Maintaining Facilities Operation During Re-Roofing

Assessing Impact and Preventing Interruption of Continuous Operations During an Overhead Re-Roofing Project

BY CHUCK WHARY

INTRODUCTION

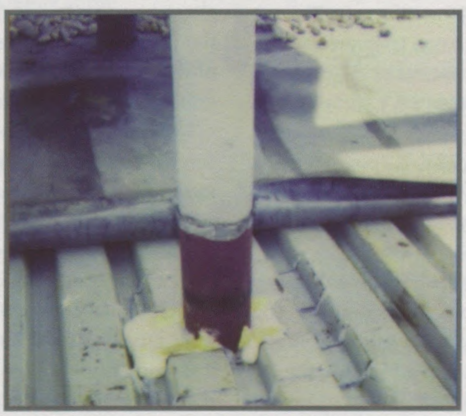
THE NEED FOR PLANT RENOVATION AND CONSTRUCTION FREQUENTLY CONFLICTS WITH THE need for continuous operation of manufacturing facilities. The need for close coordination of access, space requirements, and containment of construction operations *within* a facility is obvious and part of any project engineer's plan of execution. When the construction project is *outside* a facility, however, the potential for conflict is not so obvious. In most cases, a re-roofing project does not represent a conflict with plant operations and traditionally requires only cursory notification to prevent access problems and ensure utility availability. The following case history serves to advise engineers and contractors of the potential for serious interference with certain manufacturing processes and the solution employed in this specific case.This solution will be made part of our re-roofing process as required in the future.

Project Synopsis

AMP Inc., East Berlin, PA, manufactures electronic terminals and connectors for a wide variety of applications.

Their overall building is 230′ x 310′ and was constructed in the early 1970s. The original roof construction consisted of the following: steel decking over steel joists, fiberglass insulation boards placed on top of the decking, and a ballasted EPDM membrane (river-washed stone ballast). The approximate building usage allocations are: 65% light manufacturing, 20% plating, 10% office space, and 5% maintenance.

The structure maintains a positive building pressure of approximately +0.05 to +0.10 inches (water column) in all areas of the building except plating. The plating area maintains a negative pressure of approximately -0.05 inches. This is an AMP requirement to prevent the expulsion of plating atmosphere and to ensure treatment of all associated vapors present as a by-product of the plating process. These are the normal operating parameters for the facility.



Expanding foaming agent used at all larger openings.

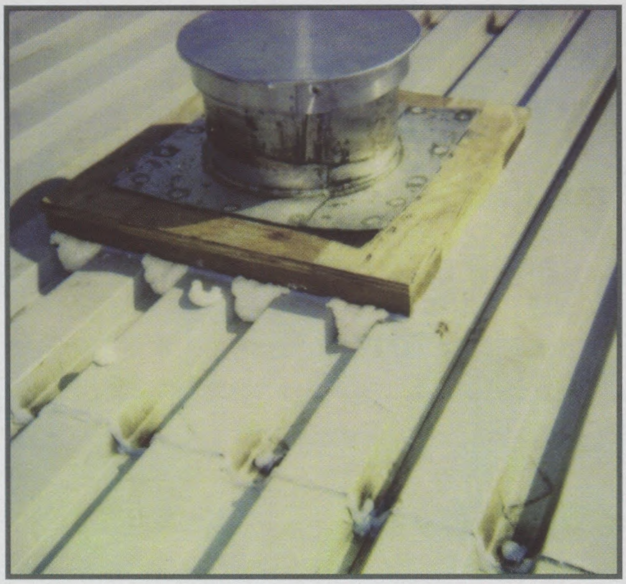
This project scope was to remove the existing roofing system down to the steel decking. The replacement roof system consisted of polyisocyanurate insulation, reinforced EPDM membrane, and the used existing river ballast, due to its excellent condition.

