STEEL EPOXY FOOD & BEVERAGE INDUSTRIAL

Solving a Corrosion Crisis at a Food Processing Facility

BY **JENNIFER FRAKES**
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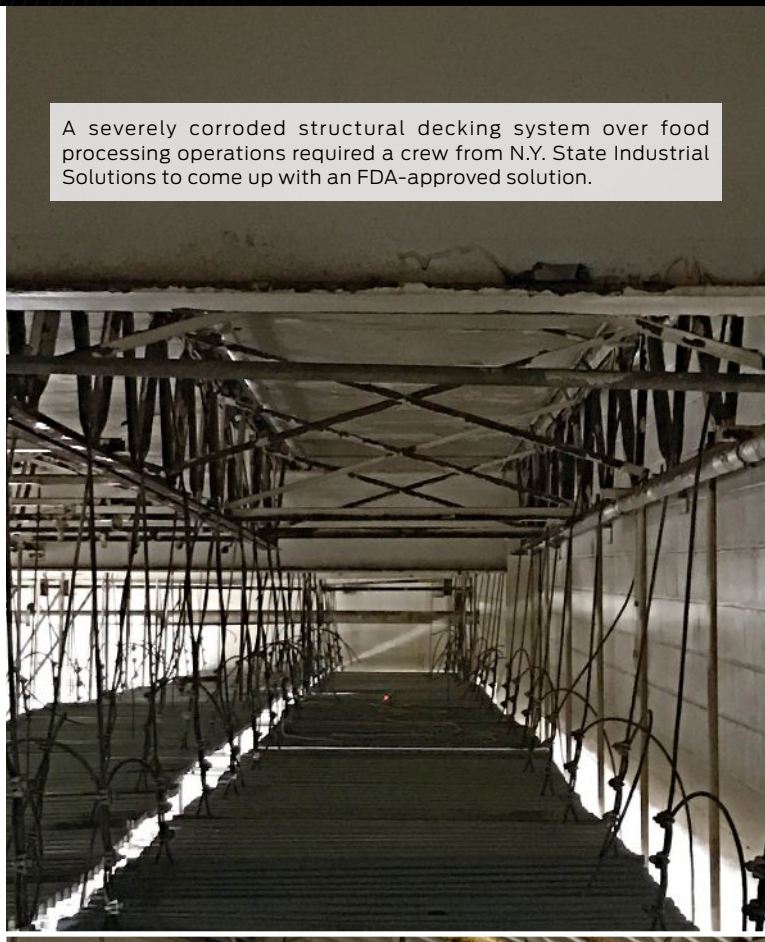
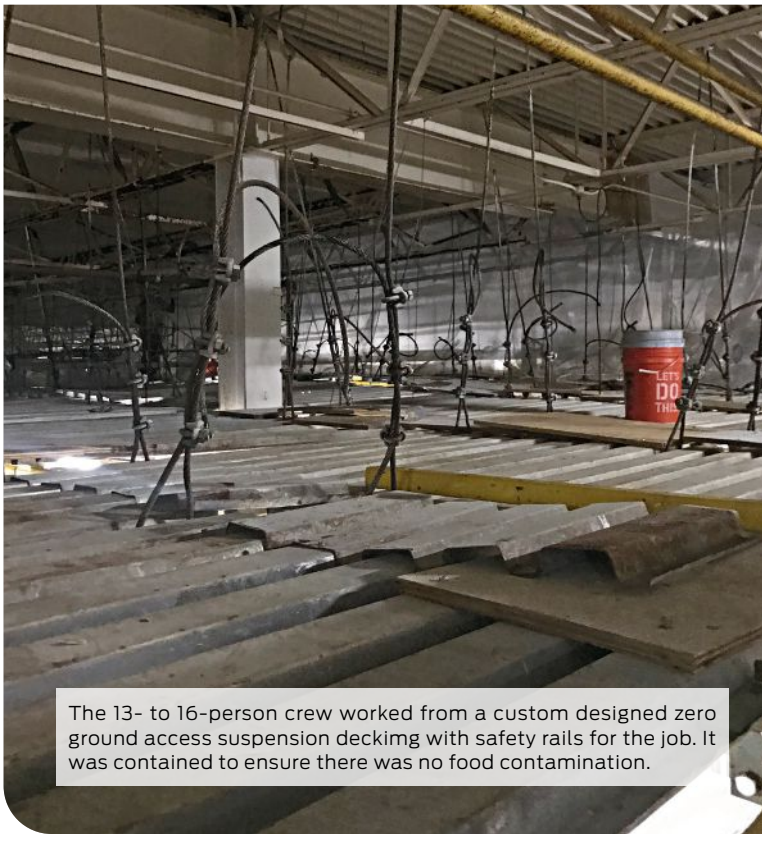
One of the largest national fruit and vegetable processing companies received a U.S. Food and Drug Administration (FDA) violation due to extensive paint and rust scale fallout from a severely corroded structural steel decking system. The rehab would be an urgent and complex job — one that N.Y. State Industrial Solutions was ready to tackle.

