Toxic Reduction Plan

Cobalt
Rubber Solutions Division
101 Glasgow Street, Kitchener, Ontario

AirBoss of America Corporation

GHD | 651 Colby Drive Waterloo Ontario N2V 1C2 Canada

018651 | 18 | Report No 4 | December 21 2017

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1. Introduction

1.1 Basic Facility Information

Name & CAS # of Substances	Cobalt	7440-48-4 (NA-05)
Facility Identification and Site Address		
Company Name	AirBoss of America Corporation	
Facility Name	Rubber Solutions Division	
Facility Address	101 Glasgow Street Kitchener, Ontario N2G 4X8	
Spatial Coordination of Facility (UTM Coordinates)		
Number of Employees	243	
NPRI ID	7004	
9-digit business number		
Parent Company (PC) Information		
PC Name	AirBoss of America Corporation	
PC Address	16441 Yonge Street Newmarket, Ontario L3X 2G8	
Percent Ownership for PC	100%	
Primary North American Industrial Classification System Code (NAICS)		
2 Digit NAICS Code	32 – Manufacturing	
4 Digit NAICS Code	3262 - Rubber Product Manufacturing	
6 Digit NAICS Code	326290 - Other Rubber Product Manufacturing	
Company Contact Information		
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Facility Technical Contact	Jesse Baldwin, Environmental Manager	
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Company Coordinator Contact	Jesse Baldwin, Environmental Manager	
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1.2 Statement of Intent

The AirBoss of America Corporation (AirBoss) Rubber Solutions Division (Facility) is currently using cobalt in two products (three total CAS RN numbers). These products all serve the same function, which is to improve rubber adhesion to metal. These products repel water for the rubber matrix, which enables long-term adhesion as opposed to the instantaneous adhesion that is required for the rubber to adhere to metal rubber when the part is being manufactured.

After consideration of all reduction options it has been determined that, the Facility is not currently capable of reducing the use of Cobalt, as they are essential additive materials for the manufacturing of rubber products. AirBoss does not create Cobalt; therefore, this plan will not address reducing its creation.

1.3 Objectives

AirBoss operates a rubber product manufacturing facility in an environmentally responsible manner. AirBoss is committed to protect the environment through continual improvement of its manufacturing processes and the prevention of pollution. The objective of this Plan is to review and

evaluate the potential for reducing the usage of Cobalt. The objective of this plan is to evaluate and determine the technical and economic feasibility of various reduction options, and identify if any are viable for implementation at this time.

AirBoss did not identify any reduction objectives in this Plan.

1.4 Facility Description

The AirBoss Facility is a rubber product manufacturing facility. Rubber mixes at Airboss differ depending upon the desired characteristics of the product being manufactured. The rubber product manufacturing process begins with the production of a rubber mix from polymers (raw and/or synthetic polymer), carbon black (the primary filler used in making a rubber mixture), oils, and miscellaneous chemicals. The miscellaneous chemicals include processing aids, activators, accelerators, age resistors, fillers, softeners, and specialty materials.

The main processes at the facility which will be discussed in further detail throughout the report begins with receiving the raw materials such as natural rubber, synthetic rubber, carbon black, oils, and other miscellaneous chemicals. The received materials are handled and stored prior to being loaded into one of the five Banbury mixers. The mixed rubber is then discharged to a mill, which forms it into a long strip or sheet. Some of the rubber may then go to the cold fed extruder, which transforms the rubber into various shapes or profiles by forcing it through dies via a rotating screw. The rubber products are then allowed to cool before being stored until ready to be shipped off site to the customers. The Facility's North American Industrial Classification Service (NAICS) Code is 326290 - "Other Rubber Product Manufacturing".

2. Identification and Description

2.1 Stages and Processes

The following is a description of the main stages and processes in the manufacturing of rubber products at the facility. The stages and processes that involve Cobalt are as follows:

