July 22, 2008 VTC - - Dialouge Session Talking Points

1 Post Treatment - Off Site

Off Site Incineration - Baseline and Initial Target Reductions (GE program GPRA goals)

Off Site: Other Post Treatment activities

2 Post Treatment - On site

Baseline for stream flows to on site post treatment

Ability to separate soluble from insoluble

Stream diversions from off to on site post treatment

3 Separate / isolate

A Isolation / Separation of **Insoluble** streams:
Ability to divert to:
Energy Recovery - incineration

solvent recovery - solvent recovery / distillation

B Isolation / Separation of **Soluble** streams:
Ability to divert to:
Heat Integration - solvent recovery

4 Recoverability and new RCRA law, Revisions to the Definition of Solid Waste; Proposed Rule

40 CFR Pars 260 & 261, Monday, March 26, 2007

Ability to Recover solvent upstream

cost estimates with and without RCRA rule

5 Reduce, Recover, Reuse, Resale

Proposed improvements / metrics in each category

Reduce Ideal sets of solvents, process optimizations, reaction concentrations, power and steam

Reuse: High purity, focus on insoluble

3rd party markets: $$ toward resell of soluble after use as cooling / heating agent

6 Resell

3rd party markets - Tabs 5 & 6. Economics for soluble vs insoluble

additional support:
DOC / NIST / MEP - MEP in PR

Methanol Institute
PRMA as resource / Broker

7 Partnership Mechanism - collectively developed Public Domain / linkage with Performance Tracks

This is NOT an information collection and / or reporting exercise!!

8 Public Domain Home(s) for universal Database & Technology Transfer to industry and academia

* GE academic materials and Center for Sustainable Engineering ***(supporting PPT)***
* Prentice Hall Book Build ***(supporting PPT)***
* Adapted EPA Sustainable Futures Workshops: covers property estimation and chemsteer tools, add GSK / NCU modules

Pollution Prevention and Stewardship in the Pharmaceutical Sector Initiative

Puerto Rico Manufacturing Association - July 3rd, 2008 Meeting Taking Points

Greetings! I just wanted to let you know that last week I met with two pharmaceutical representatives from Pfizer and the Puerto Rico Manufacturing Association (PRMA). As part of the meeting, we discussed the upcoming video conference event for which they showed a genuine enthusiasm, and expressed some general comments that I truly believe we should focus before the event as follows:

- They wanted to know how the partnership building for the business case development would function (step by step), and what would be required for them to do as participants. The invitation letter from EPA HQ is of utmost importance in order to justify their participation;
- They also wanted to know the main objective of the pilot project, long term commitments, timeframes, legal implications, and public appearance (information dissemination);
- They were interested on how to use the model software based on the TRI data. In the event that they become a participant, they would like to provide you with more specific data from their manufacturing processes;
- They asked details about the Solid Waste Final Rule and the expected date to be signed.
- It was mentioned that an effort can be made to deviate solvents from incineration destination, but needed to know about alternate disposal options, and a list of contacts regarding the 3rd Party Market Exchange;
- They asked about the pilot project metrics, project realistic goals, and specific timeline;
- They asked about the relationship between this pilot project and Performance Track, since they would like to get credits as participants;
- They wanted more details about individual technical assistance for the pilot project;
- It was mentioned if EPA can assist the local government environmental offices such as the Environmental Quality Board (EQB) and the Solid Waste Management Authority (SWMA) to become acquainted with the project efforts, and to be involved;
- They asked about the upcoming AICHE Convention and what would be presented about the project; and,
- If there would be any environmental recognition or incentives for the participants.

Chemical: **METHANOL**

CAS Number: 67-56-1

Health Hazard		**Reference(s)**
Recognized:	--	
Suspected:	Developmental Toxicant	CERHR JANK OEHHA-CREL
	Gastrointestinal or Liver Toxicant	RTECS
	Kidney Toxicant	MERCK
	Neurotoxicant	DAN EPA-HEN EPA-SARA
	Respiratory Toxicant	RTECS
	Skin or Sense Organ Toxicant	EPA-

Regulatory Coverage

5 federal regulatory lists.

- Air Contaminants (Occupational and Safety Health Act)
- Hazardous Air Pollutants (Clean Air Act)
- Hazardous Substances (Superfund)
- Registered Pesticides (Federal Insecticide, Fungicide, and Rodenticide Act)
- Toxic Release Inventory Chemicals

Chemical Use Profile

This is a high volume chemical with production exceeding 1 million pounds annually in the U.S.

