Domtar Inc.
Dryden Mill
2017 Toxic Substance Reduction Plan
Methyl Isobutyl Ketone
Dryden, Ontario
Executive Summary

True Grit Engineering (TGE) was retained by Domtar Inc. (Domtar) to prepare, certify and provide recommendations for a toxic substance reduction plan for Methyl Isobutyl Ketone (MIK) as required by Ontario Regulation 455/09 (O. Reg. 455/09) and the Ontario Toxics Reduction Act (TRA). The Toxics Accounting Report has been previously prepared by Domtar, posted to the Domtar corporate website and submitted to the Ontario Ministry of the Environment and Climate Change (MOECC) through the Environment Canada (EC) Single Window Information Manager (SWIM) website.

The table below summarizes the toxic substance reduction plan, options for reduction and toxic substance reduction planner recommendations.

A separate document has been prepared for the toxic substance reduction plan summary for Domtar to post to the Domtar corporate website. As part of the requirements of the Act and Regulation, Domtar will be required to provide notification to the employees at the facility upon posting on the corporate website.

<table>
<thead>
<tr>
<th>Substance</th>
<th>Substance Present in</th>
<th>Process Created In</th>
<th>Options for potential reduction in use and/or creation</th>
<th>Technically Feasible?</th>
<th>Economically Feasible?</th>
<th>Toxic substance reduction planner recommendations</th>
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</thead>
<tbody>
<tr>
<td>MIK</td>
<td>substance is not used</td>
<td>digesting</td>
<td>No options were identified for reduction in use or creation - refer to toxic substance reduction plan for discussion.</td>
<td>N/A</td>
<td>N/A</td>
<td>None - refer to toxic substance reduction plan for why no recommendation was made.</td>
</tr>
</tbody>
</table>
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1.0 Introduction

True Grit Engineering (TGE) was retained by Domtar Inc. (Domtar) to prepare, certify and provide recommendations for a toxic substance reduction plan for Methyl Isobutyl Ketone (MIK) as required by Ontario Regulation 455/09 (O. Reg. 455/09) and the Ontario Toxics Reduction Act (TRA).

1.1 Background

The Ontario TRA is the cornerstone of Ontario’s strategy to reduce the use and creation of prescribed toxic substances. The purpose of the legislation is to prevent pollution and protect human health and the environment by reducing the use and/or creation of prescribed toxic substances and to inform Ontarians about the prescribed toxic substances in their communities. The intent is to support the shift in domestic market to green products thereby positioning Ontario’s manufacturing and mineral processing sectors to compete in an increasingly green global economy. The associated legislation achieves the intent by requiring facilities to examine how prescribed toxic substances are used and created. The facilities must consider opportunities for reducing prescribed toxic substances while recognizing that there may be essential and beneficial uses for some prescribed toxic substances. The legislation does not restrict the use, creation or release of any prescribed substance. While it is mandatory to prepare a toxic substance reduction plan, the implementation of any options by the facility is completely voluntary.

1.2 Regulatory Requirement

The TRA requires the reporting and planning of approximately 350 substances published in the National Pollutant Release Inventory (NPRI) which have been identified by the federal government as being of concern to human health and the environment, as well as acetone, specified for reporting under Ontario Regulation 127/01 (O. Reg. 127/01) (Acetone).

From the initial list of 350 substances, the Ontario Ministry of the Environment and Climate Change (MOECC) prepared a priority list of 47 substances and substance groups for inclusion in the initial regulatory requirements in 2010 (identified as Phase I substances). The toxic substance reduction plans were required to be completed for these substances by December 31, 2012.

The requirement under TRA and O. Reg. 455/09 for Phase II substances applied as of January 1, 2012 with toxic substance reduction plans to be prepared by December 31, 2013.

The requirement to complete toxic substance reduction planning is based on a facility meeting the criteria identified below:

- the facility belongs to the class of facilities identified by North American Industry Classification System (NAICS) code commencing with the digits “31”, “32” or “33”; or identified by a NAICS code commencing with the digits “212” that processes minerals, but only if the mineral processing at the facility involves the use of chemicals to extract, refine or concentrate an ore;
- the facility employs at least one employee; and
• the amounts of toxic substance used or created at the facility exceeds zero.

The requirement to create a toxic substance reduction plan is met when the facility is required to provide information under the NPRI notice for the prescribed substance or if the substance is acetone and the facility is required to report under O. Reg. 127/01. Domtar has met this criteria and is required to track and account for prescribed toxic substances throughout the processes at the facility (Toxic Substance Accounting) on an annual basis. This information is submitted through Environment Canada’s (EC) Single Window Information Manager (SWIM) website and communicated to the public and facility employees through an annual report posted to the corporate website.

