

DETAIL DESIGN

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INVESTMENT:

INTENSIFICATION OF SODA ASH PRODUCTION BY 200,000 TONS/YEAR AT
SODA POLSKA CIECH IN INOWROCŁAW

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INTENSIFICATION OF SODA ASH PRODUCTION BY 200,000 TONS/YEAR AT SODA POLSKA CIECH IN INOWROCŁAW

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1. SUBJECT AND SCOPE OF THE ELABORATION

Guidelines concerning anticorrosion protection of newly designed construction parts for the soda ash production system at SODA POLSKA CIECH in Inowrocław are the subject of the elaboration..

The range of the elaboration includes:

- carrying out of paint coats on steel structures
- protection of designed tanks and technological equipment
- protection of technological piping
- renovation of existing paint coats in the area of systems being modernized.

This elaboration (revision C) introduces a painting system for push-plate conveyors.

2. CLASSIFICATION OF THE CORROSIVE ENVIRONMENT

Adopted category of atmosphere corrosivity - C 5I - very high (industrial)

Lifetime - long - over 15 years

3. STEEL STRUCTURE PAINTING

3.1. Surface preparation

The steel structure surface shall be shot blasted to gain the purity degree Sa 2 ½ according to PN-ISO 8501-1.

Sharp edges should be rounded off. Welded joints should be uninterrupted, without blowholes, cleaned and then evened by grinding. Before the shot blasting, the steel surface should be washed water under pressure and dried. Dedust the structure surface immediately before painting.

Apply the first layer of the priming paint not later than within 4 hours after surface cleaning is finished.

Leave strips 50 mm wide without painting to carry out welded joints.

3.2. Painting system

- epoxy priming paint Epinox 98 - the coat thickness 3 x 80 microns.
 - polyurethane enamel Emapur P - the coat thickness 2 x 40 microns.
- Total dry film thickness should be 320 microns.

3.3. Colouring

- steel structure – grey RAL 7040
- ladders, guard rails – yellow RAL 1023

4. PAINTING OF TANKS AND TECHNOLOGICAL EQUIPMENT

Paint coats shall be applied:

- on conveyor structures
- on external surfaces of tanks, both heat-insulated and without insulation
- inside filters, technological tanks for brine, technological tanks of Utilization System including the decanter E1.1002 D.

Motors, fans, pumps, etc. should be painted according to the manufacturer's technology adapted to the atmosphere corrosivity category C5I.

The guidelines do not include the chimney structure protection.

Solutions for these system components will be specified separately.

4.1. Surface preparation

The surface to be protected shall be shot blasted to gain the purity degree Sa 2^{1/2} according to PN-ISO 8501-1. Sharp edges should be rounded off.

Before surface cleaning, protect the flange pads and threads against damage and shield the holes.

Dedust the surface immediately before painting, preferably with suction devices to remove abrasant and dust remainders thoroughly.

Fill up possible defects and pits with the epoxy putty.

The coat should be applied on the dry, degreased and cleaned surface.

Required roughness grade: 50 - 75 microns

Apply the first layer of the priming paint not later than within 4 hours after surface cleaning is finished.

4.2. Painting system

4.2.1. External surface painting - not insulated surfaces with operating temperature up to 80 °C

- epoxy priming paint Epinox 98 - the coat thickness 3 x 80 microns.
- polyurethane enamel Emapur P, grey RAL 7035 - the coat thickness 2 x 40 microns.

Total dry film thickness should be 320 microns.

4.2.2. External surface painting - insulated surfaces with operating temperature up to 160 °C

- epoxy priming paint Epinox 98 - the coat thickness 2 x 80 microns.

Total dry film thickness should be 160 microns.

4.2.3. External surface painting - insulated surfaces with operating temperature exceeding 160 °C

- Inorganic zinc silicate, eg. Galwasol 19 – the coat thickness 70 microns.

4.2.4. Interior surface painting

- epoxy priming paint Epinox 98 - the coat thickness 3 x 100 microns.

Total dry film thickness should be 300 microns as minimum.

4.2.5. External surface painting - not insulated surfaces with operating temperature exceeding 200 °C - push-plate conveyors.

- Inorganic zinc silicate, eg. Galwasol 19 – the coat thickness 70 microns,
- silicone paint Oliterm 55 P – the coat thickness 2 x 15 microns,

Total dry film thickness should be 100 microns.

