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TANK FARM: Rewriting the Polyurea Rules

BY JENNIFER FRAKES

PHOTOS COURTESY OF SPI

For years, one of the most steadfast rules in the protective coating and lining industry was that applicators shouldn't coat over existing polyurea after the "recoat window." Achieving proper adhesion between the old and new liner typically involved a manually intensive process and increased overall project cost. Specialty Products, Inc. (SPI) has thrown that rule out the window with the Ultra Bond-100 product, making what was once virtually impossible a reality.

Ultra Bond-100 is a high tensile, high elongation, fast-set elastomer that has the unique advantage of adhering to many organic substrates (plastics, rubber, wood, etc.) both new and old. "There are no other coatings that can tie in to another polyurea. This is unique and is completely new protective coating technology," says Dan Helton, president of SPI.

According to Helton, Mike Cork, director of research and development at SPI and the inventor of Ultra Bond-100, created a polyurea that will stick to most organic coatings, even competitor's products. In addition, Ultra Bond-100 will adhere to nearly all substrates, with the exception of those with very low surface "Dyne" energy, such as Polytetrafluoroethylene (PTFE), olefins, or silicone. In fact, Cork uses the term "the duct tape molecule" when describing the chemical make-up of Ultra Bond-100. "Ultra Bond-100's adhesion characteristic is very similar to how duct tape works. Just like duct tape, this advanced polyurea gains adhesion strength over a period of time," says Cork.

Secondary containment for fuel tank farms is mandatory. Often polyurea is spray-applied over a geo-textile fabric to create above-ground secondary containment systems.

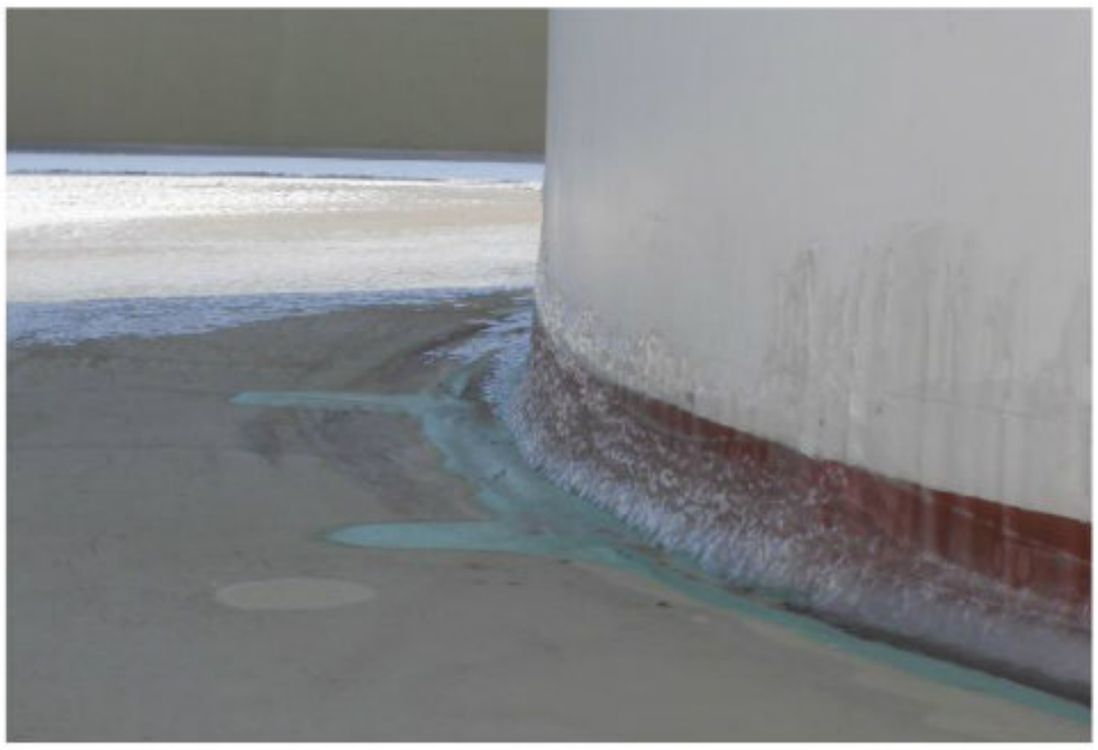
IT'S ALL IN THE CHEMISTRY

How is it possible for Ultra Bond-100 to have such tenacious adhesion properties? According to Cork, its unique cross-linking structure allows for the chemical reaction to continue after the primary polymer has depleted itself. "As a result, the material will continue to develop additional bonds with the substrate over time. In 24 hours after application, the bond will be greater; after 30 days, even after 90 days, it is still increasing bond strength," says Cork.