Used in at least 17 industries.

Which Industries Use This Chemical?	How is the Chemical Used in This Industry?
Antifreezing Agents	De-icing agents
Electroplating	Electroplating - Cold-cleaning Solvents
Electroplating	Electroplating - Vapor Degreasing Solvents
Heat Transferring Agents	**Secondary Coolants**
Laboratory Chemicals	Solvents - Dilution
Laboratory Chemicals	Solvents - Extraction
Laboratory Chemicals	Solvents - Liquid Chromatography
Machinery Mfg and Repair	Solvents - Machinery Manufacture and Repair
Paint Manufacture	Alcohol Solvents - Paint
Paint Stripping	Solvents - Paint Stripping
Printed Circuit Board Manufacturing	**Outer Layer Etch/Plate - Print Circ Brd Mfg**
Printed Circuit Board Manufacturing	**Inner Layer Etching - Print Circ Brd Mfg**
Printed Circuit Board Manufacturing	**Making PCB Holes Conductive**
Pharmaceuticals Mfg	Solvents - Pharmaceuticals
Paper Coating	Solvents
Pesticide Mfg (Herbicides)	Solvents - Herbicide Manufacture
Pesticide Mfg (Insecticides)	Solvents - Insecticide Manufacture
Printing	Solvents for Equipment Cleaning
Reprographic Agents	Diazotype Materials - Misc. Chemicals
Rubber Manufacture	Solvents - Rubber Manufacture
Semiconductors	**Cleaning - Semiconductors**
Wood Stains and Varnishes	Varnish Solvents

Chemical: **DICHLOROMETHANE**

CAS Number: 75-09-2

Human Health Hazards

Health Hazard		**Reference(s)**
Recognized:	**Carcinogen**	P65
Suspected:	Cardiovascular or Blood Toxicant	KLAA
		OEHHA-CREL
	Endocrine Toxicant	RTECS
	Gastrointestinal or Liver Toxicant	ATSDR
		RTECS
	Kidney Toxicant	RTECS
	Neurotoxicant	ATSDR
		DAN EPA-HEN
	Reproductive Toxicant	FRAZIER
		JANK
	Respiratory Toxicant	RTECS

Regulatory Coverage

On at least 8 federal regulatory lists.

- Air Contaminants (Occupational and Safety Health Act)
- Hazardous Air Pollutants (Clean Air Act)
- **Hazardous Constituents (Resource Conservation and Recovery Act)**
- Hazardous Substances (Superfund)
- **Maximum Contaminant Levels (Safe Drinking Water Act)**
- **Priority Pollutants (Clean Water Act)**
- Registered Pesticides (Federal Insecticide, Fungicide, and Rodenticide Act)
- Toxic Release Inventory Chemicals

Bold: Lists methanol is not on

Chemical Use Profile

This is a high volume chemical with production exceeding 1 million pounds annually in the Used in at least 10 industries.