Once the accounting information has been submitted and posted, Domtar is required to prepare the toxic substance reduction plan. The plan summary is submitted on EC’s SWIM website.
## 2.0 Site Information

### 2.1 Basic Facility Information

<table>
<thead>
<tr>
<th>Basic Facility Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>The legal and trade names of the owner and operator of the facility, the street and mailing address of the facility</td>
<td>Domtar Inc. 1 Duke St. P.O. Box 3001 Dryden, ON P8N 2Z7</td>
</tr>
<tr>
<td>Facility NPRI identification number</td>
<td>928</td>
</tr>
<tr>
<td>The identification number assigned to the facility by the Ministry of the Environment for the purposes of Ontario Regulation 127/01</td>
<td>5100</td>
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<tr>
<td>Number of full-time employees</td>
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<tr>
<td>UTM Coordinates</td>
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<td>UTM Zone</td>
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<tr>
<td>Datum</td>
<td>NAD83</td>
</tr>
<tr>
<td>Legal name of Canadian parent company, the street and mailing address of the company</td>
<td>Domtar Inc. 395 de Maisonneuve Blvd. West Montreal, Quebec H3A 1L6</td>
</tr>
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<td>31-33 3221 322112</td>
</tr>
<tr>
<td>Facility Public Contact</td>
<td>Bonny Skene Public Affairs Manager (807) 223 9035</td>
</tr>
<tr>
<td>Facility Technical Contact</td>
<td>Phil Slack Environmental Superintendent (807) 223 9408</td>
</tr>
<tr>
<td>Toxic Substance Reduction Planner</td>
<td>Mike Stachejczuk Project Engineer (807) 626 5640 Ext. 9203 TSRP0245</td>
</tr>
<tr>
<td>Highest Ranking Employee</td>
<td>James Blight General Manager (807) 223 9139</td>
</tr>
</tbody>
</table>
2.2 Kraft Pulp Manufacturing Operation Basic Process Descriptions

The Kraft pulp manufacturing operation located in Dryden, Ontario is owned and operated by Domtar Inc. The main products produced for commercial sale by the facility include Northern Bleached Softwood Kraft (NBSK) pulp and crude sulphate turpentine.

The manufacturing facility has been divided into stages and processes to reflect what it is currently being reported into the EC SWIM website. Therefore, some tanks are reported as a part of a process because they have emissions (i.e. weak black liquor tanks, brown stock high density storage, etc).

The manufacturing facility has been divided into the following stages: Receiving, Pulping, Chemical Recovery, Steam Production, Shipping and Ancillary (wastewater treatment, lime generation, chlorine dioxide generation and waste disposal). Below is a description of all the processes within each stage.

Receiving Stage

There are two separate receiving processes: wood chip receiving process and chemical receiving process.

Wood Chip Receiving

Wood chips are transported to the site via transport trucks. The wood chips are dumped onto chip piles via chip dumpers. As part of the wood chip receiving process, the chips are sorted through several different screens. This ensures that the wood chips proceeding to the digesting process are of an optimal size to produce softwood pulp.

Chemical Receiving

Chemicals are received by rail and/or truck and are pumped into tanks where they are stored prior to use for Kraft pulp production. Some chemicals are received in other forms (totes, bags, etc).

Pulping Stage

The pulping stage of the facility is divided into 3 main processes: digesting, bleaching and pulp drying.

Digesting

In the digesting process, screened wood chips are first carried through a steaming vessel where air and other non-condensables are purged. The preheated chips are combined with white liquor where they move through the digester while heated by forced circulation of liquor. The white liquor reacts chemically with the lignin, hemicelluloses, resins and fatty acids within the chips. As the lignin and resin material are softened and dissolved, the wood fibres separate. The black liquor is extracted and pumped to the chemical recovery stage. The cooked pulp is transferred to the diffusion washer. The atmospheric diffusion washer is a counter-current washing process where pulp from the digester is washed with weak black liquor from the brown stock washing process. The Concentrated Non Condensable Gases (CNCGs) and the Dilute Non Condensable Gases (DNCGs) from the digester are collected for incineration in either the recovery or power boilers.
**Bleaching**

The pulp is pumped from the diffusion washer to the deknotters in the bleach plant area. In the deknotting process, the knots are separated from the brown pulp. The deknotting system contains two primary knotters, two secondary knotters and a knots drainer. The primary and secondary knotters remove the fibres and the knots drainer removes the residual liquor. Once through the knotters, the brown stock screens are responsible for the removal of shives and the pulp is pumped to the brown stock decker (also known as the brown stock washer). The brown stock decker is a vacuum drum washer which displaces the residual liquor and thickens the pulp prior to the bleaching process. The bleach plant removes residual lignin and brightens pulp to customer specifications. This is accomplished through six stages of bleaching with chlorine dioxide and extractive washing. Once through the bleaching process, the pulp is pumped to the pulp drying process.