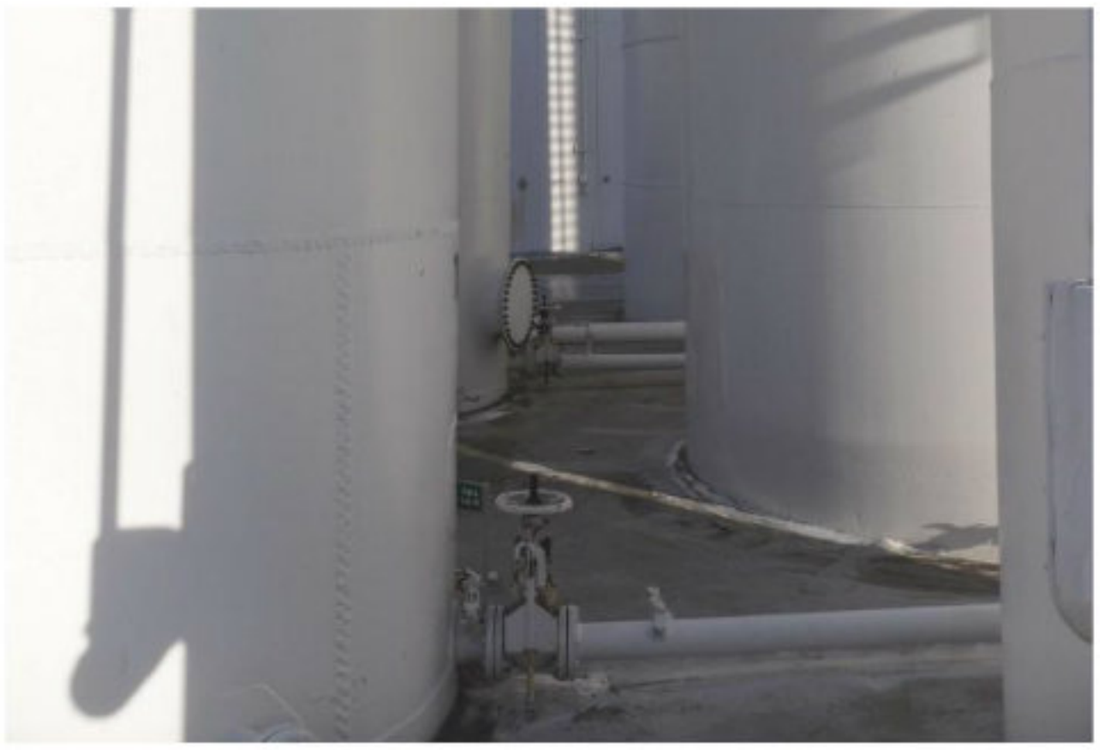
With its unique chemical make-up, Ultra Bond-100 fills a large void in the marketplace, allowing for the comprehensive repair of existing polyurea coating and lining systems. Helton states, "It is an exceptional retrofit product."

This new technology has huge implications not only for recoating over an old coating system, but also for repairs or tie-ins for ongoing projects. Most polyureas have a 12- to 24-hour recoat window, and once an application is beyond that window, extensive surface preparation must be undertaken, often including abrading. Primer must also be applied before polyurea application can resume. "Without Ultra Bond-100, if you miss the application window, you have to do it all over again," says Helton.

On large jobs, where it isn't feasible to finish all work within the recoat window, Ultra-Bond 100 can save a great deal of time and money. Because Ultra Bond-100 sticks to itself, the applicator can simply come back the next day and start spraying where he/she left off!



ABOVE ▲ At a tank farm in Alaska polyurea over geotextile had served well as secondary containment for 17 years, but eventually the harsh environment took a toll on the liners. "With the wind uplift and the salt water environment, the seams in the liners were starting to tear and delaminate," says Morrow.