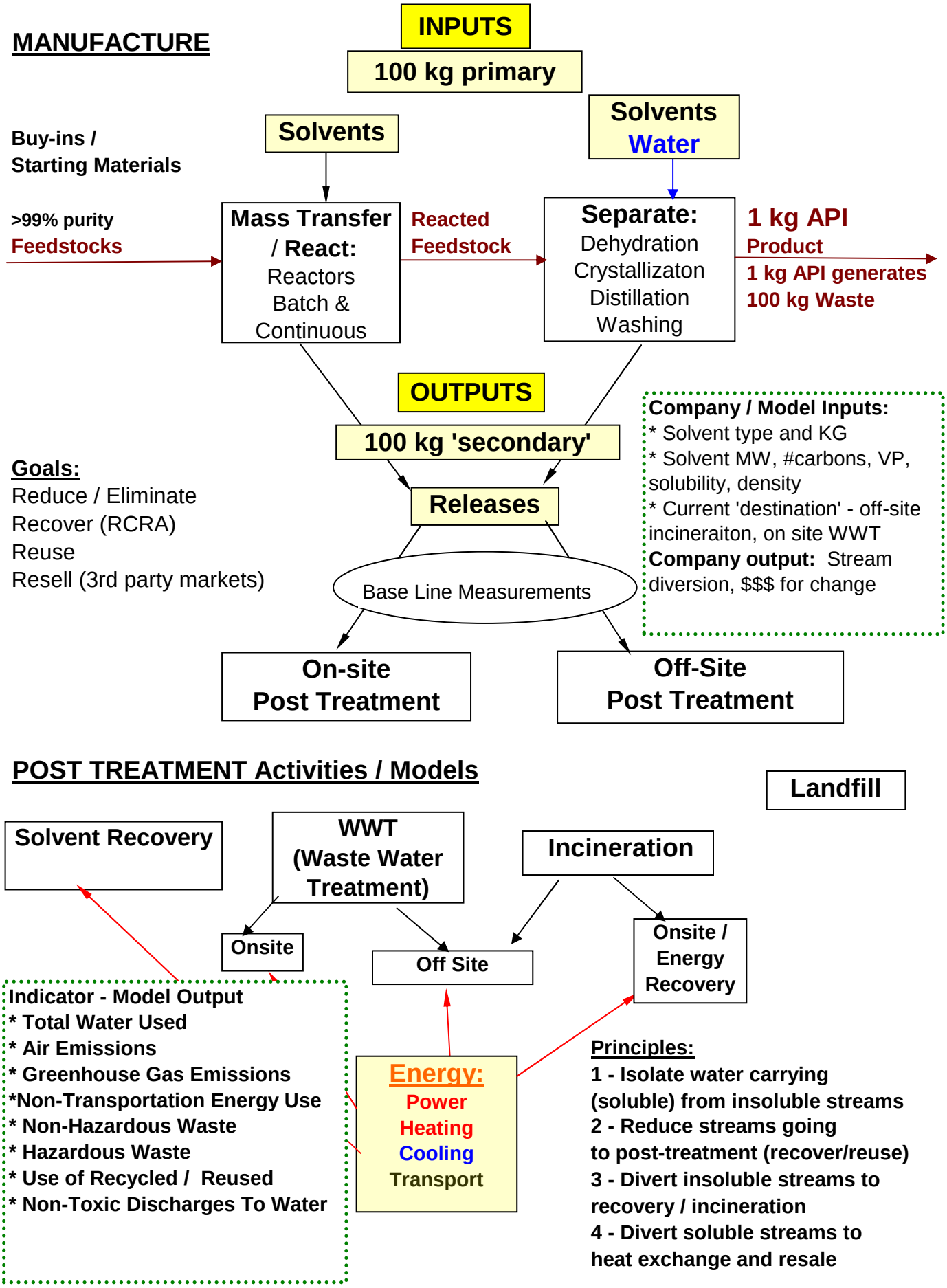
Which Industries Use This Chemical?	How is the Chemical Used in This Industry?
Circuit Board Manufacture	Image Photostrippers
Electroplating	Electroplating - Cold-cleaning Solvents
Electroplating	Electroplating - Vapor Degreasing Solvents
Integrated Iron and Steel Mfg	Solvents - Steel
Laboratory Chemicals	Solvents - Dilution
Laboratory Chemicals	Solvents - Extraction
Laboratory Chemicals	Solvents - Liquid Chromatography
Metal Degreasing	Solvents - Metal Degreasing
Paint Stripping	Solvents - Paint Stripping
Paper Coating	Solvents
Pesticide Mfg (Insecticides)	Solvents - Insecticide Manufacture
Pharmaceuticals Mfg	Solvents - Pharmaceuticals
Wood Stains and Varnishes	Resin Solvents
Wood Stains and Varnishes	Varnish Solvents

