Addressing I&I and Energy Implications at WWTPs

April 25, 2023

SEDAC
SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY

ILLINOIS SUSTAINABLE TECHNOLOGY CENTER
PRAIRIE RESEARCH INSTITUTE

Who We Are

We assist buildings and communities in achieving energy efficiency, saving money, and becoming more sustainable.

We are an applied research program at University of Illinois.

Our goal: Reduce the energy footprint of Illinois and beyond.

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ISTC Mission

To encourage and assist citizens, businesses and government to prevent pollution, to conserve natural resources, and to reduce waste to protect human health and the environment in Illinois and beyond.

Upcoming Field Day

May 16, 2023

9am – 11am: Tour of Metropolitan Water Reclamation District (MWRD) O'Brien Wastewater Reclamation Plant (Skokie, IL)

** **Limited space available**

** **Operators/Municipalities**

12pm – 2:30pm: Aeration & Energy Efficiency Workshop (Evanston, IL)

Registration launching this Thursday!

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About the IEPA PWI Energy Efficiency Program

The Illinois EPA Public Water Infrastructure Energy Assessment Program helps municipalities reduce the cost of water and wastewater treatment.

- NO-COST energy assessments and technical assistance
- Comprehensive report listing:
  - Cost of upgrades
  - Estimated payback period
  - Any applicable incentives or funding opportunities
- Operator continuing education events

Funding provided in whole or in part by the Illinois EPA Office of Energy. This program is in partnership with the U.S. Dept. of Energy Sustainable Wastewater Infrastructure of the Future (SWIFT) Accelerator for energy efficiency in wastewater treatment.

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U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

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Why Complete an Energy Assessment?

Older Existing System or No Previous Assessments?

Identify missed opportunities

Plan for capital improvements

Uncover what is possible

3rd party support for personnel's ideas

New or Recently Upgraded?

Always more to improve

Plan for future opportunities outside the scope of recent projects

New technologies and processes always in development

Identify opportunities for repairs or upgrades and associated funding!

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Apply for an Energy Assessment!

Step 1: Initial Application – Pre-Qualification

- Apply at www.smartenergy.illinois.edu/water
  - Be located in Illinois and be publicly-owned
  - Allow SEDAC/ISTC to visit site – remote visit is an option!
  - Be willing to share facility information
  - Share final assessment report with Illinois EPA

Step 2: Data Collection

- Facility information –Process flow diagram, types of processes, etc…
- 2 years of utility bills and MORs
- We're here to assist!

Step 3: Site Visit Scheduled

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Introduction

Inflow

It is the rapid inflow of rainwater into sewer systems though direct sources – open manholes, cleanout covers, cross-connections, etc.

It results in instantaneous increase in the flow rate to the WWTP.

Infiltration

It is leakage/seeping of the groundwater into the sewer pipes through holes, cracks, joint failures, root penetrations, etc.

It increases the average flow rate to WWTP over longer spans of time.

Historically, small amounts of I&I are tolerated, but excessive I&I can cause overflows or bypasses, or the cost to transport and treat exceeds the cost to eliminate it.

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Collection Systems

Collection systems can be damaged when they are forced to transport more flow than they are designed to handle. Exceeding the capacity of collection system can:

- Discharge untreated waste to the environment
- Erode supporting soil around mains
- Back-up into homes and businesses

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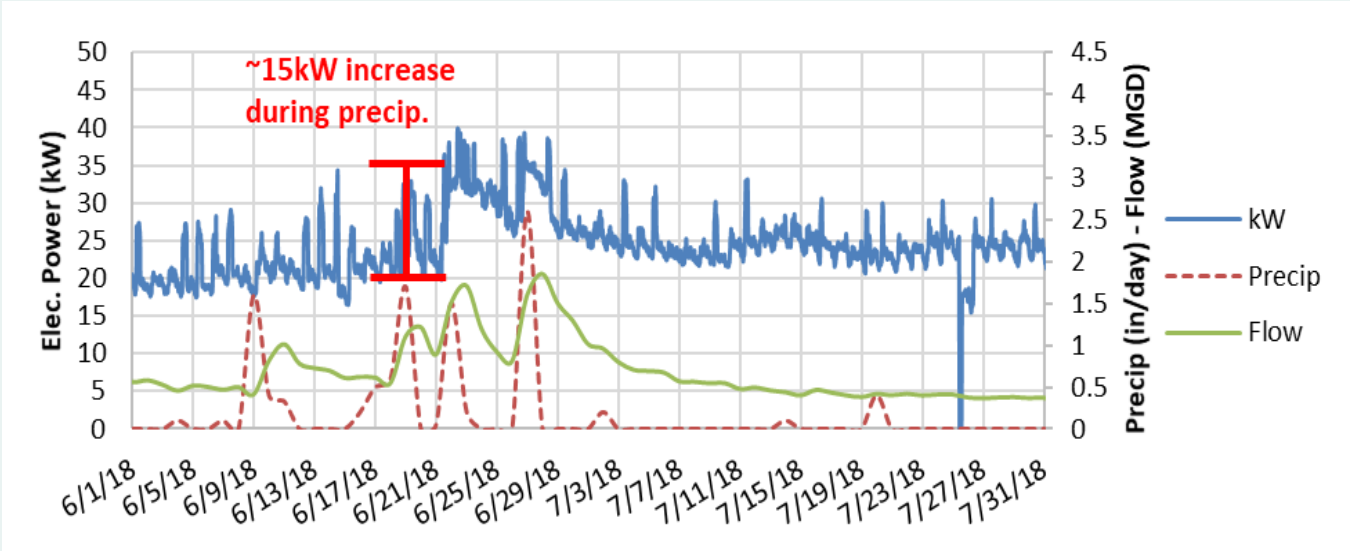
I&I in Treatment Plants

