Toxic Reduction Act

TODA Advanced Materials Inc.
Sarnia Facility
Toxics Reduction Action Plan
Manganese

Confidential Commercially Sensitive Information

TODA Advanced Materials Inc.
933 Vidal Street South
Sarnia, ON
N7T 7K2
Canada

Attention: Max Autio

Prepared by:

LEHDER Environmental Services Limited
704 Mara Street, Suite 210
Point Edward, ON
N7V 1X4

Project No.: 165346
December 23, 2016

Toxic Reduction Plan Summary

Substance

Substance Name and CAS #	Manganese and CAS # NA-09
Substances for which other plans have been prepared	Nickel, Cobalt, Sulphuric Acid
Reasons for Use	As a formulation component
Reasons for use - summary statement (mandatory)	The substance is a key component of final products at the facility and is used as both a formulation component and as a reactant.
Reasons for Creation	This substance is not created at the facility
Reasons for creation - summary statement (mandatory)	N/A

Facility Information

Company Name	TODA Advanced Materials Inc.
Facility Name	TODA Advanced Materials Inc.
Facility Physical Address	933 Vidal Street South, Sarnia, ON, Canada, N7T 7K2
Facility Mailing Address	933 Vidal Street South, P.O. Box 938, Sarnia, ON, Canada, N7T 7K2
Spatial Coordinates of Facility	384226Easting; 4755698Northing
Number of Employees	26
NPRI ID	11731
Ontario MOE (R.127)ID Number	if assigned
2 Digit NAICS Code	31-33
4 Digit NAICS Code	3251
6 Digit NAICS Code	325189

Parent Company Information

Parent Company Name	Toda Kogyo Corp.
Address	1-4 Maiji shinkai, Otake, Japan, 739-0652
Percent Ownership (if available)	100%
Parent Company Name	—
Address	—
Percent Ownership (if available)	—

Facility Contact

Public Contact	Max Autio
Position	Plant Manager
Address	933 Vidal Street South, Sarnia, ON, Canada, N7T 7K2
email	max.autio@todaca.com
Phone	519-346-4331
Fax	519-346-4310

Date of Plan: ***December 23, 2016***

Statement of Intent

TODA Advanced Materials Inc. - TODA Advanced Materials Inc. is committed to playing a leadership role in protecting the environment. Whenever feasible, we will eliminate, or reduce the use, creation and discharge of manganese in full compliance with all Federal and Provincial Regulations.

Plan Objectives

Our goal is to reduce the losses of manganese at our facility.

Description of Substance (Reason for Use and/or Creation)

Manganese is used as a formulation component and as a reactant in the manufacture of nickel hydroxide powders for use in batteries for the consumer and industrial markets.

Description of Previously Implemented Reduction Opportunities:

- improved filtration in waste water system to recover more metals than old system; better microfiltration and more reliable system with less leakage and less cleaning
- added enclosures and dust collection systems (empty bag folding table handling; magnet cleaning; supersac crystal dissolution drop station) reducing fugitive losses
- added dry sieve no flow alarm to prevent excessive build up of material when sieve cleaning is required reducing material lost to scrap and fugitive emissions during clean out
- added interlocks to reactor feeds to prevent offspec material when there is loss of one of the feeds for a prolonged period of time
- high recycle of off-spec product back into main product process (reblending)
- off-spec materials that can't be recycled into main product are sold as secondary product streams including laboratory samples; filter cake; sludge and dust collector materials
- added reblend equipment to some production lines to automate process of adding re-blend material into product stream reducing losses
- improved or tightened process control procedures to shorten alarm set point times and impose interlocks on all feeds (so if one feed is lost all feeds to reactor are stopped) - reduces response times to process upsets and minimizes generation of off-spec
- addition of internal dissolutions system to dissolve crystals as needed instead of bulk purchasing of solutions
- Addition of autosampler to control fugitive dust emission created from hand sampling

Plan Summary Statement

This plan summary accurately reflects the content of the toxic substance reduction plan for manganese, prepared by TODA Advanced Materials Inc., dated December 23, 2016.