- The first process at the facility involves receiving raw materials. Cobalt is an ingredient in two products (three total CAS RN numbers) which are all used to improve rubber adhesion to metal. Details of this receiving stage and the quantification methods for Cobalt are further described in Section 3.1.
- Once received, the products are then handled and stored prior to the manufacturing. There are several main materials received by this facility. The polymers are received by the facility in slab or bale form and consist of natural and synthetic polymer. Accelerators, antioxidants, retarders, softeners, fillers and curing agents are received in pellet, granule, flake, liquid or powder form in bags or totes which are stored in bins and on pallets. Carbon black is delivered by truck and pneumatically off loaded into storage silos. Process oils and waxes, as well as stearic acid, are delivered by truck and stored in bulk storage tanks. Polymer is transferred by forklift and conveyors. Powders are weighed at designated weigh stations equipped with dust collectors. The weighed powders are stored in low melt plastic bags formulated to melt in the mixer without affecting the integrity of the final product. The mixer lines have an automatic powder

supply system. The powders are stored in a closed system day tank from which they are automatically transferred to the mixer from hoppers. Carbon black is either transported pneumatically from the silos to the Mixer carbon black day tank for gravity feed to the Mixer, or is gravity fed from the Silo to the Mixer scale and into the mixer. Carbon black is also supplied to mixers by weigh out from totes at the tote weigh station. The tote weigh station is used to recycle carbon black at the Mixer. The carbon black is fed from the tote to the scale by a vacuum system for use in the Mixer Carbon Black Day Tanks and the Mixer. The process oils, waxes and stearic acid are transferred from the bulk tanks to day tanks for daily use. This process is further described in Section 3.2.

- Production of the rubber mixture involves weighing and loading the appropriate ingredients into an internal mixer, which is used to combine these ingredients. The polymers and miscellaneous chemicals are manually introduced into the mixer hopper, while carbon black and oils are injected directly into the mixing chamber from bulk storage systems. The mixer creates a homogeneous mass of rubber using two rotors, which shear materials against the walls of the machine's body. This mechanical action also adds heat to the rubber, which is controlled to the desired level.

  The Facility operates five Banbury mixers:

  – Skinner 3700 Mixer (Mixer #1)
  – Farrel #11 Mixer (Mixer #3)
  – Skinner 268 Mixer (Mixer #5)
  – Skinner CoFlow Mixer (Mixer #6)
  – K-7 Shaw Intermix (Mixer K7)

  The K-7 Shaw Intermix is equipped with fully automated, computer controlled weighing and delivery systems for carbon black as well as the other important bulk additives. This Mixing process is further described in Section 3.3.

- Following internal mixing, rubber processing continues with milling, soap solution coating, and cooling. The mixed rubber mass is discharged to a mill which forms it into a sheet. The hot, tacky rubber then passes through a water-based anti-tack solution, which prevents the rubber sheets from sticking together as they cool to ambient temperature. The rubber sheets are placed directly onto a long conveyor belt, which, through the application of cool air, lowers the temperature of the rubber sheets. Some of the rubber may then go to the cold fed extruder, which transforms the rubber into various shapes or profiles by forcing it through dies via a rotating screw. Extruding heats the rubber slightly and the rubber enters a water bath or spray conveyor where cooling takes place. This Milling or extruding process is further described in Section 3.4.

