

1990-1991

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1. The first thing I noticed when I stepped out of the plane was the cold. It was a sharp contrast to the warm, humid air of the tropics. I shivered slightly, but then I remembered that this was just the beginning of the adventure.

2. The second thing I noticed was the silence. It was a deep, profound silence that seemed to envelop me. I had heard that the mountains were quiet, but I didn't realize how quiet they really were.

3. The third thing I noticed was the beauty. The mountains were breathtakingly beautiful. The peaks were jagged and steep, and the valleys were lush and green. It was a sight that I had never seen before.

4. The fourth thing I noticed was the people. The people of the mountains were friendly and welcoming. They had heard that I was a visitor and they wanted to show me around. They took me to their homes and showed me their way of life.

5. The fifth thing I noticed was the food. The food was delicious and different from anything I had ever eaten before. It was a mix of traditional and modern cuisine, and it was a true delight.

6. The sixth thing I noticed was the weather. The weather was perfect. It was not too hot and not too cold. It was just what I needed.

7. The seventh thing I noticed was the scenery. The scenery was stunning. The mountains were everywhere, and the views were incredible. It was a sight that I would never forget.

8. The eighth thing I noticed was the culture. The culture was rich and diverse. There were many different tribes and languages, and it was a true testament to the diversity of the world.

9. The ninth thing I noticed was the history. The history of the mountains was fascinating. There were many stories and legends, and it was a true testament to the resilience of the people.

10. The tenth thing I noticed was the future. The future of the mountains was bright. There were many opportunities and challenges, but it was a future that I was excited to see.

Exposure of lead in computer units has resulted in the use of stainless steel plates and ribs in the areas of initial contact. The remaining lead lining in computers gives excellent service as do the auxiliary units which use lead lining.

4. ESTABLISHMENT OF LIBRARY

In a steel plant of moderate size such as at Inland, there is not sufficient cooling of steel to require an excessive flow of cold clean gas and burning of three million cubic meter units are in use at any one time. These units cost \$5 to \$6 million ea. the oil gas per day which is a much smaller volume of gas than in the Inland plant (see the said Bulletin No. 5), where of 100,000 cubic feet per day the amount is the same. This is, of course, a gross figure. The Inland plant burns 1,000,000 cu. ft. of gas burned daily by the blast furnaces and chemical plants.

[illegible]

July 25, 1947

B. DESCRIPTION AND PERFORMANCE OF OLDER UNITS

Three saturator-separator units have been in use at this plant since 1936. The saturators are in the shape of a large oval 10 x 10 ft. and are roughly 18 ft. high. As shown in the drawing, the heavy lead cracker pipes are supported 4 ft. from the bottom of the unit. Upon installation, the saturators and separators were completely lined with 3/8 in. chemical lead. One of these was relined in 1936 and another in 1937 with 5/8 in. tellurium lead. However, in 1946, when it became necessary to reline the third saturator, which apparently received less severe use, 1/2 in. chemical lead was used in place of tellurium lead. Some repairs are required periodically in areas damaged by the abrasive effect of crystals which form and drop to the bottom of the saturator. These crystals are drawn off through a slurry pump and some abrasion was encountered at the throat of the pump section. These units are all working to date with a 50% increase in capacity over former years. An important factor is the use of a Cottrell precipitator to remove 60-70% of the tar. However, there is still sufficient tar remaining to clog up the pumps and this would certainly be enough to have some protective effect for the lead linings.

The original cracker pipes are still in use in these three saturators. These are made of 1 in. lead, stand about 18 in. high and are roughly the same width. Continuous rows of slots 7 in. high by 1 9/16 in. wide allow the gas to pass through the dilute sulfuric acid liquor. The liquid level is 32 in. above the cracker pipe slots. Gas enters the cracker pipe through two 24 in. cast iron nozzles. There has been no trouble with slots breaking off nor has there been any trouble with the cracker pipe except for its great weight (approximately 6 tons). The supports for the cracker pipe are 6 in. wide, steel covered with 3/4 in. chemical lead and there has been extrusion trouble at the points of support. To correct this the weight of pipe should be distributed over larger areas of support which apparently was an oversight in the original design. Perhaps a square plate or strip of 6 or 10% antimonial lead (or stainless) would act as a means of distributing the weight over a greater area and thus prevent the extrusion of lead from between the cracker pipe and its steel supports.

After bubbling through sulfuric acid, the gas passes through a lead lined upper portion of the saturator known as the surge tank, and then through a cast iron outlet nozzle, 36 in. wide. Upon entering the separator, the gas is whirled around and down past a central tube through which it finally passes upward and out of the unit. In its rotary motion about this central tube, the acid particles are flung outward where they contact the outer lead lining, flow down the sides to a drain, and then return to the saturator.

Trouble occurs at the first point of impingement of the acid particles on the lead lining which becomes eroded. Vertical ribs of hard lead have been installed to absorb this initial impact of the acid particles. These failed, however, and the Dietzel Lead Burning Company suggested the installation of 40 in. square plates of 16-8 stainless steel which have been very satisfactory and probably will prevent the complete replacement of lead here. Here is a possible use for the abrasive resistant lead product known as "plumbalum."

