

VCM and EDC Monitoring in Chemical Plant Environment

Introduction

Polyvinyl chloride (PVC) is perhaps the most widely used plastic material for the production of polyethylene and polypropylene. It is also one of the most valuable products in the chemical industry in terms of revenue generated.

The main chemical component of PVC is the vinyl chloride monomer (VCM), which itself is made chiefly from 1, 2-dichloroethane (EDC). These two chemicals in the production of PVC are toxic and deadly. They are equally carcinogenic and corrosive. The Environmental Protection Agency (EPA) has indicated the emission from plants that produces these chemicals contributes significantly to air pollution resulting in health risk. This risk is greater for workers in these chemical plants. As such, regulatory bodies like the Environmental Protection Agency (EPA) and Occupational Safety and Health Administration (OSHA) have set acceptable limits to exposure to these chemicals in the work place.

OSHA has set permissible exposure limits (PEL) in a work environment, for EDC at 5 ppm over eight hours and that of VCM is 0.5 ppm over eight hours. Chemical plants are expected to monitor these levels and periodically report to both EPA and OSHA. Heavy fines are given to plants that do not monitor these levels or report them.

Monitoring Level of VCM and EDC

Federal and state regulators require periodic reports that show PEL levels are not exceeded in plants producing or using these chemicals. Gas Chromatography (GC) has been the preferred method for monitoring. However, tighter regulations recently enacted and the need for real-time and multiple points monitoring has made the GC less attractive. The trend of recent years has been towards mass spectrometry. Mass spectrometry is a fast, sensitive and specific analysis method that enables real-time monitoring of VCM and EDC levels and eliminates false positive alarms. Its multiple sampling capability allows the sampling of an entire plant, thus making it possible to detect leaks in sample lines throughout the entire plant, as well as, the storage facilities.



ATEX-version ProMaxion for use in hazardous location applications.



The ProLine comes complete with multiport automatic valve switching, inlet manifold, and turbomolecular pumping package.

Dycor Process Mass Spectrometry

The Dycor process analyzers are quadrupole mass spectrometers that offer high performance without the high price; they provide features and a level of performance associated with much more expensive mass spectrometric systems. It is a fast and accurate precision analyzer with excellent detection limits. The reliability and automatic calibration and verification capability help maintain the performance of the analyzer and allow it to quantify the amount of gas species in multi-component samples without the need of a separate separation stage. Real-time monitoring of up to 32 components is straightforward with these analyzers. The Dycor process mass spectrometers include the Proline and ProMaxion. These analyzers offer on-line monitoring of VCM and EDC in chemical plants. Sampling port ranges from 8 to 80, thus making it possible to map out the entire chemical plant for up to 80 sampling locations for VCM and EDC monitoring. When the membrane inlet system is used with the Dycor mass spectrometer, the sensitivity of the analyzer is further enhanced and measurements in low ppb range are possible.

VCM and EDC Monitoring in Chemical Plant Environment

A ProMaxion in a PVC Plant

The following information is taken from testing conducted at a PVC manufacturing facility using an eight-sample AMETEK ProMaxion to monitor the levels of VCM and EDC. Samples from eight different locations within the plant were monitored for the levels of VCM and EDC. Table 1 shows the output when the ProMaxion was installed with a high level of EDC evident in several areas within the plant. Table 2 shows these levels being lowered after corrective action was taken to seal leaks in pipes and secure the storage facility tightly, based on the readings from the ProMaxion.

Predetermined levels were used to set up the alarm so that a warning is given when levels of EDC and VCM are above those defined by the facility. The precise location of any leakage can easily be targeted using this system.

The new level resulting from the corrective action now meets both the EPA and OSHA requirements.

Sampling points	ppm levels
1	0.76
2	20.62
3	0.23
4	0.48
5	6.81
6	31.07
7	0.28
8	0.23
Average	7.56

Table 1: EDC levels when ProMaxion was initially installed in 2006.

Sampling points	ppm levels
1	0.90
2	2.24
3	4.44
4	2.12
5	3.94
6	5.57
7	1.57
8	2.37
Average	2.89

Table 2: EDC levels in 2007 after corrective action was taken to seal leaks.

A Safe Working Environment

The Dycor process mass spectrometers have proven to be reliable analyzers in helping monitor hazardous gases like VCM and EDC in a chemical work environment. With its speed, sensitivity, real-time analysis, excellent detection limits, as well as multi-sample capability, the Dycor process mass spectrometer is ideally suited for plant air monitoring.



150 Freeport Road, Pittsburgh, PA 15238
Ph. +1-412-828-9040, Fax +1-412-826-0399
www.ametekpi.com



© 2011 by AMETEK, Inc.
All rights reserved. Printed in the U.S.A.
F-0262 Rev. 2 (0311)

One of a family of innovative process analyzer solutions from AMETEK Process Instruments.
Specifications subject to change without notice.

SALES AND MANUFACTURING:

USA - Delaware
455 Corporate Blvd., Newark DE 19702 • Tel: +1-302-456-4400, Fax: +1-302-456-4444

USA - Oklahoma
2001 N. Indianwood Ave., Broken Arrow OK 74012 • Tel: +1-918-250-7200, Fax: +1-918-459-0165

CANADA - Alberta
2876 Sunridge Way N.E., Calgary, AB T1Y 7H9 • Tel: +1-403-235-8400, Fax: +1-403-248-3550

WORLDWIDE SALES AND SERVICE LOCATIONS:

USA - Texas
Tel: +1-713-466-4900, Fax: +1-713-849-1924

CHINA
Beijing / Tel: 86 10 8526 2111, Fax: 86 10 8526 2141
Chengdu / Tel: 86 28 8675 8111, Fax: 86 28 8675 8141
Guangzhou / Tel: 86 20 8363 4768, Fax: 86 20 8363 3701
Shanghai / Tel: 86 21 5868 5111, Fax: 86 21 5866 0969

FRANCE
Tel: 33 1 30 68 89 20, Fax: 33 1 30 68 89 29

GERMANY
Tel: 49 21 59 91 36 0, Fax: 49 21 59 91 3639

INDIA
Tel: 9180 6782 3200, Fax: 9180 6782 3232

SINGAPORE
Tel: 65 6484 2388, Fax: 65 6481 6588