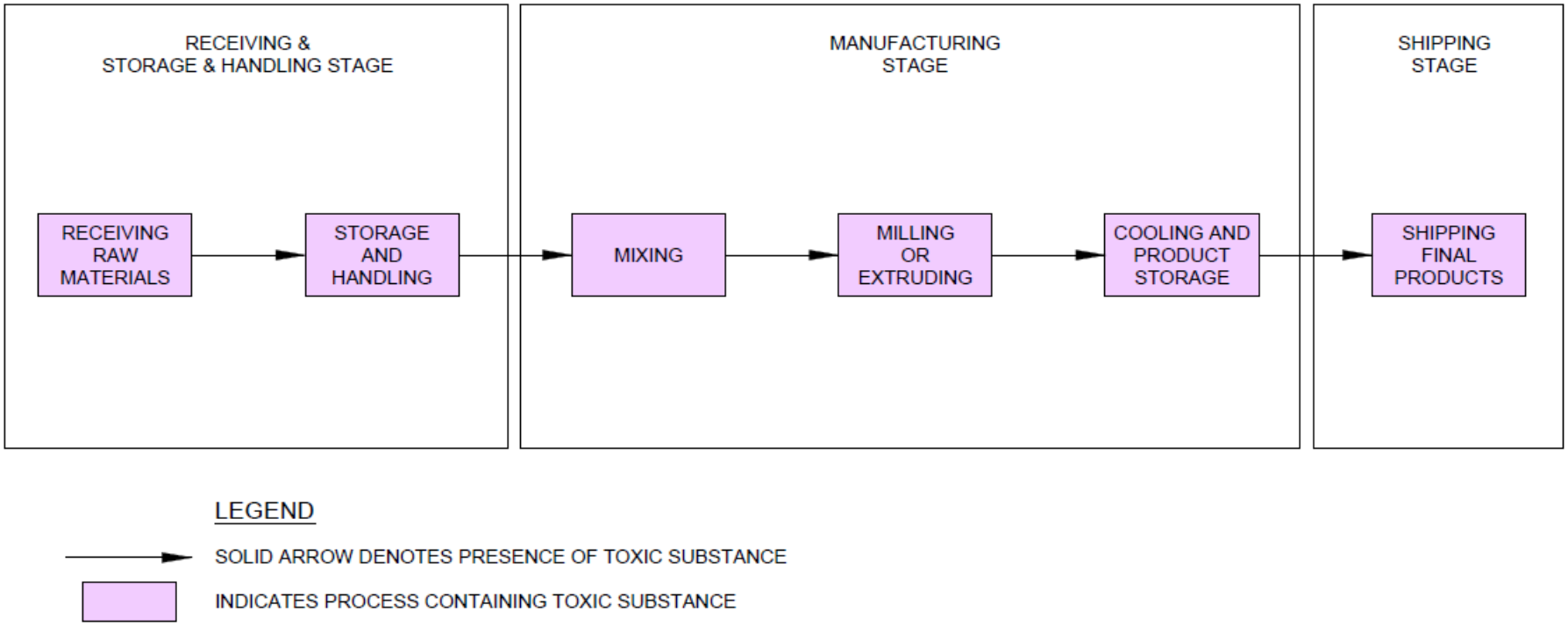
- The rubber sheets are coated with an anti-stick solution in the dip tank and are cooled on cooling racks. The sheets are then stacked and stored on pallets until shipment to the customer. The cooling and product storage prior to shipment is further described in Section 3.5.

In 2016 the Facility operated 24 hours a day, 7 days per week.

2.2 Process Flow Diagram

The following process flow diagram, showing the Facility stages and processes, is provided as a visual aid to assist in interpreting the movement of the toxic substances throughout the facility.

Figure 1 Facility General Process Flow Diagram

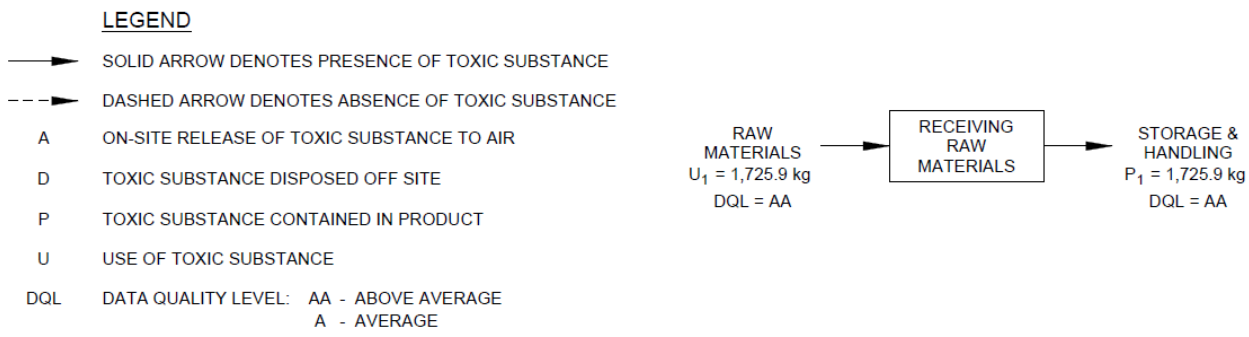


3. Tracking and Quantification

3.1 Raw Materials Receiving Process

The usage of the toxic substances at the facility begins with the raw materials being delivered and initially handled. Cobalt is an ingredient in Cobalt Naphthenate and Cobalt Neodecanoate products all of which are used to improve rubber adhesion to metal. These solid materials are received in bags or totes. After the products have been received, the material is stored in bins and on pallets.

Figure 2 Cobalt in Chemicals Receiving and Storage Process



3.1.1 Chemicals Receiving and Storage Process (Use)

A. Tracking and Quantification Method

Quantification Method: Mass Balance

The quantity of Cobalt is based on work order processes and the concentration of each pure ingredient in all received products as presented in the Materials Safety Data Sheets (MSDS).

