


Pollution Prevention Options Analysis System

P2OASys
How to use it
How to interpret the results
Where to find it: <http://p2oasys.turi.org/>



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What Does P2OASys Do?

- Allows user to assess potential impacts of alternative chemistries/technologies
 - Environmental
 - Worker
 - Public health
- Help users use a more comprehensive and systematic way of thinking about
 - Current and alternative processes
 - Based on quantitative and qualitative factors

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P2OASys Value

- Provides a numerical hazard score for the company's current process and identified options
 - Can be combined with other information sources and professional expertise to make decisions on adoption of alternatives
 - Users input both quantitative and qualitative data on the chemical toxicity, ecological effects, physical properties, and changes in work organization

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Goal of Upgrade

- To reevaluate sections, categories and data points
 - Compare to Global Harmonized System, Green Screen
 - Eliminate L, M, H input options
- To improve user interface
 - Eliminate the Excel 95 download
 - Create online user interface

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What's Wrapping Up Now

- Compiled new criteria into working tool
- Piloted tool in-house to determine assessment process
 - Compare to past P2OASys assessments
 - Compare with Green Screen assessments
- Complete on-line user interface
- External piloting scheduled Oct-Nov

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P2OASys Original Format

- Microsoft Excel 95
- Cumbersome to navigate
- Limited in number of comparative products

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Spr...

Sub Item	Units	Respiratory Irritation	Key Phrases	Eye Irritation	Key Phrases
Inhalation Toxicity	LC50 ppm	Respiratory Irritation	Key Phrases	Eye Irritation	Key Phrases
Inhalation Toxicity	Vapor GHS Category Level				
Inhalation Toxicity	mg/l gas/vapor				
Inhalation Toxicity	mg/l dust/mist/fume				
Inhalation Toxicity	Key Phrases	Respiratory Irritation	GHS H Phrases	Eye Irritation	GHS H Phrases
Inhalation Toxicity	Solid GHS Category Level				
Inhalation Toxicity	GHS H Phrases	Respiratory Irritation	GHS Category Level	Eye Irritation	GHS Category Level
Oral Toxicity	LD50 mg/kg				
Oral Toxicity	Key Phrases	Dermal Irritation	Key Phrases	Exposure Limits	PEL/TLV ppm
Oral Toxicity	GHS H Phrases				
Oral Toxicity	GHS Category Level				
Dermal Toxicity	LD50 mg/kg				
Dermal Toxicity	Key Phrases	Dermal Irritation	GHS Category Level	Exposure Limits	PEL/TLV (dust)/particle/mg/m ³
Dermal Toxicity	GHS H Phrases				
Dermal Toxicity	GHS Category Level	Dermal Irritation	GHS H Phrases	Exposure Limits	RELH ppm
Dermal Toxicity	GHS Category Level				
Dermal Toxicity	GHS Category Level	Dermal Irritation	GHS H Phrases	Health	NFPA 704 2, 3, 3, 2
Dermal Toxicity	GHS Category Level				

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>Welcome to P2OASys
Get Started

What is P2OASys?

P2OASys allows comparison to assess the potential environmental, health, and public safety impacts of alternative processes aimed at reducing toxics use. This goal is more comprehensive and robust than using either the toxicity hazard or process hazard scores used in the current P2OASys software. The tool uses several approaches:

- Automatically assesses the potential environmental and safety impacts of options, accounting for the impacts of process changes, rather than simply those of chemical changes.
- Considers options with different emissions based on experimental and calculated factors.
- Incorporates the toxicity hazard or process hazard scores for the various chemical processes and chemical entities, which can then be compared with other chemical sources and production options to assess relative or absolute or other values. Chemicals that are identified as high priority based on the chemical entity, alongside other chemical entities, are changes to work practices (e.g., in the form of process changes).

Any question or comment can be directed at Adam Roussel by phone or by email.

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Acute Human Effects

Sub Item	Units	Respiratory Irritation	Key Phrases	Eye Irritation	Key Phrases
Inhalation Toxicity	LC50 ppm	Respiratory Irritation	Key Phrases	Eye Irritation	Key Phrases
Inhalation Toxicity	Vapor GHS Category Level				
Inhalation Toxicity	mg/l gas/vapor				
Inhalation Toxicity	mg/l dust/mist/fume				
Inhalation Toxicity	Key Phrases	Respiratory Irritation	GHS H Phrases	Eye Irritation	GHS H Phrases
Inhalation Toxicity	Solid GHS Category Level				
Inhalation Toxicity	GHS H Phrases	Respiratory Irritation	GHS Category Level	Eye Irritation	GHS Category Level
Oral Toxicity	LD50 mg/kg				
Oral Toxicity	Key Phrases	Dermal Irritation	Key Phrases	Exposure Limits	PEL/TLV ppm
Oral Toxicity	GHS H Phrases				
Oral Toxicity	GHS Category Level				
Dermal Toxicity	LD50 mg/kg				
Dermal Toxicity	Key Phrases	Dermal Irritation	GHS Category Level	Exposure Limits	PEL/TLV (dust)/particle/mg/m ³
Dermal Toxicity	GHS H Phrases				
Dermal Toxicity	GHS Category Level	Dermal Irritation	GHS H Phrases	Exposure Limits	RELH ppm
Dermal Toxicity	GHS Category Level				
Dermal Toxicity	GHS Category Level	Dermal Irritation	GHS H Phrases	Health	NFPA 704 2, 3, 3, 2
Dermal Toxicity	GHS Category Level				