Performance Track Indicators

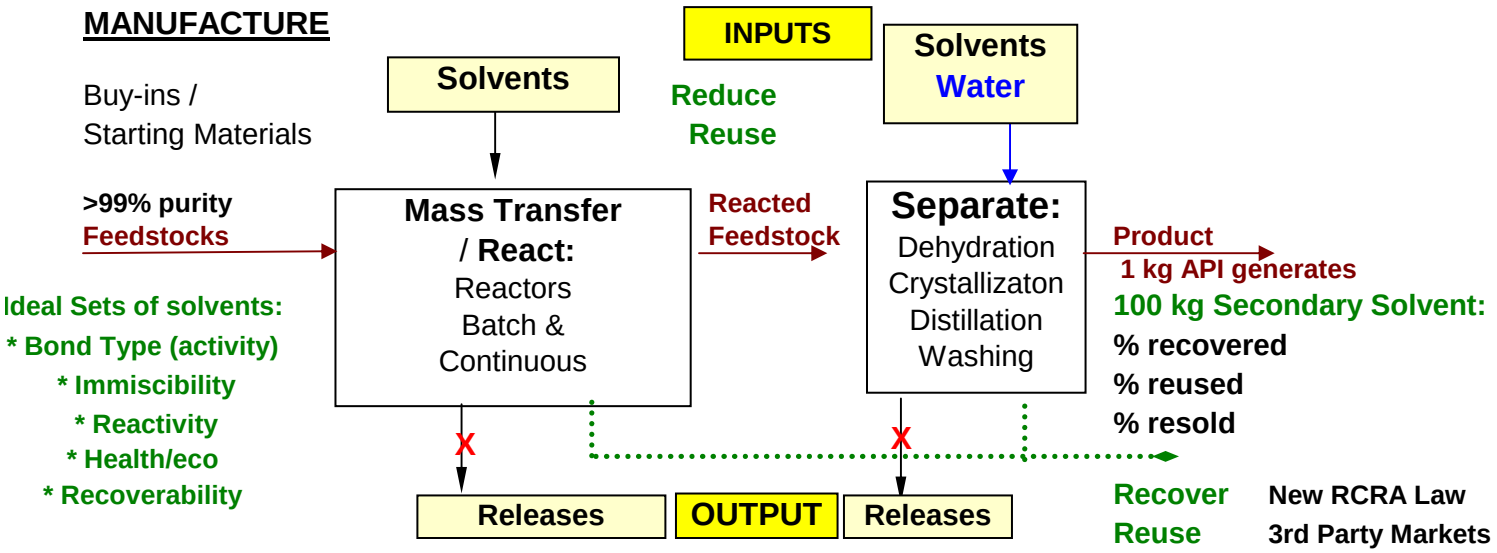
LCI Post Treatment Model Outputs & Company Inputs

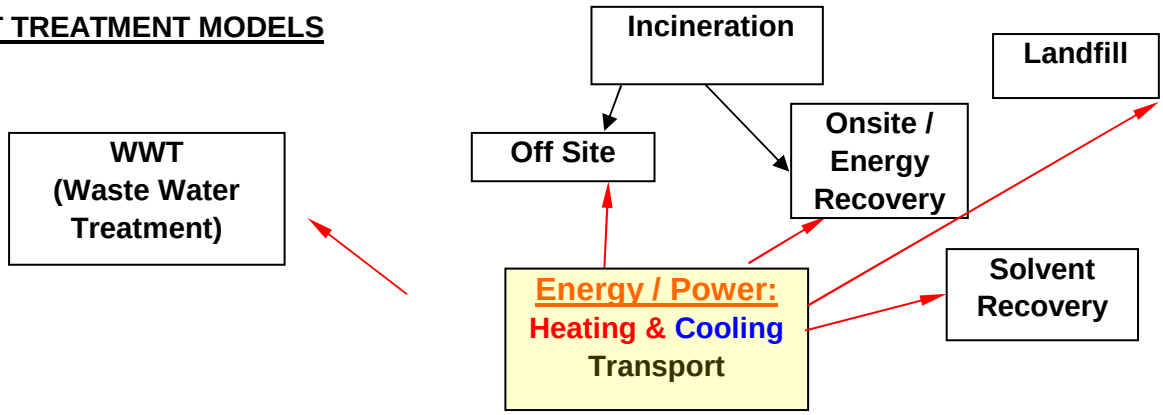
General	Detailed			
Indicator	**Category**	**Indicator**	**LCI post Treatment Model Output**	**Company Input**
	Life Cycle Stage: Upstream			kg solvent to post treatment
Use of Recycled / Reused Materials	**Material Procurement**	Recycled content		x
		Hazardous/toxic components		x
	Life Cycle Stage: Inputs			
Use of Recycled / Reused Materials	**Material Use**	Materials used	x	
		Hazardous materials used	x	
		Total packaging materials used		x
		Reused or recycled materials used	x	
Total Water Used	**Water Use**	Total water used	Water incinerated; TOC, BOD, COD, TDS	
Non-Transportation Energy Use	**Energy Use**	Total (non-transportation) energy use	x	
Greenhouse Gas Emissions		Transportation energy use		
	Life Cycle Stage: Nonproduct Outputs			
Greenhouse Gas Emissions	**Air Emissions**	Total greenhouse gases	CO2, CH4	
		Volatile organic compounds (VOCs)	x	
		Nitrogen oxides (NOx)	x	
		Sulfur oxides (SOx)	x	
		Carbon monoxide	x	
Air Emissions		Air toxics	x	
	Discharges to Water	Non-toxic discharges to water	x	
Water Discharges		Toxic discharges to water	x	
Non-hazardous waste	**Waste**	Non-hazardous waste	x	
Hazardous Waste		Hazardous waste	x	
	Life Cycle Stage: Downstream			
		Waste to air, water, land from disposal or recovery	cumulative ouput streams from post-treatment modules	

