GREENFIELD
GLOBAL

Greenfield Global TRA Annual Summary

Comparison 2015-2016

Facility Information

Company Name:	Greenfield Global Inc. Johnstown Plant
Facility Address:	141 Commerce Drive Prescott, Ontario K0E 1T0
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Parent Company:	Greenfield Global Inc. 100% Ownership
UTM Coordinates:	Zone 18 UTM Easting 461634; UTM Northing 4953252
Facility NPRI ID:	11684

In 2016, GG Johnstown Facility employed 57 full time employees

NAICS Codes:	Two Digit NAICS – 32 Four Digit NAICS - 3251

Six Digit NAICS - 325190

Reduction Objectives:

Greenfield Global Inc. (GG) operates an ethanol production facility. GG is committed to protect the environment through continual improvement of its manufacturing processes and the prevention of pollution. The objective of GG is to determine the technical and economic feasibility of various reduction options and identify if any are viable for implementation.

Toxic Substances:

The TRA requires the tracking of the following NPRI substances: Methanol, Sulphuric Acid, Acetaldehyde, Ethylbenzene, Toluene, Benzene, Ammonia, Xylene, Cyclohexane, Carbon Monoxide, Ethanol, Ethyl Acetate, n-hexane, Nitrogen Oxides, PM 2.5, PM 10 and TPM.

Tracking and Quantifications:

The method used to calculate the TRA quantifications was a mass balance approach.

Table 1 provides a summary of the facility TRA steps taken in 2016.

Table 2 provides a summary of the TRA quantities for the 2016 operational year compared to the last reported values.

Table 1: Toxic Reduction Act- Reduction Potential - Phase 1 & 2 - SUMMARY FOR 2016