Date of Plan: ***December 23, 2016***

Toxic Substance Reduction Option(s) to be Implemented

The following options have been identified for implementation to reduce the use, creation, or releases of manganese:

		Used	Created	Contained in Product	On-Site Releases to Air	On-Site Releases to Water	On-Site Releases to Land	Disposal On-Site	Disposal Off-Site	Transfer Off-Site for Recycling
Option Description:	Install sulfate recovery system on site to eliminate the processing of sulphate offsite. Additionally, the processing of metals off site is eliminated.									
Estimated Reductions due to Option Implementation	Tonnes	0.0000	N/A	0.0000	0.0000	N/A	N/A	N/A	0.0006	N/A
	%	0.00%	N/A	0.00%	0.00%	N/A	N/A	N/A	100.00%	N/A
Timeline for Reductions	Years	1	N/A							

Date of Plan: ***December 23, 2016***

Certification by Highest Ranking Employee

As of December 23, 2016, I, Kazuyoshi Murashige, certify that I have read the toxic substance reduction plan for the toxic substance referred to below and am familiar with its contents, and to my knowledge the plan is factually accurate and complies with the *Toxics Reduction Act, 2009* and Ontario Regulation 455/09 (General) made under that Act.

Toxic Substance: **Manganese**

Kazuyoshi Murashige
President
TODA Advanced Materials Inc. - TODA Advanced Materials Inc.

Certification by Licensed Planner

As of December 23, 2016, I, Melanie Hockin certify that I am familiar with the processes at TODA Advanced Materials Inc. that use or create the toxic substance referred to below, that I agree with the estimates referred to in subparagraphs 7 iii, iv and v of subsection 4 (1) of the *Toxics Reduction Act, 2009* that are set out in the plan dated December 23, 2016 and that the plan complies with that Act and Ontario Regulation 455/09 (General) made under that Act.

Toxic Substance: **Manganese**

Melanie Hockin
Toxic Substance Reduction Planner
License Number: TSRP0140
LEHDER Environmental Services Limited

Table of Contents

1. Introduction

In December 2009 the Ontario Ministry of the Environment promulgated Ontario Regulation 455/09. The regulation is under the Toxics Reduction Act which was finalized in July, 2009. The purpose of the Act and regulation is to reduce the industrial use of toxic substances via identification and reduction planning.

1.1 Toxics Reduction Plan Steps

O. Reg 455/09 made under the Toxics Reduction Act, 2009 requires that all facilities with a North American Industrial Classification System (NAICS) code commencing with the digits "31", "32", "33" or "212" who manufacture, process or otherwise use any contaminants within the Regulation's Toxic Substance lists are required to prepare a Toxic Substance Reduction Plan (TSRP).

As mandated in the TRA and O. Reg.455/09, the process definitions and calculation methods used for the Baseline Accounting Reports must be kept consistent for annual reporting until the first 5 year update.

A number of steps will be required to determine what type of information will require tracking to comply with the Toxics Reduction Act and Regulation.

Step 1 – Conduct Pathways Assessment
Step 2 – Define Process(es) and Develop Mass Balance(s)
Step 3 – Establish Toxics Accounting System
Step 4 – Prepare Annual Toxics Accounting Report (due June 29, 2016)
Step 5 – Prepare Toxics Reduction Plan (due December 31, 2016)
Step 6 – Prepare Toxics Reduction Plan Summary (due December 31, 2016)

Steps 1 through 4 have been implemented by the facility and the reader is referred to the Toxics Accounting reports prepared for the 2015 and 2016 reporting years. This report fulfills the requirements for Steps 5 and 6.

The following sections provide the mandated information outlined for the purposes of a Toxics Reduction Plan and Plan Summary as specified by the Toxics Reduction Act and O.Reg. 455 Toxics Reduction Regulation

1.2 Toxic Substance

This Toxic Reduction Plan has been developed for manganese.

