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[illegible]

[illegible] (Chem. Bulletin No. 1, C. 19)

[illegible]

As in Washington, lead has been replaced by brick for alum boil tanks in the Baltimore Water Department filtration plant. A new steel tank has been [illegible] with a complete U. S. [illegible] lining installation. The [illegible] consists of [illegible] soldier laid brick over [illegible] in. [illegible] compound. [illegible] has a wide range of chemical usefulness and is apparently cheaper than natural or synthetic rubber.

However, lead will replace Tygon and bitumastic linings now in use in the dilution tanks at this plant. Lead pipe and valves are giving good service, as is a Duriron pump.

INTRODUCTION

Information on the preparation of acid alum for use in both the Baltimore and Washington waterworks has been given in Chemical Bulletin No. 1. This report brought out that in Washington lead lined dilution tanks give long life, but the boil tank had been recently relined using an asphalt layer between the steel tank shell and the brick inner lining. A recent trip to the Baltimore waterworks revealed that the process is unaltered though lead is no longer in use for boil or make tank linings.

EQUIPMENT DESCRIPTION

a. Boil Tanks - As shown in the drawing, a 45° conical bottom is now used in the newly [illegible] steel tank, built to replace the hemispherical bottom tank formerly used. The [illegible]-in. steel tank, 15 ft. in diameter, now has an 11 ft. vertical side wall above the cone where formerly a 10 ft. vertical section was used. The conical section was installed here, only because of difficulty in getting steel plates shaped to form the hemispherical bottom. The plant engineer still prefers the curved bottom.

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The steel tank was said to cost $1700 and the U. S. Stoneware brick and Rosilon lining cost another $1800. Acid resistant brick [illegible] which was placed over a [illegible] of Rosilon cement. [illegible] over the top flange of the shell as it [illegible] the tank.

[illegible] tanks [illegible] have been [illegible] for [illegible] tion [illegible] Rosilon [illegible] which [illegible] corrosion [illegible] tion [illegible] the [illegible] will probably [illegible] 10 lb. lead with supporting [illegible] 6 to [illegible] have been used.

Three tanks are now lined with bituminite cement and a fourth is lined with four coats of Tygon paint. Covering material cost only, Tygon paint for one tank cost $150, while the bituminite covering was said to cost $600. Bituminite was said to give somewhat longer life but not enough to warrant the greater cost when compared to Tygon.

COMPETITIVE MATERIALS

Tygon is advertised as a corrosion resistant paint (also available in sheet and tube form) and claims resistance to most acids, alkalies, salts, fresh or salt water, oil, grease, gasoline and alcohols. It is said to air dry within an hour, but the filtration plant engineer complained of the extended drying time necessary between applications. It is said to resist temperatures up to 175° F. without softening and special primers allow 200° F.

Rosilon - A synthetic resinous base thermoplastic, developed for use by the U. S. Stoneware Co. of Akron, Ohio. It is available in three forms: (1) heavy duty sheets 48 x 30 x 3/8 in., (2) in bulk for hot mopping or troweling, and (3) as an emulsified paste. The compounding can be varied for specialized service requiring variations in thermal properties, hardness and resiliency without affecting the corrosion resistance. The paste form is apparently cheaper and has lower corrosion resistance.

Rosilon is said to be useful over a temperature range of -15° to 170° F. It is not an abrasion resistant material and where abrasives are encountered or temperatures exist above 170° F, the use of an acid resistant brick overshoath is recommended. Rosilon is unaffected by abrupt temperature changes and is said to be flexible enough to expand and contract with the material to which it is bonded, thus overcoming a major drawback encountered in the use of lead between a steel shell and a brick lining subject to temperature changes. It is non-oxidising and will not age.

When Rosilon is used as an intermediate membrane between acid proof brick and a tank shell (Manufacturers' claims):

1. It will withstand up to boiling temperatures any of the acids to which it is resistant.

2. Abrasive conditions are eliminated.

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5. The Resilon lining provides a cushioning effect which will add to the life of the ceramic lining.

