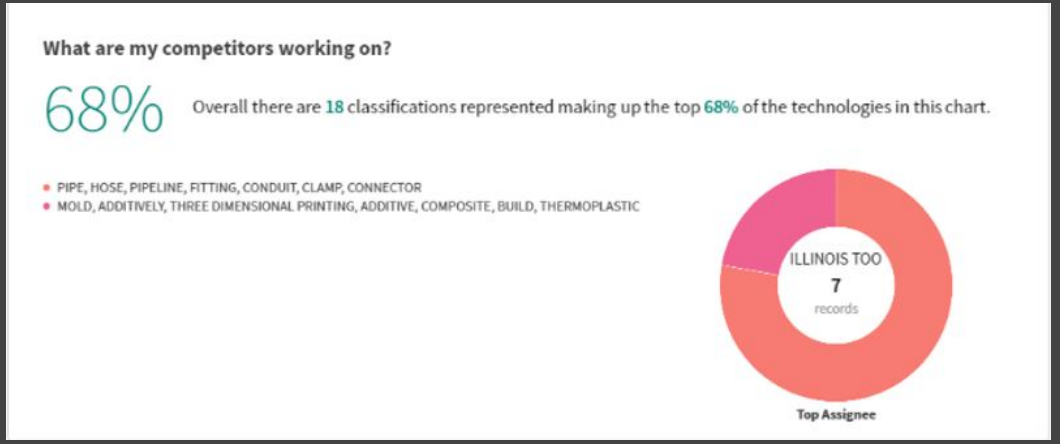
In-tandem with pig launching

Remote-controlled carrier



Commercialization

"If QuakeWrap can substantiate the value of SuperLaminate and find the right partner(s) to help them go to market the company should find ample opportunity for their novel technology. The technology might prove disruptive or it might become a best evolution of trenchless repair technology suited for select use cases."
-Foresight Science & Technology



FRP CONSTRUCTION

- QuakeWrap's sister company for installation
- Hundreds of projects completed in the USA
- Highly experienced crews in fiber reinforced polymers
- Driving force to introduce SuperLaminate™ into the O&G transmission market

"(Your crew) deserve praise for their hard work, good work ethic, and genuine care for the sensitive job location… ***they championed this project from start to finish with enthusiasm unknown to most construction work."***
Ryan Bagshaw, Inspector, Salt Lake City Department of Public Utilities

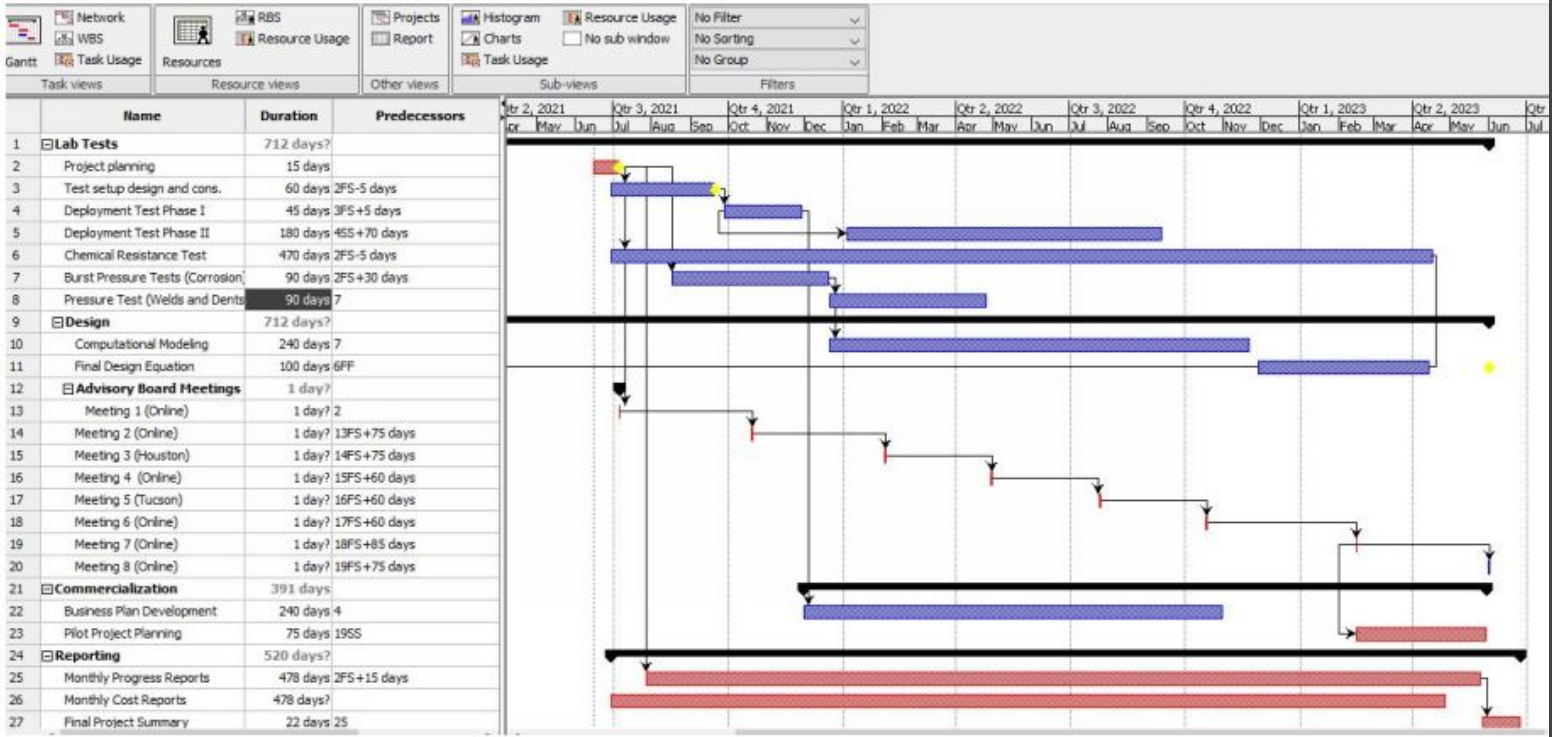


Figure 17. Preliminary Phase II schedule with an assumed start date of 6/15/2021.