2. Facility Information

Facility Information

Company Name	TODA Advanced Materials Inc.
Facility Name	TODA Advanced Materials Inc.
Facility Physical Address	933 Vidal Street South, Sarnia, ON, Canada, N7T 7K2
Facility Mailing Address	933 Vidal Street South, P.O. Box 938, Sarnia, ON, Canada, N7T 7K2
Spatial Coordinates of Facility (UTM)	384226 Easting; 4755698 Northing
Number of Employees	26
NPRI ID	11731
Ontario MOE ID Number	if assigned
2 Digit NAICS Code	31-33
4 Digit NAICS Code	3251
6 Digit NAICS Code	325189

Parent Company Information

Parent Company Name	Toda Kogyo Corp.
Address	1-4 Maiji shinkai, Otake, Japan, 739-0652
Percent Ownership	100%
Business Number	Not Available
Parent Company Name	—
Address	—
Percent Ownership (if available)	—
Business Number	—

3. Key Personnel

Public Contact	**Max Autio**
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Highest Ranking Employee	**Kazuyoshi Murashige**
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Parent Company Contact	N/A
Address	
email	
Phone	
Fax	

Planner Responsible for Making Recommendations	**Melanie Hockin**
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email	mhockin@lehder.com
Phone	519-336-4101 x228
Fax	519-336-4311

4. Facility Description

The TODA Advanced Materials Inc. is located at 933 Vidal Street South, in Sarnia, Ontario. It employs approximately 26 employees. The facility produces nickel hydroxide powders for use in the manufacture of rechargeable batteries commonly used in hybrid electric vehicles and electronic equipment including cell phones, computers and electronic games. The TODA facility can operate two (2) production lines 24 hours per day, 7 days per week. The basic operation involves the following key activities:

- Raw Materials Storage and Handling
- Reaction and Agglomeration
- Thickening, Washing and Filtration
- Ammonia Scrubbing and Stripping
- Waste Water Treatment

4.1 North American Industry Classification System

In cooperation with the United States of America, Canada and Mexico, the North American Industry Classification System (NAICS) was developed using a production-oriented conceptual framework. NAICS groups establishments into industries based on the activity in which they are primarily engaged. Establishments using similar raw material inputs, similar capital equipment, and similar labour are classified in the same industry.

NAICS uses a six digit hierarchical coding system to classify all economic activity into twenty industry sectors. Five sectors are mainly goods-producing sectors and fifteen are entirely services-producing sectors. The NAICS is required for annual reporting.

The NAICS code for this facility, based on “North American Industry Classification System Canada 1997, Statistics Canada Standards Division” is 325189 “All Other Basic Inorganic Chemical Manufacturing”.

4.2 Process Description

4.2.1 Raw Materials

The cobalt, nickel, and manganese solutions are manufactured on site using cobalt, nickel, and manganese sulphate crystals. Bulk super sacs of cobalt, nickel, and manganese sulphate arrive in crystallized form and are discharged from the second level of the plant into a dissolution tank on the first level via a chute and dissolved. The liquid solutions are stored in tanks prior to use.

4.2.2 Reaction and Agglomeration

Liquid solutions of manganese, nickel and cobalt are reacted with sodium hydroxide in the presence of ammonia to form nickel hydroxide slurry. This slurry is sent to the agglomeration tank where round agglomerates of nickel hydroxide are formed.

4.2.3 Thickening, Washing and Filtration

The agglomerates of nickel are separated into a heavy liquid phase (concentrated product suspension) and a light liquid phase (clarified solution). The light liquid phase is re-circulated to the separator and the heavy phase, containing the nickel hydroxide product, is dewatered to form a filter cake. The filter cake is washed to remove salts and ammonia. The cake is again dewatered before being charged to the dryers.

4.2.4 Drying and Packaging

The wet filtercake is transported via conveyor into the drying chamber. A high speed agitator breaks the filter cake into small pieces and eventually, a fine powder with a particle size ranging from 5-15 microns. The finished spherical nickel hydroxide product is then packaged into super sacks and weighed.

4.2.5 Ammonia Scrubbing and Stripping

Using distillation, the electrolyte solution from the separators is separated into ammonia free (<500 ppm NH3) electrolyte and ammonia/water condensate. The ammonia free electrolyte solution is sent to waste water treatment and the recovered ammonia/water condensate is reused in the reaction process. Any uncondensed vapors and air are sent to the building scrubber.

4.2.6 Waste Water Treatment

Waste water generated during the manufacturing process is treated on-site to remove dissolved metals by micro filtration and ion exchange. The solid waste filter cake is sold as a metal paste product. The filtered waste water is directed, via pipeline, to the neighbouring Arlanxeo Biological Oxidation (BIOX) plant for treatment and eventually discharges to the St. Clair River.