Manufacturing Process Interference Identified

As the original roof was being removed over the north end of the plating area, airborne contaminants generated by the tear off began to infiltrate through the construction opening of an exhaust fan. These contaminants had the potential to enter and contaminate the open plating baths, thus ruining product and warranting a line shut down. The roof was secured and work was shifted away from the plating area immediately until this issue was resolved.

The plating line needed to remain in operation 24 hours a day, 7 days a week to support manufacturing demand. The threat of contaminating the plating line using the current methodology was high and presented an unacceptable risk to the process. If contamination of the plating opera-

Removal of all foreign materials from deck area.



Sealing the deck seams with silicone caulk, and deck flutes with expandable foam.

tion took place, the cost estimates for replacement of the plating line baths, potential lost manufacturing, generation of excessive waste, and loss of wages were projected to be in the low to mid six figure range. It was obvious that, before construction could continue, new safeguards had to be added to the re-roofing process.

Solution to Infiltration Problem

The approach first offered by the contractor was simply to tent the plating line in its entirety to prevent any airborne contaminants from infiltrating. The bid was $31,500 with a projected delay to the schedule of three weeks. AMP Engineering felt this cost was appropriate due to the complicated nature of the plating area construction and the need for a variety of accesses by the plating personnel to continue operation. Surrounding areas within the designated plating area, however, would not be protected and airborne contamination was still likely to occur. This approach also would have, to some extent, restricted access to the plating line for its operators. The additional cost and schedule implications represented a significant negative impact to the project.

After further evaluation by Jeff Paul, our HVAC engineer, and myself, an alternate plan was developed. With the use of the building HVAC system, we would alter the building's positive/negative pressure relationships. This alteration, in conjunction with other measures to prevent large particle infiltration at the source, would force contaminants to stay outside the envelope and secure the entire plating area from infiltration. The plan was to provide positive building pressure while the demolition of the existing roof was accomplished. Then, after all foreign materials were removed and final sealing of the remaining openings was accomplished, the building pressure would be returned to a slight negative pressure to enable the new insulation and membrane to be installed. The temporary manipulation of the pressure was reviewed with the manufacturing process owners and compensations made to the process exhaust system.

The following outline indicates the steps that were required to accomplish the work over the plating lines:

1. Seal off all the roof openings possible from inside the plating line area with the use of an expandable foaming agent. Add secondary plastic containment under duct and pipe penetrations which penetrate the roof. Cover all strategic items with plastic. (This work was accomplished using a local general contractor.)

2. The HVAC system supporting the plating line operation was changed for a short period of time to a positive pressure to restrict any airborne contaminants from infiltrating the area. To achieve this, building exhaust fans dedicated to the plating area were turned off. The air handling unit which supplies air to the plating area was changed from low winter to high summer settings. The main plating exhaust ventilation system was not altered and remained in normal operation status. This changed the pressure from negative to positive. (This work was accomplished with AMP's building maintenance person following the guidelines set forth from Jeff Paul.)

3. After the removal of existing roofing materials from the top of the roof, the area was cleaned of all remaining foreign materials. This work was accomplished with the use of shop vacuums. At that time any remaining roof openings that were not accessible from inside the plating area were to be sealed with an expandable foaming agent. (This work was accomplished by the on-site roofing contractor.)

4. Finally, all the steel roof decking seams were caulked with a silicone caulk. (This work was accomplished by the on-site roofing contractor.)

This approach provided a normal working environment for the plating operators, and most of all, ensured the entire plating area remained free of any airborne contaminants. The cost for this work totaled $8,900 and added fewer than three days to the schedule, considerably less than the projected $31,500 and three weeks projected for tenting.

After a meeting with all the parties affected, this approach was adopted. A test area was established and monitored very closely by both plating personnel and AMP Engineering. Building pressure in the plating area was maintained at a positive range of +0.07 to +0.14 inches for removal and returned to a negative pressure of -0.06 to -0.10 inches. The test proved to be successful and the remaining work proceeded as planned.

