Pollution Prevention Options Analysis System

P2OASys

How to use it

How to interpret the results

Where to find it: http://p2oasys.turi.org/

TURI

UMASS LOWELL

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

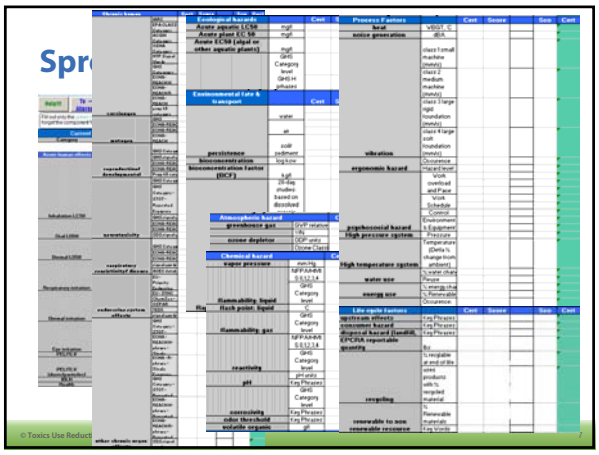
- To reevaluate sections, categories and data points
  - Compare to Global Harmonized System, Green Screen
  - Eliminate L, M, H input options
- To improve user interface
  - Eliminate the Excel 95 download
  - Create online user interface

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

P2OASys Original Format

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



Acute Human Effects

Sub Item	Units
Inhalation Toxicity	LC50 ppm
Inhalation Toxicity	Vapor GHS Category Level
Inhalation Toxicity	mg/l gas/vapor
Inhalation Toxicity	mg/l dust/mist/fume
Inhalation Toxicity	Key Phrases
Inhalation Toxicity	Solid GHS Category Level
Inhalation Toxicity	GHS H Phrases
Oral Toxicity	LD50 mg/kg
Oral Toxicity	Key Phrases
Oral Toxicity	GHS H Phrases
Oral Toxicity	GHS Category Level
Dermal Toxicity	LD50 mg/kg
Dermal Toxicity	Key Phrases
Dermal Toxicity	GHS H Phrases
Dermal Toxicity	GHS Category Level

Respiratory Irritation	Key Phrases
Respiratory Irritation	GHS H Phrases
Respiratory Irritation	GHS Category Level
Dermal Irritation	Key Phrases
Dermal Irritation	GHS Category Level
Dermal Irritation	GHS H Phrases

Eye Irritation	Key Phrases
Eye Irritation	GHS H Phrases
Eye Irritation	GHS Category Level
Exposure Limits	PEL/TLV ppm
Exposure Limits	PEL/TLV (dusts/particles) mg/m
Exposure Limits	GHS Category Level
IDLH	ppm
Health	NFPA/HMIS 0,1,2,3,4

Chronic Human Effects

Sub Item	Units
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

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/Disease	Asthmagen Type (ADEC Database)
Respiratory Sensitivity/Disease	Key Phrases

Chronic Human Effects

Endocrine System Effects	EU - Priority Endocrine Disruptor
Endocrine System Effects	EU - SVHC
Endocrine System Effects	ChemSec - SIN
Endocrine System Effects	OSPAR
Endocrine System Effects	TEDX
Endocrine System Effects	Key Phrases

Other Chronic Organ 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

Ecological Hazards

Sub Item	Units
Acute Aquatic Toxicity	Acute Fish LC50 (mg/l)
Acute Aquatic Toxicity	Acute Algae (or other aquatic plant) EC50 (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	NOEC (NOAEC) or EC0 (mg/l)
Chronic Aquatic Toxicity (fish, crustacea or algae) - Rapidly Degradable, with Adequate Data	mg/l
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	mg/l
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

Environmental Fate & Transport

Sub Item	Units
Persistence	Water t1/2 Days
Persistence	Water Signal Words
Persistence	Air t1/2 Days
Persistence	Air Signal Words
Persistence	Soil/Sediment t1/2 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
Heat	WBGT, deg C
Noise Generation	dBA/hr
Vibration	Class 1 Small Machine (mm/s)
Vibration	Class 2 Medium Machine (mm/s)
Vibration	Class 3 Large Rigid Foundation (mm/s)
Vibration	Class 4 Large Soft Foundation (mm/s)
Ergonomic Hazard	Occurence
Ergonomic Hazard	Hazard Level
Psychosocial Hazard	Work Overload and Pace: Work Load
Psychosocial Hazard	Work Overload and Pace: Machine Pacing
Psychosocial Hazard	Work Overload and Pace: Time Constraints
Psychosocial Hazard	Work Schedule: Shift Work
Psychosocial Hazard	Work Schedule: Work Isolation

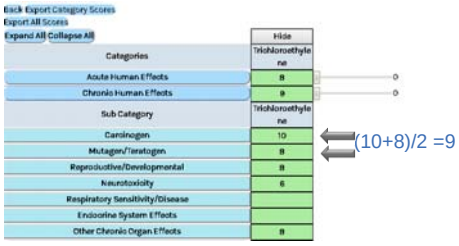
Psychosocial Hazard	Control
Psychosocial Hazard	Work Environment & Equipment: Equipment Stability
Psychosocial Hazard	Work Environment & Equipment: Work Space
High Pressure System	Pressure (Delta % Change From Ambient)
High temperature System	Temperature (Delta % Change From Ambient)
Water Use	% Water Change
Water Use	Reuse
Energy Use	% Energy Change
Energy Use	% Renewable Energy
Exposure Potential	Occurence: Near Certain
Exposure Potential	Occurence: Highly Likely
Exposure Potential	Occurence: Likely
Exposure Potential	Occurence: Unlikely
Exposure Potential	Occurence: Remote

Life Cycle Factors

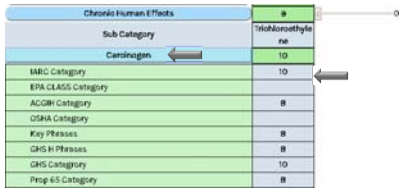
Sub Item	Units
Upstream Effects	Key Phrases
Consumer Hazard	Key Phrases
Disposal Hazard (landfill, incineration)	Key Phrases
Reportable Quantity	Pounds
Recycling	% Recyclable at End of Life
Recycling	Uses Products With % Recycled Material
Renewable to Nonrenewable Resource	% Renewable Materials
Renewable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

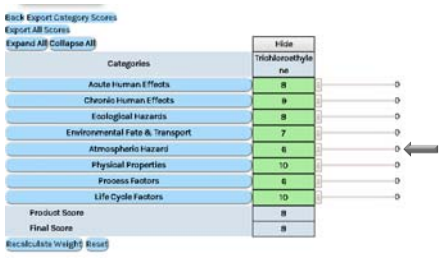
Calculating Category Score

Average Top Two High Scores



Subcategory Score





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 factor)

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

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