

RELEASE MITIGATION FACTORS FOR RMP WORST CASE EVALUATIONS

The worst case scenario of the Federal Risk Management Plan (RMP) permits the inclusion of a Mitigation Factor (MF) to reduce the rate of the release. Only passive elements can be considered as mitigation devices in the worst case scenario.

The Total Containment Vessel (TGO Vessel) of TGO Technologies for one ton containers can be considered as a passive system. The TGO Vessel is a passive containment structure up to the location where the high pressure fitting connects the pigtail from the one ton container inside the TGO Vessel to the wall of the TGO Vessel. This fitting permits the passage of chlorine through the wall of the TGO Vessel to the exterior. All the devices external to the wall of the TGO Vessel are assumed to no function for the worst case scenario. The chlorine is assumed to be in the ambient surroundings once it is external to the wall of the TGO Vessel.

Mitigation Factors for the worst case scenario for the Federal EPA Risk Management Plan (RMP) are to be determined for the use of a TGO Vessel with a one ton container of chlorine sealed inside of it.

DISCUSSION:

The rate of release of Regulated Substance for the RMP worst case is given as:

$$RQ = (TQ/10)(MF)$$

Where:

RQ = Rate of Release of Quantity of Regulated Substance, lb/min
TQ = Total Quantity of Regulated Substance to be Considered, lb
10 = 10 minutes
MF = Mitigation Factor

Mitigation Factors for the worst case scenario of the RMP can be determined for a considered case situation by iterating on the value of RQ until the distance to the end point for the worst case is equal to the end point determined for the considered case situation.

Mitigation Factors for the worst case scenario of a TGO Vessel with a one ton container of chlorine sealed inside of it, will determined based upon the results obtained from the consideration of the following case situation:

- The TGO Vessel has a 1/4 inch hole in the wall fitting with the contents of a one ton container inside the Vessel

The following conclusion is deduced from the results:

- The release of chlorine gas from a TGO Vessel with a standard high pressure fitting of 1/4 inch i.d. that has a Mitigation Factor of 0.035 into a ventilated room with a Mitigation Factor of 0.55 has a combined Mitigation Factor of 0.019. The end-point distance for this mitigated worst case is a 97% reduction in the affected surface area from the unmitigated worst case.

The use of the TGO Vessel results in an end-point distance and affected ground surface area for the worst case scenario for the RMP that are reduced significantly from the unmitigated worst case scenario.

In addition, the use of the TGO Vessel will reduce significantly the end-point distance and affected ground surface area for the alternative release scenarios to be done for the RMP as well.

Affected Surface Area Reductions for Worse Case

Release Case - Chlorine Liquified Gas	Affected Surface Area Reduction
TGO Vessel with 1/4 inch hole in ventilated room	97%
Ventilated room with scrubber	31%

See Chart 2

**CHLORINE BUILDUP IN ROOM WITH LIQUID CHLORINE RELEASE
 COMPARING ONE-TON TGO VESSEL TO ROOM W/ 3.000 CU FT/MIN SCRUBBER NOT OPERATING
 NO ACTIVE COMPONENTS OPERATIONAL IN EITHER SYSTEM
 FOR FEDERAL RISK MANAGEMENT PLAN WORSE CASE SCENARIO**

TIME	Room Volume 1,000 CU FT		Room Volume 5,000 CU FT		Room Volume 10,000 CU FT		Room Volume 20,000 CU FT	
	Vented Room with TGO Vessel (ppm)	Vented Room with Scrubber with Scrubber Not Operating (ppm)	Vented Room with TGO Vessel (ppm)	Vented Room with Scrubber with Scrubber Not Operating (ppm)	Vented Room with TGO Vessel (ppm)	Vented Room with Scrubber with Scrubber Not Operating (ppm)	Vented Room with TGO Vessel (ppm)	Vented Room with Scrubber with Scrubber Not Operating (ppm)
0	0	0	0	0	0	0	0	0
1	0	1,000,000	0	203,000	0	102,000	0	51,000
2	0	1,000,000	0	375,000	0	188,000	0	94,200
3	0	1,000,000	0	520,000	0	261,000	0	131,000
4	0	1,000,000	0	643,000	0	323,000	0	162,000
5	0	1,000,000	0	748,000	0	375,000	0	188,000
10	0	1,000,000	0	1,000,000	0	538,000	0	269,000
15	0	1,000,000	0	468,000	0	233,000	0	117,000
30	0	190,000	0	38,600	0	19,100	0	9,550
40	0	35,600	0	7,290	0	3,610	0	1,800
50	0	6,700	0	1,380	0	682	0	341
60	0	1,260	0	260	0	129	0	64
70	0	237	0	49	0	24	0	12
80	0	45	0	9	0	5	0	2
90	0	8	0	2	0	1	0	0.4
100	0	2	0	0.3	0	0.2	0	0.1
110	0	0.3	0	0.1	0	0	0	0
120	0	0.1	0	0	0	0	0	0
130	0	0	0	0	0	0	0	0