SEDAC estimates that I&I could be responsible for about 30-50% of the total flow entering wastewater treatment plants (WWTPs) in the state of Illinois.

It is estimated that in Illinois alone, $41 million to $68 million in energy cost is spent every year to transport treat I&I.

I&I also causes various other problems and issues in treatment plants and processes involved.



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I&I in Treatment Plants

I&I causes the following problems in the treatment plants:

- Oversizing of new plants to handle larger flows.
- Decreases plant operating efficiency during normal flows.
- Increases the pumping energy required.
- Can require construction of overflow treatment facilities

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I&I in Treatment Plants

I&I causes the following problems in the treatment plants:

- Decreases nutrient concentration.
- Changes the incoming dissolved oxygen (DO) content.
- Can upset plants by washing out microbes.
- Requires time and energy to restore plant operations.

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I&I and Energy

Quantifying how I&I impacts your plant's energy involves a few steps

- Step 1: Quantifying inflow and infiltration.
- Step 2: Estimating the energy used to treat each unit of flow (kWh/MG).
- Step 3: Calculating the total energy for each unit of I&I flow (kWH x MG of I&I)

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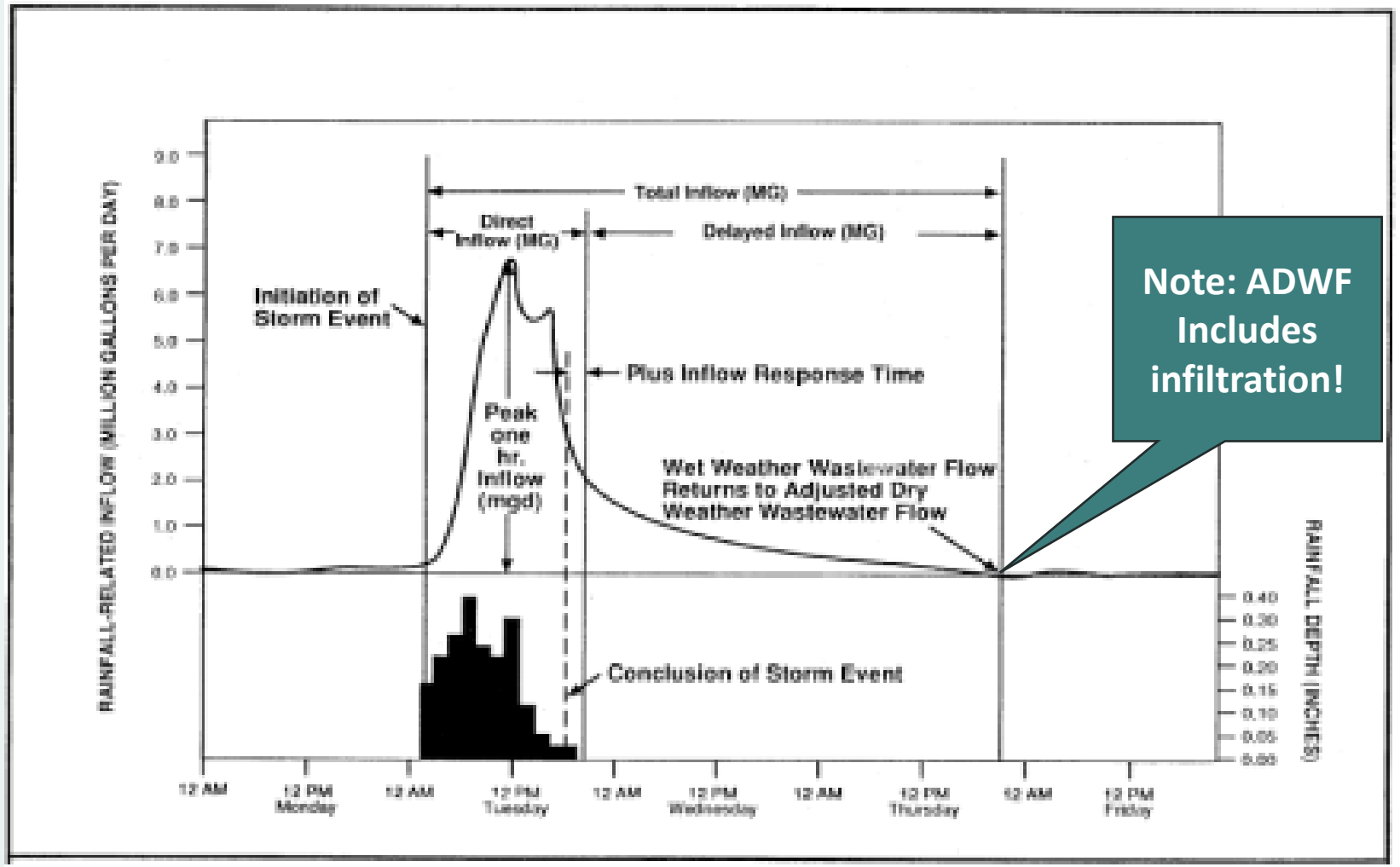
Step 1: Quantifying I&I