ABOVE ▲ Typically there is only one option when containment fails: Tear out the old liner and install a new one. This process is time-consuming, costly, and risky. "What happens if you have a spill while the liner is being torn out?" asks Morrow.

In addition, Ultra Bond-100 is 100 percent solids with no solvents or volatile organic compounds (VOCs); it exhibits good chemical resistance, allows for a fast return to service, and can be applied in surface temperatures ranging from below 0°F to 150°F (18°C to 66°C). This advanced elastomeric polymer can be applied with traditional polyurea equipment. However, unlike other polyureas, Ultra Bond-100 does not require labor-intensive surface preparation or primer application – a clean, dry surface that is free of oils and debris is all that is required.

In addition, Ultra Bond-100 can also adhere to many inorganic substrates with the use of SPI's AE-4 adhesion enhancer additive. These substrates include many ferrous and non-ferrous metals, cementitious surfaces, and silicas, such as concrete and glass. The AE-4 admixture helps to form a chemical bond to a properly prepared substrate and eliminates time-consuming surface preparation.

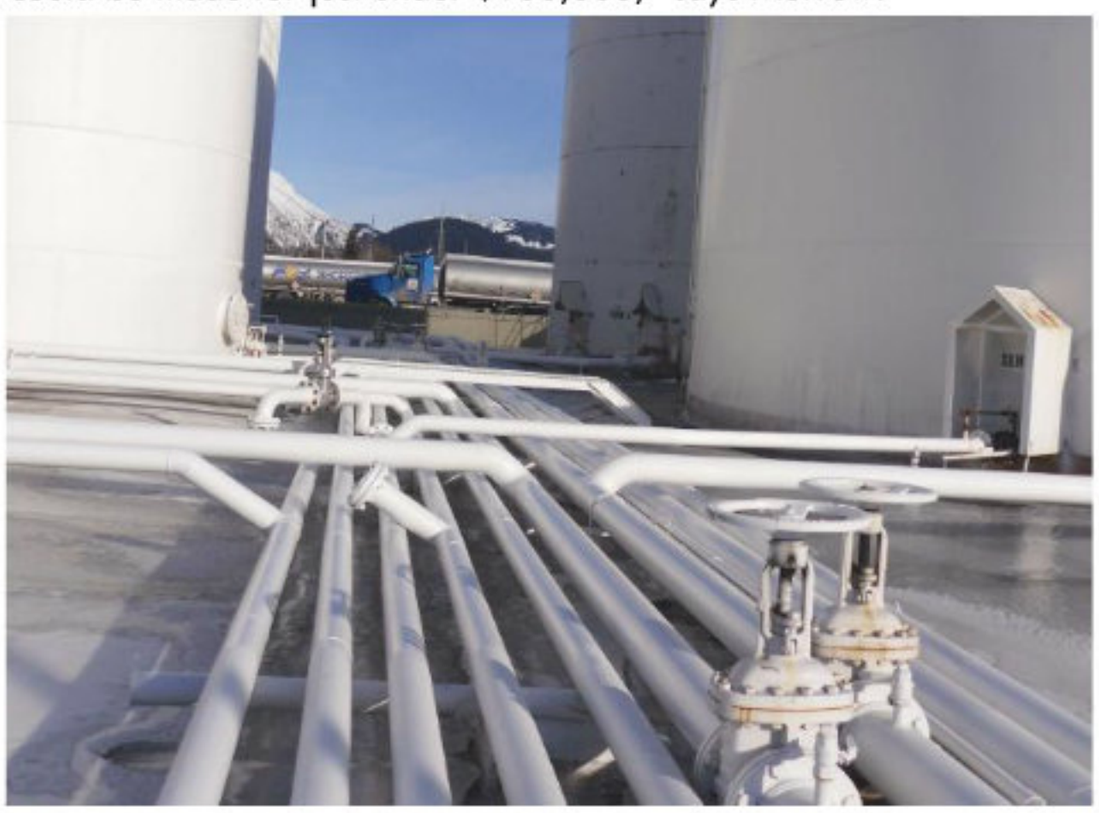
"I DON'T MAKE THE RULES; I JUST LIVE BY THEM"

One applicator, who is ecstatic about this revolutionary product, is Ron Morrow, owner of Linings Unlimited, located in Anchorage, Alaska. Morrow is an accomplished applicator with approximately 20 years of experience with polyurea coatings and liners.

