

# SAMPO Workshop 27 – 28.11.2019

## New "Lining" in Tanks on Ringhals AB

22-11.2019 Stjepan Jagunic

- Last year I had a presentation about new lining in tanks on Ringhals instead of natural rubber.
- After study visit at the BWR reactor Brunswick there 2 Condensate storage tanks were renovated with Chesterton ARC SD4i 2007 respectively 2008 and leaching tests on Ringhals we decided to use this product.
- **ARC SD4i** consists of:
  - **base material** – epoxy composite (50 - 60 weight percent silicon carbide and 5 weight percent titanium dioxide)
  - **binder** - aliphatic amine hardener (30 – 40 weight percent silicon carbide and 1- 2 weight percent quartz
  - Resistent to abrasion and Chemicals

- Outage 2017 did we painting in RWST R4
- Outage 2018 did we painting in RWST R3
- The result shows that the water quality in the tanks has improved silicon and sulphates. Chlorides and fluorides and metals are just like before painting constant low while the concentration of organic acids appears to be higher than before repair during periods without cleaning via ion exchange (perhaps depending of residuers after blasting). All lackable pollutants are kept at a low level and clearly within the requirements of chemical specifications using ion exchange treatment before and after outage.

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## Plate thickness

- Bottom 8 mm
- Walls 10 – 7 mm
- Roof 5 mm



Inside area about  
500 m<sup>2</sup>

Ø 15,3 \* 12,5 m

Useful volume  
2100 m<sup>3</sup>

Deionized but not degassed  
water  
about 2500 ppm boron

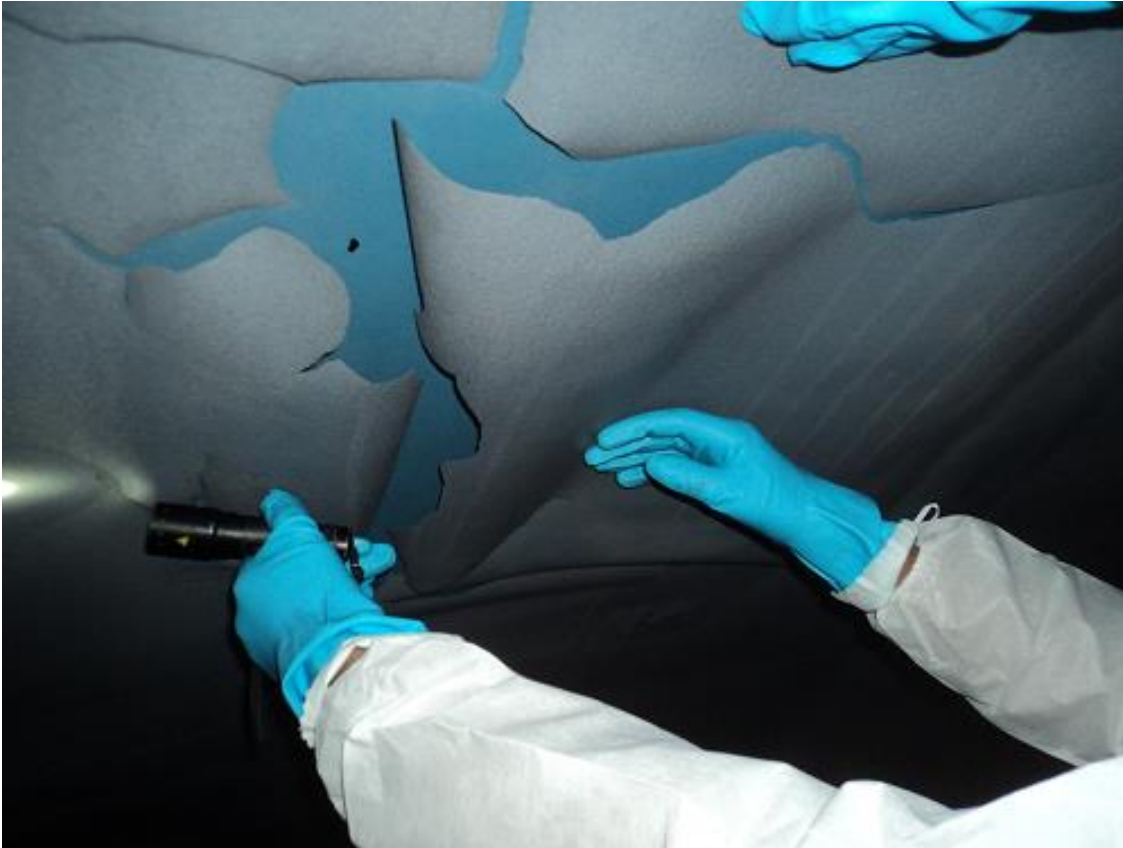
Designing temperature  
5 - 60°C

Plates in CS SIS 1312 weldid  
(MMA)

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## Outage 2019 - visual inspection



On the south side of the tank roof, an area of about 0.5 m<sup>2</sup> was noted where the upper inner composite layer has dropped from the underlying composite layer. However, nothing has fallen into water.

The reason was hot days and exceeded time span for application of the second composite layer. The underlying layers were intact.