5. O.Reg. 455 Toxic Substance Identification

LEHDER has completed an assessment for the TODA facility and based on the NPRI reporting for 2015, LEHDER identified the following contaminants that trigger reporting under O. Reg. 455/09:

- Cobalt
- Manganese
- Nickel
- Sulphuric Acid

Manganese met the reporting threshold for the first time since 2012 due to 2015 customer demand for a metal product blend containing manganese. MPO data, supplied by the facility, was used to determine which substances meet the O. Reg. 455/09 thresholds. These substances enter the process through raw materials used in the process and can be found throughout the majority of the areas of the plant.

6. Substance

Substance Name: Manganese

CAS #: NA-09

Previously Implemented Reduction Activities:

- improved filtration in waste water system to recover more metals than old system; better microfiltration and more reliable system with less leakage and less cleaning
- added enclosures and dust collection systems (empty bag folding table handling; magnet cleaning; supersac crystal dissolution drop station) reducing fugitive losses
- added dry sieve no flow alarm to prevent excessive build up of material when sieve cleaning is required reducing material lost to scrap and fugitive emissions during clean out
- added interlocks to reactor feeds to prevent offspec material when there is loss of one of the feeds for a prolonged period of time
- high recycle of off-spec product back into main product process (reblending)
- off-spec materials that can't be recycled into main product are sold as secondary product streams including laboratory samples; filter cake; sludge and dust collector materials
- added reblend equipment to some production lines to automate process of adding re-blend material into product stream reducing losses
- improved or tightened process control procedures to shorten alarm set point times and impose interlocks on all feeds (so if one feed is lost all feeds to reactor are stopped) - reduces response times to process upsets and minimizes generation of off-spec
- addition of internal dissolutions system to dissolve crystals as needed instead of bulk purchasing of solutions
- Addition of autosampler to control fugitive

	dust emission created from hand sampling

7. Stages and Processes

An assessment of the facility's process operations has identified that several contaminants are used or created in all processes at the TODA Advanced Materials facility.

7.1 Data Tracking Requirements

Process substance tracking is necessary in order to maintain a sound understanding of the impacts on the process. O. Reg 455/09 specifies that all reportable substance be tracked in a manner that identifies any amount of the substance that:

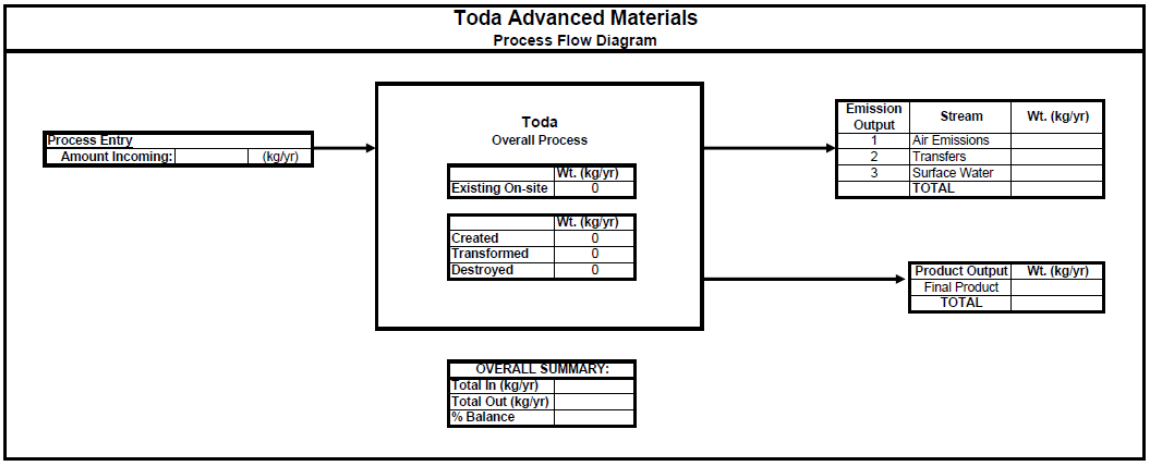
- Enters as Raw Materials
- Is Created, destroyed or transformed
- Is contained in a product that leaves a process
- Is Released on site to air
- Is Released on site to surface waters
- Is Released on site to land
- Is Disposed of on site
- Is Disposed of off site
- Is Transferred off site for treatment before final disposal
- Is Transferred off site for recycling

7.2 Process Flow Diagram

LEHDER has conducted an assessment to determine how each substance moves through the process, where the substances are created or destroyed and how each contaminant leaves the site.