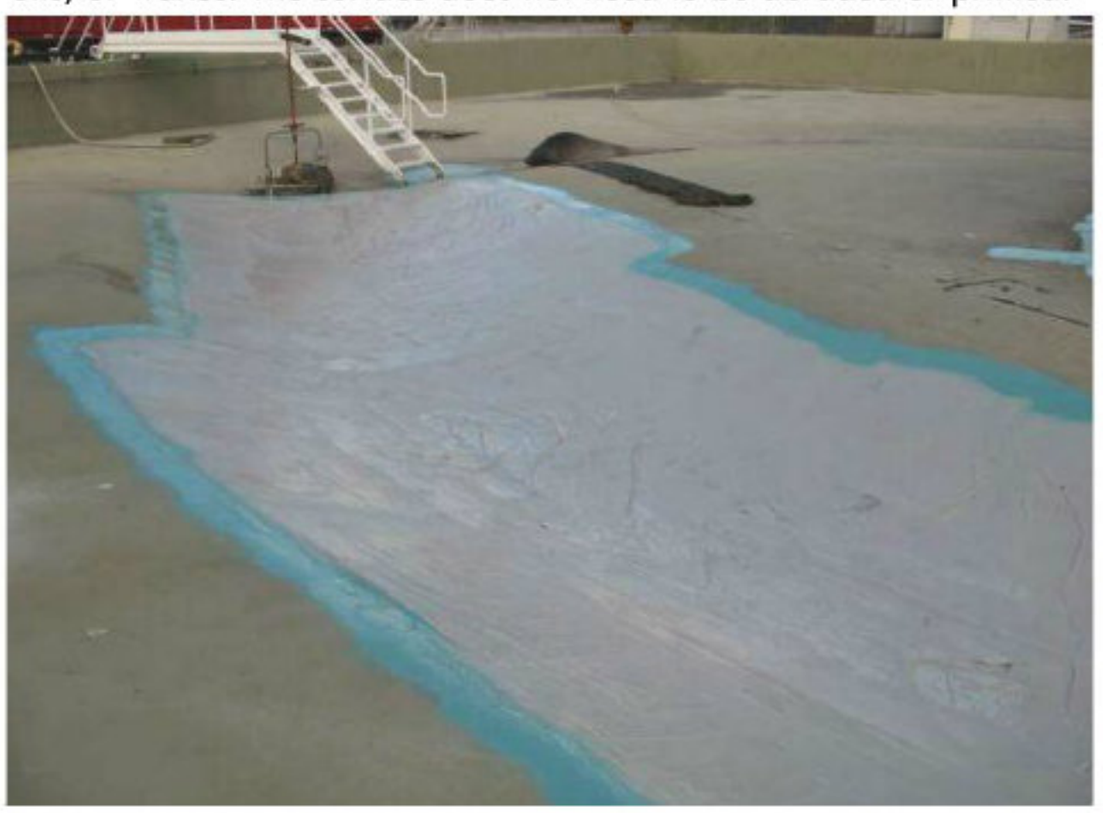
Where applying polyurea was concerned, he had a great deal of frustration with the rules. "I'm in the application business, not the coating removal business, and to apply a new coating to existing polyurea, we would have to completely remove the old lining system with a chisel and hammer," says Morrow.

