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Date June 1, 1975

Originating Dept. Engineering

Subject Technical Reports Pertaining to Sampling Systems Used in Vinyl Chloride Monitoring

Gentlemen:

Attached are copies of Technical Reports TEC-75-6 and TEC-75-7 by Mr. G. L. Baker. TEC-75-6, "Installation and Maintenance of Sampling Systems for Vinyl Chloride Analyzers" discusses recommended procedures for checking the sampling system for proper operation.

TEC-75-7, "Effect of Tubing Material on Samples Containing Trace Concentrations of Vinyl Chloride" describes tests performed at the South Charleston plant. The test results point out the dangers associated with using sample lines other than stainless steel.

Due to the cost and difficulty associated with running stainless ste l tubing, some individuals prefer using polyethylene tubing. From the outs t of the vinyl chloride monitoring program started a year ago, SID has recommended the use of stainless steel tubing.

Please direct all queries per these two Technical Reports to Mr. Baker at Ext. 4482.

Sincerely yours,

J. H. Brubaker
Measurement and Control Technology
CHEMICALS AND PLASTICS

JHB:sgm
Attachment

UCC 095473

TEC-75-6

Technical Report

ENGINEERING DEPARTMENT
CHEMICALS AND PLASTICS
UNION CARBIDE CORPORATION
SOUTH CHARLESTON, WEST VIRGINIA

SUBJECT: Installation and Maintenance of Sampling Systems for Vinyl Chloride Analyzers

WRITTEN BY: G. L. Baker DATE: April 24, 1975

REVIEWED BY: J. H. Brubaker

Introduction:

The accuracy of the data obtained from any analyzer which requires the sample to be conveyed from the sampling point to the analyzer, is highly dependent on the integrity and performance of the sampling system. The vinyl chloride (VC) analyzers are no exception. Some guidelines are given below for installing the sampling systems for the VC analyzers, and for maintaining their reliability.

Discussion:

Clean tubing, preferably Type 304 stainless steel, should be used for all sample lines. A particulate filter and a rain guard should be used at the end of each line to prevent dirt and water from entering. (See Figure 1).

Before any new sample line is put into service, it should be back flushed with high pressure air with the filter removed, to insure that any loose dirt which might enter during installation is removed. Several solenoid valve and pump failures have been found to be caused by dirt in the sample lines.

A Tiny Tim air switch has been provided in each of the original stream switching stations to permit air to enter the sample pump on stream 20 (the check sample point). (Refer to Figure 2). The new analyzers do not include this switch because it is easier to check the performance of the sampling system without it. For the older systems, it is suggested that the open port of this switch be plugged so that all sample to the vacuum pump will be shut off on stream 20. This will cause the pump to pull maximum vacuum on stream 20, and will also shut off all the flow to the rotameter on the sample bypass vent from the back pressure regulator if the stream switching hardware is in good condition.

When a new sampling system is put into service, it should be tested to verify that the sample points are properly identified, and connected to the proper point at the stream switching station. This can be done by plugging each sample line at the sampling point, while sampling from that point, and checking sample flow at the stream switching station. (Only one point should be plugged at any one time). This test will insure the proper sample point identification, and also will check the sample line for leaks.

After each sample line is found to be properly identified and leak tight, the pump vacuum and sample bypass flow rate for each point should be recorded on a chart for easy reference during any future sampling system maintenance (refer to Table 1 for an example). It is important to remember when identifying sample points, that the main sample pump pulls sample one stream ahead of the one being analyzed. For example, while stream 1 is being analyzed, sample from stream 2 is flowing through the sample valve in the analyzer.

The data for stream 20 (check sample) is a particularly good trouble-shooting guide. It will quickly show the general condition of the pump and the sample switching hardware. If the pump vacuum is reduced, the pump is not performing as well, and could indicate a dirty check valve or a leaky diaphragm. If any flow is indicated on the sample bypass rotameter, then a leak must exist somewhere upstream from the pump. Any such leak would affect the accuracy of the analyzer, and should, therefore, be corrected immediately.

Conclusion:

Reliable data from an automatic analyzer is highly dependent upon the performance of the sampling system. Reliability cannot be assured even in a well designed system unless it is properly installed and maintained. Careful testing of the sampling system after installation and tabulating system parameters, as described in this report, will lead to more reliable data.

GLB:sgm

TABLE 1

SAMPLING SYSTEM PARAMETERS

Sample Point	Pump Vacuum (inches Hg)	Rotameter Reading, cm.
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