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Chronic Human Effects

Sub Item	Units	Other Chronic Organ Effects	Key Phrases
Carcinogen	IARC Category		
Carcinogen	EPA CLASS Category		
Carcinogen	ACGIH Category		
Carcinogen	OSHA Category		
Carcinogen	Key Phrases		
Carcinogen	GHS H Phrases		
Carcinogen	GHS Category		
Carcinogen	Prop 65 Category		
Carcinogen	Key Phrases		
Carcinogen	Key Phrases		
Mutagen/Teratogen	Key Phrases		
Mutagen/Teratogen	GHS H Phrase		
Mutagen/Teratogen	GHS Category		
Reproductive/Developmental	Key Phrases		
Reproductive/Developmental	GHS H Phrases		
Reproductive/Developmental	GHS Category		
Reproductive/Developmental	Prop 65 Category		
Neurotoxicity	GHS Category - STOT - Single Exposure		
Neurotoxicity	GHS Category - STOT - Repeated Exposure		
Neurotoxicity	Key Phrases		
Neurotoxicity	GHS H Phrase		
Respiratory Sensitivity/Irritant	Acute Irritant Type (ACGIH Equivalent)		
Respiratory Sensitivity/Irritant	Key Phrases		

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Chronic Human Effects

Endocrine System Effects	EU - Priority Endocrine Disruptor	Other Chronic Organ Effects	Key Phrases
Endocrine System Effects	EU - SVHC		
Endocrine System Effects	ChemSec - SIN		
Endocrine System Effects	OSPAR		
Endocrine System Effects	TEXX		
Endocrine System Effects	Key Phrases		
Other Chronic Organ Effects	GHS H Phrase - Single Exposure		
Other Chronic Organ Effects	GHS Category - STOT - Single Exposure		
Other Chronic Organ Effects	GHS H Phrase - Repeated Exposure		
Other Chronic Organ Effects	GHS Category - STOT - Repeated Exposure		

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Ecological Hazards

Sub Item	Units	Chronic Aquatic Toxicity (fish, crustacea or algae) - Rapidly Degradable, with Adequate Data	NOEC (NOAEC) or EC ₁₀ (mg/l)	Chronic Aquatic Toxicity (fish, crustacea or algae) - NOT Rapidly Degradable, with Adequate Data	mg/l
Acute Aquatic Toxicity	Acute Fish LC50 (mg/l)				
Acute Aquatic Toxicity	Acute Algae (or other aquatic plant) EC ₁₀ (mg/l)				
Acute Aquatic Toxicity	Key Phrases				
Acute Aquatic Toxicity	GHS H Phrases				
Acute Aquatic Toxicity	GHS Category level				
Chronic Aquatic Toxicity (fish, crustacea or algae) - Rapidly Degradable, with Adequate Data	Key Phrases				
Chronic Aquatic Toxicity (fish, crustacea or algae) - Rapidly Degradable, with Adequate Data	GHS H Phrases				
Chronic Aquatic Toxicity (fish, crustacea or algae) - Rapidly Degradable, with Adequate Data	GHS Category				
Chronic Aquatic Toxicity (fish, crustacea or algae) - NOT Rapidly Degradable, with Adequate Data	Key Phrases				
Chronic Aquatic Toxicity (fish, crustacea or algae) - NOT Rapidly Degradable, with Adequate Data	GHS Category level				

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Environmental Fate & Transport

Sub Item	Units
Persistence	Water t/2 Days
Persistence	Water Signal Words
Persistence	Air t/2 Days
Persistence	Air Signal Words
Persistence	Soil/Sediment t/2 Days
Persistence	Soil/Sediment Signal Words
Persistence	Key Phrases

Rapid Degradability	28-day Studies, % Breakdown Based on Dissolved Organic Carbon
Rapid Degradability	28-day Studies, % Based on O2 Depletion or CO2 Generation
Rapid Degradability	BOD Half-life (days)
Rapid Degradability	Hydrolysis Half-life (days)
Rapid Degradability	Key Phrases
Bioconcentration/ Bioaccumulation	Log Kow / Pow
Bioconcentration/ Bioaccumulation	BAF/BCF (l/kg)
Bioconcentration/ Bioaccumulation	Presence on Env Canada CEPA Domestic Substances List (DSL)
Bioconcentration/ Bioaccumulation	Key Phrases

Atmospheric Hazards

Sub Item	Units
Greenhouse Gas	GWP Relative to CO2
Greenhouse Gas	Y/N
Ozone Depletor	ODP Units
Ozone Depletor	GHS H Phrase
Ozone Depletor	Ozone Classification
Acid Rain Formation	Y/N
Acid Rain Formation	Key Phrases
NESHAP	Y/N
NESHAP	Key Phrases