Conclusion

The plating area re-roofing was accomplished in three working days. There was no airborne contamination and no disruption in operations. The benefits of the success of this approach are twofold. First, a careful evaluation of special requirements of manufacturing processes inside a facility will be conducted as part of the planning process for all roofing projects in the future. Second, in the event that special requirements are identified, a tried and true methodology is available for implementation to avoid contamination problems in the future.

About The Author

Chuck Whary *is a facilities engineer at AMP Incorporated, based in Harrisburg, PA. During his 32-year career, Chuck has worn many hats. He started out in the nuclear engineering field and expanded into other fields of expertise. In 1987, Whary entered into the facilities arena and has remained there ever since. Chuck is in charge of roofing, parking lot, and civil/structural projects at AMP.*

Cold Weather Application Tips For Roof Coatings

A Roof Coatings Manufacturer's Association (RCMA) TechNote

The viscosity of bitumen is temperature sensitive—thinner and more fluid when hot; thicker and more viscous when cold. Today's manufacturers of cold applied (liquid at room temperature) asphalt roof coatings formulate their product to be usable at ambient temperatures as low as 40 degrees Fahrenheit and up to a high temperature of around 120 degrees F. Water-based coatings and coal tar coatings are usually applied at 50 degrees F or higher.

In order to cover the wide temperature range, some manufacturers offer "all temperature" products, while others may offer winter grade, summer grade or intermediate grade products. Check with your supplier or manufacturer to determine which route to follow to enable a proper product selection. If the manufacturer offers various viscosity grades, find out how to distinguish one grade from the other. Also, check how the containers are marked and identified. Whatever the weather, there are always important "do's and don'ts" to follow for a successful system application.

Storage

Keep the product as close to room temperature as possible. A heated warehouse is ideal. If kept outside, store the containers as close together as possible under a tarp. This will slow down the internal temperature drop of the product, keeping the viscosity and application properties closer to standard for a longer period of time. This is also important when using asphalt saturated roofing felts in cold weather. These felts can become brittle when cold and can crack at temperatures under 40 degree Fahrenheit. Unsaturated membranes, such as polyester, are not affected by cold temperatures (but must be kept dry).

Heating

With proper storage, heating should not be necessary. On the jobsite, the use of heated storage cabinets/units for heavier-bodied coatings, or warming devices which use circulating oil to heat liquid roofing materials for easier spray application, may be utilized. Consult the equipment manufacturer for information on the safety requirements pertaining to whichever heating device is used.

Surface Preparation

Never apply the product to a frost- or ice-covered surface. Once the area is free of frost, ice and/or snow, follow the manufacturer's standard application directions. In addition to removing frost, ice and/or snow, the surface must be dry for solvent-based coating products unless using specially formulated wet surface products. Slightly damp conditions may be acceptable for emulsions.

Application

If possible, wait until afternoon on a sunny day. This will enable the roof to warm up as much as possible. Remember when working with a black roof, the surface will absorb heat, making the roof temperature warmer than the air temperature. This will accelerate the overall cure rate. Special considerations may be required for certain coatings, such as emulsified asphalt aluminums. Specific instructions from the manufacturer should be followed.

Cure Time

While modern technology permits the application at low temperature, the cure time can be longer than on a warm summer day. A product that may cure over night at a temperature of 70 to 75 degrees F may take several days to cure at 40 degrees F.

Remember that emulsion type coatings require temperature conditions which permit thorough evaporation of the water content before the film is subjected to rainfall, freezing, or standing water. One can also consider use of a polymer-modified emulsion for use in cooler temperatures as these products tend to have shorter set and cure times.

In conclusion, select one of the many fine roof coating products that have been formulated for use during cold weather. When in doubt concerning the product or the particular weather conditions, give the manufacturer or supplier a call to discuss your particular situation and product selection so that your cold weather application or repair will yield the desired results.