**Pulp Drying**

The pulp drying process removes the water from the bleached pulp slush and dries it to 93% air dry pulp sheets. The pulp sheets proceed to the pulp packaging and storage process.

**Chemical Recovery Stage**

The chemical recovery stage includes the following processes: black liquor evaporation; recovery boiler and green liquor generation; and recausticizing and white liquor generation.

**Black Liquor Evaporation**

The evaporation at the mill includes a set of pre-evaporators, six effect LTV evaporators, and concentrators. The liquor is at approximately 15% solids leaving the digester and is at approximately 68% solids when pumped into the recovery boiler. The black liquor evaporation process also includes a foul condensate steam stripper which removes 99% of TRS compounds. Stripper Off Gases (SOGs) produced from the foul condensate stripper operation are collected and incinerated in either the recovery or power boilers.

**Recovery Boiler & Green Liquor Generation**

Black liquor is incinerated in the recovery boiler at high temperatures. The recovery boiler completes the following functions:

- evaporates residual moisture from the liquor solids;
- burns the organic constituents;
- supplies heat for steam generation;
- reduces oxidized sulphur compounds to sulphide;
- recovers inorganic chemicals in molten form; and
- conditions the products of combustion to minimize black liquor carryover.
An electrostatic precipitator removes particulate matter from the flue gas of the recovery boiler, some of which is recycled back into the process. Any chemicals coming in with the black liquor would either pass through with the green liquor or be emitted through the stack. Smelt is dissolved in weak wash to form green liquor which is transferred to the green liquor dissolving tank and then transferred to the green liquor clarifier.

Feedwater is used to create steam and does not interact with the black liquor at any time. For the mass balance, feedwater is assumed to be equal to steam created and blowdown steam. The recovery boiler can burn either natural gas and/or black liquor to produce steam.

DNCGs are only incinerated in the recovery boiler. CNCGs and SOGs collected from the digesting and black liquor evaporation processes can be incinerated in the recovery or power boilers.

Recausticizing & White Liquor Generation

The causticizing process involves the green liquor clarifier, causticizers, slaker and clarifils. The purpose of the process is to convert sodium carbonate into the active sodium hydroxide to be used for cooking chips (pulping).

The green liquor clarifier settles dregs formed in the recovery boiler. The dregs are transferred to the dregs filter while the clarified green liquor is pumped to the slaker. In the slaker, green liquor is reacted with lime (fresh or reburnt) to regenerate the sodium hydroxide component of the white liquor required for digesting the wood chips. Slaker grits formed during the reaction are also transferred to the dregs filter. The new product from the slaker is pumped through clarifils which separate the lime mud (containing calcium carbonate – by-product of slaker reaction) from the white liquor. The lime mud is sent to the lime generation process. The white liquor is used in the digester.

The dregs and grits formed off the dregs filter are transported for disposal to the on-site landfill.

Steam Production Stage

The steam production stage involves two processes: boiler feedwater production and gas/wood boilers steam production.

Boiler Feedwater Production

In the boiler feedwater production process, water is pumped from Wabigoon Lake and filtered to remove large particles and silica from the water. Once through filtered, the water is pumped through demineralizers which remove ions still left in the water (Na+, K+, CO3^2-, SO4^2-, etc). The water is pumped into mixed bed units which remove residual ions that were not removed in the demineralizers. The water is pumped into deaerators which remove any air/oxygen. The feedwater can be used in any of the boilers.

The mill also reuses clean condensate from the process for feedwater. The clean condensate is collected from all the areas and is collected in the main mill condensate tank. The condensate is pumped through condensate polishers which remove iron and other suspended materials. The condensate is pumped into the deaerators from the polishers.
**Gas & Wood Boilers Steam Production**

Natural gas and hog fuel are burned to turn boiler feedwater into usable steam for the Kraft pulp manufacturing operation. Some steam from this process is also used to generate electricity. The VU & BW power boilers can burn both natural gas and hog fuel. Any ash produced from the power boilers is collected in a bunker before it is transported for disposal to the onsite landfill. Air emissions from both power boilers are treated through wet scrubbers prior to being emitted out a common stack. Most of the steam required for the operation of the facility is generated by the recovery boiler.

The CNCGs and SOGs collected from the digesting and black liquor evaporation processes can be incinerated in the power or recovery boiler.

There are two natural gas-fired Foster Wheeler package boilers that have been included in this process; however, they are currently not being used.

**Shipping Stage**

**Turpentine Production & Shipping**

Turpentine is a by-product formed during the digesting process. The turpentine recovery system receives gases from the steaming vessel and the #1 and #2 flash tanks. The steaming vessel gasses pass through a turpentine separator, where liquor and fibre carryover are separated. The exiting vapour joins the gas stream and the condensate is sent to the foul condensate tank, while the vapour stream continues through a turpentine condenser. Gases from the turpentine condenser pass through a moisture separator. The turpentine and water pass to a turpentine decanter and is separated due to the difference in density. Turpentine is drawn off the top and sent to storage, while underflow is pumped to the foul condensate tank. Turpentine is shipped off-site via rail.