		TOXIC SUBSTANCES										
	Acetaldehyde [MPO] CAS#: 75-07-0	**Ammonia CAS#: NA-16**	**Sulphuric Acid CAS#: 7664-93-9**	**Benzene CAS#: 71-43-2**	**Ethylbenzene CAS#:100-41-4**	**Cyclohexane, toluene, xylene, [MPO - component of gasoline]**	**Total PM, PM10, PM2.5 [CACs]**	**CO, NOx [CACs] CAS#: 630-08-0; 11104-93-1**	**Ethyl Acetate CAS#: 141-78-6**	**Ethanol CAS#: 64-17-5**	**n-Hexane, Pentane CAS#: 110-54-3; NA-35**	**Methanol CAS#: 67-56-1**
SOURCE	Generated in process in low concentration at evaporation, fermentation and dryers.	1. Purchased in bulk, received and stored on plant site in tank. Vented to atmosphere from tank. Vapour balance with truck during transfers. Neutralized/converted upon mixing in to process. Used for pH control.	Purchased in bulk, received and stored on plant site in SS tanks. Consumed / neutralized upon mixing into process. Used for pH control.	In gasoline which is used to denature ethanol product.	In Corrosion inhibitor which is added to gasoline which is used to denature ethanol product.	In gasoline which is used to denature ethanol product.	Created - Natural Gas Combustion by-product, grain handling, distillers grains drying process	Created -Natural Gas Combustion by-product	Created - during fermentation and dry distillers grain drying process	Primary facility product. Production based on consumer demand. Mainly fugitive losses - occur from process vents, storage tank vents and product transfers.	Used - Formulation component	Used - Formulation component Created - during Fermentation
Means of Reduction: 1. Material or feedstock substitution	Not applicable. This is a by-product of our process.	A direct substitution is being made which will eliminate ammonia.	No direct substitution is being made at this time. New enzymes are being used that are helping to reduce usage.	Currently blending natural gasoline at a higher rate thus contributing to higher amounts of this substance. Denaturing is a requirement by Excise Canada.	Currently blending natural gasoline at a higher rate thus contributing to higher amounts of these substances.	Currently blending natural gasoline at a higher rate thus contributing to higher amounts of these substances.	Not applicable.	Not applicable.	Not applicable.	not applicable	Currently blending natural gasoline at a higher rate thus contributing to higher amounts of these substances.	not applicable.
2. Product design or reformulation	Not applicable - this is a by-product of our process.	Ongoing enzyme trials.	H2SO4 is neutralized in the process.	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	Not applicable.	Not applicable.	No change at this time	Plant optimization is ongoing.	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	No changes at this time.
3. Equipment or process modification	Corn oil extraction implementation.	Continue enzyme trials to further reduction.	Continue enzyme trials to further reduction.	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	Leak prevention programs are in place to minimize particulate matter as well a computerized program was installed to maintain operating parameters within a tight tolerance and therefore again minimizing leaks and inefficiencies.	A computerized program was installed to maintain operating parameters within a tight tolerance and therefore again minimizing leaks and inefficiencies.	Corn oil extraction implementation.	No change at this time.	This is currently part of our denaturing process. Denaturing of fuel ethanol is a requirement by Excise Canada	No change at this time.
4. Spill and leak prevention	Leak checks and pressure readings help minimize leakage.	Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Maintenance and operations are taught to detect, report and repair leaks whenever possible. This early detection allows us to prevent emissions.	Maintenance and operations are taught to detect, reports and repair leaks whenever possible. This early detection allows us to prevent emissions.	Maintenance and operations are taught to detect, reports and repair leaks whenever possible. This early detection allows us to prevent emissions.	Continued PMs. These PM's help prevent leaks and spills by maintaining equipment before they lead to breakdowns and spills.	Not applicable.	Maintenance and operations are taught to detect, reports and repair leaks whenever possible. This early detection allows us to prevent emissions.	Maintenance and operations are taught to detect, reports and repair leaks whenever possible. This early detection allows us to prevent emissions.	Leak checks and pressure readings help minimize leakage.	not applicable.
5. On-site reuse or recycling	not applicable	not applicable. All ammonia is consumed in process.	not applicable. All sulphuric acid is consumed in process.	Not applicable. All gasoline is utilized as ethanol denaturant.	Not applicable. All gasoline is utilized as ethanol denaturant.	Not applicable. All gasoline is utilized as ethanol denaturant.	All materials captured via dust collectors are returned to the process.	Not applicable.	Not applicable.	Any test samples taken are captured and re-introduced into the process.	Not applicable. All gasoline is utilized as ethanol denaturant.	No change at this time.
6. Improved inventory management or purchasing techniques	not applicable	QA is developing a program to audit suppliers as part of our purchasing procedure.	No change planned at this time.	QA is developing a program to audit suppliers as part of our purchasing procedure.	QA is developing a program to audit suppliers as part of our purchasing procedure.	QA is developing a program to audit suppliers as part of our purchasing procedure.	not applicable	No change planned at this time.	No change planned at this time.	No change planned at this time.	No change planned at this time.	not applicable.
7. Training or improved operating practices	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Operations is tracking and optimizing dryer reliability and temperature.	Operators are trained to monitor for leaks and shut down and report any problems to repairs can be made.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Training continues to improve. Maintenance and operations are taught to detect, reports and repair leaks whenever possible.	Negligible amounts, no change planned at this time.	not applicable.
Reduction Targets	N/A	7% reduction in 2016, will be eliminated in 2017	15% reduction over 6 years - 1.85% reduction this year	70%	100% reduction target- 99.9% reduction this year from baseline.	Toluene 98% Xylene 99%	N/A	N/A	1% reduction target 1% reduction from baseline has been achieved.	N/A	N/A	N/A
Timeline/Steps Taken	Corn oil extraction in place. Improved dryer optimization	Substitution is being made which will eliminate ammonia in 2017.	On schedule with different enzyme trials.	Switch has been made to natural gasoline but using higher concentrations and increased production.	Switch has been made to natural gasoline but are currently utilizing a different inhibitor with a small amount of ethylbenzene present.	Switch has been made to natural gasoline but are currently utilizing a different inhibitor with a small amount of Xylene present.	N/A	N/A	Corn oil extraction in place.	N/A	N/A	N/A
Amendments to Plan	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Additional Reduction Actions	N/A	Ammonia is being substituted and will be eliminated in 2017	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Table 2: Toxic Reduction Act- Phase 1 & 2 - 2016 Quantities

