- ***Corrosion of galvanized air conditioning structures on building roof at coastal region***

Galvanized coatings are not enough durable at coastal regions, mainly because of rain or snowfalls containing chlorides. Corrosion threat increases if content of suspended dust in air has an over normative value. Aggressive water that entered into towers through openings for interior air exit effected corrosion of tubular heat exchangers, water tanks and supporting construction elements. White rust was formed mainly on the interior surface of the structures after half a year storing before air conditioning and chemical passivation with modified water started.
Tower roofings were partly covered with white rust probably formed after evaporation of cooling water exhausted by vans after several months that passed since air conditioning started.

Chemical analysis of white rust sample taken from the tower interiors before starting of air conditioning determined over 25% of water soluble substances, composed nearly entirely of zinc chloride as a product of a chemical reaction. Because of very high zinc chloride solubility equal to 432g/100g at 25ºC it accelerates galvanized coating damage. Most probably Dead Vistula river mouth with chloride concentration equal to 0,27-0,39 % was the main source of chloride salts. Corrosive aerosol containing chlorides was carried with winds from the sea direction and Dead Vistula situated around half a kilometer from the building.

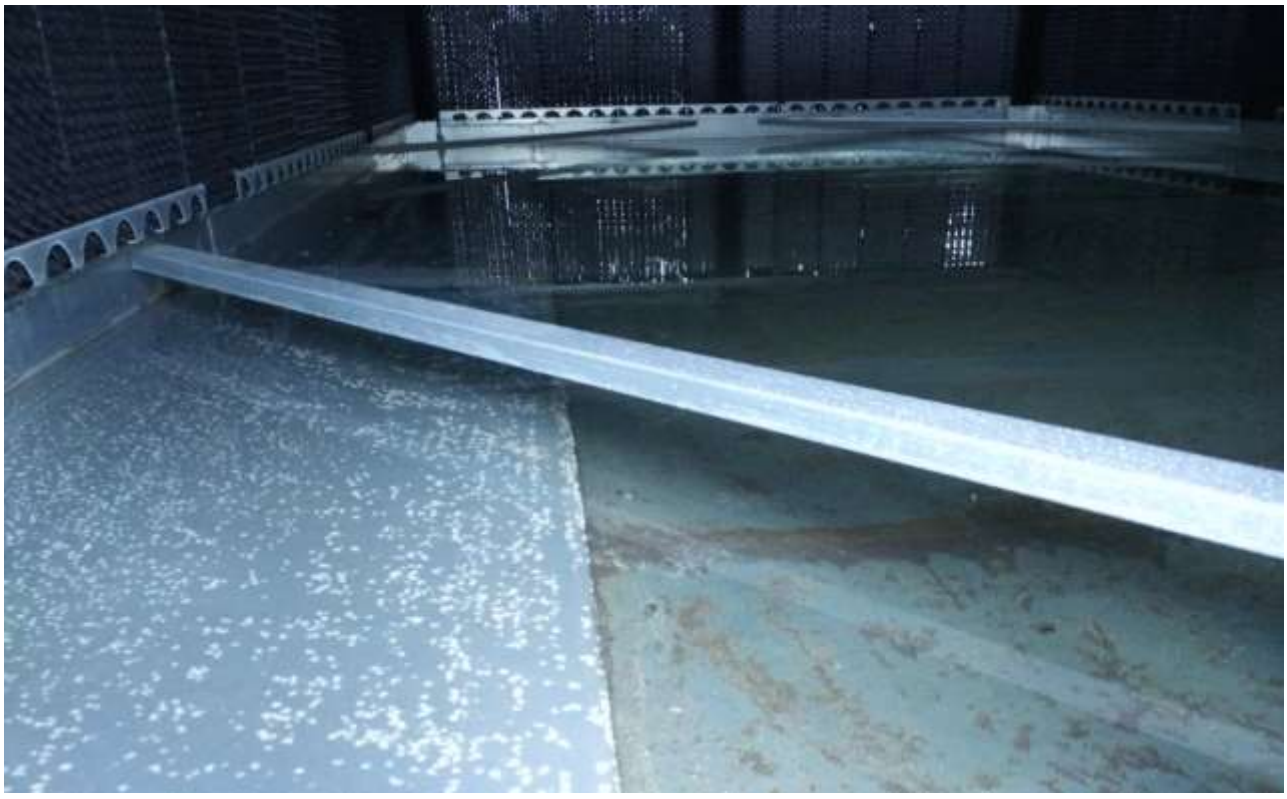

Fig.1. White rust and iron oxides on galvanized coating of cooling water tank before air conditioning started work

Fig,2. Iron oxides on the tower external surface in pores of galvanized coating after half a year of exposure at the building roof. The damaged coating on the rain collecting shelf was later, after cleaning, repaired with zinc rich paint

Fig.3. Deposit present on galvanized coating on heat exchanger after white rust removal, at the time of modified water application

After most of the deposit was removed by mechanical and chemical means, some needle pitting was locally present in the coating having thickness over 40 µm. At the pit bottoms was rust (iron oxides).

Water was modified with the aim to passivate zinc within the pH region of 7-8 by increasing hardness to produce a thin film of badly soluble phosphates and carbonates on the zinc surface.

It was advised to cover galvanized internal tower surface (except heat exchanger) with epoxy coating system durable in water containing chemicals at elevated temperature. The reason was high corrosion rate of zinc coating because of an atmospheric pollution with aggressive agents and periodical wetting and drying. In the case of heat exchanger damage it was advised to disassemble it and renew hot zinc coating to get an effective heat exchange. A possibility for application of another material solution was also mentioned.

The zinc coating on external tower surface was in a good condition with expected sufficient thickness for several years of usage. A periodical coating control was advised because of existing corrosion threat. It was also advised to renew zinc coating with application of epoxy/poliurethane paint system in mthe case the damages are equal to Ri2/Ri3 patterns within the PN-EN ISO 4628 standard.

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