C. DESCRIPTION AND PERFORMANCE OF NEW UNITS

Three additional saturator-separator units were said to have been built in August, 1943, of different design. These new saturators are 25 ft. high and 18 ft. 9 in. in diameter. The bottom and sides of the saturator are lined with 3/16

in. chemical lead covered by one course of acid resistant brick. The sloping top of the saturator is lead lined with support obtained by straps. Gas entry to the upper chamber is shown at the right of Drawing No. 2. As dry gas only is in contact with the metal here, there is no need for lead lining. Passing down through the eight vertical stainless steel tubes (18-8) the gas bubbles through the acid liquor where ammonia is absorbed to form the hard ammonium sulfate crystals. Through steel pipes in the center of each cracker pipe from (concentrated) acid is added.

The crystals form and collect at the bottom of the saturator and are drawn off through lead pipes to the slurry feed tank where the crystals are separated from the acid liquor. An agitator in the lower portion of the saturator keeps the acid in circulation. Here the brick lining over the lead prevents abrasion from the agitation of the hard ammonium sulfate crystals.

The wet gas bubbles into the surge chamber and flows up a 5 ft. diameter lead lined steel pipe 14 ft. high. A horizontal lead lined steel pipe 3 ft. 6 in. in diameter conducts the coke oven gas to the separator where acid particles are thrown out against the sides as described above. Both sides of the separator exit tube and the inner wall of the separator are said to be lined with 1/4 in. lead. The gas outlet tube is lined with 3/16 in. lead.

A lead pipe returns drip acid to the saturator as shown. Acid from the overflow weir and return acid from the slurry feed tank are fed into a distribution pot and returned to the saturator as shown.

It is claimed a power saving is brought about through the use of stainless steel cracker pipes by means of a decrease in gas pressure required to drive the coke oven gas through the system. In the units using lead cracker pipes there is a 39 in. difference between the liquid level and the upper edge of the cracker pipe slots. This difference in height of liquid through which the gas must be forced is reduced to 18 in. in units using stainless steel cracker pipes. This was said to change the pressure head required from 80-100 to 20-25 mm. of mercury. This is an important power saving but, if the gas flow is kept the same, just why there is this difference in head when using lead or stainless is still not clearly brought out. However, the Koppers engineers state that when the gas flow is greatly increased then stainless steel cracker pipes show their superior resistance to abrasion.

CONCLUSIONS

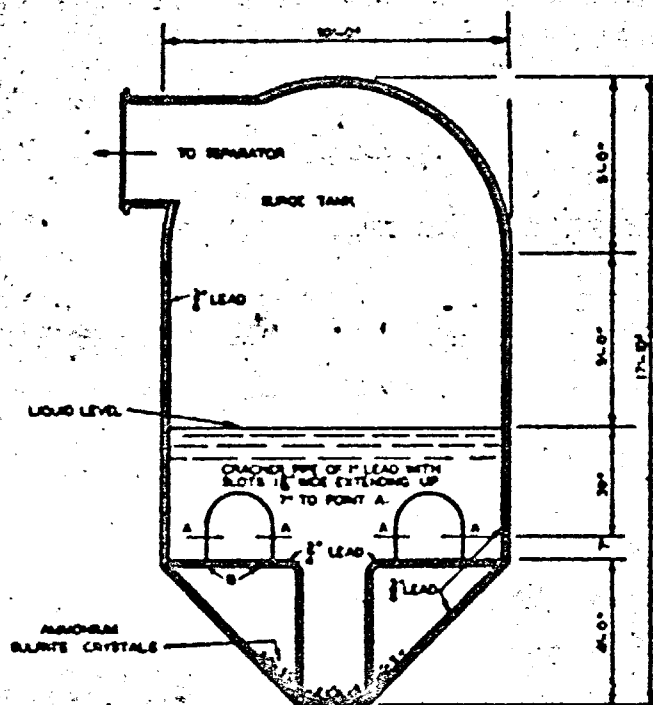
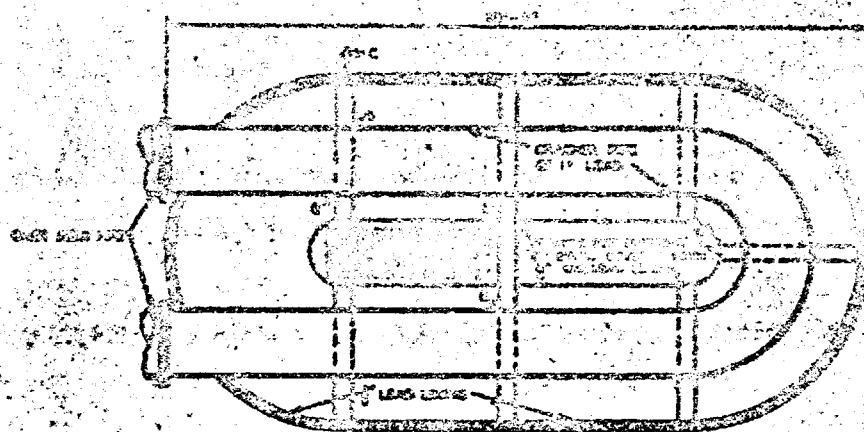
1. In saturators handling moderate quantities of gas, lead linings have given fairly good service but there is a general trend toward stainless steel and other materials.
2. Saturators, lead and brick lined and using stainless steel cracker pipes, have given excellent service since their installation in 1943. Saturators of this type should give excellent service even though the gas flow were greatly increased.
3. Extrusion of lead from beneath lead cracker pipes due to their great weight is an original design fault rather than a lead failure, however, lead is blamed.

