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PROGRESS REPORT
TECHNICAL SERVICES DEPARTMENT
ANNISTON, ALABAMA PLANT

JOB NO. 729-58 **REPORT NO.** 3 **DATE** January 20, 1958

TITLE: Aroclor - Chlorine Feed System

OBJECTIVE: To present design data for chlorine vaporizer system.

PERSONNEL: W. J. Dougherty, R. L. Hedworth

REPORTED BY: W. J. Dougherty, R. L. Hedworth

SUMMARY: The existing chlorine vaporizer system does not have capacity requirements, it is difficult and costly to maintain, and a safety hazard. Replacement with an Armstrong vertical vaporizer and control system, as shown on Drawing TS-B-76 attached, is recommended. This vaporizer is rated at 7,400 lbs./hour. It is designed and located to minimize maintenance costs. Controls are provided to prevent excessive pressure in the vaporizer and to prevent liquid from being carried into the gas lines. The detail section of this report provides design data for the installation of a Size G Armstrong chlorine vaporizer.

Future Work:

Prepare mechanical cost estimate and appropriation request. Follow installation and operation of vaporizer system.

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Details:

Background:

Liquid chlorine is purchased in tank cars and vaporized to supplement plant chlorine required for the production of Aroclors.

The existing chlorine vaporizing system consists of eight vertical double pipe vaporizers heated by a steam-water mixture. This system is inadequate because of the following reasons:

1. Additional vaporizer capacity is necessary to provide for present and future chlorine demand.

2. Maintenance is costly because of inaccessible location of vaporizers, dismantling difficulty, and frequent cleaning of heat transfer surface is required.

3. Safety hazards which are inherent in the existing design. These vaporizers were designed to withstand the full pressure possible with Anniston steam pressure but no means of pressure relief is provided to prevent rupture resulting from corrosion weakness, etc.

Replacement with the Armstrong vertical vaporizer and control system shown on Drawing TS-B-76 is recommended.

Required Capacity:

Vaporizing capacity to produce 56,000,000 lbs./year of Aroclor (total company) will be provided. Sales forecasts indicate sales of this amount will be reached during 1960. This amount of Aroclor requires approximately 60,000,000 lbs./year or about 7,000 lbs./hour of chlorine.

One 7,400 lbs./hour vaporizer is recommended to meet this requirement.

Maintenance:

Outdoor installation, replaceable tube bundles, and ease of dismantling will result in reduced maintenance cost compared with existing vaporizers. The reduction in cost cannot be calculated until this vaporizer has been in operation long enough to accumulate cost data.

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Chlorine Vaporizer:

Purchase one Armstrong Chlorine Vaporizer, Size G, and install west of No. 1 Blowing Tank Support Column, beneath stairway. This vaporizer is to be located so that, by removing two of the steps on the stairs, the top of the vaporizer can be removed for cleaning.

Liquid chlorine is to be supplied to this vaporizer through a 1" steel line as shown in Drawing TS-B-76. This line is to contain a pressure gauge, a manual and an automatic valve (specified below).

Steam is to be provided to this vaporizer through a 1" steel insulated line. This line is to contain a pressure reducer to reduce the steam pressure to 30 psig, a manual and an automatic valve (specified below).

Vaporized chlorine is to be piped from this vaporizer to the gaseous chlorine header beneath the rotometers by means of a 4" steel line. This vaporized chlorine line is to contain the existing pressure control valve that controls the pressure in the rotometer feed header.

Controls:

The safety controls and pressure relief devices to be provided on the vaporizer are to be as follows:

High Liquid Level Shut Off

One Fig. 270-OM-OA Fisher & Porter level indicating alarm instrument complete with 6" 300# ASA mounting flange of steel, 6" diameter 20 gauge stainless steel ball, stainless steel float extension rod; magnetic type indicator graduated 0-5 inches is to be provided. The control is to be in a weatherproof case with relay contact rating of 10 amps at 115 volts 60 cycle power system.

The control is to function when the liquid level reaches 36" above the center of the liquid inlet. This level control is to actuate a buzzer and a control valve for shutting off liquid chlorine supply to the evaporator: The valve is to be a 1" Model HB-11 Fisher & Porter diaphragm operated on-off valve with 1" 300# ASA steel flange connections and 300# valve body, Kel-F diaphragm, and non-explosion proof 3-way solenoid valve. The valve is to be designed to close on air failure. The solenoid valve is to accept 110 volts 60 cycle power supply from the level control described above.

changed to steel body 250# valve and flanges. Plug type. Solenoid Valve recommended for top air operated Valve.

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High Temperature Shut Off

For the temperature indicating alarm, a temperature indicating controller is to be provided. This controller shall have on-off operation.

One Model 1451T-11-53PR 4100 fiberglass case temperature indicating controller complete with on-off controller for a range of 0-125°F. is to be provided. The instrument shall have 10 ft. of stainless steel armored stainless steel capillary, 10" flexible stainless steel bulb extension, stainless steel bulb, 1/2" NPT stainless steel bushing, and 1/2" NPT 316 stainless steel well with insertion length of 6". The control is to be mounted on the vaporizer and is to control a 1" NPT diaphragm operated control valve with cast steel body, 316 stainless steel trim, for a maximum flow of 1,000 lbs./hour of steam. The control is to function when the temperature of the liquid chlorine exceeds 115°F. (equivalent to 160 psig) and a buzzer is to sound.

Safety Relief Devices

During normal operation, the vaporizer pressure will be approximately that of the tank car to which it is connected. This pressure varies with outdoor temperature and has never exceeded 160 psig in the experience of this plant. Tank car safety valves are set at 225 psig. In the event of simultaneous blockage of vaporizer inlet and outlet lines, and failure of the temperature control system, the pressure of the confined chlorine will rise rapidly. A relief system is to be provided.

At 225 psig pressure on the vaporizer, the ~~Impervite~~ Ni Kel F coated rupture disc to be provided, is to burst. This is indicated by pressure registering on the diaphragm pressure gauge installed between the disc and the relief valve. The chlorine vapor is contained by the relief valve while the vaporizer is emptied to the tank car by opening the liquid charging valve and carefully applying steam. After the vaporizer is empty and cool, the rupture disc and relief valve are replaced.

At 275 psig, the relief valve to be provided is to function. The chlorine vapor is to be discharged to the atmosphere 50 ft. above ground to permit access to chlorine shut-off valves at the vaporizer. After any contact with chlorine, the steel relief valve is to be replaced.

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Piping

The piping not previously specified will consist of a 4" gaseous chlorine header, to be located between the southern support columns for the No. 1 blowing tank. The existing rotometers are to be located above this header and valved with 1-1/2" Merco Teflon plug cock valves, all as shown on Drawing TS-B-76.

The plant chlorine line is to be 4" steel and is to be located as shown on the above mentioned drawing. This line is to contain a 4" Merco Teflon lined cock type valve.

All piping is to be adequately supported and systematically located.

R. L. Hedworth

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Att.

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