

## WE NEED A BETTER COAT?

By Bill Lape, SCS Engineers

In this month's edition of Epic Fails, we will look at failures of coatings. Time and again, ammonia refrigeration facilities fail to keep up with the maintenance of the paint and insulation on their equipment and piping, resulting at best in citations from regulatory inspectors, and, at worst, a release that injures or kills someone.

First, let's look at our requirements for inspection, testing, and maintenance (ITM), as prescribed in IIAR6-2019.

Chapter 11 calls out that insulated piping shall be inspected annually for indications of damage or moisture incursion in insulation, as evidenced by dampness, condensation, frost, or ice buildup. In addition, the protective jacket of the insulation must be inspected annually for degradation.

If damage, degradation, or moisture incursion is identified, IIAR6 requires that the insulation be removed, as needed, at the areas of concern to evaluate the piping underneath. Had to add a pipe



*Frost buildup on insulated piping, indicating a breakdown of the insulation and its moisture barrier.*



*Armaflex insulation, mastic coating, and multiple layers of mold.*



*More heat shrink or electrician's tape? Over Armaflex, no less.*



*Had to add a pipe but ran out of money to repair the insulation.*



*Heat Shrink insulation?*



*Extreme corrosion on a condenser drain line.*



*Protective jacket deterioration.*



*Not really sure what this coating is.*

Let's look further at what IIAR6 has to say about insulated piping. Section 11.1.2 states, for insulated piping, where insulation is removed, partly or completely, for visual inspection or remaining wall thickness measurement(s), a protective coating shall be applied to the exposed metal surface and insulation shall be replaced in accordance with the manufacturer's installation instructions after arresting any identified exposed piping metal surface corrosion. **The protective coating called for here can be paint, or a reactive gel that acts as a rust converter and corrosion inhibitor. After this is applied, the insulation must be replaced.**



*Deteriorated mastic coating at the end of insulation*

Chapter 11 also calls out that metal surfaces of uninsulated piping shall be inspected annually for indications of degradation of the protective coating. To paraphrase, ensure that the paint on the uninsulated pipe is not flaking off and no rust is appearing through the paint. Finally, IIAR6 calls for an annual inspection of uninsulated piping for pitting or surface damage. If evidence of pitting or surface damage of the piping is identified, IIAR6 requires that the remaining wall thickness be measured, using NDT techniques, if necessary.



*Deteriorated PVC elbow, but, by gosh, we've inspected it.*

Let's look more at what IIAR6 requires for uninsulated piping.

Section 11.1.1 states, where pitting, surface damage, general corrosion, or a combination thereof, is visually observed on a metal surface of the piping, deficient areas shall be further evaluated per Sections 11.1.1.1 - 11.1.1.3. **We can't just leave it.**

11.1.1.1 Where pitting, surface damage, general corrosion, or a combination thereof, has materially reduced the remaining pipe wall thickness, the piping remaining wall thickness shall be measured using appropriate techniques. **We must measure the remaining wall thickness using a pit gauge or other suitable non-destructive testing technique.**

11.1.1.2 Where pitting, surface damage, general corrosion, or a combination thereof, has not materially reduced the remaining pipe wall thickness, the piping metal surface shall be cleaned and recoated to arrest further deterioration. **We must clean the corrosion from the pipe and repaint it.**

11.1.1.3 Where pitting, surface damage, general corrosion, or a combination thereof, has materially reduced the remaining pipe wall thickness beyond the owner's established acceptance criteria, the piping shall be evaluated to determine suitability for continued operation.

11.1.1.3.1 Where the owner does not have established acceptance criteria for pipe wall thickness from the original design or subsequent calculations, the owner or owner's designated representative shall establish a replacement thickness that shall not be less than the calculated thickness for pressure containment in accordance with the code or standard in which the component is designed at its design pressure. **We must calculate the minimum wall thickness based on the design pressure of the system or section of the system.**

11.1.1.3.2 Where a pipe is determined to be at or below the owner's established replacement thickness, the owner shall immediately isolate the pipe from service and proceed with a plan for its replacement or decommissioning. If the pipe is



**Still more lipstick on the pig.**

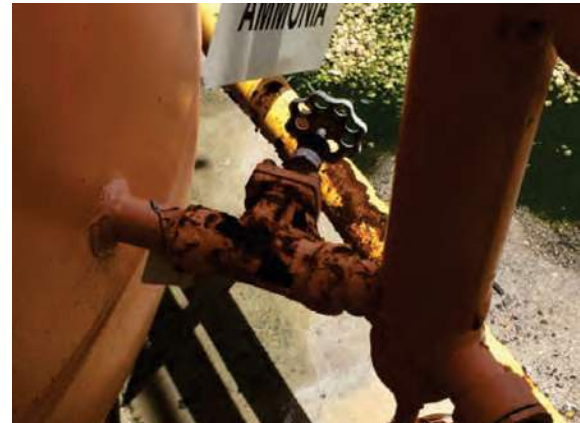
at or below the minimum thickness, it must be replaced.

Regarding the need for non-destructive testing, IIAR6 states in the informative appendix that, if "visual inspection cannot fully determine the condition of the piping, then additional nondestructive testing (NDT) is recommended. The additional NDT may require insulation removal. If insulation removal is necessary to conduct a test, the location or locations on the piping to be tested should be selected based on prior experience with refrigeration piping and at locations with an increased probability of corrosion under insulation (CUI) to occur.

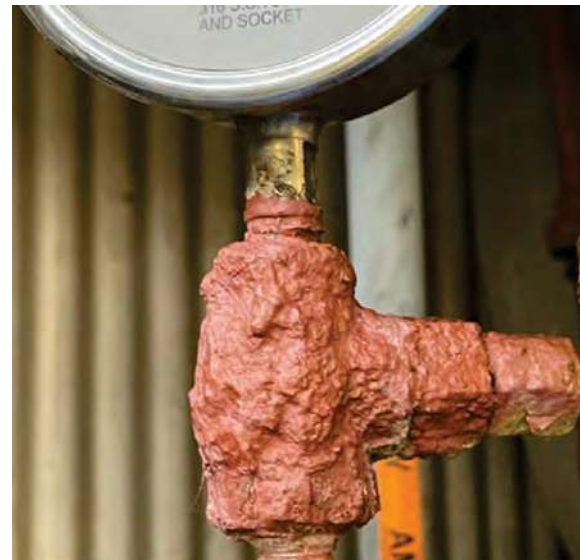
Inspections of the piping are required to be done annually. In areas subject to winter weather, the best time to conduct the inspection of the outside piping is in the Spring, so that deficiencies may be identified, and repairs made quickly. It is best to clean and repaint uninsulated piping and to repair damaged insulated before they look like the photos in this article.

If you have pictures of some Epic Fails from your "Brother-in-law's" facility, please send them to NH3isB2L@gmail.com.

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**Pitted valve that was less than five years old when the photo was taken.**



**Not entirely sure what this is on the valve.**



**Insulation breakdown, maybe after an army stepped on the pipe**