FIGURE 1

RAIN GUARD WITH FILTER

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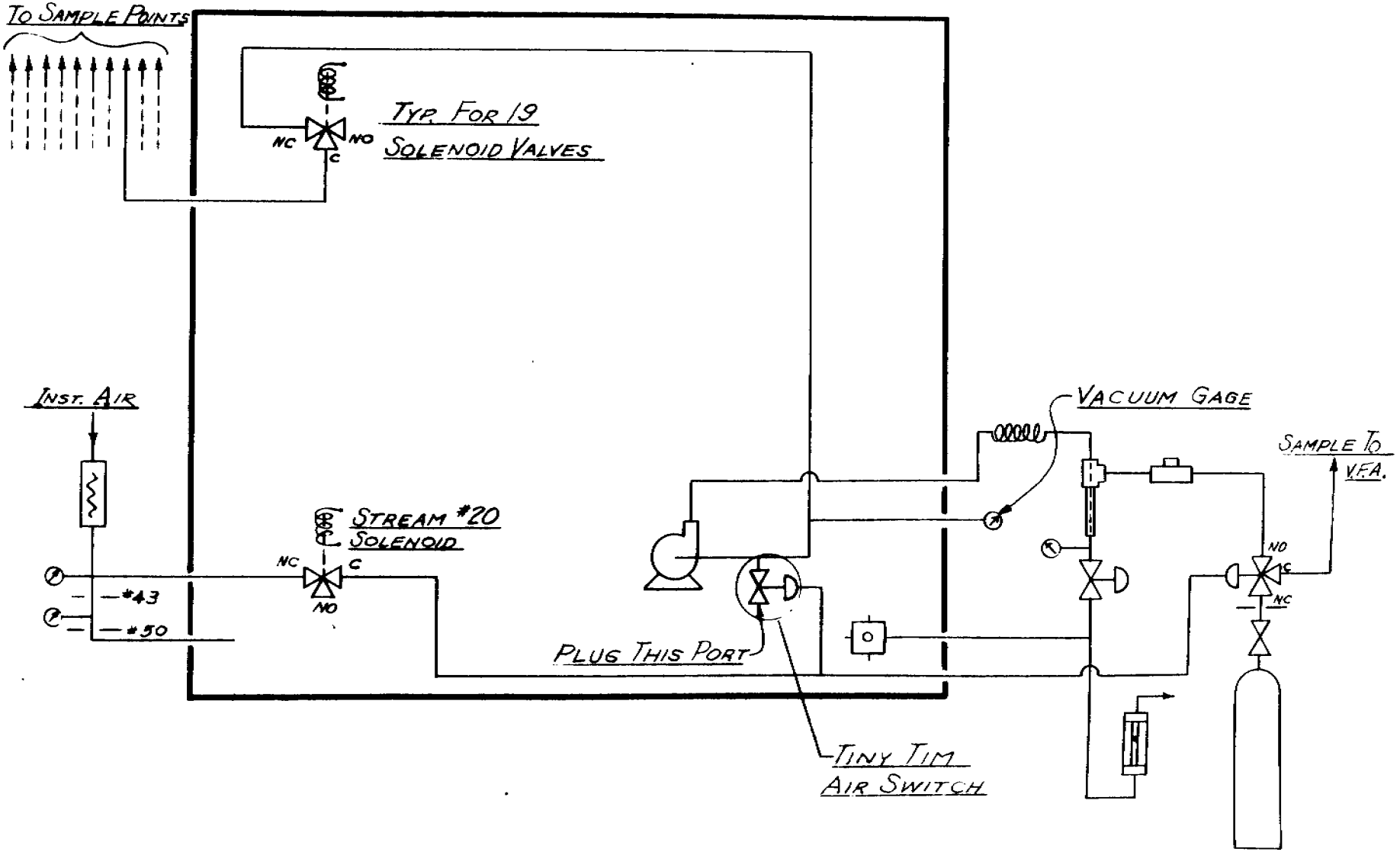

FIGURE 2 - STREAM SWITCHING STATION

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TEC-75-7

Technical Report

ENGINEERING DEPARTMENT
CHEMICALS AND PLASTICS
UNION CARBIDE CORPORATION
SOUTH CHARLESTON, WEST VIRGINIA

SUBJECT: Effect of Tubing Material on Samples Containing Trace Concentrations of Vinyl Chloride

WRITTEN BY: G. L. Baker DATE: April 24, 1975

REVIEWED BY: J. H. Brubaker

Introduction:

Concern has been expressed by several people involved with monitoring vinyl chloride (VC) in work areas about whether any of the VC is lost in the sample tubing, particularly when some of the sample lines are several hundred feet long. Therefore, tests were performed on sample tubing used with the VC analyzers at Buildings 152 and 153 at the South Charleston Plant with samples of 1 ppm and 5 ppm VC in nitrogen.

Discussion:

A 5 ppm VC sample from a Goss steel cylinder was purged directly into the analyzer located in Building 152 which was adjusted to read 25 ppm VC full scale. Four successive readings of 19 (± 0.5) chart divisions were recorded. A clean Tedlar bag was then filled with the sample, and the bag was attached to Sample Point 28. That sample line is 0.21 inch ID type 304 stainless steel, approximately 400 feet long.

The first sample from the bag read 19 chart divisions, indicating that virtually no VC was absorbed by the sample tubing. The next three samples read the same, within ± 0.5 divisions. The bag was then removed and air was sampled. The analyzer indicated no VC in the air.

Later, the same test was performed with a 1 ppm VC sample at a higher analyzer sensitivity. The sample read 11 ± 0.5 chart divisions when introduced directly at the analyzer, and 11 ± 0.5 chart divisions when introduced at Sample Point 28.

The same test procedure was used on the analyzer at Building 153 with the 1 ppm VC sample to determine the effect of polyethylene tubing. The sample read 12 ± 0.5 chart divisions when introduced directly at the analyzer. When it was introduced at Sample Point 11, it read 9 ± 0.5 chart divisions. This sample line is 0.180 inch ID polyethylene tubing, about 125 feet long.

Conclusion:

The results of the tests indicate that no detectable loss of VC should occur in stainless steel tubing, but that a substantial loss can occur in polyethylene tubing at low VC concentrations.

Mr. Charles McKibben at the Texas City Plant is running extensive tests with polyethylene tubing to determine whether it can be conditioned to reduce the loss of VC. Additional information on this subject can be obtained from Mr. McKibben or from the author.

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