



Erica's Radical Tool

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Radical Trip

- Journey of Radical Tool
- Radical Tool worksheets
- Groovy name
- Planned updates
- Summary
- Questions





Journey of the Radical Tool



- Began as a unit conversion tool for units found in the tools and programs used by the Consequence Assessment Team (CAT).
- Radionuclide inventory tool for determining which nuclides to include in a mixture.
- Chemical inventory mixture tool to determine surrogate source term.

Conversion Worksheet



Unit Conversions for units found in consequence assessment tools and modeling codes.

CONVERSION TOOL		
	FROM (Input)	TO (Output)
Energy	<input type="text" value="0"/> MW	<input type="text" value="0"/> cal/s
Gallons to Pounds (Liquid Chemicals Only)		
Choose Chemical from pulldown menu. Choose NONE if chemical is not available.		
Pulldown Menu >>	<input type="text" value="NONE"/>	
Specific Gravity	<input type="text" value="0"/> g/cm ³	Molecular Weight <input type="text" value="0"/>
Or enter Specific Gravity and Molecular Weight below from Section 9 of MSDS		
Specific Gravity	<input type="text" value="0"/> g/cm ³	Molecular Weight <input type="text" value="0"/>
	<input type="text" value="0"/> gal	<input type="text" value="0"/> lbs
	<input type="text" value="0"/> lbs	<input type="text" value="#DIV/0!"/> gal
Gallons to Liters		
	<input type="text" value="0"/> Liters	<input type="text" value="0"/> gal
	<input type="text" value="0"/> gal	<input type="text" value="0"/> Liters
ppm to mg/m³		
	<input type="text" value="0"/> ppm	<input type="text" value="0.00"/> mg/m ³
	<input type="text" value="0"/> mg/m ³	<input type="text" value="#DIV/0!"/> ppm
Length		
	<input type="text" value="0"/> ft.	<input type="text" value="0.0000"/> meters
	<input type="text" value="0"/> m	<input type="text" value="0.0000"/> miles
	<input type="text" value="0"/> mi	<input type="text" value="0"/> ft.
	<input type="text" value="0"/> km	<input type="text" value="0"/> miles
Mass		
	<input type="text" value="0"/> g	<input type="text" value="0.00000"/> lbs
	<input type="text" value="0"/> kg	<input type="text" value="0.0000"/> lbs
	<input type="text" value="0"/> lbs	<input type="text" value="0"/> g
Speed		
	<input type="text" value="0"/> m/s	<input type="text" value="0"/> mph
		<input type="text" value="0"/> fps
		<input type="text" value="0"/> knots
Temperature		
	<input type="text" value="0"/> °C	<input type="text" value="32.0"/> °F
	<input type="text" value="0"/> °F	<input type="text" value="-17.8"/> °C

Rad Inventory Worksheet



- User input inventory
- Cut and paste from SNL radiological material inventory tracking system.
- Does not have embedded functions.

	A	B
	Nuclide	Activity in Curies
1		
2	Am-242	20
3	Sr-90	6
4	Pu-234	1300
5	U-235	600
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		

Rad Inventory Data Worksheet

Conversions Rad Inventory V.003 Rad Inventory Data V.003 Rad Explosives V.001 Explosives Liquids Chem Inventory V.001 Liquid Chemicals V.002 Chem Summary Data V.001

E6 =IF(ISERROR(VLOOKUP("Rad Inventory V.003!\$A6,Rad_DB,2,FALSE)), "(VLOOKUP("Rad Inventory V.003!\$A6,Rad_DB,2,FALSE)))

	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
	Element	Specific Activity (Ci/g)	Mass (g)	Mass (lbs)	ARF Solid	ARF Powder	DOE-1027 Cat 3 (Ci)	Ratio of Cat 3	RQ Value	5*RQ	Environmental Concern	Criticality Concern	Clearance Class	Radionuclide	Activity (Ci)
1															
2	Americium	809000	2E-05	5E-08	8.33E-02	0.066667	0.0101	198019.8%	100	500			S	Am-242	20
3	Strontium	136	0.0441	1E-04	8.33E-02	0.066667	0.12	5000.0%	0.01	0.05	>5xRQ		S	Sr-90	6
4	Plutonium	1520000	0.0009	2E-06	8.33E-02	0.066667	0.0131	9923664.1%	1000	5000			S	Pu-234	1300
5	Uranium	2.16E-06	3E+08	612396	8.33E-02	0.066667	1900000	0.0%	0.01	0.05	>5xRQ	Criticality?	S	U-235	600
6															
7															

Rad Inventory Data V.003 Rad Explosives V.001 Explosives Liquids Chem Inventory V.001 Liquid Chemicals V.002 Chem Summary Data V.001

- Embedded with formulas.
- Automatic calculations of mass, 5 x RQ
- Lists: Specific Activity, DOE-1027 Appendix A Threshold, Clearance Class
- Conditional formatting flagging Environmental Concern and Potential Criticality Concern.