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

The Cobalt used in the Receiving and Storage stage is calculated based on the amount of each product, the weight percent of each product provided on each MSDS, and the weight fraction of each pure contaminant. The MSDS information showing the constituent compositions is an above average source of data as the concentrations provided are specific numbers.

Raw Material Quantities

The total amount of each chemical product used in the processes was determined based on actual usage and the facility's internal inventory records.

C. Quantification of Toxic Substance

Table 1 Cobalt Used in the Chemicals Receiving and Storage Process

Product	Average Composition (%)	Quantity Used in 2016 (kg/year)	Pure Contaminant Weight Fraction (%)	Total Contaminant Used (kg/year)
Cobalt Naphthenate 10.5% (U_{1A})	100%	219.1	14.8%	32.5
Cobalt Neodecanoate 20.5% (U_{1B})	70%	6,272.6	14.7%	920.8
Cobalt Neodecanoate 20.5% (U_{1C})	30%	2,688.3	28.7%	772.6

Cobalt:

$$U_{1A} = 219.1kg \times 100\% \times \left(\frac{58.93\frac{g}{mol}}{397.42\frac{g}{mol}}\right)$$

$$U_{1A} = 253{,}7\ kg \times 65\%\ x\ 0.148$$

$$U_{1A} = 32.5\ kg$$

$$U_{1B} = 6{,}272.6\ kg \times 70\% \times \left(\frac{58.93\frac{g}{mol}}{401.45\frac{g}{mol}}\right)$$

$$U_{1B} = 6{,}272.6\ kg \times 70\%\ x\ 0.147$$

$$U_{1B} = 920.8\ kg$$

$$U_{1C} = 2{,}688.3\ kg \times 30\% \times \left(\frac{58.93\frac{g}{mol}}{205.07\frac{g}{mol}}\right)$$

$$U_{1C} = 2{,}688.3\ kg \times 30\%\ x\ 0.287$$

$$U_{1C} = 772.6\ kg$$

$$Total\ Usage = U_{1A} + U_{1B} + U_{1C} = 32.5\ kg + 920.8\ kg + 772.6\ kg = 1.725.9\ kg$$

3.1.2 Chemicals Receiving and Storage Process (Contained In Product)

A. Tracking and Quantification Method

Quantification Method: Mass Balance – see Section 3.1.1

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The amount of Cobalt contained in product was assumed to be equal to the amount that was delivered to the facility, as all material delivered to the site entered the Raw Materials Receiving Process.

Cobalt:

P = Cobalt contained in product after Chemicals Receiving and Storage Process
P = P_1 = 32.5 kg + 920.8 kg + 772.6 kg
P = 1,725.9 kg

3.1.3 Input/Output Balance

To ensure that all Cobalt has been accounted for in this process, an input/output calculation was completed using the following equation:

Use + Creation = Transformed + Destroyed + Contained in Product + On Site or Off Site

Release (to Air, Land, Water) +Off-Site Transfers (for treatment, recycling) + Disposals

Note: This process only contains materials used and material contained in product (to next process)

$U_1 = P_1$

Cobalt:

1,725.9 kg = 1,725.9 kg

Unaccounted Material = 0 kg

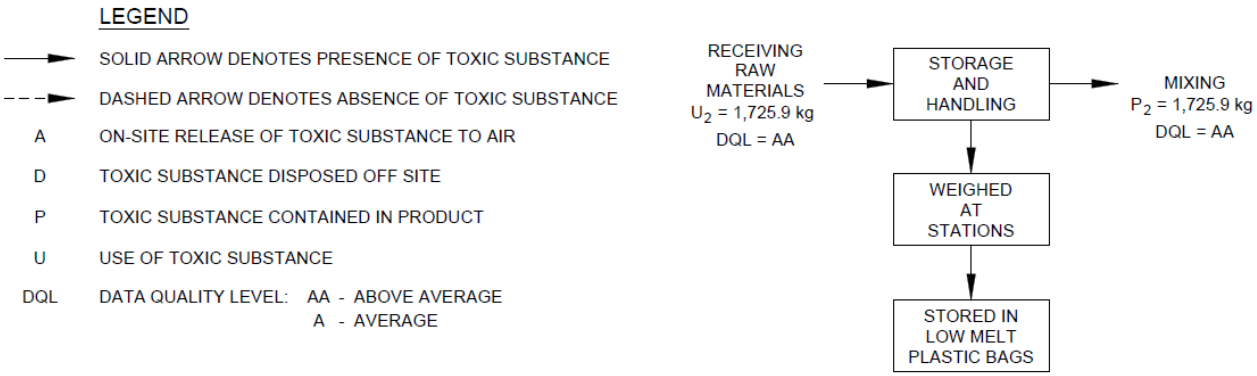
After evaluating the input/output balance, no material sources were found to be missing and no calculation errors were identified. Therefore, given the data quality of the values used in the input/output balance, the results are considered to be approximately equal.