"The structural steel decking system is directly above the food processing operations, so going into the job, we knew that it was going to be a challenge," said Jeff DeFranco, president and CEO of N.Y. State Industrial Solutions, formerly known as N.Y. State Industrial Coatings. "We were able to provide solutions for all aspects of the job, from the design build of the zero ground access suspension decking to the surface preparation and coating application. Safety was a critical part of this job. We had to consider food safety since the plant was fully operational adjacent to our work area. We also had to consider the safety of the client's personnel as well as the safety of our own crew."

According to DeFranco, this project was especially unique because it required the collaborative efforts of the highly diversified divisions that comprise N.Y. State Industrial Solutions. The process began when DeFranco inspected the site and got a feel for exactly what was needed on the job. Then, the engineering team evaluated the existing structure's integrity, load limits, and design of the proposed fabricated suspended decking. The safety director, Michael Bacher, worked with team engineers to develop the site-specific safety plan to ensure that crew members, vendors, and client employees were safe and in accordance with U.S. Occupational Safety and Health Administration (OSHA)



A severely corroded structural decking system over food processing operations required a crew from N.Y. State Industrial Solutions to come up with an FDA-approved solution.



The 13- to 16-person crew worked from a custom designed zero ground access suspension deckimg with safety rails for the job. It was contained to ensure there was no food contamination.

NACE Level III specifiers developed the solution with the coating manufacturer. And the team designed and monitored a floor drain lined with mesh to keep paint chips from out of the filtration.

regulations. Bacher also coordinated with the client's Health, Safety, and Environment (HSE) staff as well as Nick DeFranco, head of operations for N.Y. State Industrial Solutions, to ensure compliance with protocol for employee and associate safety.

"In addition, our team also coordinated with the client's Quality Control division to ensure that the food safety aspect of the project was compliant with FDA and in-house food safety regulations. The coating system specifications were designed by our NACE Level III specifiers, working with Carboline, the coating manufacturer. And it's an FDA-approved system, meaning it's safe for use in food and beverage processing facilities and can withstand the environmental exposures within those facilities," explained DeFranco.

Specialized Suspension Decking

The first order of business for the crew was the design build of the zero ground access suspension decking system on which the crew would work throughout the 18-week duration of the project. "Fifteen years earlier, I designed suspension scaffolding for a project in the same facility; however, at 5,000 square feet [464.5 m^2], it was just a fraction of the size of what was needed on this 42,000-square-foot [3,901.9 m^2] job," revealed DeFranco.

The custom design build of the zero ground access suspension decking took into account the weight of the decking, equipment, and workers. An engineering evaluation of the existing structure's weight-carrying capacity was also conducted, considering potential and projected snow load, because the job took place during the winter in western New York. The crew constantly monitored the snow load and removed snow as needed to ensure that the proper weight-bearing load on the decking was maintained.

In addition, proper safety rails were constructed, and the decking was modified to eliminate fall-though hazards around penetrations in the decking. "We also had to contend with extremely tall floor equipment that is tightly fitted together in some sections of our work area. And since the plant was in operation adjacent to our work area, there was even more to consider. We actually constructed the suspension decking over the factory lights so that the workers on the ground in production had adequate lighting to safely perform their jobs," explained DeFranco.

