# HOW UV CIPP Works

By **Jeff Griffin**, Senior Editor


## Manufacturers of cured-in-place-pipe (CIPP) liners cured by ultraviolet light are enthusiastic about prospects of growth for this method of pipe rehabilitation.

Reline America Inc. is the exclusive North American manufacturer of Alphaliner ultra-violet glass reinforced, cured-in-place pipe (UV CIPP). Alphaliner is available for non-pressurized applications in pipe diameters from six to 54 inches. In addition, Reline America manufactures a state-of-the-art UV-light installation equipment system specific to Alphaliner. Previously Alphaliner was known as Blue-Tek.

Saertex multiCom has been manufacturing and supplying worldwide, UV-cure GRP (glass reinforced pipe) CIPP (cured-in-place-pipe) liners since 1996 and offers non-pressure, M & S+, pressure, S+ premium and potable water, S+XR liners, the equipment for installation and on-going training and support to contractors and utility providers.

### Reline America

Reline America has been providing UV-cured resin liners and equipment since 2007, one of the few in the market at that time, said Mike Burkhard, president. The tailor-made package of Alphaliner and installation equipment is sold directly to the contractors and utilities whose crews have completed Reline America's comprehensive installation training and certification program.

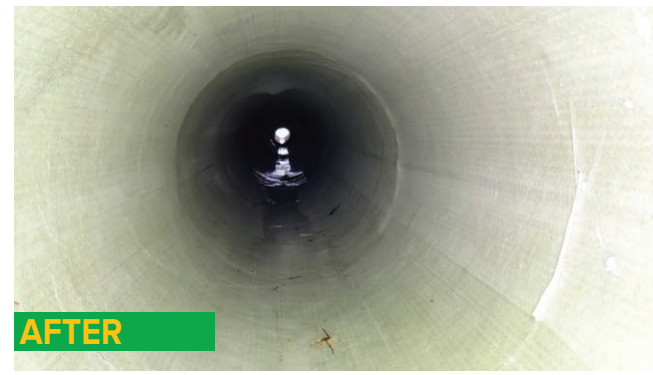
"Currently we are the only company that makes both UV-cure liner and the equipment to install it," said Burkhard.

Demand for UV CIPP is steadily increasing, he added. "When we first started offering UV CIPP, we sometimes had trouble getting our foot in the door. We would get some projects, others we wouldn't. There was a lot of education necessary to understand the benefits of UV CIPP compared to traditional CIPP.

"Now we are finding some cities have established a 'UV-only' policy for CIPP installations."

Burkhard noted that in Europe, UV CIPP gained approximately 80 percent of the market over a period of 10 to 15 years.

Equipment necessary to install UV CIPP includes: a blower truck to inflate the liner to the prescribed pressure, constant-tension winch, cure


truck, UV light train and CCTV truck.

The UV CIPP process, differences and benefits of each method are summarized by Allen Orr, Reline America field support manager.

## First steps

The first step in making a conventional CIPP installation and one using UV-cured liner are the same: liner is inserted into a segment of old pipe. Conventional liner is either inverted or pulled into place, but UV CIPP always is pulled into the old pipe. For pipes 54 inches in diameter and larger, a conveyor is needed to handle the pipe. A limitation to UV CIPP is that it can't accommodate bends as sharp as felt liners.

"However," Orr said, "pulling in the liner actually is faster than inversion, and it is possible to accurately estimate the time it will take to place the liner in the pipe. With inversions, it's more of a guessing game about the time it will take. All thermoset resin emulsifies in the presence of water during cure, so if groundwater is present, Reline America attaches a pre-liner to the UV liner during manufacturing. Traditional CIPP needs to add a pre-liner during installation to protect the liner from water emulsification and liner damage."

With the liner inflated and brought to specified pressure, the light train is pulled toward the blower truck to inspect the uncured liner. Then the UV light is activated and pulled back toward the cure truck at a prescribed speed, typically about 5½ feet per minute.

"The speed depends on the diameter of the pipe and wall thickness," said Orr. "Three hundred feet takes about one hour to cure. We have a quality tracking system that monitors every inch of pipe. The UV light-curing process is a balance of the light's intensity, wavelength and time of exposure. The curing speed of the Reline America UV CIPP is guided by our thorough knowledge of the particular tube's lighting exposure needs as indicated on our curing chart. We provide the installer with the ability to access this knowledge base through our automated protocol control system built into our installation equipment control log.

"The full protocol for time, temperature, rate of travel of the light assembly and amount of lamps in operation is automatically maintained as documentation for the correct curing of the CIPP liner.

"When curing is finished, there is a printed cure log of each inch of pipe. With felt, the only data recorded are up and downstream temperatures."

## Dulles International Airport project

When Airport Design Consultants Inc. (ADCI) was searching for the best option to solve problems with Dulles International Airport's glycol collection system which captures liquids used for deicing aircraft, the solution was Reline America's Alphaliner.