Figure 1 outlines the contaminant pathways for a mass balance across the overall process

Figure 1: Facility Process Flow Diagram



7.3 Pathways

Pathway	Manganese
Process Entry	Enters process as a raw material (feedstock and as trace contaminant in Natural Gas)
Created	N/A
Destroyed	N/A
Transformed	N/A
In a product that leaves the process	Contained in final products
Points of Release to Air	Air emissions from Natural Gas Combustion and process operations
Released on site to surface waters	N/A
Released on site to land	N/A
Disposed of on site	N/A
Disposed of off site	N/A
Transferred off site for treatment	Trace constituent of process effluent transferred for disposal
Transferred off site for recycling	N/A

8. Tracking and Quantification

The pathways assessment in the previous section outlines the process and substance pathways to be analyzed using a mass balance. The reader is referred to the "Toxics Accounting Report" prepared by LEHDER for the detailed accounting.

8.1 Estimation Methods & Data Requirements

Facilities must conduct toxic substance accounting in order to prepare a mass balance of toxic materials containing the substance found within each defined process. In addition to quantifying the amount of each substance that is released or transferred offsite, the facility is required to track usage from arrival onsite, and through each process in which it is used.

8.2 Data Collection

The data used to perform this assessment includes:

- Material Usage and Production Information (Appendix B of the Toxics Accounting Report)
- Air Emission Calculation Summary (Appendix C of the Toxics Accounting Report)
- Waste Transfer Summary (Appendix D of the Toxics Accounting Report)

8.2.1 Enters the Process as Raw Materials

Manganese enters the facility as a raw material and as a trace component of the natural gas used on site. The facility input data and purchasing data can be found in Appendix B of the Toxics Accounting Report.

Best Available Method Rationale: The calculations were based on production data and analyses provided by the facility which are considered to be the most accurate available accounting data.

8.2.2 Created, Destroyed or Transformed

Manganese was not created, destroyed or transformed within the process.

8.2.3 In a Product that Leaves the Process

Manganese leaves the process in the final product streams. The facility input data and purchasing data can be found in Appendix B of the Toxics Accounting Report.

Best Available Method Rationale: The calculations were based on production data and analyses provided by the facility which are considered to be the most accurate available accounting data.

8.2.4 Released on site to Air

Manganese is emitted to air through various process operations and is also released from natural gas combustion sources because it is a trace contaminant of natural gas. The emission estimates can be found in Appendix C of the Toxics Accounting Report.

Best Available Method Rationale: The amount of manganese released to air from process sources is calculated using engineering estimates based on production data and lab analyses. The amount of manganese released to air from combustion sources is calculated using emission factors.

8.2.5 Released on site to Surface Waters

Manganese was not released on site to surface waters.

8.2.6 Released on site to Land

Manganese was not released on site to land.

8.2.7 Disposed of on/off site

Manganese was not disposed of off-site.

8.2.8 Transferred off site

Manganese was transferred off site as a trace constituent of process effluent for treatment before disposal. This data can be found in Appendix D of the Toxics Accounting Report.

Best Available Method Rationale: The disposal calculations utilize effluent transfer quantities and the estimated manganese concentration supplied by the facility.

8.3 Mitigating Factors

It is important to identify any mitigating factors that may affect the emission calculations for a given reporting year. Process changes, process interruptions, shutdowns and spills can all significantly impact a facility's annual emissions. In order to demonstrate that a facility is in compliance with ministry standards accurately, we must account for any uncharacteristic emissions which may have occurred throughout the respective reporting year.

8.3.1 Process Changes for the 2015 Reporting Year

There were no significant process changes during the 2015 reporting year.