Database References – LANL Fact Sheet (LA-12846-MS), Inhalation Coefficients per Federal Guidance Report 13, EPA RQ (Reportable Quantity) values

Explosives Worksheet



- Using the total mass of the container and contents, ARF and RF are calculated for both powder and solid.
- Same available for Explosions Adjacent to Liquids
- Equations for ARF and RF from DOE-HDBK-3010-94, Dec. 1994

Explosions ONLY

Legend	
	Required Input
	Model Input Data

Explosion Adjacent to Powder or Solid

Input Data	
Total Mass of Container(s) and Contents	300 lbs
Mass High Explosives (HE) Assumed	25 lbs TNT

Ref. RadTrack Container Data tab

Total Rad Mass	6.12E+05 lbs
Rad/Total	2.04E+03
Airborne Release Fraction (ARF)	0.066667 Powder
	0.083333 Solid
Respirable Fraction (RF)	0.25 Powder
	1.0 Solid

Chemical Inventory Worksheet

Conversions Rad Inventory V.003 Rad Inventory Data V.003 Rad Explosives V.001 Explosives Liquids **Chem Inventory V.001** Liquid Chemicals V.002 Chem Summary Data V.001

CAS Number	Primary Chemical Name	Physical State	Ingredient Quantity (lbs)	Threshold Quantity (lbs)	Percent of Threshold	Optional LPF	Optional Conc.
7722-84-1		Liquid	10				70%
50-00-0		Liquid	25				37%
4109-96-0		Gas	40				
7732-18-5		Liquid	5				

Explosions	
Mass of High Explosive (HE) (lbs)	
Mass of Container Only (lbs)	

Legend	
Input Required	
Optional - If Provided	
Chemicals that Transform Spontaneously or In a Fire	

Chemicals that Transform Spontaneously or in a Fire						
If This Chemical		Then Use This Chemical			Use Replacement In	
CAS	Name	CAS	Name	Conversion Ratio	Release	Fire
67-56-1	Methanol	50-00-0	Formaldehyde	0.48	✓	
540-59-0	Dichloroethylene	7782-50-5	Chlorine	0.71		✓
4109-96-0	Dichlorosilane	7647-01-0	Hydrogen Chloride	0.7	✓	✓
7784-42-1	Arsine	1327-53-3	Arsenic trioxide	1.5		✓
7803-51-2	Phosphine	1314-56-3	Phosphorus pentoxide	2.1		✓

Rad Inventory Data V.003 Rad Explosives V.001 Explosives Liquids **Chem Inventory V.001** Liquid Chemicals V.002 Chem Summary Data V.001

- Manual input (only green header columns required for user input).
- Cut and Paste from SNL Chemical Information System. Columns are the same.
- Does not have embedded functions allowing user to sort.
- Explosions input is used in next worksheet to determine Chemical Source Term.

Liquid Chemicals Worksheet

Conversions Rad Inventory V.003 Rad Inventory Data V.003 Rad Explosives V.001 Explosives Liquids Chem Inventory V.001 **Liquid Chemicals V.002** Chem Summary Data V.001

Liquid Mixture

Puddle Calculator

	Chemical Name	Physical State	Concentration	MAR to container ratio	ARF	RF	LPF	ST (g)	INPUT	OUTPUT	Puddle Calc. ST (g)	TOTAL ST (g)	TEEL-25	
									Amount (g)	Mass (kg)			Pac-2	Pac-3
1	Hydrogen peroxide	Liquid	70%	1	1.000000	1	1	4.5359E+03	4535.9237	0.00637	6.4	4.459	71	142
2	Formaldehyde	Liquid	37%	1	1.000000	1	1	1.1340E+04	11339.80925	0.03230	32.3	11.951	17.2	68.7
3	Dichlorosilane	Gas	100%	1	1.000000	1	1	1.8144E+04	0			18143.6948	45.4	206
4	Buffer solution, aqueous	Liquid	100%	1	1.000000	1	1	2.2680E+03	2267.96185	0.07	74.0	74	500	500
5			100%						0					

Rad Inventory Data V.003 Rad Explosives V.001 Explosives Liquids Chem Inventory V.001 **Liquid Chemicals V.002** Chem Summary Data V.001

- Embedded with formulas.
 - Liquid chemicals are automatically highlighted flagging user to use the Puddle Calculator (AlphaTrac) to complete source term calculations.
 - **Mass** data is imported from the Puddle Calculator.
- TEEL Database reference – Protective Action Criteria (PAC) with AEGLs, ERPGs, & TEELs: Rev. 25 for Chemicals of Concern (08/2009)*



Groovy Name

Erica's



Radionuclides

Chemical

Tool

Planned Updates

- Sum of the fractions for materials of criticality concern.
- Automatically list ARF and RF for Radionuclides in all scenarios



Summary

- Biggest benefit of the tool is that workaids, websites, papers pinned to the wall, and knowledge from experienced team members were all consolidated into one tool.
- Easy to update, keeps pace with SNL inventory systems.
- Automated calculations decrease the margin of error.

Questions

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