3.2 Storage and Handling Process

Once the raw materials are received they are handled and stored until ready to be used in production. There are several main materials received by this facility. There are two raw materials (three total CAS RN numbers) that contain Cobalt. Accelerators, antioxidants, retarders, softeners, fillers and curing agents are received in pellet, granule, flake, liquid or powder form in bags or totes which are stored in bins and on pallets. The carbon black is delivered by truck and pneumatically off loaded into storage silos. Low vapour pressure process oils and waxes are delivered by truck and stored in bulk storage tanks. Powders are weighed at designated weigh stations equipped with dust collectors. The weighed powders are stored in low melt plastic bags that are formulated to melt in the mixer without affecting the rubber mix so the entire bag can be placed in the mixer to reduce exposure and emissions of the powders. It should be noted that some powders are hand weighed. Carbon black is either transported pneumatically from the silos to the #1 Mixer carbon black day tank for gravity feed to the #1 Mixer, or is gravity fed from the K7 Silo to the K7 Mixer scale and into the mixer. Carbon black is also supplied to mixers by weigh out from totes at the tote weigh station. The tote weigh station is used to recycle carbon black at the K7 Mixer. The carbon black is fed from the tote to the scale by a vacuum system for use in the #1 Mixer Carbon Black Day

Tanks and the #6 Mixer. The process oils and waxes are transferred from the bulk tanks to day tanks when required to be used.

Figure 3 Cobalt in the Storage and Handling Process



3.2.1 Storage and Handling Process (Use)

A. Tracking and Quantification Method

Quantification Method: Mass Balance

The amount of Cobalt used in the Storage and Handling Process is the same as the amount contained in product when it was delivered to the facility (see Section 3.1.1). This quantity is based on work order processes and the concentration of Cobalt in all received products as presented in the Materials Safety Data Sheets (MSDS).

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The quantification of the amount used in the Storage and Handling Process was assumed to be equal to the amount that was contained in the various products when they were received.

U_2 = Cobalt used in the Storage and Handling Process: 1,725.9 kg

3.2.2 Storage and Handling Process (Contained In Product)

A. Tracking and Quantification Method

Quantification Method: Mass Balance – see Section 3.1.1

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The amount of Cobalt contained in product was assumed to be equal to the amount that was delivered to the facility, as all material delivered to the site entered the Storage and Handling Process.

Cobalt:

P = Cobalt contained in product after Storage and Handling Process

P = P_2 = 1,725.9 kg

3.2.3 Input/Output Balance

To ensure that all Cobalt has been accounted for in this process, an input/output calculation was completed using the following equation:

Use + Creation = Transformed + Destroyed + Contained in Product + On Site or Off Site

Release (to Air, Land, Water) +Off-Site Transfers (for treatment, recycling) + Disposals

Note: This process only contains materials used and material contained in product (to next process)

$U_2 = P_2$

Cobalt:

1,725 kg = 1,725 kg

Unaccounted Material = 0 kg

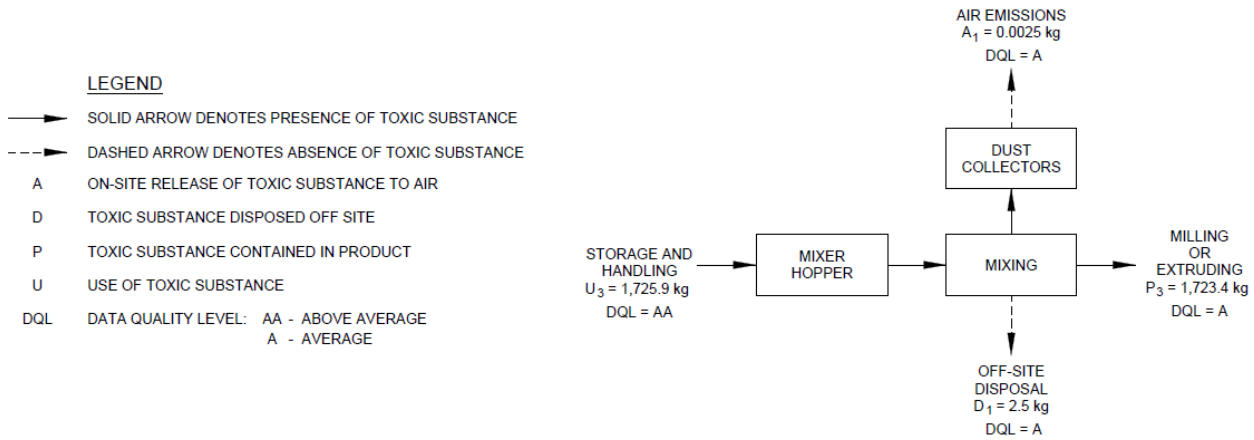
After evaluating the input/output balance, no material sources were found to be missing and no calculation errors were identified. Therefore, given the data quality of the values used in the input/output balance, the results are considered to be approximately equal.

3.3 Mixing Process

Production of the rubber mixture involves weighing and loading the appropriate ingredients into one of the Banbury mixers which is used to combine these ingredients. The polymers and miscellaneous chemicals are manually introduced into the mixer hopper, while carbon black and oils are injected directly into the mixing chamber from bulk storage systems. The mixer creates a homogeneous mass of rubber using two rotors, which shear materials against the walls of the machine's body. This mechanical action also adds heat to the rubber, which is controlled to the desired level. The Facility operates five Banbury mixers. There are a total of eight dust collectors

associated with the mixing operations. The mixed rubber mass is then discharged to a mill to reshape the rubber mix.

Figure 4 Cobalt in Mixing Process



3.3.1 Mixing Process (Use)

A. Tracking and Quantification Method

Quantification Method: Mass Balance

The amount of Cobalt used in the Mixing Process is the same as the amount contained in product when it was delivered to the facility and stored (see Section 3.1.1).

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The quantification of the amount used in the Mixing Process was assumed to be equal to the amount that was contained in the various products when they were received.

U_3 = Cobalt used in the Mixing Process: 1,725.9 kg

3.3.2 Mixing Process (Off-Site Transfer for Disposal)

A. Tracking and Quantification Method

Quantification Method: Engineering Calculation

The amount of Cobalt transferred off site for disposal was quantified based on the total amount of dust from the dust collector tracked by AirBoss transferred off site and the concentration of Cobalt in the dust.

B. Best Available Method Rationale

Cobalt Amount Transferred Off Site for Disposal

The engineering calculation is considered a conservative estimate because it calculates the concentration of Cobalt in the dust based on the total usage of Cobalt as a fraction of the total powders. It is known that the carbon black usage quantity accounts for approximately 85 percent (%) of all incoming materials in powder form. Therefore, the concentration of Cobalt in the dust is determined by ratio of the total MPO quantity and the total amount of incoming powder.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

Calculation of Off-Site Transfer for Disposal of Cobalt from the Mixing Process:

Percent Cobalt = 1,725.9 kg of Cobalt used ÷ 12,112,451.3 kg of total powders used = 0.01%

D_1 = Cobalt transferred off site for disposal from Mixing Process in 2016

D_1 = 17,300 kg of dust collected x 1.5% concentration of Cobalt

D_1 = 2.5 kg of Cobalt transferred off site for disposal.

3.3.3 Mixing Process (On-Site Release to Air)

A. Racking and Quantification Method

Quantification Method: Engineering Calculation

The on-site release to air of Cobalt from the mixing process is based on the total amount of Cobalt contained in the dust being disposed off site, and the efficiency of the dust collector treating the emitted dust from the mixers.