8.3.2 Process Interruptions & Shutdowns

There were several shutdowns at this facility in 2015:

- January 17th to March 20th, 2015
- April 28th to May 6th, 2015
- August 3rd to October 5th, 2015
- November 2nd to November 19th, 2015

The shutdowns resulted in decreased production during the reporting year.

8.3.3 Spills

There were no spills that resulted in any manganese emission releases during the 2015 reporting year.

9. Step 3 - Toxic Substance Accounting

Manganese is brought onto the site as a dry powder which is dissolved to form an aqueous solution. This aqueous solution is then supplied with other components into the process. Manganese is also in the final products manufactured at the site and it is emitted to air during the manufacturing process. Waste water containing manganese is treated on-site to remove metals which are then sold as products. The treated waste water containing trace metals is then sent offsite for further treatment prior to disposal. It is not recycled. Manganese is not created, destroyed or transformed in the process. Table 1 outlines the manganese mass balance within the facility.

Table 1: Manganese Accounting

Manganese Accounting Summary	
Total In (tonnes/yr):	43.88
Total Out (tonnes/yr):	36.45
Difference	7.43
% Balance:	83.07%

The difference in the mass balance for manganese is likely due to calculation methodologies; the quantity of raw materials input is calculated based on purchasing data whereas the product total is an actual quantity based on weight of product from production. Discrepancies are also caused by material carry over from year to year.

The Mass Balance flow diagram for manganese, from the Toxics Accounting, is provided in Appendix A.

Table 2: Toxics Accounting Summary Table

Manganese	
Pathways	tonnes
U - Enters the Process (Raw Materials)	43.8828
C - Created	0
Total In	43.8828
D - Destroyed	0
T - Transformed	0
P - In a product that leaves the process	36.4521
A - Released on site to air	1.63E-04
W - Released on site to surface waters	0
L - Released on site to land	0
DS - Disposed of on site	0
DOS - Disposed of off site	0
TD - Transferred off site for treatment before final disposal	6.20E-04
TR - Transferred off site for recycling	0
Total Out	36.4528

A detailed Toxics Accounting Summary Table can be found in Appendix E of the Toxics Accounting Report.

10. Cost Estimates for Manganese at the Facility

The baseline estimate of direct and indirect costs associated with having manganese at the facility is included in the following table:

Table 3: Baseline Costs Summary Table

Application	***Manganese***
Material Purchasing	*$47,078*
Material recycling	*$0*
Process equipment	*$0*
Equipment maintenance	*$4,426*
Disposal	*$418*
Utilities	*$14,734*
Production area labour	*$20,612*
Process / product research & development	*$0*
Health & safety compliance and personal protective equipment (PPE)	*$603*
Liability insurance	*$1,071*
Support staff (ex. Plant management, EH&S, accounting, etc.)	*$12,972*
Sampling and testing	*$428*
Environmental compliance	*$121*
Storage and handling	*$1,860*
General facility operations (water, electricity, etc.)	*$0*
Company reputation / public perception	*$0*
Toxics Accounting (ex. LEHDER costs)	*$2,000*
Toxics Reduction Planning (ex. LEHDER costs)	*$3,000*
TOTAL	**$109,322**

The facility has considered both direct and indirect costs in this assessment; the additional details of this assessment remain with the facility due to the commercially sensitive nature of cost information.

11. Identification and Analysis of Manganese Reduction Options

The reduction options and feasibility analyses and/or reasons for why a reduction option was not identified are provided below.

Table 4: Reduction Options Summary Table

Reduction Options	*Technical Feasibility (Y/N)*	*Projected Cost ($)*	*Payback Period (yr)*	*Anticipated Savings ($/yr)*	*Economic Feasibility (Y/N)*
Material or Feedstock Substitution					
No reduction opportunity identified - manganese is a required component of the finished product and cannot be substituted in the feedstock.					
Product Design or Reformulation					
No reduction opportunity identified - driven by customer demand/specifications.					
Equipment or Process Modification					
No further reduction opportunity identified - Internal Dissolution system utilized to dissolve crystals instead of bulk purchasing solution to feed reactor.					
Spill and Leak Prevention					
No further reduction opportunity identified - manganese purchased as solids instead of liquid to reduce risk of environmental contamination due to spills; auto-sampler in place to limit hand sampling techniques and potential for product release.					
Onsite Reuse or recycling					
Install sulfate recovery system on site to eliminate the processing of sulphate offsite. Additionally, the processing of metals off site is eliminated.	Y	8,500,000.00	51	168,000.00	Y
Install reblend equipment that will automate process of adding re-blend material into product stream to reduce losses. Completed on 'A' production line and shared with 'B' production line; possibility to expand to 'B' production line in the future.	Not at this time – revisit in future.				
Improved inventory management or purchasing techniques					
No further reduction opportunity identified - Inventory control based on forecasted Sales Schedule.					
Training or improved operating practices					
No further reduction opportunity identified - Addition of individual mass flow controller for feeding Mn solution to reactor. All interlock in place to stop flow if one flow to the reactor is stopped.					