6. Brick protection prevents mechanical injury to the Resilon lining.

Resilon will not resist chromic acid, strong oxidizing agents, oils, benzol, bisulfide, concentrated sulfuric and concentrated nitric acids. It is soluble in hydrocarbons and chlorinated solvents.

Partial Listing of the

Chemicals Resilon Will Handle

Alums	Ferric Sulphate	Sodium Silicate
Aluminum Sulphate	Lead Acetate	Sulfur Dioxide
Ammonium Chloride	Magnesium Sulphate	Sulfur Trioxide
Ammonium Sulphate	Phosphoric Acid	Sulfuric Acid
Calcium Chloride	Plating Solutions	Sulfurous Acid
Chlorine	Sodium Bisulfate	Water (brine)
Copper Sulphate	Sodium Chloride	Zinc Chloride
Ferric Chloride	Sodium Hydroxide	

It is to be noted that the above chemicals are all safely handled in lead in competition with Resilon.

For application as a tank lining a blow torch, a roller and two trowels are needed. Resilon sheets are fused to the tanks with the blow torch flame. Manual troweling smooths out the molten layer of Resilon while the roller is used to apply pressure to ensure a firm bond between the steel tank wall and the lining. Joints are welded with strips of Resilon. No extra supports are required and pinholes are eliminated by heating and troweling. No curing or drying time is required. It is said to cost less than half the cost of rubber or synthetic rubber.

In the application of bulk Resilon it must be melted and a possible explosion hazard exists. To prevent an explosion, "Never melt Resilon in the container in which it is received or in any container in which the material has been allowed to solidify in mass." •

Durisite is an alkali and acid resistant cement of the Furane base resin type used to cement the bricks. It is useful up to 350° - 375° F. in resisting inorganic acids, organic acids, any degree of alkali concentration, oils and solvents. Durisite is obtainable in liquid or powder form and is quick setting, within 20 - 30 min. at room temperature. It can be placed in service within two or three days after laying the last brick. Compressive strength is 12,000 psi and tensile strength is 1400 psi. One half pound of mortar is required per 9 in. brick buttered on three sides. The boil tank installation in Baltimore had a generous ¼-in. plus between each brick.

• From Bulletin R-12 of the U.S. Stoneware Co., Akron, Ohio. Other data on Resilon is given in Bulletin 1502.

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[illegible] OF OTHER [illegible]

A Durison pump has been in operation for 12 years [illegible] replacements required. A "standby" is kept on hand in case the [illegible] should fail but it has not as yet been put in use. Connections to [illegible] of lead pipe [illegible] give very good service. In the line from [illegible] a [illegible] is [illegible] to keep stones and trash [illegible]. The [illegible] lead lined trash box is roughly 10 in. sq. by 18 in. deep and is usually emptied about once a week.