- Base Sanitary Flow: can be based on GPPD estimates or billed water use
- Groundwater Infiltration: ADW-BSF after snowmelt and ground thaw or measure ADW 0:00-6:00
- Inflow easier to estimate from hydrographs, like left.

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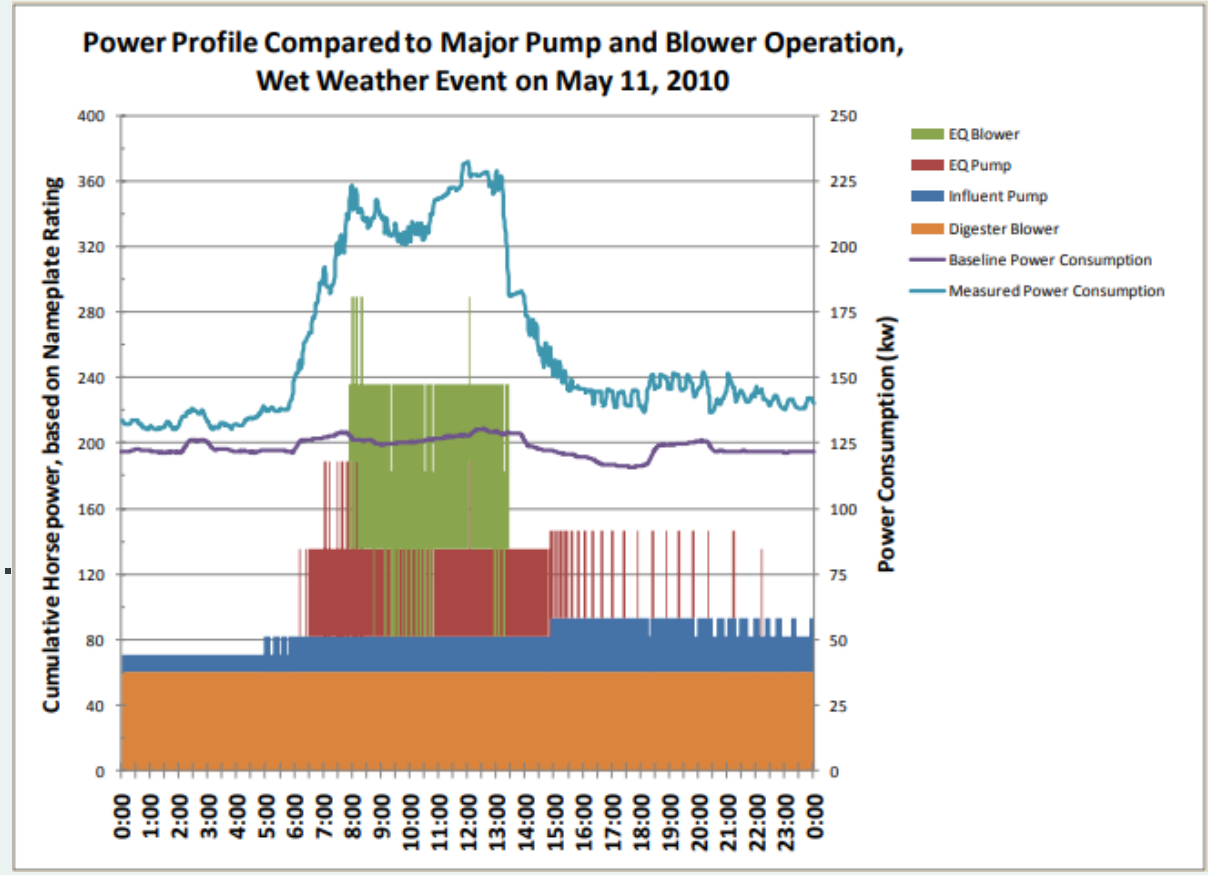
Step 2: Flow and Energy consumption

Total plant energy used during high and low flows provides some insight. Breaking out into components can provide deeper insight:

- Document pumping energy at various flows.
- Document aeration energy at various flows.
- Document energy use of excess flow facilities.

