

WaterWorld

Serving the Municipal Water/Wastewater Industry

Proper Evaluation Plays Important Role In Planning Tank Preventive Maintenance

By BILL DAUGHERTY

Preventive maintenance on municipal water storage tanks has been, and always will be, less expensive than crisis maintenance. Preventive maintenance allows owners to identify solutions before the problems reach crisis proportion.

Maintenance

Water tank preventive maintenance should begin with a thorough evaluation of the tank. Tank owners should do a cursory tank evaluation at least once each year, or once each quarter if feasible.

The foundation should be examined for signs of settlement, and the concrete inspected for evidence of cracking, crumbling or exposed reinforcing steel.

The tank should be observed for signs of leaking or rust streaking that could be caused by a leak. If a leak is discovered, the tank should be inspected by a professional structural engineer familiar with water tank maintenance.

The general condition of the exterior coating and evidence of corrosion should be monitored. If the exterior of the tank is in poor condition, the interior coating could be as poor or worse.

The tank and site should be monitored for signs of unauthorized access and vandalism, both of which can be a liability for the tank owner. Manholes and other means of access to the tank interior should be secured against unauthorized

entrance. Unlocked manholes are also a potential liability for the tank owner.

The condition of sanitary items such as the overflow discharge screening and vent screening, and any potential for a cross connection between the potable water stored in the tank and water in a storm or sanitary sewer should be checked.

Immediately following a tornado, major windstorm, earthquake or during freezing weather, the tank should be checked for damage. If damage is evident, a professional structural engineer

Many tanks in operation today were designed and constructed before the first OSHA standards were put into effect in 1971. Even if the tank's safety devices are structurally sound, they may not be in compliance with OSHA standards.

familiar with water tank maintenance should evaluate the tank.

Other things that may need to be checked even more frequently are the proper positioning and operation of the vacuum/pressure relief pallets before and after freezing weather (if the tank is

equipped with a freeze-resistant vent) and the proper operation of any lighting systems on the tank.

Any above-ground evaluation should only be conducted by experienced climbers equipped with the proper safety equipment.

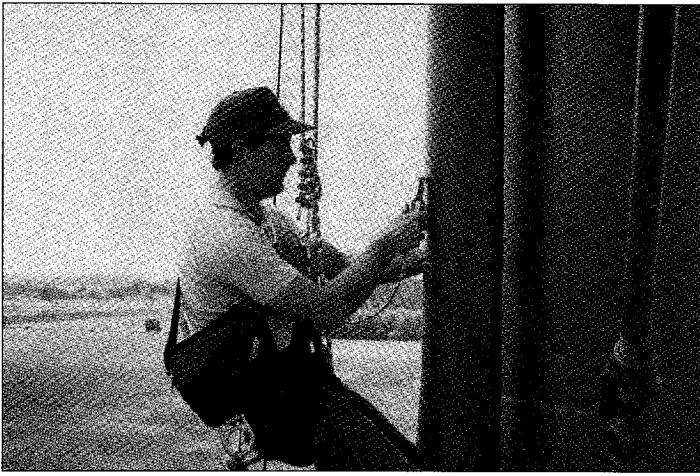
Professional Evaluation

When retaining a firm or person to perform a professional tank evaluation, the owner should refer to the AWWA Standard D101, "Inspecting and Repairing Steel Water Tanks, Standpipes, Reservoirs, and Elevated Tanks for Water Storage."

A tank owner investing in a professional tank evaluation should expect it to be thorough. In addition to the more usual components of an evaluation, the evaluation team should also identify any peculiarities associated with the tank, such as unshielded, vertically oriented vents that could allow the intrusion of wind-blown dust and precipitation into the tank, or a leaded joint at the base of the inlet/outlet pipe.

The team should also report visual defects and changes or modifications from the tank's original design and construction.

Measurements should be taken of all structural members during the evaluation, including ultrasonic testing of the plate thickness. Metal loss should be located, identified and measured. The evaluation report should indicate the structural



Dry film thickness testing of the coating is important in determining the life of a coating as well as the necessary coating repairs.

impact associated with the loss. The report also should make recommendations for structural repairs or modifications and corrosion control. If metal loss is overlooked or improperly analyzed, it could cause unnecessary repairs or a critical structural defect to be left unrepaired.

On multi-column, tower-supported tanks, special attention should be given to connection points because they are a critical link in preventing structural failure. The connection points are susceptible to poor coating application and corrosion and also are the most common place for inadequate original design.

If a tank owner is concerned about the structural integrity of a tank or wants a structural evaluation, a professional structural engineer should be involved in the evaluation and/or report preparation.

Sanitary Evaluation

The water tank is one area of the distribution system which may allow contaminants into contact with potable water. Therefore, all openings to the tank should be evaluated closely. Potential cross connections, inadequate screening over the overflow discharge and vent openings, improperly designed manhole openings, and misaligned cathodic protection hand-hole covers should be identified.

One critical item in maintaining a sanitary water supply is vent and overflow screening. Badly deteriorated vent screening or screening that is not restrictive enough could allow insects, birds and animals to come in contact with the potable water. The evaluation report should identify these deficiencies and

make recommendations for their repair.