11.1 Estimates of Potential Reductions for Identified Options

Estimates for the potential reductions associated with the identified options are provided in Appendix B.

12. Implementation of Options for Reduction of Manganese

TODA Advanced Materials Inc. has selected the following options for implementation:

Table 5: Implementation Steps/Timelines

Technically and Economically Feasible Reduction Options Selected for Implementation	***Implementation Steps***	***Estimated Time to Implement***
Install sulfate recovery system on site to eliminate the processing of sulphate offsite. Additionally, the processing of metals off site is eliminated.	1. Obtain equipment quotes 2. Engineer equipment installation 3. Install/test 4. Develop procedures/revise existing procedures 5. Train Employees	In process of Re-Engineering Target Completion is March 2017.

13. Planner Recommendations and Rationale

The Certified Toxics Reduction Planner has made recommendations or provided a rationale for not making a recommendation for the following mandated elements:

1. Expertise relied on to prepare the plan
2. Identification and description of stages and processes
3. Descriptions of how, when, where, and why a substance is used and/or created
4. Process flow diagrams
5. Data and methods used in toxic substance accounting
6. Analysis of input/output balances
7. Reduction estimates prepared for each identified reduction option
8. Technical and economic feasibility analyses
9. Direct and indirect costs associated with the use, creation, release, disposal, transfer and the amount contained in the product of the toxic substance
10. Implementation steps and timelines in the plan and whether they are likely to be achieved
11. Additional technically and economically feasible reduction options that were not included in the plan which might result in equal or greater reductions

The reviewer is directed to Appendix C for Planner recommendations and rationales.

14. References

The following references were used in preparation of this document:

LEHDER	2015 Toxic Substance Accounting Report, Toda Advanced Materials Inc., Project 165186, May 2016
LEHDER	2015 NPRI, O. Reg. 127 and GHG Review, Toda Advanced Materials Inc., Project 165186, May 2016
MOE, 2009	O. Reg 455/09, Toxics Reduction Act, 2009
Toda	Manufacturing Usage Report and Correspondence, 2015-2016

Appendix A Contaminant Mass Balance Summary

TODA - Overall Mass Balance

Contaminant Id	352	MANGANESE COMPOUNDS(INCLUDING PERMANGANATES)

		MANGANESE COMPOUNDS(INCLUDING PERMANGANATES)		
Process Input	Stream	Stream (litres)	wt %	wt (tonnes)
1	Raw Material			43.88
2				
3				
4				
5				
Total				**43.883**

TODA
Overall Process

	wt (tonnes)
Existing On-site	

	wt (tonnes)
Created	0
Transformed	0
Destroyed	0

	MANGANESE COMPOUNDS(INCLUDING PERMANGANATES)	
Emission Output	Stream	wt (tonnes)
1	Air Emissions	1.63E-04
2	Transfers - Disposal	6.20E-04
3	Transfers - Recycle	0.00E+00
4	Surface Water	0.00E+00
5		
Total		**0.00078**

		MANGANESE COMPOUNDS(INCLUDING PERMANGANATES)		
Product Output	Stream	stream wt (tonnes)	wt %	wt (tonnes)
1	C95Z00-5	507.32	0.00%	0.00
2	C95Z00-15	0.00	0.00%	0.00
3	C120Z00-11	96.59	0.00%	0.00
4	C220M200-5	181.57	20.01%	36.33
5	PCU (Plant Clean Up) / Scrap	0.00	0.00%	0.00
6	Nickel Paste	11.99	1.00%	0.12
7				
8				
9				
10				
11				
12				
Total				**36.452**

Tonnes

Total In	**43.88**
Total Out	**36.45**
Difference	**7.43**
% Balance	**83.07**

Total Out	**36.453**

	Purchasing Data
	MSDS or Certificate of Analysis
	LEIMS
	Production Data
	Analysis data supplied by Facility

Notes:
Process inputs provided by Toda. The discrepancy between the raw material total and the product total is that the raw material numbers were calculated based on plant data, while the product total is an actual number based on weight of product coming from the production.