This will map out how I&I impacts energy consumption, and what effect I&I reduction will have in a specific facility.



Source: http://www.ohiowea.org/docs/Knowledge_Power_Energy_mgmt_Williams.pdf

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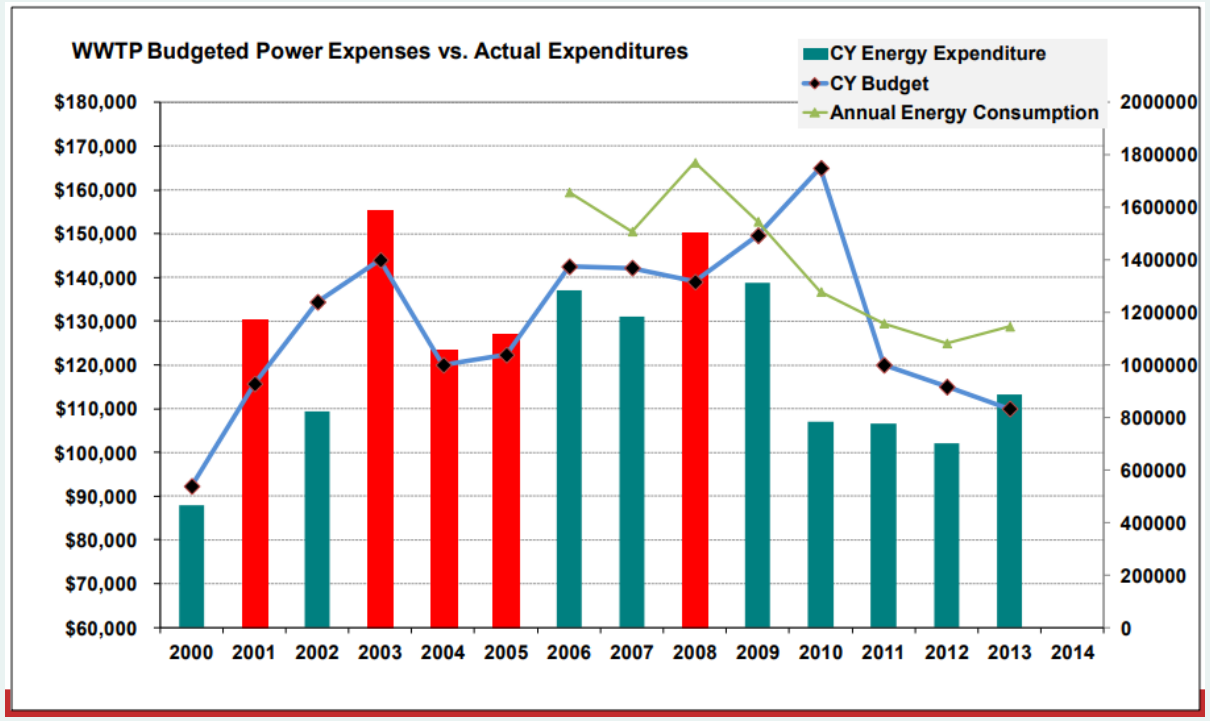
Step 3: Estimating Energy Costs

Understand rate structure and energy fees from your utility

Track energy costs and spending over time to gauge impacts.



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Step 3: Estimating Total I&I Costs

To estimate the entire cost burden caused by I&I on a facility, energy is a relatively minor factor.

Larger components include:

- Overflow fees and penalties (Consent Decrees)
- Clean-up fees and labor
- Additional labor at plant to adjust and monitor processes
- Emergency response to back-ups/overflows rather than planned/budgeted spending

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Session Speakers

- Cody Vande Wettering – Vice President, ECM – Infrastructure
- Dustin Schlachter – OBIC Products
- David Collard – Clark Dietz