Physical Properties

Sub Item	Units
Vapor Pressure	mm Hg
Flammability, Liquid	NFPA/HMIS 0,1,2,3,4
Flammability, Liquid	GHS H Phrase
Flammability, Liquid	GHS Category Level
Flash point, Liquid	deg C
Flash point, Liquid	Key Phrases
Flammability, Gas	GHS H Phrase
Flammability, Gas	GHS Category Level
Reactivity	NFPA/HMIS 0,1,2,3,4
Reactivity	GHS H Phrase
Reactivity	GHS Category Level

pH	pH Units
pH	Key Phrases
Corrosivity	Key Phrases
Corrosivity	GHS Category Level
Odor	Key Phrases
Volatile Organic Compound	g/l

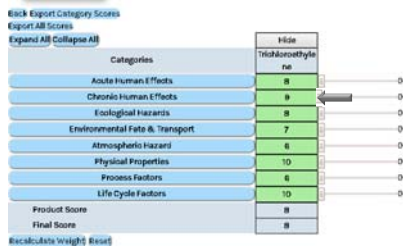
Process Factors

Sub Item	Units	Psychosocial Hazard	Control
Heat	WBGT, deg C		
Noise Generation	dBA/ft		
Vibration	Class 1 Small Machine (mm/s)	Psychosocial Hazard	Work Environment & Equipment Stability
Vibration	Class 2 Medium Machine (mm/s)		
Vibration	Class 3 Large Rig/ Foundation (mm/s)	Psychosocial Hazard	Work Environment & Equipment Work Space
Vibration	Class 4 High Soft Foundation (mm/s)		
Ergonomic Hazard	Occurrence	High Pressure System	Pressure (delta % Change From Ambient)
Ergonomic Hazard	Hazard Level	High Temperature System	Temperature (delta % Change From Ambient)
Psychosocial Hazard	Work Overload and Pace/Work Load	Water Use	% Water Change
Psychosocial Hazard	Work Overload and Pace/ Machine Pacing	Water Use	Reuse
Psychosocial Hazard	Work Overload and Pace/ Time Constraints	Energy Use	% Energy Change
Psychosocial Hazard	Work Schedule: Shift Work	Energy Use	% Renewable Energy
Psychosocial Hazard	Work Schedule: Work Justice	Exposure Potential	Occurrence: Near Certain
		Exposure Potential	Occurrence: Highly Likely
		Exposure Potential	Occurrence: Likely
		Exposure Potential	Occurrence: Unlikely
		Exposure Potential	Occurrence: Remote

Life Cycle Factors

Sub Item	Units
Upstream Effects	Key Phrases
Consumer Hazard	Key Phrases
Disposal Hazard (Banfill, Incineration)	Key Phrases
Reportable Quantity	Pounds
Recycling	% Recyclable at End of Life
Recycling	Uses Products With % Recycled Material
Renewable to Nonrenewable Resource	% Renewable Materials
Renewable to Nonrenewable Resource	Key Words

Calculating Category Score



Average Top Two High Scores

Back Export Category Scores
Export All Scores
Expand All Collapse All

Categories	Hide	Tri-Monoethylene
Acute Human Effects	8	0
Chronic Human Effects	8	0
Sub Category	Tri-Monoethylene	
Carcinogen	10	
Mutagen/Teratogen	8	
Reproductive/Developmental	8	
Neurotoxicity	6	
Respiratory Sensitivity/Disease		
Endocrine System Effects		
Other Chronic Organ Effects	8	

$(10+8)/2 = 9$

Subcategory Score

Chronic Human Effects	8	0
Sub Category	Tri-Monoethylene	
Carcinogen	10	
MARC Category	10	
EPA CLASS Category		
ACOH Category	8	
OSHA Category		
Key Phrases	8	
GHS H Phrases	8	
GHS Category	10	
Prp 65 Category	8	

Back Export Category Scores
Export All Scores
Expand All Collapse All

Categories	Hide	Tri-Monoethylene
Acute Human Effects	8	0
Chronic Human Effects	8	0
Ecological Hazards	8	0
Environmental Fate & Transport	7	0
Atmospheric Hazard	6	0
Physical Properties	10	0
Process Factors	6	0
Life Cycle Factors	10	0
Product Score	8	
Final Score	8	

Final Score
The cumulative score of each of the categories.

Weighted score
Takes the final score and will adjust score when using the sliding scale (weighting factors)

Sliding scale
The sliding scale will allow you to give a section more emphasis and thus shift the final score accordingly. If a category is more important to you, give it more impact to the weighted score to give you a more process specific result.

P2OASys Scores

- **NOT a definitive value**
 - Comparative purpose
 - Compare existing process to options
- Quality of SDS will have impact on data entry and final score
 - Try comparing one chemical using various SDS
- **Expert judgement**
 - Will vary from one user to the next

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P2OASys Tool Summary

- Assess TUR process changes for impacts on
 - Environment
 - Worker
 - Public health
- Provides systematic thinking process about the potential hazards posed by current and alternative processes
 - Based on quantitative and qualitative factors
- P2OASys doesn't include economic comparisons or performance criteria

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