**Pulp Packaging & Storage**

Dried pulp sheets from the pulp machine are transferred through several conveyors where the sheets are compacted into bales, wrapped with a large pulp sheet (also known as pulp wrapper) and wire strapped. The bales are then stacked and transported via fork truck to the pulp shipping stage.

**Pulp Shipping**

The bales are loaded into trucks and rail cars or sent to storage in the onsite warehouse as required by the customers.

**Ancillary stage**

The ancillary stage is comprised of four separate processes: wastewater treatment, lime generation, chlorine dioxide generation and mill waste disposal.
Wastewater Treatment

The wastewater treatment system collects the effluent from all of the operating areas. The effluents combine prior to the bar screen where large objects (such as wood chips) are removed. Based on the pH probe at this location, caustic or sulphuric acid can be added upstream. From the bar screen, the effluent flows into a primary clarifier where the solids settle out. The solids are then processed through a coil filter and v-press which removes water content. These solids are deposited in the onsite landfill. The effluent flows to the Aerated Stabilization Basin (ASB) for secondary treatment. Nutrients (also known as fertilizer) may be added at prior to the ASB to control nitrogen and phosphorus residuals of the ASB. The ASB contains two major sections: an aerated section and a quiescent zone. In the aerated section, there are 34 aerators which add oxygen to the effluent to aid the biological degradation of the mill effluent. In the quiescent zone, any biological solids formed in the aerated cell settle. The effluent flows through a parshall flume to a foam pond and is discharged to the Wabigoon River through a diffuser.

Lime Generation

Lime Generation is an integral part of the sustainable Kraft pulp manufacturing operation. A by-product of the recausticizing process, lime mud (which contains calcium carbonate), can be burnt in a kiln to form lime (calcium oxide) that is used in the slaker to react with the green liquor to form the necessary chemical (sodium hydroxide) used for the digesting process. On occasion (downtime on the lime kiln, maintenance, etc), a portion of the lime mud will be deposited into a bunker for transportation to the on-site landfill.

Chlorine Dioxide Generation

Chlorine dioxide is a chemical that cannot be transported because of its explosiveness and instability. Chlorine dioxide must be produced on site. A chlorine dioxide generator reacts sodium chlorate with sulphuric acid and methanol under vacuum with some steam. The reaction produces the chlorine dioxide gas which is dissolved in clean water to from the chlorine dioxide solution required for the bleaching process. During the reaction, sodium sesquisulphate (solid) is formed. This solid is pumped to filters where the acid is washed and returned to the chlorine dioxide generator and the saltcake is dissolved in strong black liquor and returned to the black liquor evaporation process.

Waste Disposal

The facility owns and operates two landfills on-site for the disposal of solid, non-hazardous waste originating from the facility.
3.0 Methodology

As identified in the MOECC *Toolkit for Toxic Substance Reduction Planning*, the general steps to toxic substance reduction planning are:

- identify and describe the stages and processes at the facility that have the potential for reduction of use or creation of the toxic substance (required);
- describe the use and/or creation of the toxic substance and its flow through each process (required);
- prepare process flow diagrams and associated records (required);
- toxic substance tracking and quantification (required);
- annual reporting (required);
- identify staff to assist in plan development (optional);
- identify external resources needed (optional);
- estimate the direct and indirect costs associated with the substance (required);
- identify the reduction under each of the seven toxic substance reduction categories (required);
- estimate reductions for each option (required);
- technical and economic feasibility analyses, estimated savings, payback (required);
- statement of intent to reduce the use and/or creation of the toxic substance or an explanation why not (required);
- objectives (required) and targets (optional);
- planner’s recommendation(s) or rationale for not providing recommendation(s) (required);
- certification of the plan by the highest ranking employee and licensed planner (required); and
- preparation and submission of plan summary (required).

The toxic substance reduction plan was prepared by Mr. Mike Stachejczuk, P.Eng. and reviewed by Ms. Jennifer Main, P.Eng. based on the information provided by Domtar to TGE. No site visit was required as Ms. Jennifer Main had been previously employed at Domtar and was familiar with the site and its operations to help prepare and review the toxic substance reduction plan. A review of the accounting information was included as part of the work as it was required to prepare the recommendations.
4.0 Toxic Substance Reduction Plan

4.1 Toxic Reduction Plan

4.1.1 Statement of Intent

Domtar Inc. – Dryden Mill does not intend to reduce its creation of MIK because it is an unintentional, trace by-product of the Kraft pulp manufacturing operation. Domtar Inc. – Dryden Mill is committed to continuing to develop and implement measures to ensure sustainable use of materials, resources and energy.