5. PAINTING OF TECHNOLOGICAL PIPING

The following piping between facilities, made of carbon steel, both insulated and not heat insulated ones shall be painted:

- calciner gas piping GD with diameter DN 1000,
- forcing gas piping G-LF with diameter DN 400,
- furnace gas collector with diameter DN 1600,
- process gas piping DN 400,
- low pressure cooling water piping DN 1000,
- high pressure water piping DN 250,
- energy piping DN 150,
- cooling water piping DN 350, steel, insulated, unheated
- after cooling water piping DN 350,
- after cooling water piping DN 300,

- supplementary water piping DN 150,
- underground cooling water piping DN 1000,
- soda condensate piping,
- purified brine piping,
- ammoniated brine piping,
- low-pressure steam piping DN 700,
- milk of lime piping DN 150,

and

- technological piping at the individual facilities, operating at the ambient temperature as well as at elevated and high temperatures up to 500 °C.

5.1. Surface preparation

Before painting, the piping surface shall be shot blasted up to degree of purity Sa 2^{1/2} according to PN-ISO 8501-1. Sharp edges should be rounded off. Welded joints should be uninterrupted, without blowholes, cleaned and then evened by grinding. Before the abrasive jet treatment, wash the surface to be painted with water and detergent and then with pure water and dry it. Dedust the substrate immediately before painting.

Apply the first layer of the priming paint not later than within 4 hours after surface cleaning is finished.

5.2. Paint coat composition

5.2.1. Not insulated piping with operating temperature up to 80 °C

- epoxy priming paint Epinox 98 - the coat thickness 3 x 80 microns.
- polyurethane enamel Emapur P - the coat thickness 2 x 40 microns.

Total dry film thickness should be 320 microns.

5.2.2. Insulated piping with operating temperature up to 110 °C

- epoxy priming paint Epinox 98 - the coat thickness 2 x 80 microns.

Total dry film thickness should be 160 microns.

5.2.3. Insulated piping with operating temperature 110- 400 °C

- Inorganic zinc silicate, eg. Galwasol 19 – the coat thickness 75 µm

5.2.4. Insulated piping with operating temperature exceeding 400 °C

- silicone priming paint Olitem 52 - the coat thickness 2 x 25 microns.

5.3. Piping colouring and marking

The piping should be marked according to PN-70/N-01270.

The not insulated piping should be painted in distinctive colour as a whole.

The insulated piping should be marked with bands in distinctive colour.

Flow direction should be marked on the piping; in addition, alphanumeric marking of the agent name and the piping no. should be placed.

Fittings should be painted in the distinctive colour for the agent.

According to *Health Minister's order of 29 May 2012 on methods of marking of areas, piping, containers and tanks for hazardous substances or mixtures*, the piping should be marked with warning signs.

5.3.1. Distinctive colours for piping

The following distinctive colours are accepted for piping:

- gaseous CO₂ - yellow RAL 1023
 - ammonia solution – violet RAL 4005
 - milk of lime– violet RAL 4005
 - hydrochloric acid – violet RAL 4005
 - brine – grey RAL 7035
 - distillation lye – grey RAL 7006
 - process air – blue RAL 5012
 - water – green RAL 6029
 - steam – aluminium RAL 9006
 - condensate – aluminium RAL 9006
 - firefighting agents – red RAL 3000
- support structures – grey RAL 7040

5.3.2. ID bands

The bands shall be placed on both sides of the fittings, on joints and branching.

The band width should depend on the piping diameter.

For piping diameters of 25 - 80 mm (including the insulation thickness), the band width should be 40 mm and the distance between the bands should be 2 m as a maximum.

For diameters above 80 mm up to 160 mm (including the insulation thickness), the band width should be 60 mm and the distance between the bands - 3 m as a maximum.

For diameters above 160 mm up to 300 mm (including the insulation thickness), the band width should be 100 mm and the distance between the bands should be 4 m.

For diameters above 300 mm (including the insulation thickness), the band width should be 160 mm and the distance between the bands should be 6 m.

When pipes of different diameters are arranged in parallel, the bands should have the same width and should be equidistant. Preferably, accept the width of the bands and the distances between them provided for the piping of the biggest diameter.

5.3.3. Flow direction signs

Flow direction should be marked with unidirectional arrows

- on plates attached to the piping with diameter up to 80 mm (including the insulation thickness) or
- painted directly on the piping with greater diameters.

The plates should be placed near the ID band.

Flow direction should be marked in black.

5.3.4. Inscriptions

Inscriptions on the piping should be black in a background in distinctive colour and in a black border;

- on plates attached to the piping with diameter under 80 mm (including the insulation thickness) or
- painted directly on the piping with greater diameters.