For the N.Y. State Industrial Solutions crew to have adequate and safe lighting themselves, explosion-proof magnetic lights were utilized. "These lights are manufactured by Milwaukee Tool and are wired in such a way that they can't release the amount of energy needed to make a spark. And while the risk of explosion was very slight on this job, we wanted to do all we could to mitigate even that small risk," said DeFranco.

After power washing and hand tooling, the crew applied Carboline's Rustbond and Carboguard. Areas above off-gassing received Carboguard 890. Coatings were sprayed and backrolled.

Beam clamps were used to hook up crew members with six-foot (1.8 m) self-retracting lifelines (SRL) on their safety harnesses, and wrist lanyards were utilized for all hand-held tools and sprayers to eliminate the risk of equipment falling into the facility below. "And, of course, while we were building the decking, we used guide rails, aerial lifts, and ladders in accordance with OSHA guidelines," said DeFranco.

Containment: Another Key Component

According to DeFranco, containment was a crucial element on the jobsite for three distinct reasons. "Because the food processing operations were live in an adjacent area for the duration of the job, we had to maintain proper food safety protocols at all times. In addition to this, we needed to keep the client's workers and other personnel safe from any hazards our crew created. And as on all jobs, we needed to keep our crew members safe. Containment was a huge part of keeping everything and everyone safe at all times," said DeFranco.

To protect the food production processes that were active in adjacent areas, a poly film curtain along the entire section was constructed to hermetically seal the work area. The containment material ensured that no debris would be in contact with any food product. "We also engineered air flow to ensure that any odor and particulates would be eliminated, and we covered the equipment directly below the work area to ensure that no debris fell in the food processing equipment," said DeFranco.

A decontamination area was constructed to eliminate any introduction of construction debris into the active food processing area. "In addition to the containment system and the decontamination area, we performed a final food grade cleaning at the completion of the project," said DeFranco.

It was also imperative to keep the personnel from the client, which wishes to remain unnamed, safe — both those who were involved with the project and those who were working in the adjacent areas. "We became a part of the facility, working behind an airtight barrier that allowed our crew as well as the factory crew to work simultaneously. We also constructed safety barricades underneath our working area to keep the facility workers safe. There were

JOB AT **A GLANCE**

PROJECT:
Provide an FDA-approved solution to a corroded structural decking system

COATINGS CONTRACTOR:
N.Y. State Industrial Solutions
Rochester, NY
(585) 235-6424
www.nystateindustrialcoatingsinc.com

SIZE OF CONTRACTOR:
20+ employees

SIZE OF CREW:
13–16 crew members

PRIME CLIENT:
One of the United States' largest fruit and vegetable processing companies

SUBSTRATE:
Structural steel

CONDITION OF SUBSTRATE:
Extremely compromised and corroded

SIZE OF JOB:
42,000 sq. ft.

DURATION:
18 weeks

UNUSUAL FACTORS/CHALLENGES:
- The processing plant was in full operation adjacent to the work area.
- Potential snow was constantly monitored and removed from decking.
- NACE Level III specifiers developed an FDA-approved solution with the coating manufacturer that had the proper environmental resistance.
- The team designed and monitored a floor drain lined with fiber mesh to keep paint chips from going into the filtration system.

MATERIALS/PROCESSES:
- Erected containment to catch potential debris
- Power washed steel decking using 4,000 psi with in-house fabricated wands and attachments per NACE No. 5/SSPC-SP 12
- Hand tooled areas over electrical rooms per SSPC-SP 2/3
- Applied Carboline's Rustbond at an average of 1–2 mils DFT
- Spot primed and applied two full coats of Carboline's Carboguard 60 at 4–10 mils DFT per coat
- Sections above areas in the food processing plant with off-gassing were also coated with Carboguard 890 of 4–6 mils
- Used Titan SpeeFlo airless sprayers and then backrolled all coatings
- Completed final food grade cleaning at the end of the project

SAFETY CONSIDERATIONS:
- Custom designed and built zero ground access suspension decking with safety rails for the job with explosion-proof magnetic lights
- Defined walkway areas and used ground crews to ensure staff's safety
- Used beam clamps to hook up crew with 6-foot self-retracting lifelines
- Wore 3M full face respirators and Tyvek protective suits
- Utilized wrist lanyards for all hand-held tools and sprayers
- Worked with client, FDA, and OSHA to ensure compliance
- Monitored the air with Honeywell gas monitors

delineated specific walkway areas as well as a ground crew who was tasked with ensuring that factory workers didn't accidentally cross into our work area. And working with the HSE client personnel, we scheduled periodic shutdowns if necessary to keep everyone safe," said DeFranco. He added that all this was done by identifying and navigating the schedule of not only his crew but also the production schedule of the facility.