4.1.2 Objectives

Domtar Inc. – Dryden Mill does not intend to reduce its creation of MIK because it is an unintentional, trace by-product of the Kraft pulp manufacturing operation. Based on the information gathered in this report, the amount of MIK created is not expected to significantly increase. Domtar Inc. – Dryden Mill is committed to continuing to develop and implement measures to ensure sustainable use of materials, resources and energy.

4.1.3 Identification & Description of Stages and Process

The following process descriptions are visually depicted in the process flow diagrams illustrated on Figures 4.1 to 4.6 (attached).

MIK is not used in the Kraft pulp manufacturing operation.

MIK is a Volatile Organic Compound (VOC) that is created through complex chemical reactions in the Kraft pulp manufacturing operation.

The stages and processes where MIK is present are as follows:

- MIK is not created or used in the receiving stage.
- MIK is present in all processes in the pulping stage.
  - MIK is created in the digesting process. The MIK created is present in the pulp to bleach plant, Concentrated Non-Condensable Gases (CNCGs) transferred to the boilers for incineration and black liquor to the black liquor evaporation process.
  - MIK is present in the pulp used in the bleaching process. Some of the MIK present will continue with the pulp to the pulp machine and the rest will be emitted to the air and waste water treatment plant.
  - MIK present in the pulp drying process is assumed to be emitted to air as there is currently no data available on the presence of MIK in the dried pulp.
- MIK is not created but is present in the chemical recovery stage.
MIK is present in the black liquor evaporation process in black liquor transferred from the digesting process. A small amount of MIK in the black liquor will volatilize to atmosphere from the weak black liquor storage tanks. MIK present in the black liquor to the evaporators/concentrators will either be captured in the CNCGs to be incinerated in the power or recovery boilers. These condensates, together with the foul condensate from the digester, will proceed through the stripper system. Most of the MIK present in the stripper will be captured in the Stripper Off-Gases (SOGs) and will be incinerated in either the power or recovery boilers. A small portion of MIK will be present in the stripped condensates to the brown stock washer or wastewater treatment process. MIK present in the heavy black liquor storage tank will be emitted to the air through the smelt dissolving tank scrubber.

MIK is present in the CNCGs and SOGs incinerated in the recovery boiler process. Most of the MIK present will be destroyed in the recovery boiler; however, a small amount will be emitted to atmosphere via the electrostatic precipitator.

- MIK is not created or used in the shipping stage.
- MIK is not created but is present in the steam production stage.

- MIK is present in the CNCGs and SOGs incinerated in the natural gas/wood boilers steam production process. Most of the MIK present will be destroyed but some will be present in air emissions to the power boiler scrubbers. MIK discharged to the scrubbers will not be removed and will be emitted to air.

- MIK is not created or present in the boiler feedwater production process.

- MIK is not created but is present in one process of the ancillary stage of the Kraft pulp manufacturing operation – wastewater treatment. MIK is present in the combined effluent from the mill. Most of the MIK will be present in the fugitive air emissions from the aerated stabilization basin. The rest will be present in the effluent discharged to the Wabigoon River.

In 2016, the facility operated 24 hours a day for 356 days of the year.

4.1.4 Tracking & Quantification Methods

All calculations were completed using mass balance and industry emission factors. Quantification of all processes where MIK is present are identified in Table 4.1 - Summary of Process Quantifications (attached).

The sum of the quantities of MIK present in the overall process identified is approximately equal to the sum of the quantities of MIK that is destroyed, transformed or leaves the process. Therefore, no record was created to describe why the sums are not approximately equal.
4.1.5 Best Method Rationale

MIK is a VOC which is part of an extensive group of compounds. Testing specifically for MIK is expensive and thus industry emission factors and mass balance have been used to calculate MIK in the processes of the Kraft pulp manufacturing operation.

4.1.6 Estimated Direct & Indirect Costs – Facility Level

Raw Materials

MIK is not purchased as a raw material for use in the Kraft pulp manufacturing operation. Therefore, there is no specific cost that can be allocated to its use.

Production

MIK is an unintentional, trace by-product created in the Kraft pulp manufacturing operation. There is no way to differentiate the cost for its production versus the other substances.

Sampling and Analysis

There is no sampling or analysis completed with respect to MIK. Therefore, there is no cost that could specifically be allocated.

Health & Safety Compliance

The concentration of MIK in the processes does not provide any specific safety hazards above that are required for process chemicals or liquors. Thus, there is no cost specific to WHMIS training, personal protective equipment or occupational health sampling.

MIK is present as a trace contaminant in the pulp and process liquors. Therefore, there is no requirement to maintain an MSDS for this substance.

Storage & Handling

MIK is a trace contaminant found in numerous sources. There is no way to differentiate the cost to store or handle MIK versus other substances.

Maintenance & Labour

MIK is not known to impact the process equipment that it comes into contact with to a greater extent than that of the process chemicals, liquors or pulp. Therefore, there is no cost that could be specifically allocated to maintenance and labour.