The plates to be attached shall be made of aluminium sheet.

5.3.5. Warning signs

The piping for ammonia solution, milk of lime and hydrochloric acid should be marked with the warning signs - the triangular sign - the black pictograph in the yellow background with black margins (the signs no. 4 and 6 acc. to the Annexe of Health Minister's order of 29 May 2012).

- sign no. 4 - a warning of toxic substances - the ammonia solution piping,
- sign no. 6 - warning of caustics - the milk of lime and hydrochloric acid piping.

The warning signs shall be placed near valves or joints, in well-lighted, readily available and apparent places.

5.4. Underground piping

Use pipes with factory-made trilaminar polyethylene coat to lay the underground carbon steel piping. Insulate joints, elbows and pipe tees with thermoshrinkable bands or cold applied polyethylene tapes - insulation of class C 30 acc. to PN-EN 12068.

Before applying of the insulation, clean surfaces of carbon steel joints, elbows and pipe tees using mechanical methods up to degree of purity St 3 according to PN-ISO 8501-1. Sharp edges should be rounded off and welded joints should be cleaned and then ground smoothly. The surface to be insulated should be dedusted and degreased and then grounded with the system component.

Apply tapes according to manufacturer's instruction.

Check the coating density with a flaw detector using voltage of 5 kV per 1 mm of the coating thickness, however not exceeding 15 kV.

6. REPAINTING

6.1. Surface preparation

Clean the steel structure to be repainted using the abrasive jet method to remove the loose-fitting paint coats. Leave the well-adherent layers of the old paint coat. Where signs of corrosion are visible, remove the all coat to obtain pure metal with degree of purity Sa 2 acc. to PN ISO 8501-1. Dedust and degrease the base before painting.

6.2. Paint coat composition

- epoxy priming paint Epirustik 2000, the coat thickness 60 microns,
- epoxy priming paint Epirustik 2000, the coat thickness 2 x 90 microns,
- polyurethane enamel Emapur P, the coat thickness 2 x 40 microns.

Total dry film thickness should be 320 microns.

7. EXECUTION ENVIRONMENT FOR PAINTING WORK

The painting work shall be carried out by a specialized company.

The work shall be carried out at the base and ambient temperatures at least 5°C as optimum and at least by 3°C higher than temperature of the air dew point.

Do not paint surfaces heated above 40°C.

The relative humidity of the air should not exceed 80%.

Outdoor painting is prohibited during rain, fog, drizzle and when the structure is covered by dew.

During painting, observe the weather conditions, the method of painting, the sequence of layers application and the time interval between application of the following layers. Comply with the product manufacturer's instruction as regards paints preparation, spraying parameters and variables of the process including the paint coat drying and seasoning times.

Paint roughly edges, hips, welded and screwed joints with a brush.

Fresh coats should be protected against moisture and dust. The surface to be painted should be dry and clean before applying of both the priming paint and the following.

The paints should be applied with the airless spraying or a brush. In case of painting with a brush, preferably dilute the paint and provide necessity of additional layers application to obtain the required coat thickness. Fresh coats should be protected against moisture and dust.

The paints should have tight packages and should be accompanied with testing certificates; their expiration dates should be valid.

Notes!

Different materials with equivalent technical parameters can be used to carry out the paint coats.

8. QUALITY CONTROL OF THE COAT CARRIED OUT

Control of the protection carried out should include:

- surface preparation - degree of purity - by comparison with the standard according to PN-ISO 8501-1.
- visual inspection of the coat - surface defects such as: areas without paint, sagging, wrinkles, craters, blisters, coat settling, foreign matter inclusions in the coat are inadmissible. The coat defects should be eliminated immediately.
- measurements of dry coat thickness - carry out when the coat is fully hardened according to PN-EN ISO 2808. Results of measurements are acceptable if they reach values between 0.8 and 1.0 of the specified values if the arithmetic mean of all measurements is equal to or higher than the specified thickness. Areas of lower thickness than 0.8 of the specified value must be painted once again. An individual maximum result should not exceed the triple specified value.

9. INDUSTRIAL SAFETY CONDITIONS

The paints to be used contain harmful and flammable substances that come out during the paint application and the coat drying. Avoid inhalation of product vapours and mist as well as avoid eye and skin contact. Good ventilation shall be provided during painting. Use of open flame and tools causing sparking must be prohibited within the working area. The work may be done by persons trained in industrial safety and equipped with protective clothing and personal protection means.

Comply with recommendations contained in the dangerous substance data sheets.

Provide workstations with the hand fire-fighting equipment.