CASE STUDY

ASSESSMENT OF ENVIROCURE®-FELT STYRENE EMISSION DURING CIPP PROCESS

Final styrene concentration measurements for EnviroCure-Felt was never found to be above the 20-ppm threshold set by EPA. In fact, readings came in at less than 1 ppm.

THE CHALLENGE

Citizen Energy Group wanted to ensure that CIPP installation using EnviroCure-Felt reduces styrene emissions, and their associated smells, from trenchless rehabilitation jobsites while also falling well-below the EPA standards.

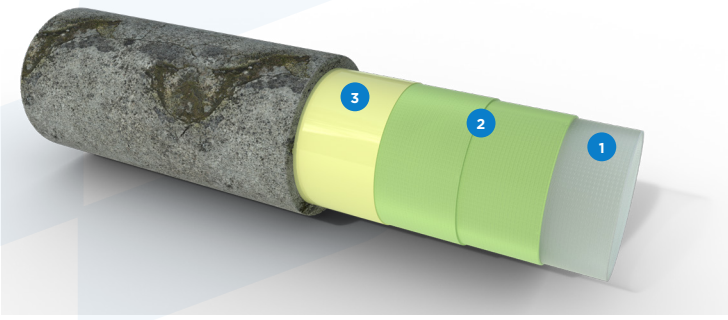
Citizen Energy Group wanted a CIPP option that could rehabilitate pipe without the potential hazards of styrene, however they were reluctant to try styrene free liners due to a recent shortage of styrene free products and problems associated with non styrene based resines. Citizen Energy decided to evaluate EnviroCure-Felt.

EnviroCure®-Felt, manufactured by United Felts, uses a styrene impermeable polymer coating applied to traditional CIPP liners that controls styrene emissions and its associated odor. The proprietary all-felt tube construction or hybrid felt/glass liners coated with a styrene barrier vastly reduces, if not eliminates, styrene odors and emissions on the jobsite before and after the tube installation — removing the significant cost and unpredictability of styrene-free resin systems.

ANATOMY OF ENVIROCURE-FELT LINER

Features multiple layers of material, which are overlapped to reduce styrene odor and emissions. This multi-layer construction consists of:

1. **Inner Felt Layer - With Styrene Barrier Coating**
2. **Felt Liner Layers - Resin Saturated**
3. **Pre-Liner - Optional**



UNITED FELTS
A VORTEX COMPANY

PROJECT SNAPSHOT

PROJECT
IUPUI

OBJECTIVE
To measure styrene concentration of EnviroCure-Felt during the CIPP process.

PROGRAM
Polymer Sciences

DEPARTMENT
Mechanical Engineering

CUSTOMER
Citizen Energy Group

ENVIROCURE®-FELT
PATENT PROTECTED
US PATENT NO. 12,467,573

UNITED FELTS PRODUCTS USED

EnviroCure®-Felt

UNITED FELTS
A VORTEX COMPANY

CASE STUDY

To assist the Citizen Energy Group with the assessment of the new product, the team at IUPUI was assigned to conduct styrene concentration measurements during installation—with and without the use of a pre-liner—and report the results to Citizen Energy Group considering the following guidelines:

1. According to Unites States Environmental Protection Agency (EPA) – Styrene Interim AEGL document (https://www.epa.gov/aegl/styrene-results-aegl-program), styrene exposure for the public should not exceed 20 ppm for more than 1 hour to avoid irritation (eyes, nose and throat).
2. The National Institute for Occupational Safety and Health (NIOSH) recommends workers be exposed to no more than 50 ppm styrene on average over a 10-hour workday. Workers who are exposed to high amounts of styrene for a long time can have injury to their nervous systems.
3. The Occupational Safety and Health Administration (OSHA) has a permissible exposure limit of 100 ppm average over an 8-hour workday for styrene. These values are based upon studies of health effects in workers exposed to styrene, including reports of irritation at concentrations above 200 ppm and reports of weakness, dizziness, and changes in color vision in people exposed at high concentrations over a long period of time.

THE STUDY

The objective of the analysis was to measure the styrene concentration during the CIPP process. The measurements were performed over four days during October 11-14, 2021, for two different pipe diameters of 12" and 24" on Oakland Avenue and English Avenue. There were segments with a pre-liner and segments without a pre-liner.

Styrene concentration in the air was measured using Dräger XPID 8500 monitoring equipment with data acquisition. This allowed a very fast response and a broad measuring range.

THE RESULTS

The EnviroCure®-Felt coating is manufactured using multiple layers of compatible flexible polymer materials. Unlike traditional CIPP coatings, EnviroCure-Felt creates an impermeable barrier the entire length of the liner that does not allow styrene molecules to pass through the coating. When the ends of the liner are similarly secured and sealed after the wet out process, the styrene emissions are contained within the tube and does not diffuse into the reefer truck, protecting crew safety. Furthermore, using a trenchless industry pre-liner to capture the resin within the outer protective film, styrene transfer via lateral connections into existing structures is mitigated.

IMPACT

1

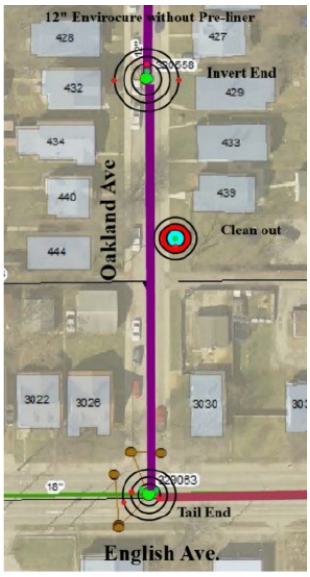
The team at IUPUI was assigned to conduct styrene concentration measurements during installation—with and without the use of a pre-liner.

2

During the CIPP process, the post-installation styrene concentration measurements for EnviroCure-Felt was less than the 20-ppm threshold set by EPA (with two minor exceptions).

3

These measurements suggest a low-risk level for the use of EnviroCure-Felt product—with or without pre-liner—during the CIPP process.



During the CIPP process, the final styrene concentration measurements for EnviroCure®-Felt was measured below the 20-ppm threshold set by EPA except for the following two readings:

1. **During heating/cooking of 24" pipe with pre-liner, at 5 ft. from Tail End:**
   - First Styrene measurement = 41.6 ppm
   - Second Styrene Measurement within 2 min = 0.00 ppm
2. **During heating/cooking of 12" pipe with Pre-liner, at 0 ft from Clean Out:**
   - First Styrene measurement = 20.6 ppm
   - Second Styrene Measurement within 2 min = 0.00 ppm

Because the first reading for these two measurements was found to exceed the 20 ppm set threshold, a second reading was conducted within two minutes of the first reading. In both cases, the concentration of styrene was determined to be zero. These measurements suggest a low risk level for the use of the EnviroCure-Felt product with or without pre-liner during CIPP process.