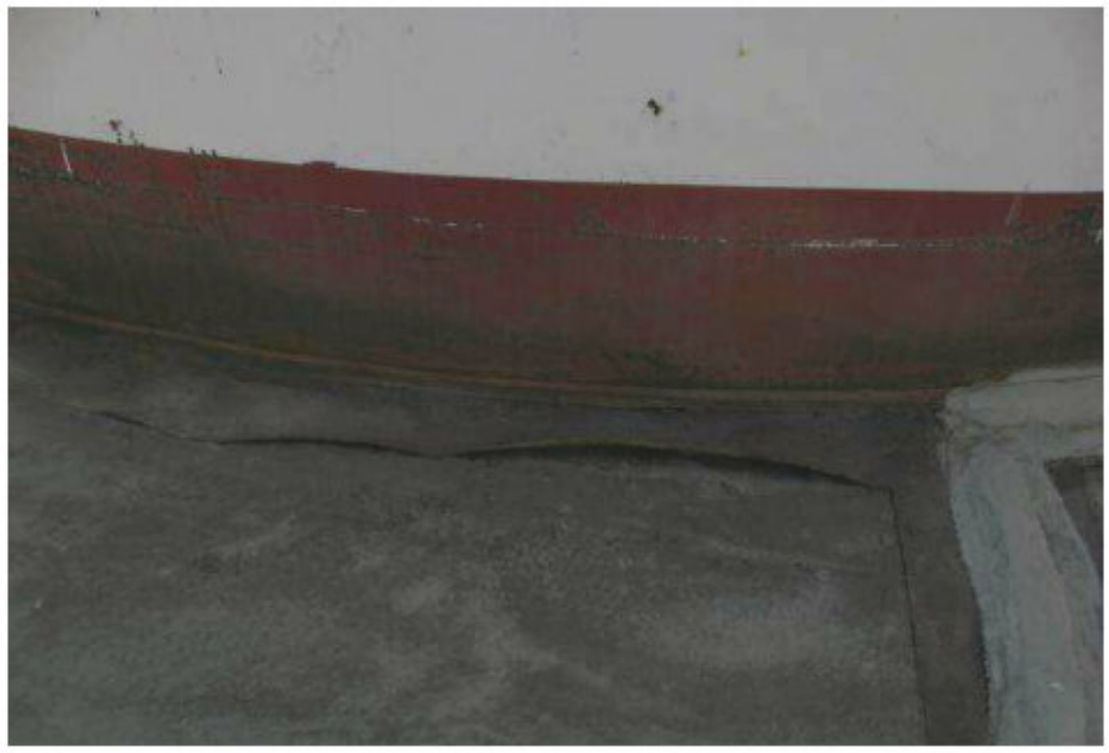
The removal of an existing coating or lining system can be a painstaking process, costing owners a great deal of time and money. In today's challenging times, very few organizations have much of either to spare. Now with Ultra Bond 100, there is another option.

BELOW ▼ "For just one of the tank farms, it would cost about $450,000 to install a new lining system, plus an additional $200,000 for the removal of the old system. With Ultra Bond-100, the repairs could be made for just under $100,000," says Morrow.



BELOW ▼ First areas are masked off, and the surface is cleaned – all debris is swept away, and the area is washed to remove any dirt, oils, or waxes. The surface does not need to be abraded or primed.





ABOVE ▲On average, Morrow and crew apply 60,000 sq. ft. (5,574.18m²) of Ultra Bond-100 using standard polyurea equipment (Gusmer 20/35 Pro). "Depending on the weather conditions, we shoot from 5,000 to 7,000 square feet (464.52m²-650.32m²) a day," he says.

FUEL TANK FARMS AND ULTRA BOND-100: A PERFECT MATCH

Ultra Bond-100 spent 2 to 3 years in research and development and the last 3 to 4 years in field testing. The best example of how Ultra Bond-100 completely changes the rules of polyurea application in the protective coating industry involves Morrow and the remediation of fuel tank farms in Alaska. Approximately 17 years ago, one of SPI's polyurea products, Polyshield SS-100, was used in conjunction with geotextile fabric to create above-ground secondary containments for dozens of fuel tank farms along the coast of Alaska. The Polyshield SS-100 performed very well for more than 15 years, but eventually everyday wear and tear, plus the harsh Alaska weather cycle, took a toll on the liners. "With the wind uplift and the salt water environment, the seams in the liners were starting to tear and delaminate," says Morrow.

After walking around one of the tank farms, Morrow knew that something needed to be done. Before Ultra Bond-100, there would have been only one option: Tear out the old liner and install a new one. This process is time-consuming, costly, and presents a great deal of risk. "What happens if you have a spill while the liner is being torn out?" asks Morrow. "Then you've got an even bigger problem on your hands."