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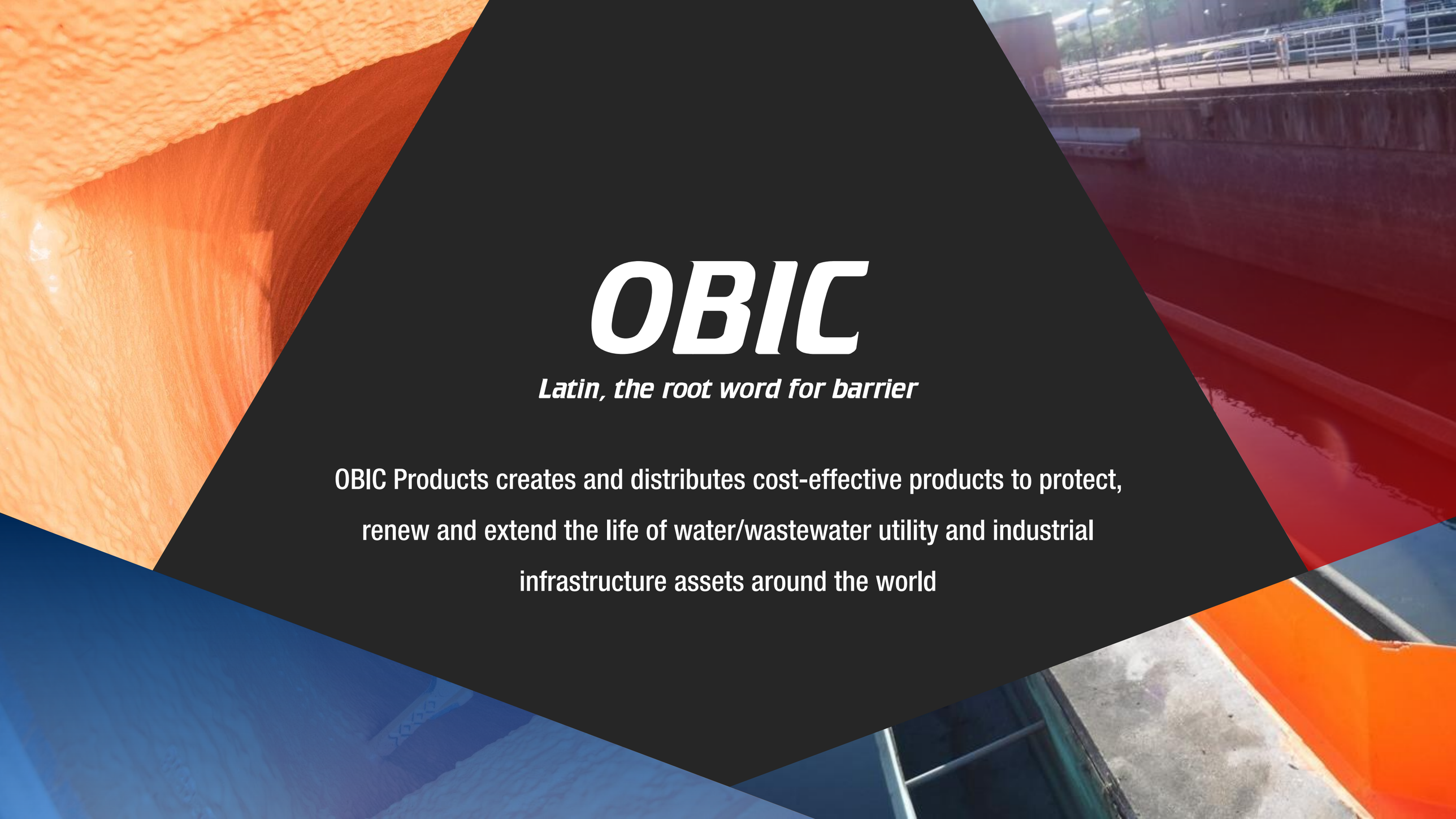
OBIC

SOLUTIONS FOR RESCUING, PROTECTING AND DEFENDING AMERICA's INFRASTRUCTURE

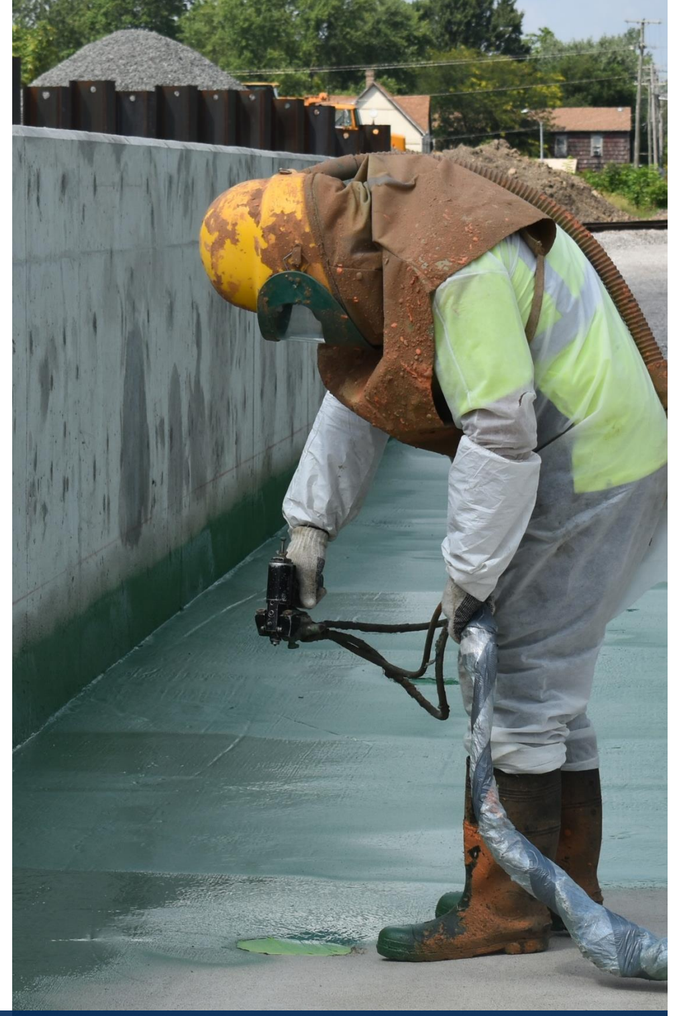
When it absolutely, positively must last.