As for creating a safe environment for the N.Y. State Industrial Solutions' 13- to 16-member team, large Allegro explosion-proof rooftop fan units were used to create negative air flow. Advanced Containment Systems Inc. air scrubbers with high-efficiency particulate air (HEPA) filters were also utilized to ensure that a safe atmosphere was maintained. "The air flow was engineered to create an environment that yielded zero LEL [lower explosive limit]. We monitored the air throughout the entire project using Honeywell BW GasAlert Max XT II LEL monitors," stated DeFranco.

Innovative Power Washing Solution

Going into this project, DeFranco knew that surface preparation was going to be critical for the success of the new coating system, but he also acknowledged that it would present a challenge, especially considering that the suspension decking was only 6.5 feet (1.9 m) from the structural steel decking to be prepped and coated. The substrate was compromised of ferrous metal structural steel and corroded galvanized coated decking.

All rust, contaminants, and existing coatings needed to be completely removed. "Once we took samples of the existing coating to determine if there were any additional mitigation methods we needed to take, we formulated a plan to efficiently and safely prep the substrate, given the tight quarters we were dealing with," said DeFranco.

The crew applied a biodegradable surfactant to the substrate, and then they power washed the steel decking with in-house fabricated wands and attachments. This was done in accordance with NACE No. 5/Society for Protective Coatings (SSPC) Surface Preparation (SP) 12, "Surface Preparation and Cleaning of Steel and Other Hard Materials by High- and Ultrahigh-Pressure Water Jetting Prior to Recoating," using various tips to ensure maximum removal of the poorly adhered coatings and rust scale. "We designed and fabricated these 4,000-psi [27.6 MPa] power washing wands because there really wasn't anything on the market that served our specific needs. The ergonomic T-handles and tips can be safely adjusted for any angle our crew needs. This is really important, especially on jobs like this one where there was only about 6.5 feet from the decking to the ceiling of the facility," said DeFranco.

The team also designed a drain filtration system to ensure that all debris and contaminants were captured and would not enter the facility's water treatment system. "The floor drains were lined with fiber mesh to keep paint chips from going into the drainage system while still allowing water to pass through. This drainage process was monitored constantly throughout the project," said DeFranco.

There were some sections that could not be power washed due to the electrical rooms directly below. According to DeFranco, these sections were prepared and profiled using hand cleaning and tool methods in accordance with SSPC-SP 2/3 ("Hand Tool Cleaning" and "Power Tool Cleaning," respectively).

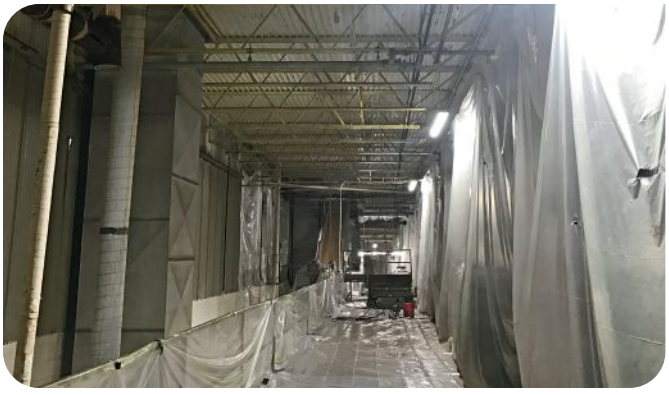
Finding the Right Coating System

Once the structural steel decking system was properly prepared and profiled, it was time for the crew to apply the coating system that was FDA-approved and offered the proper environmental resistance for the conditions in the food processing facility. "Ultimately, we determined that the combination of one coat of Carboline Rustbond and two coats of Carboguard 60 was the right high-performance system for this job," said DeFranco.