$$$$ saved


MANUFACTURE
INPUTS
100 kg primary
Solvents
Solvents
Water
Buy-ins /
Starting Materials
>99% purity
Feedstocks
Mass Transfer / React:
Reactors
Batch &
Continuous
Reacted
Feedstock
Separate:
Dehydration
Crystallizaton
Distillation
Washing
1 kg API
Product
1 kg API generates
100 kg Waste
OUTPUTS
100 kg 'secondary'
Releases
Base Line Measurements
On-site
Post Treatment
Off-Site
Post Treatment
Company / Model Inputs:
* Solvent type and KG
* Solvent MW, #carbons, VP, solubility, density
* Current 'destination' - off-site incineraiton, on site WWT
Company output: Stream diversion, $$$ for change
Goals:
Reduce / Eliminate
Recover (RCRA)
Reuse
Resell (3rd party markets)
POST TREATMENT Activities / Models
Landfill
Solvent Recovery
WWT
(Waste Water
Treatment)
Incineration
Onsite
Off Site
Onsite /
Energy
Recovery
Indicator - Model Output
* Total Water Used
* Air Emissions
* Greenhouse Gas Emissions
*Non-Transportation Energy Use
* Non-Hazardous Waste
* Hazardous Waste
* Use of Recycled / Reused
* Non-Toxic Discharges To Water
Energy:
Power
Heating
Cooling
Transport
Principles:
1 - Isolate water carrying (soluble) from insoluble streams
2 - Reduce streams going to post-treatment (recover/reuse)
3 - Divert insoluble streams to recovery / incineration
4 - Divert soluble streams to heat exchange and resale

Reduce, Recover, Reuse, Resell Opportunities and Principles





Puerto Rico - ALL Energy Needed (BTUs) **348 Billion**
24,270,243 lbs GHG (metric tons) **7,820**

Puerto Rico 2006 TRI Chemical	Pounds Offsite Incinerated	other uses**	Solubility / water content
METHANOL	8,153,854	17	*50% solvent / 50% H2O*
ACETONITRILE	3,130,686	4	*50% solvent / 50% H2O*
N,N-DIMETHYLFORMAMIDE	875,768	4	*50% solvent / 50% H2O*
N-BUTYL ALCOHOL	249,913	2	*50% solvent / 50% H2O*
Soluble Pounds	**12,410,221**	6	*50% solvent / 50% H2O*
DICHLOROMETHANE	10,770,577	10	98.7% DCM
TOLUENE	1,089,445	13	assume no water content
Insoluble Pounds	**11,860,022**		
Total Pounds	**24,270,243**		

Bold: Carcinogen **scorecard.org*

PR - Pfizer
Total Off Site Incinerated: 13,213,097 lbs
Energy Needed (BTUs) 171 Billion
GHG (metric tons) 3,870

PR - Bristol
Total Off Site Incinerated: 3,302,436 lbs
Energy Needed (BTUs) 37 Billion
GHG (metric tons) 825

4R Principles

*** Target / Eliminate High Risk materials**
*** Substitute Hazardous with Non-Hazardous Materials**
*** Reduce streams going to post treatment**
*** Use insoluble for solvent recovery & reuse and insite incineration (ER)**
*** Use soluble for heat exchange, reuse and resale to 3rd Party Markets**

Puerto Rico - All
Incineration treatment module calculation sheet

Puerto Rico - All	EPA TRI Solvents		Off Site Incineration
Calculation basis=	**24,270,033.00**	**Pounds**	**348 Billion BTUs**
			7820 Metric Tons GHG

