

(2) etc.

STRICTLY

Selection of materials for the construction of the strip mill is of great importance. The materials must be of high quality and must be able to withstand the severe conditions of continuous operation. The materials must also be able to be replaced when a complete set of parts is required.

Pickle tank covers are of light gauge steel lined with insulating material and have given good service since the original installation. The tanks and tops are in separate 60-in. sections.

Sponge rubber cushions in the end sections are not installed and only one course of 1/2-in. acid resistant brick is used. With temperatures at 212-215° F., conditions are severe and repairs are made occasionally which involve replacement of large areas of brick and rubber.

Monel metal is used for tie-rods for wooden tanks where a light pickle wash is used in some batch pickling. As construction for pickle tanks, monel was said to be "foul."

By request the plant name is being withheld from this report but can be furnished to members upon inquiry.

a. INTRODUCTORY HISTORY

In the modern continuous strip mill the combination of "Triflex" rubber and acid resistant brick is widely used and very well liked by the plant engineers. In this completely modern strip mill built on the southern bank of the Monongahela River near Pittsburgh there are two continuous pickler units. These are quite similar to the pickle tanks discussed in Chemical Bulletin No. 4 with exceptions as noted below.

b. PROCESS DESCRIPTION

Steel strip is brought to the end of the pickler in coils where one end is stitched to the tail end of the coil undergoing pickling. A slack trap accumulates enough strip to allow uninterrupted movement through the acid baths while the stitching occurs. The strip moves at varying speeds up to as high as 100 ft. per min. depending upon the quantity of scale to be removed and other variables.

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The first acid bath the strip contacts is the washpot, containing 5% sulfuric acid. The acid flows counter-current to the movement of the strip and is replaced by 10% acid in the final of the bath. Steam is introduced at the bottom of the tanks for purposes of agitation and maintenance of temperature at 212°F. The acid flows by gravity from tank to tank and finally is removed to a condenser before disposal.

Exhaust at the lower end of the pickler at the floor level there are no traces of acid fumes. These are captured by removable covers and drawn off to exhaust through stacks alongside the building.

c. PICKLING INSTALLATION

There are two continuous picklers built to take 80 and 38 in. wide strip. Each consists of four 60-ft. tanks, approximately 6 ft. deep. Each tank is a separate unit which was not the case in the Armac plant (see Bulletin No. 6). The steel tanks were elevated for ease of repair and all were lined with 1/4-in. "Triflex" rubber manufactured by the Goodrich Rubber Co. of Akron, Ohio. In this plant only one course of 1-1/2 in. acid proof brick was used as an inner lining and no sandstone slabs were placed on the tank bottom for abrasion resistance. The end construction did not use a sponge rubber cushion as was done at Armac.

The cement used is a "Tegul-Vitrabond" sulfur based cement produced by the Atlas Mineral Products Co. which is said to withstand temperatures up to 200°F. It is plasticized with olefine polysulfide to withstand thermal and mechanical shock and is applied while hot by pouring between and behind the bricks.

A rib supported steel top, "Triflex" lined, was in use to contain the steam and acid vapors. Sections of the top, 12-ft. in length, may be removed for repairs or inspection by means of a crane hoist attached to hooks on top of the ribs. A "Triflex" lined fume duct conducts vapors from the top of each tank to an exhaust stack alongside the building.

The only use of lead in this installation was in the steam pipes which carry steam to the tank bottoms for agitation of the liquor and to maintain the temperature at 212-214°F. Low pressure steam is brought to the bottom of each tank by a pair of 2 in. AA lead pipes as shown in the drawing. "Triflex" rubber lined pipes from either side of the tanks lead to the next tank and maintain the liquid level by allowing liquor flow from one tank to the next.

d. PERFORMANCE OF LEAD AND "TRIFLEX"

The previous experience of the plant engineers with lead lined pickle tanks and with lead and brick in combination had been one of constant maintenance. As discussed in Bulletin No. 4, the brick expansion upon repeated heating cycles extruded the lead from behind the brick work causing thin walled sections which failed, allowing acid attack upon the outer tank or steel. These breaks occurred constantly and were not detectable until the acid had penetrated the steel shell.

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"Triflex" consists of three layers of rubber, a sheet of lead under covered with a sponge rubber layer on either side. The total thickness being 1 1/2 in. The heavy rubber gives the lining its durability and the sponge rubber the soft outer layers allow sufficient room to withstand much of the expansion of the brick.

In this installation, one course of 4-1/2-in. brick was used above two courses of 8-in. brick used in the Araco pickle tank. In this case, the course of brick would have the effect of insulating the rubber lining to temperature variations, which may be a cause for more frequent repairs. This plant also did not make use of a sponge rubber expansion cushion at the tank ends as was done at Araco. However each tank section was a separate unit with no additive expansion effects of one continuous 200 ft. tank which would tend to counteract somewhat the effect of one course of brick and the non-use of an expansion cushion.

When viewed, one tank of the 80-in. pickler had just been repaired in three places. One entire end section had new patches of sheet rubber applied over the old lining and one course of new brick was installed. A "Pitobond" cement was heated in kettles and poured in between the brick crevices with no signs of paper to prevent formation of dagger-like crystals of the cement compound as was done in the Araco plant. Two other sections just repaired were on the bottom and side and each was roughly 15 sq. ft. in area. At least that much new brick had been installed over and around the area of damage to the rubber. The older brick plainly showed the ravages of the hot acid, being worn away to different levels, but not pitted or gouged by the steel strip. Rubber covered steel rollers at either end of each tank controlled the strip.