The crew first applied Carboline's Rustbond, a cross-linked penetrating sealer. It is highly flexible with good chemical and solvent resistance. It provides a firm anchorage for a variety of topcoats, and its thixotropic character reduces undercutting and peeling. Rustbond was applied at an average dry mil thickness of 1–2 mils (25.4–50.8 microns) throughout the entire area.

Then, any areas in particularly bad shape needed a spot prime coat consisting of 4–10 mils (101.6–254.0 microns) of Carboguard 60. According to DeFranco, that helped to ensure that those areas were ready to receive the body coats of the coating system. "After the spot priming was complete, all areas received two [full]

Explosion-proof magnetic lights were just one solution that the crew used to keep safety in the forefront. They also delineated walkway areas and worked with various experts to ensure compliance.



PPE included 3M full face respirators, Tyvek protective suits, writs lanyards, self-retracting lifelines, and Honeywell gas monitors. The pleant was in full operation during the project, to boot.

coats of Carboguard 60 at a dry film thickness [DFT] of 4–10 mils," said DeFranco. Carboguard 60 is a high-solids, versatile, abrasion-, chemical-, and corrosion-resistant coating that's also FDA-approved in food and beverage processing facilities.

The crew was not done, though. "Some of the decking is above the food processing operations that produce a highly corrosive environment. In these areas, it was necessary to apply a coating specially formulated to protect the substrate from the acids released during off-gassing that aggressively corrode exposed metal and coatings," stated DeFranco. These areas received an additional layer: 4–6 mils (152.4 microns) of Carboguard 890, a highly chemical-resistant epoxy mastic coating.

All coatings were applied using spray and backroll methods. "The crew used Titan SpeeFlo 4,500 psi [31.0 MPa] airless sprayers and wore 3M full face respirators and Tyvek protective suits. We were also very conscientious about the integrity of the coating we laid down, measuring dry film thicknesses and ensuring that it was in accordance with Carboline's recommendations," said DeFranco.

The team worked off-shifts and weekends to ensure that areas were properly recoated within their respective recoat windows, and they paid special attention to the temperatures in the work area. According to DeFranco, maintaining the proper heat for substrate temperature and recoat windows was challenging, given that the roof was old and poorly insulated. The use of temporary heat on particularly cold days was required.

In addition, plywood was fastened to roof vent shafts to engineer air flow properly to keep cold air out and to keep a safe atmosphere and allow products to cure appropriately. "We really needed to be aware of the temperature because the coating material has a short [15- to 20-minute] pot life for application. Once the product was mixed, it had to be applied and pushed through the hoses clean before cure or the entire airless spray rig from the gun to the packings would be lost," said DeFranco.

From Crisis to Success Story

According to DeFranco, this job was a huge success in no small part due to his team's ability to work while the food processing facility was operational. "Originally, it was thought that the facility would have to shut down while the structural steel decking was recoated. Keeping the plant open for the 18-week duration saved the client multi-millions of dollars," said DeFranco.

DeFranco also credits his team, including Nick DeFranco and Bacher, with keeping the project on schedule even while navigating through enormous amounts of red tape. "We had daily meetings to discuss logistics and planning with all entities involved. The FDA and OSHA are two big government agencies, and obviously you want to do the right thing and comply with all regulations but still deliver the project on schedule. Nick and Mike made sure that we were always in compliance and on schedule," said DeFranco.

While DeFranco said all aspects of the job were challenging, from developing the coating spec and the design build of the scaffolding to all safety considerations and working under a strict deadline with multi-millions of dollars at stake, he is proud to say that his team pulled together and pulled through for the client. "Every aspect of the job was ultimately rewarding. We provided the client with creative solutions to maintain their pristine level of product. This is part of why we are now N.Y. State Industrial Solutions, an expansion of N.Y. State Industrial Coatings. Our new name and branding reflects the evolution of our company and the comprehensive package of service we offer," said DeFranco. It's also why they won first place in *CoatingsPro*'s 2022 Contractor Awards Program for the Industrial Steel category. It was a job well done. **CP**

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