Information needed (enter in the yellow cells)

Name of the organic substances to be incinerated	Molecular weight	Number of Carbon atoms in formula	Amount to be incinerated [kg]	Organic carbon to incinerator [kg]
methanol	**32**	**1**	**839,565**	314,837
dichloromethane	**84.9**	**1**	**2,189,198**	309,427
toluene	**92.13**	**7**	**224,354**	204,556
acetonitrile	**41**	**2**	**322,358**	188,697
N,N-dimethylformamide	**73**	**3**	**90,175**	44,470
n-butyl alcohol	**74.12**	**4**	**25,733**	16,665
				0
			Total Carbon to incinerator [kg] =	**1,078,652**
			Total Organics to incinerator [kg] =	**3,691,383**
			Total aqueous to incinerator [kg]	1,306,291
		BTUS	**Energy Recovered (%)**	**0%**
Energy needed = [MJ of Natural gas]	**55,376,493**	348	**Energy Recovered (MJ of Steam)**	**0**

348 Billion BTUs

GHG Metric Tons: 7,820	**Total from incinerator**	**From incineration process**	**Energy usage-related**	**Energy recovery-related**
Air emission [kg]				
CH4	**8,860.30**		**8.86E+03**	**0.00E+00**
CO	**2,646.73**	**1.73E+03**	**9.21E+02**	**0.00E+00**
CO2	**7,812,361.16**	**3.92E+06**	**3.90E+06**	**0.00E+00**
NMVOC	**21,869.48**	**1.73E+02**	**2.17E+04**	**0.00E+00**
NOx	**12,358.47**		**1.24E+04**	**0.00E+00**
SOx	**1,480.33**		**1.48E+03**	**0.00E+00**
Water emission [kg]				
TOC	**1.32**		**1.32E+00**	**0.00E+00**
BOD	**0.23**		**2.30E-01**	**0.00E+00**
COD	**3.79**		**3.79E+00**	**0.00E+00**
TDS	**1.51E+02**		**1.51E+02**	**0.00E+00**
Solid waste [kg]	**4,859.16**		**4.86E+03**	**0.00E+00**

Puerto Rico 2006 TRI Chemical	**Off Site Incinerated Pounds**	**Kilograms**	**RCRA**	**other uses**
METHANOL	8,153,854	3,698,588	Y	17
ACETONITRILE	3,130,686	1,420,079	Y	4
N,N-DIMETHYLFORMAMIDE	875,768	397,248	Y	2
N-BUTYL ALCOHOL	249,913	113,361	Y	6
	12,410,221	**5,629,276**		
DICHLOROMETHANE	10,770,577	4,885,534	Y	10
TOLUENE	1,089,445	494,172	Y	13
	11,860,022	**5,379,706**		

Total Off Site Incinerated: **24,270,243** **11,008,982**

348 Billion BTUs

Bold: Carcinogen **7,820 Metric Tons GHG**

Summary - Including Companies

Puerto Rico

Total Off Site Incinerated: **24,270,243** pounds

348 Billion BTUs

7820 Metric Tons GHG

Pfizer

Total Off Site Incinerated: **13,213,097** pounds

171 Billion BTUs

3,870 Metric Tons GHG

Bristol

Total Off Site Incinerated: **3,302,436** pounds

37 Billion BTUS

825 metric tons GHG

Pfizer - Arcibo and Barceloneta

Incineration treatment module calculation sheet

	EPA TRI Solvents		Off Site Incineration
Calculation basis=	13,213,097.00	Pounds	171 Billion BTUs
			3,870 Metric Tons GHG

Information needed (enter in the yellow cells)

Name of the organic substances to be incinerated	Molecular weight	Number of Carbon atoms in formula	Amount to be incinerated [kg]	Organic carbon to incinerator [kg]
methanol	32	1	428,295	160,611
dichloromethane	84.9	1	1,505,270	212,759
toluene	92.13	7	101,578	92,614
acetonitrile	41	2	47,123	27,584
n-hexane	87.17	6	9,944	8,213
N,N-dimethylformamide	73	3	41,056	20,247
n-butyl alcohol	74.12	4	25,733	16,665
				0
			Total Carbon to incinerator [kg] =	538,692
			Total Organics to incinerator [kg] =	2,158,998
			Total aqueous to incinerator [kg]	571,719
		BTUs	Energy Recovered (%)	0%
Energy needed = [MJ of Natural gas]	27,122,983	171	Energy Recovered (MJ of Steam)	0