Environmental Compliance

The facility currently meets all Federal and Provincial discharge requirements for wastewater treatment.
MIK is reportable under both NPRI and Ontario Toxic Substance Reduction regulations. Therefore, the cost associated with calculating and reporting MIK to these government bodies is $2,400/year. In order to complete this task, the mill has a membership with NCASI that provides the facility with the necessary emission factors to complete the calculations. The membership fee is $46,192 for 88 substances and includes all services provided by NCASI to the mill. The maximum cost per substance is $525 per year and includes the technical assistance that may be required. Therefore, the cost for environmental compliance is approximately $2,925 per year.

Disposal (Solid & Liquid)

There was no solid or liquid disposal of MIK from the facility in 2016.

Pollution Control Equipment

The facility currently meets the Point of Impingement (POI) criteria and there is no specific air emissions control equipment installed for MIK. Therefore, no cost could be associated.

Total Annual Direct and Indirect Costs

Based on the above, the total estimated direct and indirect annual costs related to MIK at the facility is $2,925.

4.1.7 Options Considered for Toxic Substance Reduction

Materials or Feedstock Substitution

MIK is an undesirable, trace by-product that is created from reactions in the digesting process. There is no alternative to the use of wood chips in the digesting process to produce Kraft pulp. Therefore, no material or feedstock substitution option would reduce its creation.

Product design or reformulation

NBSK pulp is not known to contain MIK but is created as a result of the digesting process. There is no alternative process to create NBSK pulp. Therefore, no option for product design or reformulation would reduce its creation.

Equipment or process modification

MIK is an undesirable, trace by-product that is created as a result of reactions in the digesting process. There is no known change in equipment or process modification that would reduce the creation of MIK in the Kraft pulp manufacturing operation.

Spill and leak prevention

MIK is an undesirable, trace by-product that is created as a result of reactions in the digesting process and is not stored as a pure product. Spills of black liquor can contain MIK. However, there were no leaks or spills of black liquor to the environment in 2016. Therefore, there is no option for spill and leak prevention that could be implemented to reduce its creation.
**On-site reuse or recycling**

MIK is an undesirable, trace by-product that is created as a result of reactions in the digesting process. There is currently no mechanism to concentrate the MIK from other compounds present in the Kraft pulp manufacturing operation. There is no process at the facility that requires MIK as a feedstock. Therefore, there is no option for on-site reuse or recycling that could be implemented to reduce the creation of MIK.

**Improved inventory management or purchasing techniques**

MIK is an undesirable, trace by-product that is created as a result of reactions in the digesting process and is not a raw material used in the Kraft pulp manufacturing operation. Therefore, no option for improved inventory management or purchasing techniques would reduce the creation of MIK.

**Training or improved operating practices**

As the specific reaction mechanism for the creation of MIK is not known, there is no option for training or improved operating practices that would reduce its creation.

### 4.1.8 Detailed Estimate of Reduction of MIK From Implementation of Options

No options were identified; therefore, no estimates for reduction could be calculated.

### 4.1.9 Technical Feasibility Analysis

No options were identified; therefore, no technical feasibility analysis could be completed.

### 4.1.10 Economic Feasibility Analysis

No options were identified to be technically feasible; therefore, no economic feasibility analysis could be completed.

### 4.1.11 Implementation Plan (s) & Timeline(s)

No options were identified to be technically or economically feasible. Therefore, no option will be implemented to reduce the creation of MIK.

### 4.2 Toxic Substance Reduction Planner Recommendations

**Expertise relied on in preparing the plan**

The plan relies on numerous sources of information including internal technical personnel and external technical personnel (NCASI – specific industry knowledge and experience). As such, there are no areas where significant, practical improvements could be made.
Data & Methods Used in the Toxic Substance Accounting and Input/Output Analysis

The accounting currently relies upon industry emission factors and mass balance. Process testing for MIK is expensive and would provide no additional information to reduce the creation of MIK. There is no area for improvement that can be recommended at this time.

Identification & Description of Stages & Processes

All stages and processes where MIK is present have been accurately identified with an appropriate description of how MIK is present in each stage. As such, there are no recommendations at this time.

Process Flow Diagrams

Process flow diagrams are easy to follow and depict how, when, where and why MIK is present. Therefore, there are no recommendations at this time.

Determination of Approximately Equal

The sum of quantities of MIK present in specific processes identified is approximately equal to the sum of the quantities of MIK that is destroyed, transformed or leaves the processes. A review of the calculations does not indicate that a record to describe why the sums are not approximately equal would be required.

Descriptions of How, When, Where and Why a Substance is Used or Created

Descriptions of how, when, where and why MIK is present have been accurately identified. There are no recommendations at this time.

