

Appendix 4.2 Results of Incident Review

Chlorine

Summary of Incidents related to tank/drum incidents

Native ID	Year	Country	Description
3229	1968	USA	<u>Chlorination unit</u> in <u>waterworks</u> damaged allowing large quantity of <u>chlorine</u> to escape.
2073	1969	USA	<u>Chlorine gas alarm</u> alerted employees to release from unattended <u>discharging tank container</u> at <u>water treatment plant</u> . Time = 2130. valve isolated 1 hour later. Cloud dispersed inside 3 hours. 100 people evacuated from nearby restaurant.
3783	1979	USA	3500 people fled a <u>chlorine gas cloud</u> from a leak in a 3500pound <u>tank</u> used to <u>treat city water supply</u> .
2130	1981	USA	<u>Chlorine leak</u> when fitting broke on tank at rolling hills <u>water treatment facility</u> , owned by fort worth water dept. <u>Leak</u> stopped before evacuation ordered. Two hospitalized workers were not wearing gas masks in violation of plant regulations.
2330	1981	Brazil	<u>Chlorine corroded</u> the main valve at <u>water filtration plant</u> owned by Prasa + the resulting rupture allowed most of the <u>chlorine</u> in the 2*1 ton <u>tanks to leak</u> into the atmosphere. 2000 people treated for chlorine exposure.
4227	1981	Puerto Rico	Spill of nearly 4 te <u>liquid chlorine</u> at <u>water purification plant</u> gave toxic cloud causing evacuation of 1500. 200 people received emergency treatment in 6 San Juan hospitals. Contents of 3 tanks & most of fourth escaped.
4019	1987	USA	Rupture of 1te <u>container of chlorine gas</u> at <u>water treatment plant</u> caused 1000 residents to be evacuated from homes ahead of an advancing chlorine gas cloud. 2 company employees & 2 firefighters injured.
5830	1991	UK	1kg <u>liquid chlorine</u> spilled at <u>chlorine drum store</u> at <u>water treatment works</u> because of faulty valve.
6047	1991	UK	85 families evacuated because of gas cloud from <u>water treatment works</u> as hundreds of gallons of <u>chlorine leaked</u> , supposedly from <u>barrel</u> . Wall of water set up to prevent cloud from spreading. Village sealed off.

Summary of Incidents related to pipework incidents

Native ID	Year	Country	Description
1936	1969	USA	<u>Release of chlorine</u> from <u>water treatment plant</u> led to cloud over residential area. One man sleeping affected by fumes later died as did his wife. Safety equipment at plant locked away. Damages claim awarded to children orphaned by deaths.
1988	1977	USA	<u>Cloud of chlorine</u> escaped from <u>faulty connection</u> at <u>water treatment plant</u> . Low dense cloud dispersed by wind.
1866	1978	UK	Leak from <u>faulty pipe on chlorine cylinder</u> at <u>water treatment plant</u> . 3 injured.
5823	1991	UK	Spill from <u>two 30kg cylinders</u> in chlorine building of water treatment plant released chlorine. Incident caused by <u>small crack in pipework</u> which was replaced. Leak stemmed by water authority engineers with BA.
6778	1992	Hong Kong	Leakage of chlorine from <u>water treatment works</u> holding twice recommended safety inventory. <u>150kg chlorine leaked</u> from <u>3mm hole in dented pipe</u> during transfer operation. Lime powder sprinkled on pipe to neutralize release.
8102	1994	UK	Chlorine gas leaked from <u>pipe connected to chemical drums</u> at <u>water treatment works</u> . 1 treated at hospital for breathing problems & 4 families living on site evacuated. Leak believed to have been caused by faulty pressure gauge.

Summary of Incidents related to use and storage incidents

Native ID	Year	Country	Description
2270	1985	France	Cloud of toxic chlorine gas caused <u>by leak at water treatment plant</u> dispersed after hovering for nearly three hours over the countryside of western France. 2 employees were hurt, 1 seriously when <u>37000 cubic meters billowed from the plant</u> .
6380	1992	Portugal	Dozens of people taken to hospital after <u>chlorine gas escaped from waterworks overnight</u> . Three were reported in a serious condition & 34 were kept in hospital overnight.
8451	1995	USA	Fire in <u>building used to store chlorine for water treatment plant</u> . When water was used to fight fire, white smoke turned black & wind blew noxious fumes toward ocean. 20 firefighters in SCBA who spent time in smoke examined in hospital.
8781	1995	USA	<u>Fire at plant making water treatment chemicals</u> caused chlorine cloud to drift over suburb. 100 evacuated from businesses, apartments and University 'North of Scene' - fire brought under control in 2.5 hours by 120 firefighters. No injuries.
12782	2001	France	A chlorine <u>leak at a water treatment plant</u> forced the evacuation of a village in southern France.

Summary of Incidents related to transport/cylinder/hose incidents

Native ID	Year	Country	Description
1889	1960	USA	Chlorine spilled from drum on truck, when valve burst according to driver. Chlorine was <u>for water purification purposes</u> . Firemen summoned to dispose of liquid by flushing away and they required treatment for the effects of chlorine inhalation.
2031	1978	UK	<u>Leak from chlorine cylinder at water treatment plant</u> . Cause thought to be faulty equipment. No injuries reported.
2059	1949	USA	<u>A ton container</u> being transported on a multi-unit railcar was found to be <u>leaking around a valve shank on arrival at a water treatment plant</u> . A Solvay chlorine emergency kit was used to cap the valve. A temp. line let Cl ₂ to be used from car.
10393	1998	UK	<u>Chlorine leaked from a cylinder at a water treatment works</u> . Fire crews were called. It was a small leak and no-one was affected. An investigation has been launched.
13659	2002	USA	Hose, which contained metal weave not normally used in <u>chlorine transfer hoses</u> , ruptured on rail car at plant which packages chlorine used for water treatment. Shut off valve at plant and overflow valve on car failed to work.
15220	2003	USA	<u>Truck with water treatment chemicals ran off road</u> close to retirement village. Sodium hydroxide, fluorosilic acid and bisulphites released, though chlorine tank remained intact.

Methane

Summary of Incidents related to storage tank incidents

Native ID	Year	Country	Description
6717	1992	Turkey	Explosion in 1000m ³ <u>storage tank</u> under factory canteen. Suspected <u>methane</u> being pumped in with water. 32 killed due to <u>blast & drowning</u> . 64 injured.
9112	1996	India	<u>Tank of methane gas exploded</u> at effluent treatment plant while <u>welding work</u> was being completed on <u>tank's roof</u> . 3 workers killed & 1 seriously injured. Workers were trying to prevent gas leaks upon orders of state pollution control officers.
13606	2002	Australia	<u>Gas started leaking from gasometer</u> after <u>tank top tilted</u> . Situation worsened as gas was still being pumped into tank. 2km safety zone imposed.