Appendix B Estimates of Potential Reductions for Identified Options

Estimates of Manganese Reductions

		Used	Created	Contained in Product	On-Site Releases to Air	On-Site Releases to Water	On-Site Releases to Land	Disposal On-Site	Disposal Off-Site	Transfer Off-Site for Recycling
Baseline Quantity from Toxics Accounting	**tonnes**	**43.8828**	**0**	**36.4521**	**0.0002**	**0**	**0**	**0**	**0.0006**	**0**
Reduction Options Selected for Implementation										
Option Category:	**Onsite Reuse or recycling**									
SWIM Dropdown Options:	Other									
Option Description:	Install sulfate recovery system on site to eliminate the processing of sulphate offsite. Additionally, the processing of metals off site is eliminated.									
Estimated Reductions due to Option Implementation	tonnes	0.0000	N/A	0.0000	0.0000	N/A	N/A	N/A	0.0006	N/A
	%	0.00%	N/A	0.00%	0.00%	N/A	N/A	N/A	100.00%	N/A
	Comment/Basis	It is assumed that the amount disposed of in 2015 would be reused on site in a new product stream. This would not however reduce the overall use as the recovered metals cannot be reused in the primary product stream.								
Timeline for Reductions **IF** Implementing	Years	1	N/A							

Appendix C Planner Recommendations and Rationales

Toda Advanced Materials
Planner Recommendations
Toxic Substance: Manganese
Plan Version: New Plan dated December 23, 2016

Planner Name: Melanie Hockin
TRSP Number: TSRP0140

Recommendation for Improvement	Rationale for Recommendation
1. Expertise relied on to prepare the plan	
No recommendation for improvement.	Recommendations for including appropriate personnel were provided and implemented during the preparation of the plan.
2. Identification and description of stages and processes	
No recommendation for improvement.	The identification and descriptions included in the plan meet the current requirements of the Toxics Reduction Act and Regulation.
3. Descriptions of how, when, where, and why a substance is used and/or created	
No recommendation for improvement.	The descriptions included in the plan meet the current requirements of the Toxics Reduction Act and Regulation.
4. Process flow diagrams	
No recommendation for improvement.	The process flow diagrams meet the current requirements of the Toxics Reduction Act and Regulation.
5. Data and methods used in toxic substance accounting	
Consider alternative calculation methodologies.	Source measurement, engineering estimates or mass balance approaches may provide more accurate/representative data which can help with the tracking and quantification processes resulting in a better understanding of how to implement or identify mitigation opportunities.
6. Analysis of input/output balances	
No recommendation for improvement.	All recommendations were provided and implemented during the preparation of the plan.
7. Reduction estimates prepared for each identified reduction option	
No recommendation for improvement.	Consider revisiting this when/if the current re-engineering work for the reduction option to be implemented identifies alternate reductions.
8. Technical and economic feasibility analyses	
No recommendation for improvement.	Consider revisiting this when/if the current re-engineering work for the reduction option to be implemented identifies alternate costs.
9. Direct and indirect costs associated with the use, creation, release, disposal, transfer and the amount contained in the product of the toxic substance	
No recommendation for improvement.	All apparent direct and indirect costs were considered.
10. Implementation steps and timelines in the plan and whether they are likely to be achieved	
No recommendation for improvement.	The implementation steps and timelines included in the plan meet the current requirements of the Toxics Reduction Act and Regulation.
11. Additional technically and economically feasible reduction options that were not included in the plan which might result in equal or greater reductions	
No recommendation for improvement.	The planner is not aware of any additional feasible options that were not considered by the facility.