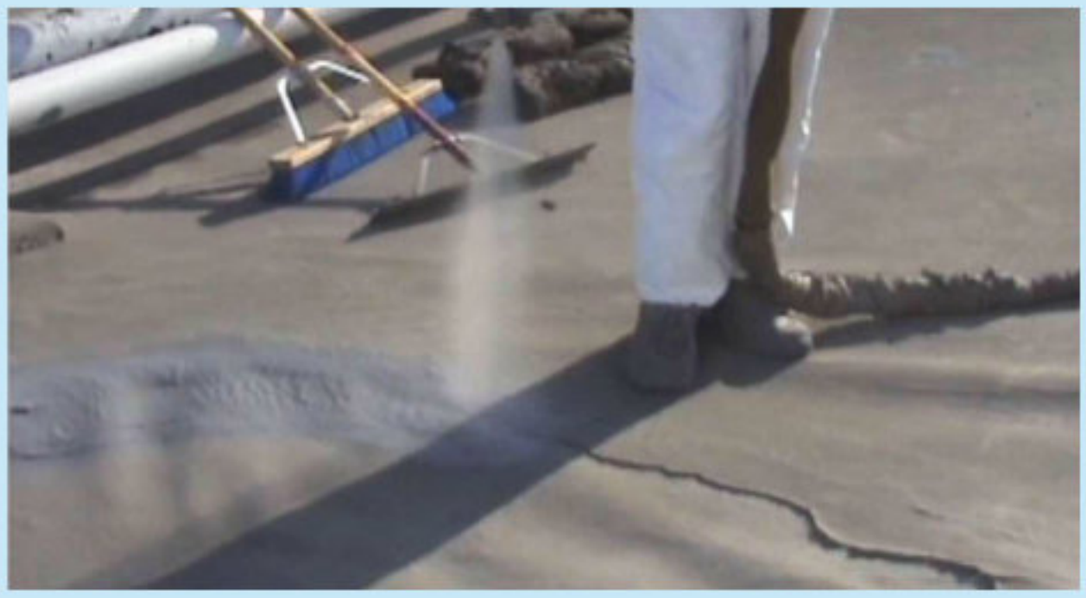
According to Morrow, Petro Marine, the owner of the tank farms, asked his advice. Morrow presented Ultra Bond-100 as the remediation technology. "For just one of the tank farms, it would cost about $450,000 to install a new lining system, plus an additional $200,000 for the removal of the old system. With Ultra Bond-100, the repairs could be made for just under $100,000. With the application of Ultra Bond-100, I anticipate 15 to 18 years of service will be added to the existing lining system," says Morrow.

Needless to say, the owner gave Morrow and his crew the green light.

APPLYING THE NEW RULES

Although Ultra Bond-100 is not your run-of-the-mill polyurea, its application is fairly standard. When Morrow and his crew arrive

JOB AT A GLANCE



PROJECT:

Apply ultra-high-strength polyurea to secondary containment at Alaska tank farm

COATINGS CONTRACTOR:

Linings Unlimited
7645 King Street, Unit B
Anchorage, AK 99518
(907) 561-1869
www.liningsunlimited.com

PRIME CLIENT:

Petro Marine

SUBSTRATE:

Geotextile fabric

SUBSTRATE CONDITION:

The geotextile had tears and delaminations

SIZE:

Varied, typical tank farm has 8-9 tanks

DURATION:

Ongoing

UNUSUAL FACTORS:

- Tight time-frame due to harsh Alaskan weather
- Unique polyurea coating can coat over existing coatings—including polyurea coating
- Unique coating not constrained by 12-hour recoat window so can easily tie in to previous day's work