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4. Cracker pipes of stainless steel are being successfully used and, it is claimed, result in an important power saving by reducing the pressure required for gas propulsion.
5. In acid separators there has been trouble from erosion of lead in the area of impingement of acid particles on the lining. This has been overcome by using a stainless steel plate in the area of erosion which allows lead to serve with satisfaction throughout the rest of the separator.



OLD SATURATOR

DRC NO. 1
BY PRODUCT CODE
BY H.M. CHURCH

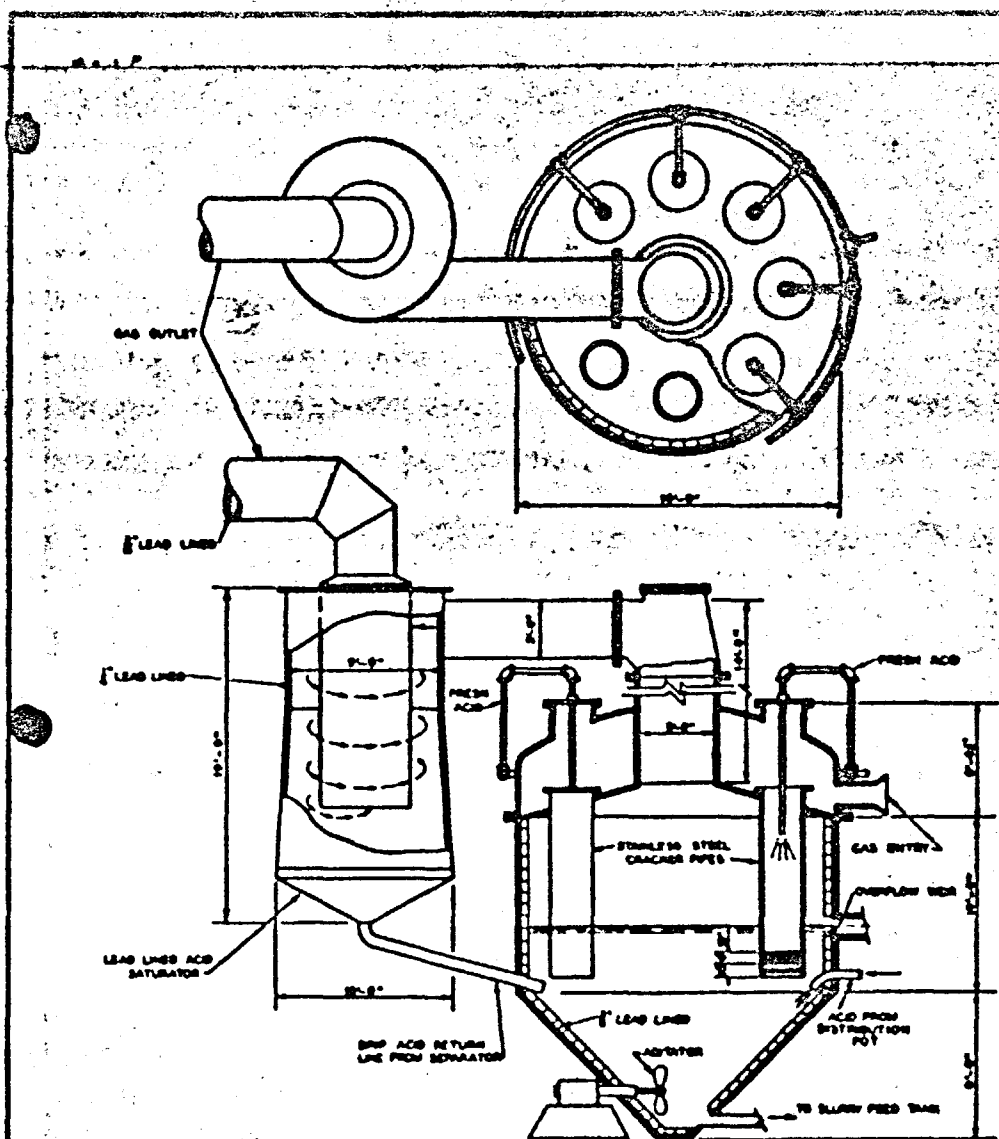
MAY 8, 1947

LEAD INDUSTRIES
ASSOCIATION

420 LEONGTON AVE

NY 17 NY

INLAND STEEL COMPANY
CHEMICAL BULLETIN
NO 18



NEW SATURATOR

ORG NO 2
BY PRODUCT COKE
BY H M CHURCH

MAY 8, 1947

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