OBIC

Latin, the root word for barrier

OBIC Products creates and distributes cost-effective products to protect, renew and extend the life of water/wastewater utility and industrial infrastructure assets around the world



OBIC saves you TIME and MONEY. OBIC has solutions that will allow you to maintain and extend the life of your current structure by 50+ years with minimal service interruptions or downtime.

What we do

Help Asset Owners Renew versus Replace Valuable infrastructure

Trenchless Technology Options

Long-term solutions that are less costly and disruptive and minimize down-time

Choices

Multiple products to meet diverse application requirements

NOT One-Size-Fits-All Approach

Expertise

Field proven and tested products applied by factory trained, certified installers

The Problem

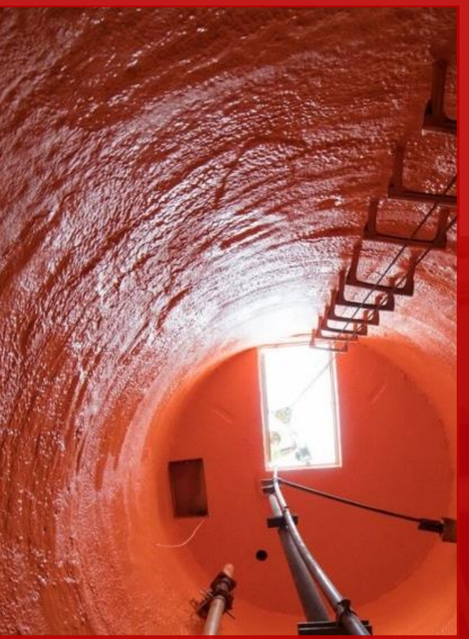
Common Infrastructure Deterioration Causes

- **Infiltration**
  - Leaks through precast joints
  - Cracks from shifting and expanding soil
  - Seismic activity
- **Fatigue**
  - Traffic loading
  - Groundwater loading
  - Temperature variation
- **Corrosion**
  - Sulfide rich effluents
  - Warm/humid environments
  - Long retention times

the good news…

The Solution

OBIC Polymer Coatings



Polyureas
Polyureathanes
Epoxies

Formulated to Fit

For structural renewal of wastewater, stormwater, potable and process water environments as well as civil infrastructure or architectural elements

Applied to Last

Treated structures can expect an extended life span of 50+ years and be restored to as “as new” appearance in most cases

OBIC Advantage

A Multi-Layer System

For Water and Wastewater Structures

Adhesion Layer of Polyurea

Polyurethane Foam

Barrier Layer of Polyurea

Why Multi-Layer?

Flexible (not susceptible to cracking)