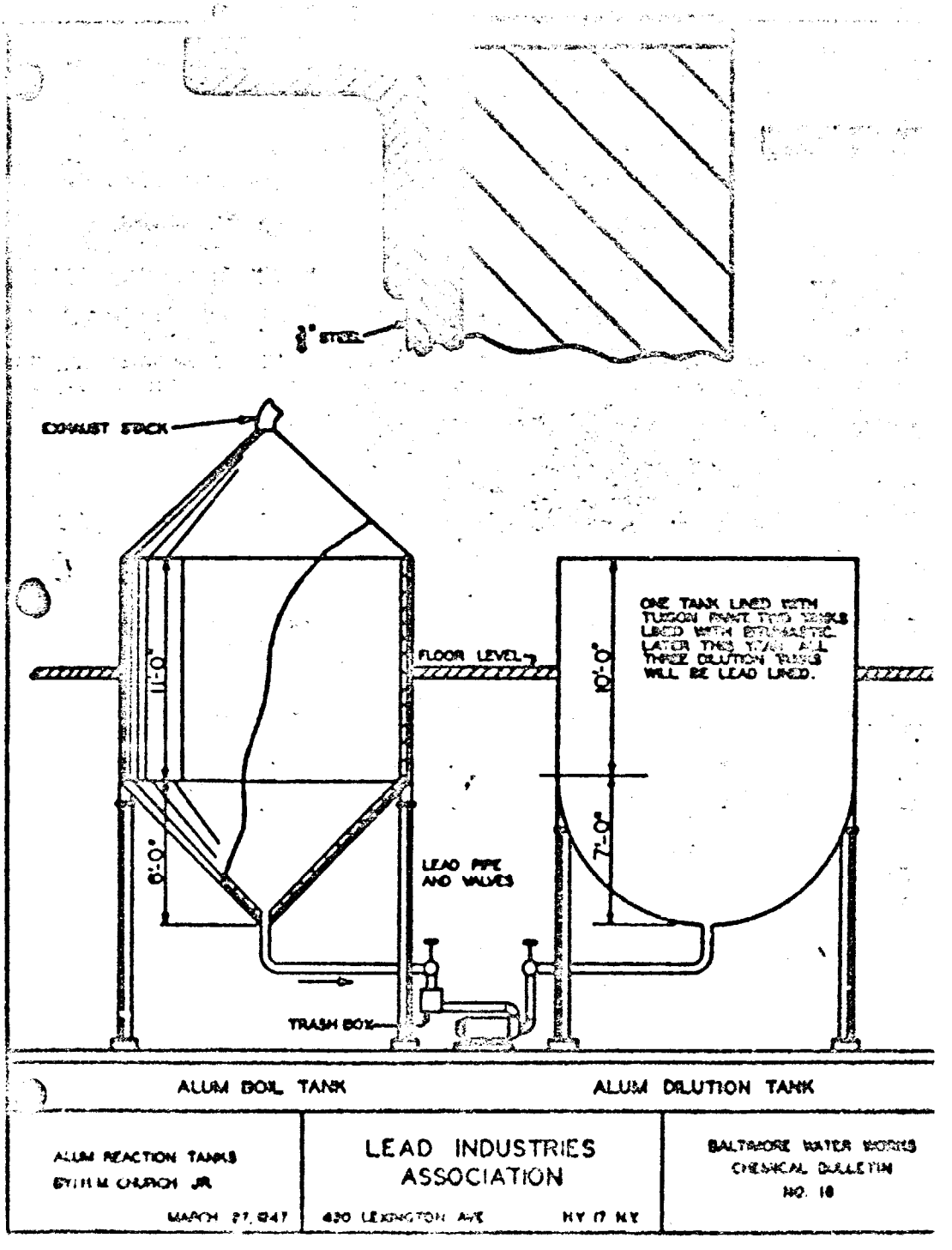
CONCLUSIONS

a. Satisfactory Lead Service

Lead pipe is giving satisfactory service for handling the acid alum solutions. Lead linings for dilution tanks have given very good service in the Washington waterworks (see Bulletin No. 1) and plans are to line the Baltimore plant dilution tanks with lead as soon as feasible. For dilution tanks, lead linings are regarded as more resistant and more economical than either bitumastic linings or the 4-coat application of Tygon paint.

b. Performance of Competitive Materials

For boil tanks, lead linings have not given good service and are being replaced by a U. S. Stoneware lining of acid resistant brick and a Resilon backing compound. The Resilon will probably be impermeable to the alum solution that will in time soop between the bricks and will also give the bricks room for expansion - contraction occuring during heating cycles. This installation should have excellent life as long as the Resilon layer remains impermeable and retains its flexibility.



ALUM REACTION TANKS BY H. M. CHUPKA JR. MARCH 27, 1947	LEAD INDUSTRIES ASSOCIATION 420 LEXINGTON AVE NY 17 NY	BALTIMORE WATER WORKS CHEMICAL BULLETIN NO. 18