Additional Technically & Economically Feasible Options Not Currently Identified in Plan

To the best knowledge of the toxic substance reduction planner, there are no known options at this time that have not been identified in the plan.

Reduction Estimates Prepared for Each Identified Reduction Option

No options were identified and, therefore, there are no recommendations for the reduction estimates.

Technical & Economic Feasibility Analysis

No options were identified for reduction and, therefore, there are no recommendations for the technical or economic feasibility.

Direct & Indirect Costs

MIK is an undesirable, trace by-product created in the digesting process. There are numerous other substances that are also created. As such, there is currently no mechanism to differentiate costs associated with its production versus other by-products. Therefore, no recommendation can be made with respect to the costs.
Implementation Steps and Timelines

No options were identified for reduction and therefore, there are no implementation steps and timelines.
5.0 Closure

The information and data contained in this report, including without limitation, the results of any sampling and analyses conducted by TGE pursuant to its Agreement with the client, have been developed or obtained through the exercise of TGE’s professional judgment and are set forth to the best of TGE’s knowledge, information and belief. The assessment and conclusions made in this report are based, in part, on information provided by the client and on information accessed from third parties. TGE has relied on this information for the purpose of this report and cannot be held liable for inaccurate information provided by third parties. Although every effort has been made to confirm that this information is factual, complete and accurate, TGE makes no guarantees or warranties whatsoever, whether expressed or implied, with respect to such information or data.

The information and data presented in this report are based on the purpose and scope of the Project and form the basis for any conclusions and recommendations presented herein. Any conclusions and recommendations presented herein do not preclude the existence of environmental concerns other than those that may have been identified.

Work performed by TGE personnel employed sound environmental assessment principles. TGE cannot guarantee the accuracy and reliability of information provided by others or third parties. Therefore, TGE does not claim responsibility for undisclosed environmental concerns or conditions that may result in costs for environmental clean-up and/or remediation. This report is intended for information purposes only.

Respectfully submitted by:

TRUE GRIT ENGINEERING

Mike Stacheczuk, P.Eng.
Project Engineer
mike@truegriteng.com

Jennifer Main, P.Eng.
Manager Planning and Development Services
jmain@truegriteng.com
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Table 4.1 - Summary of Process Quantifications for Methyl Isobutyl Ketone

2017 Toxic Substance Reduction Plan
Domtar Inc. - Dryden, ON
Figures
Domtar Inc. - Dryden Mill
2017 Toxic Substance Reduction Plan
Methyl Isobutyl Ketone
Dryden, ON

Black Liquor Evaporation Process

FIGURE 4.3
Wastewater Treatment Process

Domtar Inc. - Dryden Mill
2017 Toxic Substance Reduction Plan
Methyl Isobutyl Ketone
Dryden, ON

FIGURE 4.6
Appendix A: Certification by Highest Ranking Employee
Certification by Highest Ranking Employee

As of December 20, 2017, I, James Blight, certify that I have read the toxic 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 Toxic Reduction Act, 2009 and Ontario Regulation 455/09 (General) made under that Act.

- Methyl Isobutyl Ketone

James Blight
General Manager
Domtar Inc. - Dryden Mill
Appendix B: Certification by Toxic Substance Reduction Planner
Certification by Toxic Substance Reduction Planner

As of December 20, 2017, I, Mike Stachejczuk certify that I am familiar with the processes at Domtar Inc.’s Dryden Mill 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 20, 2017 and that the plan complies with that Act and Ontario Regulation 455/09 (General) made under that Act.

- Methyl Isobutyl Ketone

Mike Stachejczuk  
Certified Toxic Substance Reduction Planner (License TSRP0245)
References


Tran, Honghi. *Lime Kiln Chemistry and Effects on Kiln Operations*. Toronto, Canada: Pulp & Paper Centre and Department of Chemical Engineering and Applied Chemistry, University of Toronto.
2017 TOXIC SUBSTANCE REDUCTION PLAN SUMMARY
December 20, 2017

Methyl Isobutyl Ketone
Dryden Mill
Prepared under the Toxics Reduction Act & O. Reg. 455/09
Domtar Inc.
Dryden Mill
2017 Toxic Substance Reduction Plan
Methyl Isobutyl Ketone
Dryden, Ontario
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Certification by Toxic Reduction Planner

As of December 20, 2017, I, Mike Stachejczuk certify that I am familiar with the processes at Domtar Inc.'s Dryden Mill 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 20, 2017 and that the plan complies with that Act and Ontario Regulation 455/09 (General) made under that Act.

- Methyl Isobutyl Ketone

Mike Stachejczuk
Mike Stachejczuk
Certified Toxic Substance Reduction Planner (License TSRP0245)
Certification by Highest Ranking Employee

As of December 20, 2017, I, James Blight, certify that I have read the toxic 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 Toxic Reduction Act, 2009 and Ontario Regulation 455/09 (General) made under that Act.