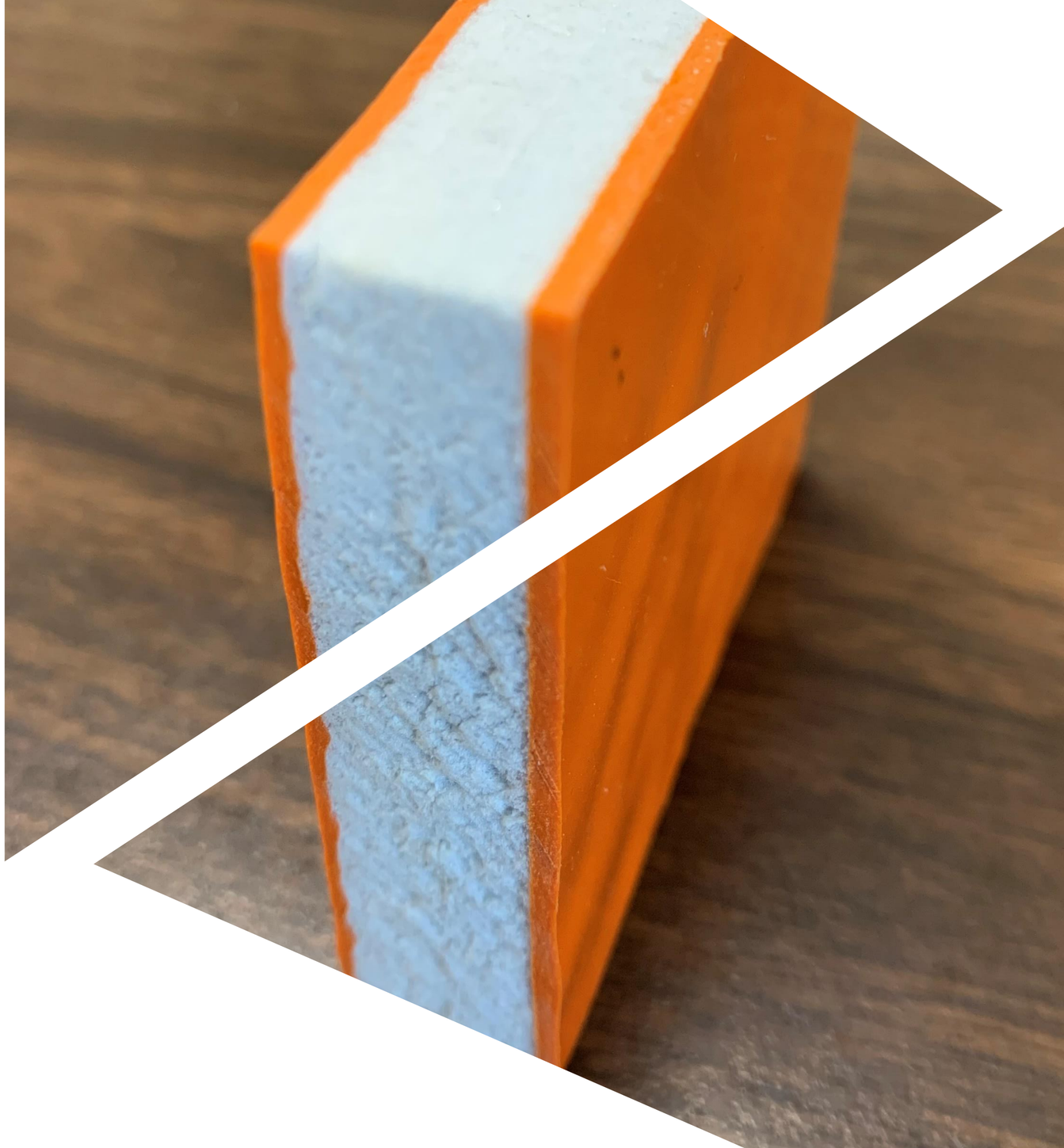
Exceptional Bonding Strength

Stops Infiltration

Prevents Corrosion

Fast Return To Service

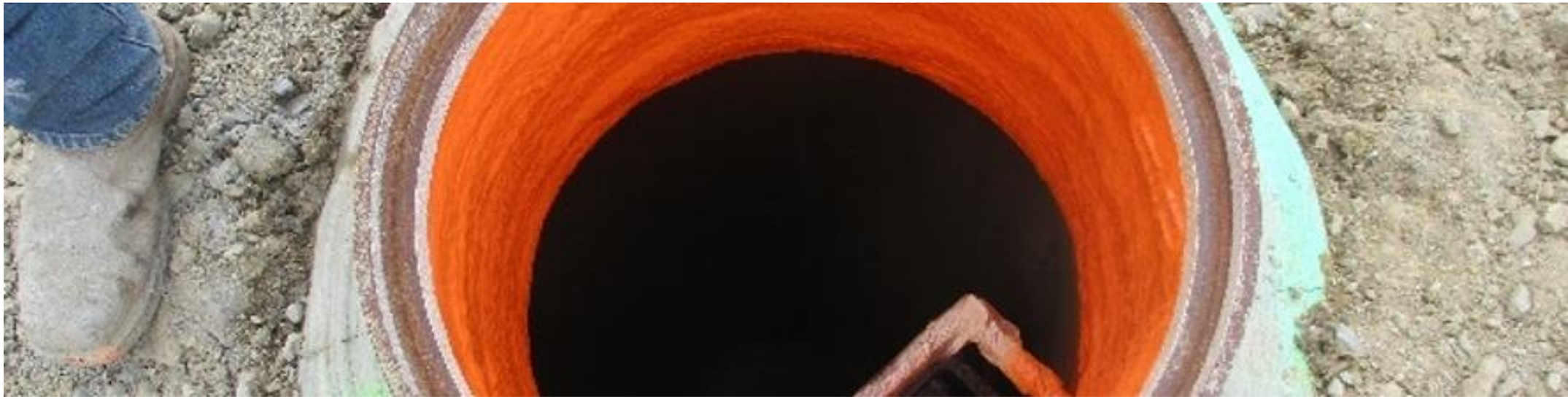
“Stress-Skin Panel” design



Installation Process

Six Steps to Structure Renewal Success

1. Structure Cleaning and Prep
2. Barrier Layer
3. Resurfacing Layer
4. Final Barrier Layer
5. Date Stamp
6. Return to Service



Cleaned and Prepared Manhole

First Adhesion Layer

Surfacing Layer

Final Barrier Layer and Completed Manhole

APPLICATIONS

For OBIC Products

the possibilities are endless

OBIC Advantages

- Competitive Price Point
- Retains Flexibility With Strength
- Superior Resistance To Gas Attack
- 10 Year Limited Warranty
- Quick Return To Service
- Does Not Require a Secondary Chimney Seal

Secondary Chimney Seal Not Required

Resists Cracking During Freeze/Thaw Cycles and Traffic Loading

OBIC

When it absolutely, positively must last.