The lead steam pipes for heating and agitation have given satisfactory service since their installation as have the "Triflex" lined steel tank covers.

e. OTHER MATERIALS

Monel was said to be "foul," when tried as a pickle tank. It was said to spring leaks very easily, particularly around welds. Monel tie rods used with wooden tanks where they use a mild pickle wash give excellent service.

A Goodyear product, "Plioweld," is competitive to "Triflex" as well as lead in the field of tank linings for corrosion resistance. When vulcanized it is quite flexible and may be bonded to steel tanks of almost any size or shape. Advertising photographs show continuous picklers constructed of steel, "Plioweld," and brick that seem to be identical to installations using "Triflex." The Goodyear advertising claims that pipe and fittings, fan coverings and housings, storage tanks and other units in the chemical process industry may be protected by "Plioweld," from the ravages of a number of corrosives so it can be seen that this material will compete with lead in fields other than continuous picklers.

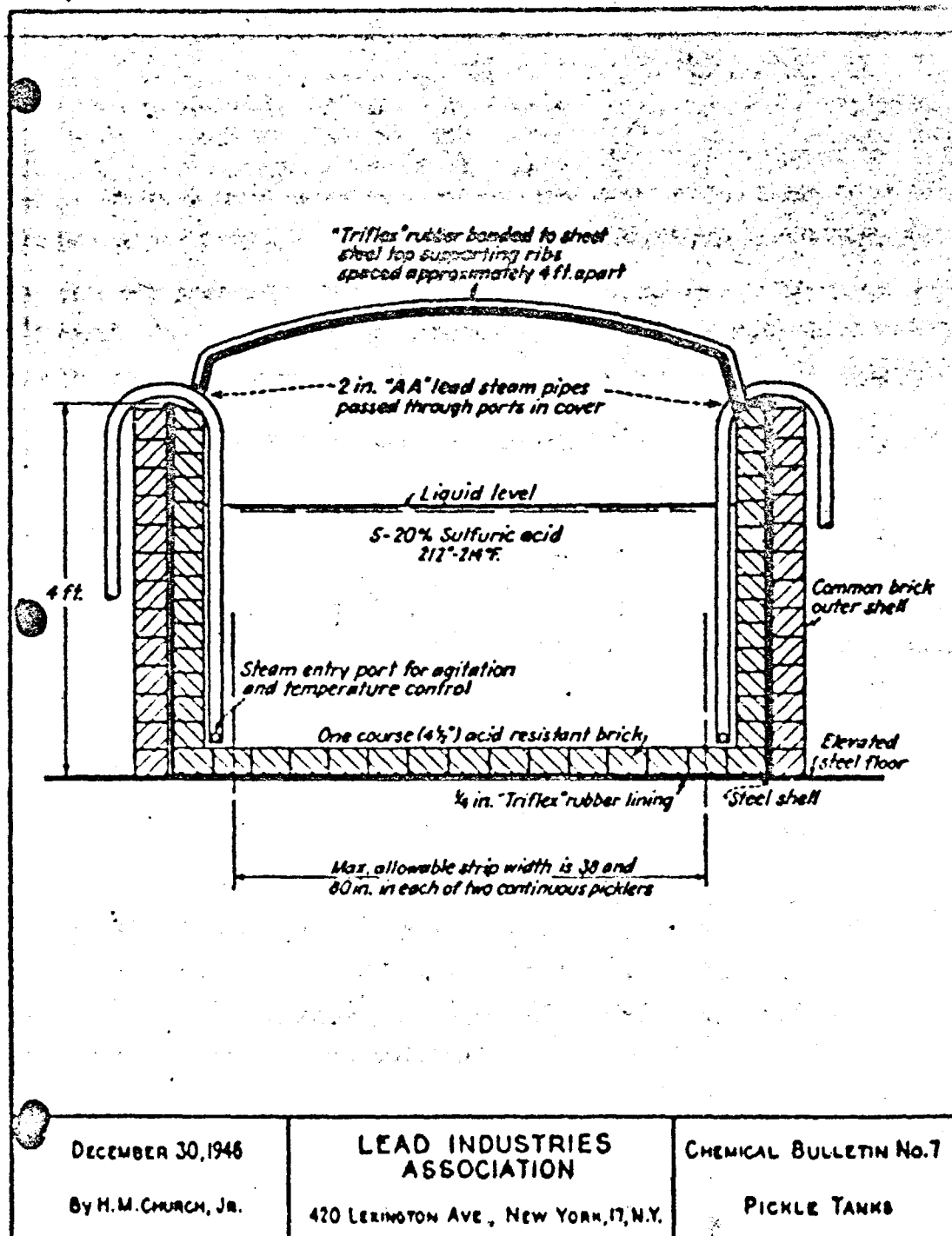
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CONCLUSIONS:

1. Even though rubber under brick requires some repair, the plant engineers prefer linings of rubber rather than lead because of its maintenance costs and greater reliability of service although more expensive.
 - a. Only one course of brick which allows a greater temperature range to affect the rubber lining.
 - b. No sponge rubber cushion is used to take up the brick expansion which would cause greater pressure to be exerted on the inner lining, causing weak spots in the lining.
2. "Triflex" lined steel covers have been very satisfactory, lasting for 9 years (to date), compared to a little over 4 years at Araco where "Triflex" covers are used with no steel backup, just the steel ribs as shown in Chemical Bulletin No. 4, Drawing No. 2.
3. Separate 60 ft. tanks are used which prevent additive effects from brick expansion in all four tanks when joined together as at Araco.



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PICKLE TANKS