171 Billion BTUs

8,520 Metric Tons GHG	Total from incinerator	From incineration process	Energy usage-related	Energy recovery-related
Air emission [kg]				
CH4	4,339.71		4.34E+03	0.00E+00
CO	1,312.95	8.62E+02	4.51E+02	0.00E+00
CO2	3,864,102.88	1.96E+06	1.91E+06	0.00E+00
NMVOC	10,713.17	8.62E+01	1.06E+04	0.00E+00
NOx	6,053.09		6.05E+03	0.00E+00
SOx	725.05		7.25E+02	0.00E+00
Water emission [kg]				
TOC	0.65		6.49E-01	0.00E+00
BOD	0.11		1.13E-01	0.00E+00
COD	1.86		1.86E+00	0.00E+00
TDS	7.38E+01		7.38E+01	0.00E+00
Solid waste [kg]	2,379.98		2.38E+03	0.00E+00

PR - Pfizer	Energy Needed (BTUs)		171 Billion	
13,213,097 lbs	GHG (metric tons)		3,870	
TRI Chemical	Arcibo	Barceloneta	Total = Pounds	kilograms
METHANOL	2,116,461	2,043,068	4,159,529	1,886,762
ACETONITRILE	440,050	17,600	457,650	207,590
N,N-DIMETHYLFORMAMIDE	285,728	113,000	398,728	180,863
N-BUTYL ALCOHOL	249,913	0	249,913	113,361
	3,092,152	**2,173,668**	**5,265,820**	
DICHLOROMETHANE	7,103,738	302,000	7,405,738	3,359,243
TOLUENE	142,354	350,900	493,254	223,740
N-HEXANE	48,285	0	48,285	21,902

	7,294,377	**652,900**	**7,947,277**	2,388,576
Totals	**10,386,529**	**2,826,568**	**13,213,097**	

Total Off Site Incinerated:

3,870 Metric Tons GHG

Bristol Myers Humaco and Barceloneta
Incineration treatment module calculation sheet

	EPA TRI Solvents	Off Site Incineration
Calculation basis=	3,302,436.00	37 Billion BTUS
		825 metric tons GHG

Information needed (enter in the yellow cells)

Name of the organic substances to be incinerated	Molecular weight	Number of Carbon atoms in formula	Amount to be incinerated [kg]	Organic carbon to incinerator [kg]
methanol	32	1	123,610	46,354
dichloromethane	84.9	1	417,471	59,006
toluene	92.13	7	9,874	9,003
N,N-dimethylformamide	73	3	10	5
				0
			Total Carbon to incinerator [kg] =	114,368
			Total Organics to incinerator [kg] =	550,966
			Total aqueous to incinerator [kg]	129,048
		BTUs	Energy Recovered (%)	0%
Energy needed = [MJ of Natural gas]	5,809,047	37	Energy Recovered (MJ of Steam)	0

37 Billion BTUS

825 metric tons GHG

	Total from incinerator	From incineration process	Energy usage-related	Energy recovery-related
Air emission [kg]				
CH4	929.45		9.29E+02	0.00E+00
CO	279.59	1.83E+02	9.66E+01	0.00E+00
CO2	823,940.43	4.15E+05	4.09E+05	0.00E+00
NMVOC	2,294.32	1.83E+01	2.28E+03	0.00E+00
NOx	1,296.42		1.30E+03	0.00E+00
SOx	155.29		1.55E+02	0.00E+00
Water emission [kg]				
TOC	0.14		1.39E-01	0.00E+00
BOD	0.02		2.41E-02	0.00E+00
COD	0.40		3.97E-01	0.00E+00
TDS	1.58E+01		1.58E+01	0.00E+00
Solid waste [kg]	509.73		5.10E+02	0.00E+00

TRI Chemical	Humacao	Barceloneta	Total Pounds	kilograms
METHANOL	8,400	1,192,083	1,200,483	544,539
DICHLOROMETHANE	21,701	2,032,203	2,053,904	931,651
TOLUENE	0	47,948	47,948	21,749
N,N-DIMETHYLFORMAMIDE	0	101	101	46
Totals	30,101	3,272,335	**3,302,436**	**1,497,985**

Bold: Carcinogen

37 Billion BTUS

825 metric tons GHG