Superior Resistance To Gas Attack

SWAT Testing

Marries Well With CIPP

When it absolutely, positively must last.

Allows For A Complete Seal

When it absolutely, positively must last.

Can Be Installed In Any Configuration

When it absolutely, positively must last.

8’ Diameter x 30’ Deep Wet Well

Several active leaks as well as leaks that have returned in areas where chemical grout was used.

When it absolutely, positively must last.

One of Several Active Leaks

Proper preparation is essential to a long lasting installation.
Larger structures are prepared using Ultra-High Pressure Water Blasting

When it absolutely, positively must last.

ZOBIC

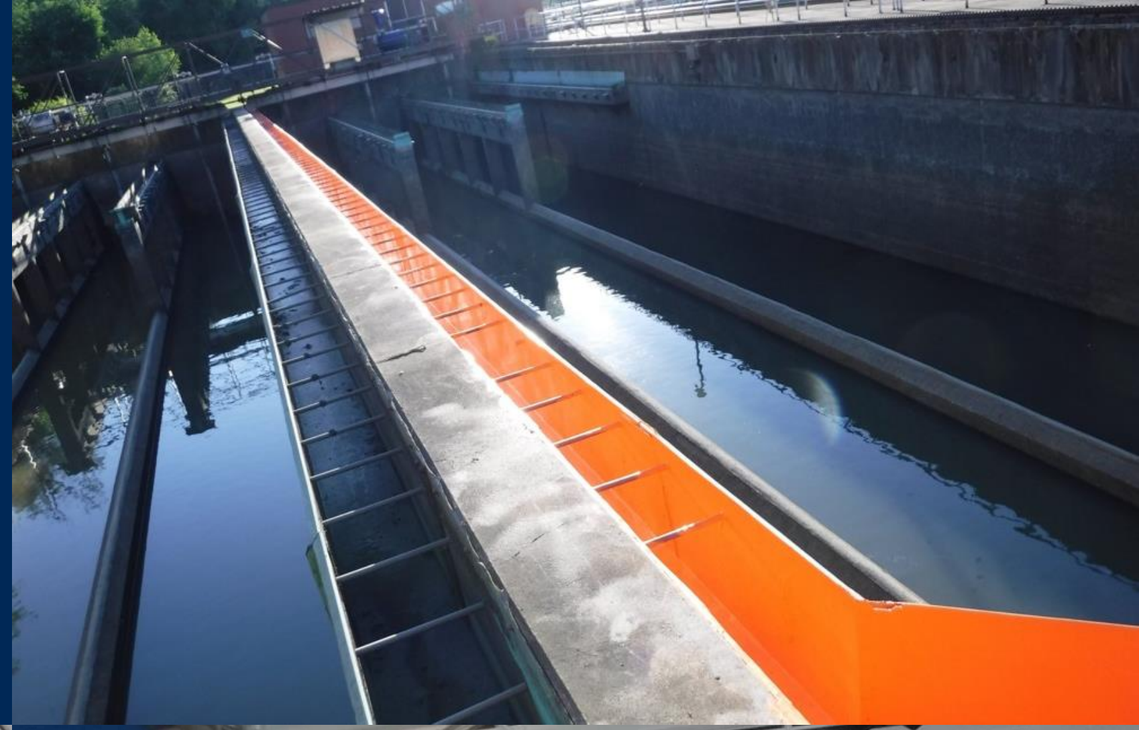
When it absolutely, positively must last.

The Bottom Line

1. The Wet Well has several leaks running 2 – 4 gallons per minute. If your average wastewater treatment cost is $1.75 per 1,000 gallons that adds up to **1.5 million gallons of ground water being treated in a year, costing $2,760.00.**
2. Saving the $2,760.00 per year pays off the $16,000.00 lining cost in just under 6 years. And, by reducing ground water at the plant it can provide more service to homes and business without expansion.
3. The corrosion was severe and the installation of the liner will extend its service life 50 years. Clearly a savings compared to the cost and disruption involved with replacing a wet well of this size.
4. The liner system has a 10 year warranty.

Projects

Wastewater, Stormwater, Potable Water



Projects

Industrial Applications

Why Choose OBIC

We are DRIVEN by the following principles

D	R	I	V	E	N
Dedication	Respect	Integrity	Vision	Excellence	Nobility

We are more than a technology provider. We want to be your partner in rehabilitating and rescuing your aging infrastructure, protecting it for the long-term and defending it against costly failures.

- Repair infrastructure for less
- Minimal community or business disruption
- Quick return to service
- Proven long-term solution
- Favorable ROI

OBIC

Thank You for Sharing Your Time With Us

Continue the Dialogue and Explore the Possibilities

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