The work site was an airport taxiway, so the lining product had to be strong enough to handle aircraft loads. The CIPP liner also had to withstand the effects of ethylene or propylene glycol.

Certified installer Pleasants Construction installed three 12-inch diameter pipe runs of more than 1,200 feet. Ray Mizener, P.E., ADCI resident engineer, said the project was the first at the airport to use UV CIPP.

"UV technology was a much smoother and less invasive process than other CIPP methods we have used," said Mizener. "We were able to put utilities back in service and restore airport service much quicker. Environmentally, we did not have to worry with recapturing water or steam – a huge ordeal in an airport setting because the tanker trucks have to exit through active taxiways to dump.

"We will be utilizing this technology on a lot of future projects."

## Saertex multiCom

UV light-cured CIPP liners are widely used throughout Europe, but relatively new to the United States, said Saertex Vice President Mark R. Hallett.

"By the early 1990s throughout Europe the majority of liners being installed were CIPP felt cured by hot water or steam," Hallett said. "UV liners had a very small part of the market. That began to change in 1996 when the use of UV liners started to outgrow felt liners in Germany. Now 70 percent of all liners are installed in Germany."

In 2007, Saertex began selling UV liners in the United States, 17 years after Europe began using them. Hallett said acceptance here has been overwhelming and is growing exponentially.

"We are now providing liners throughout North America as well as South America," he said. "It is clear the U.S. market and beyond is following the same path as Europe."

Typically the UV CIPP equipment footprint is small, said Hallett. A truck or trailer mounted UV unit carries the UV curing equipment, generator and blower. The complete Saertex curing unit is very compact, contained in a 22-foot box truck. Depending on the weight of the liner, a three to 10-ton winch is used to pull the liner into place.

Installation of UV CIPP is relatively straightforward. "UV liners do not need refrigeration so it can be delivered directly to the job site in advance," Hallett said. "Liner is pulled into the existing host pipe with a winch. Once in place, 'cans' or 'packers' are attached to liner ends with ratchet straps to allow its inflation. Once inflated, air is kept flowing through the liner to keep it inflated in order to pull the light train inside the liner. When the light train is in place the liner is slowly inflated to a predetermined operating pressure, resulting in a tight fit against the host pipe. Then the light train is pulled through the liner, inspecting it as it goes."

Unique to this technology, the light train has an integrated camera. "The inspection ensures the liner is fitting properly," Hallett said. "If not, adjustments can be made before any curing takes place. This process is key to achieving a properly installed liner.

"When the light train reaches the other end of the liner and a proper fit is confirmed, the operator ignites the lights on the light train. When all the lights are confirmed to be on, the light train is pulled back at a predetermined speed

for that diameter liner and the curing process is started."

As an example, Hallett said a 300-foot-long, eight-inch diameter liner generally takes one hour to cure. While the curing process is going on, the operator can inspect the liner as it cures via the same integral light train camera. Curing complete, the light train is removed and liner ends are trimmed. The post inspection then can take place, or lateral reinstatement can begin immediately.

Comparing the UV CIPP lining process to conventional felt liner installation, Hallett said:

- UV liners are three to five times stronger than conventional felt CIPP liners;
- Saertex multiCom can manufacture UV cure liners for pressure applications;
- Because of its greater strength, UV liner can be designed much thinner than that of felt CIPP liners;
- UV technology has a smaller equipment/carbon footprint;
- UV equipment burns less fuel–8 to 10 gallons per day, compared with 50 to 100 gallons per day for conventional CIPP equipment;
- The UV process is environmentally friendly due to its construction and "dry" curing process;
- Felt liners must be kept cooled until installation and have an approximate three-week shelf life while UV liners have a six-month shelf life and can be stored so it is available for immediate or emergency use;
- When UV liner is installed, air pressure, curing speed, video inspection, light function, ambient and liner wall temperatures and length of liner are monitored and recorded during the entire process. Felt lacks the capability of such complete documentation; and
- Current limitations of using the Saertex UV liner are 1,150 feet is the longest length that that liner can be cured and 62 inches is the largest diameter for UV liner.

## Culvert rehabilitation project

The New York Department of Environmental Conservation needed to rehabilitate 54 culverts, ranging in diameter from 21 to 36 inches in a highly environmentally sensitive area on White Face Mountain in Lake Placid, NY.

Hallett said due to the sensitive eco system, the department would not allow CIPP hot water or steam cure liners to be used. Added concerns were preservation of a road which is listed on New York's Registry of Historic Places plus it is located in the National Forest area. The project was complicated further to protect hand laid stone walls, limit working space in a rock catch basin carved out the mountain decades earlier, and steep pipe grades with elevation changes of up to 60 feet.

Precision Industrial Maintenance was contracted to install the environmentally friendly UV cure Saertex-Liner.

"The small equipment footprint utilized by the UV curing technology was a benefit in keeping the mountain road, a tourist attraction open to the public," Hallett said. "Due to the short construction season, the project was started mid-June and completed by the end of August.

**FOR MORE INFORMATION:**

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