4 m<sup>2</sup> of the bad adhesive layer was removed before repair.

# Outage 2019 - visual inspection

Several smaller corrosion deposits have been found.

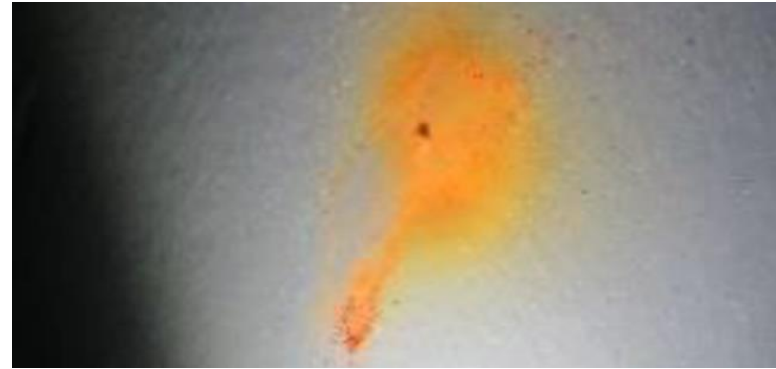
These were located mainly along the edge of the floor and mostly in one half of the tank and about 2 m up on the walls.

A few were going through.

Most of the corrosion particles were embedded in epoxy layers without contact with the underlying tank steel.

The reason for corrosion deposits is poor cleaning after blasting before painting 2017.

All locations were restored by grinding and repainting



After scrape  
with knife

## Outage 2019 - visual inspection



- Corrosion deposits around left old rubberized and welded steel plates. The reason is moisture that has not been dried before painting in 2017.
- Adhesion tests showed very good adhesion and the breakage occurs in the glue between the dolly and epoxy composite. Mean value 11,6 MPa



# Conslusions

- The new epoxy-based layer provides good corrosion protection. After two years of operation in the current environment, the painting is in good condition and has good adhesion.
- It is important to consider the following before and during application of the epoxy comosite:
  - Follow instructions when painting
  - Be careful with cleaning before painting
  - Dry well before painting to remove any moisture from any gaps

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Expiriens – Leakage in PTFE pipe on  
Ringhals AB

22-11.2019 Stjepan Jagunic

# Colling tube for generator R1



The cooling pipes in the new generator on Ringhals 1 are manufactured in PTFE (Ø30 mm). In one of these, the leak occurred.

The reason for the leak was poor purity at the manufacturer during manufacture. Small carbon steel particles have fallen into the pipe material. When these have corroded, the leak has occurred.

This type of error is difficult to catch with receive control. The example show that purity is always important.