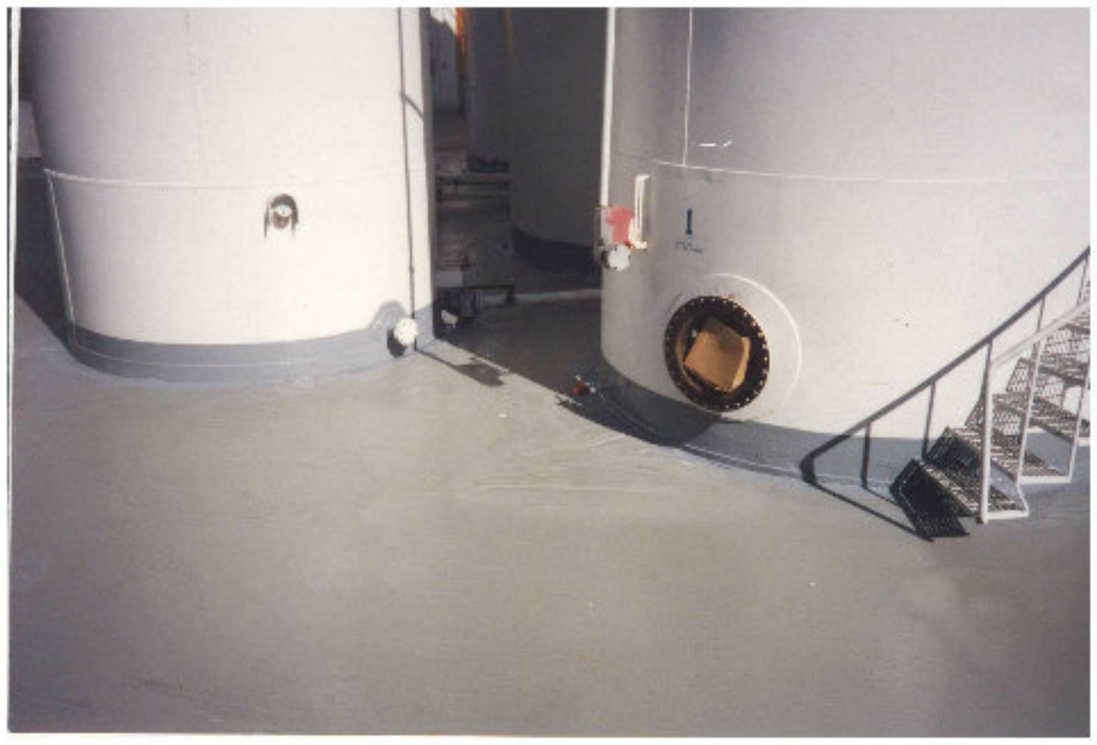
MATERIALS/PROCESS:

- Power wash surface to remove debris—dirt, oils, or wax
- Using Gusmer 20/35 Pro, spray-apply the Ultra Bond-100 directly onto the geotextile at a rate of 100 sq. ft. (9.29m²) at 16 mils (0.41mm) /gal DFT

SAFETY CONSIDERATIONS:

Crew wears Tyvek suits, cartridge respirator masks, safety glasses, steel-toe boots, and rubber gloves

ABOVE ▲ A shortcut on application does not lead to a shortcut on safety. Morrow and his crew follow all necessary safety precautions, using respirators, safety glasses, Tyvek suits, and appropriate footwear.



ABOVE ▲ The duct tape molecule: "Ultra Bond-100's adhesion characteristic is very similar to how duct tape works. Just like duct tape, this advanced polyurea gains adhesion strength over a period of time," says Cork.

at one of the tank farms, the first order of business is prep work. Areas are masked off, and the surface is cleaned – all debris is swept away, and the area is washed to remove any dirt, oils, or waxes. The biggest difference in this part of the process is that when using Ultra Bond-100, the surface does not need to be abraded or primed. The elimination of these two steps saves countless hours and dollars for the owner.

According to Morrow, the size and layout of the tank farms vary, but typically a tank farm has 8 to 9 tanks. Some are wide open with lots of space between the tanks, and others are more tightly configured. On average, he and his crew apply 60,000 square feet (5,574.18m^2) of Ultra Bond-100 using standard polyurea equipment (Gusmer 20/35 Pro). "Depending on the weather conditions, we shoot from 5,000 to 7,000 square feet (464.52m^2-650.32m^2) a day," says Morrow.

Because Ultra Bond-100 is not constrained by the 12-hour recoat window, Morrow can tie in to the previous day's work with ease.

While applying the lining system, Morrow and his crew follow all necessary safety precautions, using respirators, safety glasses, Tyvek suits, and appropriate footwear. It is important to note that while the Ultra Bond-100 technology eliminates several steps in the application process, there are no shortcuts when it comes to safety, regardless of the product or process.

MEETING A MARKETPLACE DEMAND

"There has always been a need for a polyurea that can adhere to organic coatings," says Helton. "Thanks to Mike Cork, SPI can now fill that need with Ultra Bond-100."

