GOVERNMENT OF DUBAI

Trakhees

Guidelines – Chlorine and Hydrochloric Acid works

Issued by: Inspection Department – Operations Section

1.0 Introduction

Hydrochloric acid (HCl) is a versatile chemical that has a number of different industrial uses. Some examples are hydrometallurgical processing (e.g., production of alumina and/or titanium dioxide), chlorine dioxide synthesis, hydrogen production, activation of petroleum wells, and miscellaneous cleaning/etching operations including metal cleaning (e.g., steel pickling). Also known as muriatic acid, HCl is used by masons to clean finished brick work. Hydrochloric acid is also a common ingredient in many reactions and is the preferred acid for catalyzing organic processes. One example is a carbohydrate reaction promoted by hydrochloric acid, analogous to those in the digestive tracts of mammals.

Hydrochloric acid may be manufactured by several different processes; however, over 90 % of the HCl produced in the U.S. is a byproduct of the chlorination reaction. Some examples of chlorination reactions are the production of dichloromethane, trichloroethylene, perchloroethylene, and vinyl chloride.

Chlorine and hydrochloric acid works are taken together because chlorine is often generated as an intermediate in the manufacture of hydrochloric acid. The classis mercury cell electrolysis produces both chlorine and hydrogen and these are then mixed and burnt to form hydrochloric acid gas, hydrochloric acid gas can also be formed from the use of chlorides in chemical processes, especially when a chloride and an acid react together. In all cases, the hydrochloric acid gas is absorbed in water to form liquid hydrochloric with an acid strength of 33-35 percent. Air pollution problems can also arise when chlorine or hydrochloric acid are used in other processes.

Chlorine works are defined as “works in which chlorine is made or used in any manufacturing processes.”

Hydrochloric acid works are defined as “works where hydrogen chloride gas is evolved either during the preparation of liquid hydrochloric cid, or for use in any manufacturing process, or as the result of the use of chlorides in a chemical process.”

2.0 Sampling and Measurement of Emissions

2.1 Authority shall determine the frequency and time of sampling after discussion with works management. For chlorine works, this shall not be less than once per week and the method of testing for chlorine shall be agreed between the works management and the Authority.

دائرة التخطيط والتطوير - تراخيص , ص.ب 2001 ، دبي، إ.ع.م
Dept of Planning & Development - Trakhees, PO. Box, 2001
Dubai - U.A.E

T. +971 (4) 3636 888.هاتف
F. +971 (4) 3636 860.فاكس

Customer.Relationship@trk.pcfc.ae
www.Trakhees.ae

PCFC

2.2 For hydrochloric acid works, the frequency of sampling and testing shall normally not less than once per day, the testing being by absorption in aqueous solution and analysis for chloride ion.

3.0 Emission Limits and Controls

3.1 In all cases where chlorine is made or used, the concentration of chlorine shall not exceed ten (10) ppm (v/v).

3.2 In mercury cell plants, the concentration of mercury in strong hydrogen shall not exceed 0.5 mg/m^3 and in weak hydrogen (i.e., air extracted from the process vents and containing hydrogen at less than the lower explosion limit) shall not exceed two (2) mg/m^3.

3.3 The concentration of hydrochloric acid or chlorine gas in all emissions to the air shall not exceed twenty (20) mg/m^3.

3.4 Emissions to the air from all sources shall be substantially free from persistent mist or fume, and free from droplets.

3.5 The concentration of particulates in emissions to air shall not exceed one hundred fifty (150) mg/m^3.

4.0 Operational Controls

4.1 Storage and handling facilities, including those for loading or unloading, shall be provided with venting and purging arrangements to suitable absorbers capable of dealing with the expected maximum rate of venting or purging as agreed between the management and the Authority.

4.2 Where hydrogen chloride gas is being generated for use in a further process, a standby absorber, capable of absorbing the maximum rate and quantity of hydrogen chloride expected to be evolved during breakdown conditions, shall be installed.

4.3 All chlorine production facilities shall be designed to achieve quick and effective shut down. Emergency absorption systems shall be provided to take all chlorine produced during the shutdown, with an adequate margin of safety. Power to implement shut down and emergency absorption shall be available at all times, independent of the electricity supply for chlorine production.

4.4 On diaphragm cells and ancillaries, all sources of emission of gas and fume to the atmosphere shall be duly contained and treated by appropriate means agreed with the Authority.

4.5 On Downs cells and ancillaries, all sources of emission to the atmosphere shall be contained to the maximum practicable extent, and shall be treated by means agreed with the Authority.

5.0 Chimneys

5.1 Chimney heights shall be determined after discussion between works management and the Authority who use for the first assessment, the maximum mass rate of emission of hydrochloric acid gas, or chlorine and any other significant components in the waste gas stream.

5.2 The chimney height so obtained may need to be increased to allow for local circumstances such as topography, nearby buildings or existing emissions. In no case shall it be less than three (3) meters above the roof ridge height of any adjacent buildings.

5.3 Chimneys or vents shall be designed to minimize the cooling of waste gases and so prevent condensation on internal surfaces.

5.4 The storage of volatile organic compounds with vapour pressures above five hundred seventy (570) mmHg should be accompanied by a vapour recovery system. Below that vapour pressure, pressure/vacuum (P/V) ventilation valves should be fitted to storage tanks. In some cases it is practicable to install a floating, light metal sheet on the surface of the liquid to reduce evapouration.

6.0 Environmental and Health Effects

Hydrochloric acid is corrosive to the eyes, skin, and mucous membranes. Acute inhalation exposure may cause coughing, hoarseness, inflammation and ulceration of the respiratory tract, chest pain, and pulmonary edema in humans. Acute oral exposure may cause corrosion of the mucous membranes, esophagus, and stomach, with nausea, vomiting, and diarrhea reported in humans.

Chronic occupational exposure to hydrochloric acid has been reported to cause gastritis, chronic bronchitis, dermatitis, and photosensitization in workers. Prolonged exposure to low concentrations may also cause dental discoloration and erosion.

7.0 General Operations

7.1 Best practicable means applies not only to the control of emissions, but also to efficient maintenance, proper use of equipment, and adequate supervision of the process. Planned maintenance should be used to the maximum extent, an adequate supply of essential spares should be held and duplicate equipment should be installed whenever practicable and necessary to allow continuity of operations whilst minimizing emissions to air.

7.2 Malfunctioning, breakdowns or leakages leading to abnormal emissions shall be dealt with promptly; in serious cases, the process shall be shut down as soon as practicable for repair. The Authority should be informed of any such incidents.
Emissions, leakages, etc.