		Phase 1			TOXIC SUBSTANCES - Phase 1 & 2												
	Acetaldehyde [MPO] CAS#: 75-07-0	**Benzene CAS#: 71-43-2**	**Methanol CAS#: 67-56-1**	**Sulphuric Acid CAS#: 7664-93-9**	**Ammonia CAS#: NA-16**	**PM2.5 CAS#: NA-M10**	**PM10 CAS#: NA-M09**	**Total Particulate Matter CAS#: NA-M08**	**Nox CAS#: 11104-93-1**	**CO CAS#: 630-08-0**	**Cyclohexane CAS#: 110-82-7**	**Toluene CAS#: 108-88-3**	**Ethylbenzene CAS#: 100-41-4**	**Ethyl Acetate CAS#: 141-78-6**	**Xylene CAS#: 1330-20-7**	**n-Hexane CAS#: 110-54-3**	**Ethanol CAS#: 64-17-5**
SOURCE	Generated in process in low concentration at evaporation, fermentation and dryers.	In gasoline which is used to denature ethanol product.	Utilized as a denaturant following Excise Canada requirements. Generated in fermentation process.	Purchased in bulk, received and stored on plant site in SS tank. Consumed / neutralized upon mixing into process. Used for pH control.	1. Purchased in bulk, received and stored on plant site in tank. Vapour balance with truck during transfers. Neutralized/converted upon mixing in to process. Used for pH control.	Created - Natural Gas Combustion by-product, grain handling, distillers grains drying process	Created at grain unloading and milling, the corn vents, grain transfers, cooling towers and boiler stack.	Created at grain unloading and milling, the corn vents, grain transfers, cooling towers and boiler stack.	Created -Natural Gas Combustion by-product	Created -Natural Gas Combustion by-product	In gasoline which is used to denature ethanol product.	In gasoline which is used to denature ethanol product.	Corrosion inhibitor added to gasoline which is used to denature ethanol product.	Created - during fermentation and dry distillers grain drying process	In gasoline which is used to denature ethanol product.	Used - Formulation component. In gasoline which is used to denature ethanol product as per Excise Canada.	Generated in fermentation process, final production product.
2016 Used (tonnes)	0	>10-100	>1-10	>1000	>100-1000	0	0	0	0	0	>100-1000	>10-100	>0-1	0	>1-10	1000-10000	0
2015 Used - Last reported value	0	>10-100	>1-10	>1000	>100-1000	0	0	0	0	0	>100-1000	>10-100	>0-1	0	>1-10	1000-10000	0
% Change	0	9.33%	0.00%	-1.85%	-7.06%	0	0	0	0	0	9.33%	9.31%	-7.14%	0	8.18%	9.33%	0
2016 Created (tonnes)	>10-100	0	>100-1000	0	0	>1-10	>10-100	>10-100	>10-100	>10-100	0	0	0	0	0	0	>100-1000
2015 Created - Last reported value	>10-100	0	>100-1000	0	0	>1-10	>10-100	>10-100	>10-100	>10-100	0	0	0	0	0	0	>100-1000
% Change	3.00%	0	0.00%	0	0.00%	2.64%	2.35%	27.40%	3.00%	1.65%	0.00%	0	0	0	0	0%	2.71%
2016 Contained in Product (tonnes)	>100-1000	>10-100	>100-1000	0	0	0	0	0	0	0	>100-1000	>10-100	>0-1	0	>1-10	1000-10000	0
2015 Contained in Product - Last Reported Value	>100-1000	>10-100	>100-1000	0	0	0	0	0	0	0	>100-1000	>10-100	>0-1	0	>1-10	1000-10000	0
% Change	0	9.34%	0.00%	0	0	0	0	0	0	0	9.33%	9.33%	-7.14%	0	8.48%	9.31%	0
2016 Released to Air (tonnes)	>10-100	<1	>1-10	0	0	>1-10	>10-100	>10-100	>10-100	>10-100	<1	<1	>0-1	>1-10	>0-1	>1-10	>100-1000
2015 Released to Air - Last Reported	>10-100	<1	>1-10	0	0	>1-10	>10-100	>10-100	>10-100	>10-100	<1	<1	>0-1	>1-10	>0-1	>1-10	>100-1000
% Change	3.00%	16%	1.43%	0	0.00%	2.64%	2.35%	27.40%	3.00%	1.65%	12.90%	3.51%	0%	3.01%	2.44%	5.79%	3.02%
Quantity Released to Surface Waters	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quantity Released to Land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quantity Disposed of on-site to Land	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quantity Transferred off-site for Disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quantity Transferred off-site for Treatment prior to final disposal	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Quantity transferred off-site for Recycling	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Reason for Change	Increase in production.	This is currently part of our denaturing process as per Excise Canada. Increase in production.	Increase in production	Phytase Enzyme usage	Improved operation efficiency, eliminating ammonia usage in 2017.	Increased production	Increased production	Increased production	Increased production.	Increased production.	Denaturant currently in use which is required by Excise Canada has a higher percentage of cyclohexane but lower levels of other toxic substances.	This is currently part of our denaturing process as per Excise Canada. Increase in production.	This is currently part of our denaturing process as per Excise Canada.	Increase in production	This is currently part of our denaturing process as per Excise Canada. Increase in production.	This is currently part of our denaturing process as per Excise Canada. Increased production.	Increased production

Quantification