Ultra Bond-100 can be applied anywhere there is a need for remediation of an existing organic coating, such as in the oil and gas industry or the wastewater and water industry. The invention of Ultra Bond-100 can effectively change the way owners think about the service life of their existing polyurea coating and lining systems. Affordable and reliable, long-term rehabilitation of existing systems is now possible. With the application of Ultra Bond-100, the service life of an asset can be extended 15 plus years.

For applicators, the creation of Ultra Bond-100 eliminates some of the biggest frustrations in the application process. It allows for Morrow and others like him to do what they do best – spray polyurea. Less time is spent on prep work, and tying in to the previous day's work is no longer a frustrating and labor-intensive endeavor.

Ultra Bond-100 is not the only exciting new technology Specialty Products is offering in the protective coating industry. The LPG is a lightweight and portable machine that is capable of applying Synergy Series polyurea in the tightest of quarters. This polyurea equipment utilizes low pressure and low heat. According to Helton, the LPG can apply material at close to room temperature and uses less power than a hair dryer. Together, the Ultra Bond-III Synergy polyurea and the LPG technologies make jobs that were virtually impossible only a few years ago a reality. CP

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CONTAINING OIL CONTAINERS

By Jen Kramer

Given the pristine Alaskan location of the oil tank farm featured in the accompanying case history, it is no surprise that the use of secondary containment systems is mandated and that those systems are heavily regulated by the federal government.

As part of their larger Oil Pollution Regulation, the Environmental Protection Agency (EPA) has instituted a Spill Prevention Control and Countermeasure (SPCC) rule that outlines specific requirements for facilities to prevent, prepare for, and respond to oil spills.

The Secondary Containment Clause

The regulations are intense—often requiring extensive and frequent inspections, written reports, and certifications. And, in the case of secondary containment at oil and gas facilities, these rules are based primarily on the general secondary containment provision, §112.7(c). According to the EPA (http://www.epa.gov/oem/docs/oil/spcc), the clause states that facilities will:

"Provide appropriate containment and/or diversionary structures or equipment to prevent a discharge as described in §112.1(b). The entire containment system, including walls and floor, must be capable of containing oil and must be constructed so that any discharge from a primary containment system, such as a tank or pipe, will not escape the containment system before cleanup occurs. At a minimum, you must use one of the following prevention systems or its equivalent:

1) For onshore facilities:
   - i) Dykes, berms, or retaining walls sufficiently impervious to contain oil;
   - ii) Curbing;
   - iii) Culverting, gutters, or other drainage systems;
   - iv) Weirs, booms, or other barriers;
   - v) Spill diversion ponds;
   - vi) Retention ponds; or
   - vii) Sorbent materials.

2) For offshore facilities:
   - i) Curbing or drip pans; or
   - ii) Sumps and collection systems."

It never fails that water, oil, and other chemicals seem to find the smallest holes through which to escape. And in the harsh climates where tank farms are typically located, corrosion is a constant threat. For this reason, coatings play a vital role, not only on the tanks themselves, but also on the secondary containment systems.

Coatings To The Rescue

Increasingly, specifiers are turning to polyurea to protect the primary and secondary containment in the oil and gas industries. Because secondary containment is a safety backup, it is just as important to have a strong, resilient coating. Polyurea forms a seamless membrane, which can be applied to many surfaces and can conform to any shape to eliminate the risk of the liner leaking. It can be engineered to have an instant gel time, it can be designed to specified desired thicknesses, and it can be spray-applied in a single application, which minimizes down time and reduces cost.

Further, given the diverse temperature variations that often occur at the tank farm locations, the unique chemical composition of polyurea makes it a longer lasting choice than conventional coatings. According to SPI's vice president of marketing, Cliff Haskins: "Polyurea's elongation properties will tolerate the movement of metal, concrete, and earthen substrates without tearing the monolithic barrier." He continues: "Its strong water and chemical resistance properties make polyurea an excellent selection for thoroughly containing many liquids associated with containment breach. Containment is the key function of the coating, but it also protects the containment substrate from corrosion caused by harsh acidic or caustic chemicals or environmental conditions."

And the coatings don't just protect the containment area. Polyurea can also be applied to pipes entering and leaving the containment area. Polyurea coatings truly are the science behind helping to keep the nation's oil supply safe and our wilderness pristine. CP