- Methyl Isobutyl Ketone

James Blight
General Manager
Domtar Inc. – Dryden Mill
Domtar Inc. Environmental Policy

Environmental Policy

We will conduct business in a manner that conserves resources and constantly reduces our environmental footprint. We seek continual improvement in our environmental performance by setting, reviewing and updating environmental goals.

We are committed to:

- Managing operations to comply with all applicable laws and regulations and other requirements to which we subscribe, with emphasis on pollution prevention, and minimizing adverse environmental impacts;
- Identifying and evaluating potential environmental risks and implementing appropriate measures to eliminate or control those risks;
- Developing and implementing measures to ensure sustainable use of materials, resources and energy;
- Promoting and developing awareness, leadership and accountability with respect to environmental protection among all our employees and persons working for us or on our behalf;
- Communicating with our employees, customers, suppliers, the communities in which we operate and public officials to build greater mutual understanding of environmental issues;
- Participating in the development of governmental environment policies based on sound science and sustainable growth principles;
- Supporting research aimed at improving process efficiency and environmental protection measures and applying such knowledge to our product stewardship;
- Conducting independent third party environmental audits to confirm that our management practices meet policy objectives, legislation and the principles of sound management, and reporting to the Board of Directors on the environmental status of our operations.

Our employees share in this responsibility and are accountable for the successful implementation of this policy. Local management is empowered to curtail operations, as necessary, to prevent serious environmental impacts.

July 2009
## General Facility Information

<table>
<thead>
<tr>
<th>General Facility Information</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>The legal and trade names of the owner and operator of the facility, the street and mailing</td>
<td>Domtar Inc. 1 Duke St. P.O. Box 3001 Dryden, ON P8N 2Z7</td>
</tr>
<tr>
<td>address of the facility</td>
<td></td>
</tr>
<tr>
<td>Facility NPRI identification number</td>
<td>928</td>
</tr>
<tr>
<td>The identification number assigned to the facility by the Ministry of the Environment for</td>
<td>5100</td>
</tr>
<tr>
<td>the purposes of Ontario Regulation 127/01</td>
<td></td>
</tr>
<tr>
<td>Number of full-time employees</td>
<td>351</td>
</tr>
<tr>
<td>UTM Coordinates</td>
<td>E 0511258</td>
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<tr>
<td></td>
<td>N 5514413</td>
</tr>
<tr>
<td>UTM Zone</td>
<td>15</td>
</tr>
<tr>
<td>Datum</td>
<td>NAD83</td>
</tr>
<tr>
<td>Legal name of Canadian parent company, the street and mailing address of the company</td>
<td>Domtar Inc. 395 de Maisonneuve Blvd. West Montreal, Quebec H3A 1L6</td>
</tr>
<tr>
<td>Percent Ownership</td>
<td>100%</td>
</tr>
<tr>
<td>North American Industry Classification System (NAICS) - 2, 4, and 6 digit codes</td>
<td>31-33, 3221, 322112</td>
</tr>
<tr>
<td>Facility Public Contact</td>
<td>Bonny Skene Public Affairs Manager (807) 223 9035</td>
</tr>
</tbody>
</table>
Methyl Isobutyl Ketone

CAS # 108-10-1

Plan Summary Statement

This toxic substance plan summary accurately reflects the version of the plan that was certified on December 20, 2017 by Mr. James Blight (Highest Ranking Employee) and Mr. Mike Stachejcuk (Certified Toxic Substance Reduction Planner).

Statement of Intent

Domtar Inc. – Dryden Mill does not intend to reduce its creation of methyl isobutyl ketone (MIK) because it is an unintentional, trace by-product of the Kraft pulp manufacturing operation. Domtar Inc. – Dryden Mill is committed to continuing to develop and implement measures to ensure sustainable use of materials, resources and energy.

Objective

Domtar Inc. – Dryden Mill does not intend to reduce its creation of MIK because it is an unintentional, trace by-product of the Kraft pulp manufacturing operation. Based on the information gathered in this report, the amount of MIK created is not expected to significantly increase. Domtar Inc. – Dryden Mill is committed to continuing to develop and implement measures to ensure sustainable use of materials, resources and energy.

Description of Why Toxic Substance is Used or Created

MIK is not used in the Kraft pulp manufacturing operation.

MIK is a Volatile Organic Compound (VOC) that is created through complex chemical reactions in the Kraft pulp manufacturing operation.

Options to be Implemented

No option was identified to be technically and economically feasible. Therefore, no option will be implemented for the reduction of the creation of MIK.

Estimated Reductions for Options to be Implemented

Not applicable.

Timelines for Achieving Estimated Reductions

Not applicable.
Projection of Effectiveness of Toxic Substance Reduction Plan

As no options were identified for implementation and there has not been a significant increase in the production of Kraft pulp at the facility, the amount of MIK created is not expected to significantly increase.