

Sodium Hypochlorite Tank, TK-J520A Inspection



Inspection Date: **November 22, 2017**

Prepared for: **Daniel Mach (Engineer Designate)**

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Inspector: **Bon Bacani, CCT-C, C.Tech.**

Revision: **0**

Introduction

Structural Composite Technologies Ltd. conducted an inspection at the City of Winnipeg Drinking Water Treatment Plant located at Deacon's Corner, Dugald, MB. The inspection was for the Sodium Hypochlorite Tank TK-J520A, which has no record of inspection on SCT's inspection log.

TK-J520A is used to store water and dilute sodium hypochlorite (12%). It was built in November 2007. Tank diameter is 13'-6" and height is 29'-5". Corrosion liner and main structure layer is made from AOC F010 vinyl ester resin and the outer layer is made from AOC K022 vinyl ester fire retardant resin pigmented silver gray. Corrosion layer laminate is consisting of 2 layers of synthetic veil (Nexus®) and 2 layers of 1.5 oz. mat.

The inspection was basically conducted visually and no other technical testing was conducted. All the observations and recommendations set forth on this inspection report were based solely on the visual inspection conducted on the tank.

Please see the following narrative, photos and drawing(s) for the details of this inspection.

General Observations

The tank was out of service at the time of inspection. It was located inside a building. The tank was cleaned out to facilitate inspection but there are some residues of the chemical contents present in the tank but these were deemed neutralized.

Tank Lid (inside) – appears to be in good condition as it does not normally get in contact with the tank contents.

Tank Wall (inside) – appears to have been **compromised** which is characterized by the dryness and roughness of the wall surface (see photos).

Tank Floor (inside) – appears to have been **compromised** which is characterized by the roughness of the surface. There was also significant delamination (lifting) observed on the floor seam which suggests that it has been chemically attacked (see photos).

Tank Appurtenances (inside) – there are a few piping and flanges on the tank which appeared to have been **compromised** (the areas that have contact with the contents of the tank) - Downpipe with brackets and a few nozzles.

Tank (outside) Overall – overall the external features of the tank (lid and wall) appears to be in good condition based on the following observations:

1. There was no sign of leaking nor cracks from the tank;
2. Flanges don't have any sign of cracks nor leaks;
3. No significant corrosion observed on the flange fasteners, lugs and other metal parts on the tank.

Recommendations

General – Tank should be repaired to recommendations below:

1. **Tank wall and floor (inside)** - Sandblast to remove compromised liner;
2. **Nozzles and Appurtenances (inside)** - Repair or replace nozzles on bottom half of tank; manway needs to be relined as well;
3. **Tank floor (inside)** - Remove the delaminated bond on the floor seam and laminate alternating plies of 3 – 1.5 oz mat and 2 – 24 oz woven roving before doing the whole tank reline (refer to Photo Sets 11 & 12);
4. **Tank wall and floor (inside)** - Reline the whole tank inside wall and floor after sandblasting, recommended laminate construction is 2 plies of 1.5 oz mat and 2 plies of Nexus synthetic veil using Vipel K022-ACA vinyl ester resin which is suitable for the 12% Sodium Hypochlorite service;
5. **Very important** - Cure system to be used should be BPO/DMA and the tank should be post cured using any of the following parameters:
 - a. minimum of 4 hours at 82°C or 180°F;
 - b. minimum of 6 hours at 71°C or 160°F;
 - c. minimum of 8 hours at 60°C or 140°F.
6. **From the resin manufacturer (AOC)** - Refer to next page for the resin manufacturer's recommendation.

From: Siegel, Mike [<mailto:MSiegel@aoc-resins.com>]
Subject: RE: Sodium Hypo Tank J520A

To reline this tank, the existing surface should be ground down to reach a suitable surface of the existing tank. Also since a reline, the corrosion liner will need to be wax top coated to prevent air inhibition during cure and to provide the corrosion resistance required.

Therefore, the recommendation for a storage tank to contain 12% Sodium Hypochlorite is as follows. The maximum operating temperature for this recommendation, which was not provided, should be ambient conditions up to 104 F (40 C). For a properly fabricated and cured FRP tank containing 12% Sodium Hypochlorite, the preferred resin is Vipel K022-ACA for use in the corrosion liner. Vipel F010 is also acceptable but Vipel K022 has shown to perform better in corrosion studies performed. The corrosion liner should consist of 2 plies synthetic veil like Nexus followed by either ECR chopped strand mat or ECR chopped glass roving. The corrosion barrier should be fabricated to a minimum thickness of 2.5 mm or 0.1 inches and cured with BPO/DMA. Studies have shown a corrosion barrier fabricated to 0.2 inches (5 mm) has improved the service life and would be preferred. The use of thixotropic additives is not recommended in the corrosion resin that is used in the corrosion liner/barrier.

A requirement for this type of service is that the completed tank/liner be post cured for a minimum of 4 hours at 82C or 180F. The post cure time starts once the set point temperature has been reached. Also recommended for BPO cured liners, post curing should be performed within a week of completing the tank/liner fabrication. If Vipel K022-AC is used, post curing is also a requirement for obtaining the maximum fire retardant properties.

Some precautionary statements to help support some of the guidelines listed in the above recommendation. The suggested maximum operating temperature for sodium hypochlorite service is 40C because Sodium Hypochlorite begins to decompose at temperatures over 40C. Operating temperatures as high as 50C have been suggested but the previous precautionary statement should be considered for improved service life for this tank. The decomposition rate of Sodium Hypochlorite also accelerates when the pH decreases and maintaining the suggested pH minimum of 11.0 is recommended for improved service life. Sodium Hypochlorite can be very aggressive to FRP and AOC cannot state what the life expectancy of such a tank should be because of some of the factors outlined in this recommendation.

If you have any questions or comments, please let me know.

Best Regards,

Michael Siegel
Product Leader, Corrosion & Fire Retardant Resins



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Inspection Photos



Photo Set 1: View of the outside of the tank showing external piping and sight strip



Photo Set 2: Views of the outside of tank



Photo Set 3: Additional views of the outside of tank showing external piping



Photo Set 4: Tank Appurtenances – Flanged Nozzles (outside view)



Photo Set 5: Appurtenances – Flanged Nozzle and Access Manways



Photo Set 6: Appurtenances – Lid Rib and Lifting Lugs



Photo Set 7: Appurtenances – Hold Down Lugs

Overall on the outside surface of tank, there was no issues found that requires fixing.



Photo Set 8: View of the compromised tank liner (inside)



Photo Set 9: Close up view of the dryness and roughness of the compromised tank liner



Photo Set 10: Tank floor knuckle



Photo Set 11: Overall view of the tank floor (inside)



Photo Set 12: Tank floor seam bonding – delamination (lifting)



Photo Set 13: Tank floor roughness (compromised)

Rotate Inlet towards the center of the tank



Photo Set 14: Tank wall and Lid



Photo Set 15: Additional view – Tank wall and Lid



Photo Set 16: Appurtenances – Nozzles (inside)



Photo Set 17: Appurtenances –
Access Manway and Down
pipes (inside)