Safety valuation

Ladders, platforms, balconies and manholes should be evaluated for compliance with current safety standards. Many tanks in operation today were designed and constructed before the first OSHA standards were put into effect in 1971. Even if the tank's safety devices are structurally sound, they

may not be in compliance with OSHA standards, which have changed several times since 1971.

Court decisions and OSHA fines have made it clear that tank owners can be held liable for the safety of workers and even unauthorized personnel who access their tank.

A few questions the engineering report should answer include:

- Are the platform and/or balcony handrails tall enough and designed to comply with current dimensional requirements?
- Are all ladders compliant with current OSHA dimensional standards and equipped with operational safe-climbing devices?
- Are there sufficient means of ingress and egress to provide safe access and adequate ventilation to the confined space of the water tank?

Tank Security

With increasing vandalism and the subsequent potential for owner liability, tank site security is becoming more important. The tank evaluation should identify inadequate site and tank security. Items which should be addressed include site fencing, vandal deterrents, all means of accessing the tank, and locked roof manholes.

Tanks have been regarded as an "attractive nuisance," and as such, tank owners have a responsibility to make their tanks as inaccessible as reasonably possible. If security is overlooked during the evaluation, the owner may have significant liability for "allowing" unautho-

rized access to the tank site if a vandal is injured.

Operational Evaluation

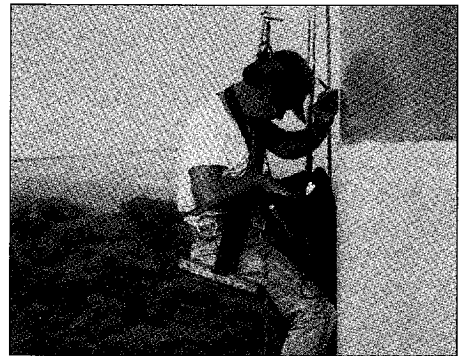
The tank evaluation should also address operational considerations. Items such as overflow pipes, target gauges, the need for freeze/clog-resistant vents, protective covers over the inlet/outlet pipes, and hinges on shell manholes are all part of the operational evaluation.

Many tanks are not equipped with freeze/clog-resistant vents as recommended by AWWA and most state regulatory agencies. Although the vent screening may be securely in place and prevent insects from accessing the water contained in the tank, if it becomes frosted over, painted over, or clogged with insects, a catastrophic vacuum or pressure situation can occur when the tank is drained or filled.

The evaluation should identify this problem and recommend that freeze/clog resistant vents be installed. If this item is overlooked and there is a need to drain the tank rapidly, it is possible the roof could be sucked in by a vacuum created inside the tank.

Corrosion Control

Corrosion control includes the use of protective coatings and cathodic protection. The coating evaluation should include adhesion, dry-film thickness, and testing for lead and other heavy metals.



Ultrasonic testing of welds on a tank can provide insight into the structural integrity of the tank.

The apparent generic type and the approximate age of the coating system should also be identified. The coating survey should determine the approximate percentages of coating failure and corrosion, the presence of mill scale and the location of the coating failures and corrosion.

The cathodic protection evaluation

should include identifying the type of system used, the apparent condition of the system, anode location and missing or broken anodes, the number and location of reference electrodes, wiring continuity, and whether the cathodic protection system appears to be working based on observations made of corrosion patterns, metal loss and the buildup of rust tubercles or calcium deposits on the inside of the tank.

This review of the cathodic protection system should not replace an annual evaluation and potential profile performed by the cathodic protection manufacturer.

Evaluation report

A thorough evaluation report should be issued concerning the observed condi-

tion of the tank, including dimensions, results of all testing performed and other pertinent data, with comprehensive recommendations for repairs and repainting.

Color photographs should be included as supporting documentation of the tank's condition. The photographs should be labeled to identify what each photo illustrates. The evaluation report should include an engineer's cost estimate for repairs and repainting as well as an estimate for the replacement cost of the tank.

In addition, the life of a new tank, the life of the existing tank (properly maintained and without maintenance) and the estimated life of the coating repair recommendations should be included.

The ultimate goal of any tank evaluation

should be to provide the tank owner with all of the information needed to make informed, realistic decisions about tank maintenance. Properly executed tank evaluations are the first step in assuring the nearly limitless life of a water storage tank.

WW

***About the author:** William Daugherty is a Registered Professional Engineer and Vice President of Tank Industry Consultants. He currently serves on the AWWA's External Corrosion Committee, the Steel Tank Manual Committee and the Construction Administration Committee.*

TANK INDUSTRY **TIC** CONSULTANTS, INC.

Headquarters

7740 West New York Street
Indianapolis, Indiana 46214
317/271-3100

East Coast Office

14435 Cherry Lane Court
Suite 103
Laurel, Maryland 20707
410/880-4004

South Central Office

320 Decker Drive
Suite 100
Irving, Texas 75062
214/719-2507

Northeast Office

3275 Veterans Memorial Hospital
Suite B-11
Ronkonkoma, New York 11779
516/467-6661

Southeast Office

5850 T.G. Lee Boulevard
Suite 650
Orlando, Florida 32822
407/851-5745