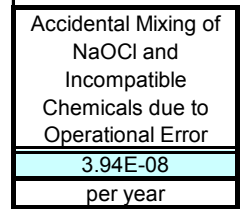
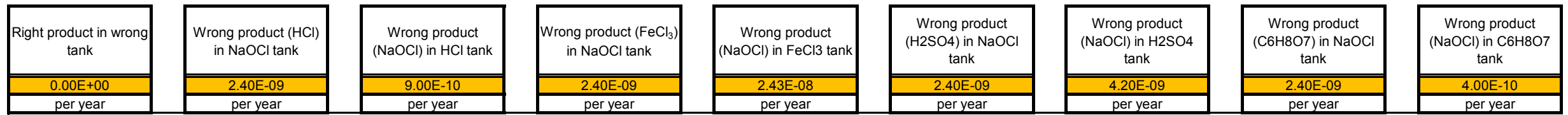



Accidental Mixing of Sodium Hypochlorite and Incompatible Chemicals due to Operational Error



 AND gate

 OR gate

Right product in wrong tank

Driver drives the tanker to the wrong tank	Driver fails to rectify the error	WSD staff fails to recover the error*
1.0E-03	1.0E-01	0.0E+00
per operation	-	per operation



Right product in wrong tank	Number of operation (NaOCl + HCl + FeCl3 + H2SO4)
0.0E+00	322
per operation	operation per year



Right product in wrong tank
0.00E+00
per year



AND gate



OR gate

* Not possible to deliver right product in wrong tank due to proper connection design, i.e. different sizes of hose and coupler.

Scenario 1

Scenario 2

Wrong product (HCl) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-

Wrong product (NaOCl) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-



Wrong product (HCl) in NaOCl tank	Number of operation (NaOCl delivery)
1.0E-10	24
per truck	operation per year

Wrong product (NaOCl) in HCl tank	Number of operation (HCl delivery)
1.0E-10	9
per truck	operation per year



Wrong product (HCl) in NaOCl tank
2.40E-09
per year



Wrong product (NaOCl) in HCl tank
9.00E-10
per year



AND gate



OR gate

Scenario 3

Scenario 4

Wrong product (FeCl ₃) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-

Wrong product (NaOCl) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-



Wrong product (FeCl ₃) in NaOCl tank	Number of operation (NaOCl delivery)
1.0E-10	24
per truck	operation per year



Wrong product (NaOCl) in FeCl ₃ tank	Number of operation (FeCl ₃ delivery)
1.0E-10	243
per truck	operation per year



Wrong product (FeCl ₃) in NaOCl tank
2.40E-09
per year



Wrong product (NaOCl) in FeCl ₃ tank
2.43E-08
per year



AND gate



OR gate

Scenario 5

Scenario 6

Wrong product (H2SO4) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-

Wrong product (NaOCl) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-



Wrong product (H2SO4) in NaOCl tank	Number of operation (NaOCl delivery)
1.0E-10	24
per truck	operation per year



Wrong product (NaOCl) in H2SO4 tank	Number of operation (H2SO4 delivery)
1.0E-10	42
per truck	operation per year



Wrong product (H2SO4) in NaOCl tank
2.40E-09
per year



Wrong product (NaOCl) in H2SO4 tank
4.20E-09
per year



AND gate



OR gate

Scenario 7

Scenario 8

Wrong product (C6H8O7) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-

Wrong product (NaOCl) delivered by supplier	Operator fails to check product sample	Operator and WSD staff fail to identify the empty tank for refill
1.0E-04	1.0E-04	1.0E-02
per operation	-	-

Wrong product (C6H8O7) in NaOCl tank	Number of operation (NaOCl delivery)
1.0E-10	24
per truck	operation per year

Wrong product (NaOCl) in C6H8O7 tank	Number of operation (C6H8O7 delivery)
1.0E-10	4
per truck	operation per year

Wrong product (C6H8O7) in NaOCl tank
2.40E-09
per year

Wrong product (NaOCl) in C6H8O7 tank
4.00E-10
per year



AND gate



OR gate