B. Best Available Method Rationale

Cobalt Amount Released to Air

The amount of Cobalt released to air was calculated using an engineering calculation approach. The estimated air emissions of Cobalt were based on the percent composition of the metal in the dust transferred off site for disposal and the efficiency of the dust collectors provided by AirBoss. This is considered a conservative approach as it calculates the concentration of Cobalt in the dust based on the total usage of Cobalt as a fraction of the total powders.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

Calculation of On-Site Release to Air of Cobalt from the Mixing Process:

Percent Cobalt = 1,725.9 kg of Cobalt used ÷ 12,112,451.3 kg of total powders used = 1.5%

A_1 = Cobalt released to air from Mixing Process in 2016

A_1 = 17,300 kg of dust collected x 1.5% concentration of Cobalt x (1-99.9%) Dust Collector Efficiency

A_1 = 0.0025 kg of Cobalt emitted to air

3.3.4 Mixing Process (Contained In Product)

A. Tracking and Quantification Method

Quantification Method: Mass Balance – see Section 3.1.1

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The amount of Cobalt contained in product is equal the amount that entered the Mixing Process from the Storage and Handling Process and was not emitted to air or collected and transferred off site for disposal.

Cobalt:

P = Cobalt contained in product after Mixing Process
P = $P_3 = U_3 – A_1 – D_1$
P_3 = 1,725.9 kg – 0.0025 kg – 2.5 kg
P_3 = 1,723.4 kg

3.3.5 Input/Output Balance

To ensure that all Cobalt has been accounted for in this process, an input/output calculation was completed using the following equation:

Use + Creation = Transformed + Destroyed + Contained in Product + On Site or Off Site

Release (to Air, Land, Water) +Off-Site Transfers (for treatment, recycling) + Disposals

Note: This process only contains materials used and material contained in product (to next process)

Cobalt:

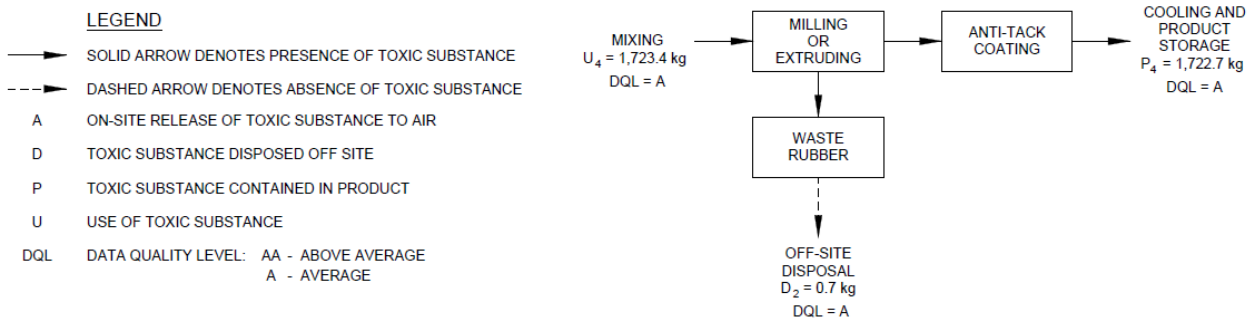
$U_3 – A_1 – D_1 = P_3$
1,725.9 kg – 0.0025 kg – 2.5 kg = 1,723.4 kg
Unaccounted Material = 0 kg

After evaluating the input/output balance, no material sources were found to be missing and no calculation errors were identified. Therefore, given the data quality of the values used in the input/output balance, the results are considered to be approximately equal.

3.4 Milling or extruding Process

Following the operations of the mixers, the process of rubber mixing continues with milling, anti-tack coating, and cooling. The mixed rubber mass is discharged to a mill, which forms it into a long strip or sheet. The hot, tacky rubber then passes through a water-based anti-tack solution, which prevents the rubber sheets from sticking together as they cool to ambient temperature. The rubber sheets are placed directly onto a long conveyor belt which, through the application of cool air, lowers the temperature of the rubber sheets. Some of the rubber may then go to the cold fed extruder, which transforms the rubber into various shapes or profiles by forcing it through dies via a rotating screw. Extruding heats the rubber slightly and the rubber enters a water bath or spray conveyor where cooling takes place.

Figure 5 Cobalt in Milling or extruding Process



3.4.1 Milling or extruding Process (Use)

A. Tracking and Quantification Method

Quantification Method: Mass Balance

The amount of Cobalt used in the Milling or extruding Process is the same as the amount contained in product when it was finished being processed in the various mixers (see Section 3.3.4).

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The quantification of the amount used in the Milling or extruding Process was assumed to be equal to the amount that was contained in product following the Mixing Process.

U_4 = Cobalt used in the Milling or extruding Process: 1,723.4 kg

3.4.2 Milling or extruding Process (Off-Site Transfer for Disposal)

A. Tracking And Quantification method

Quantification Method: Engineering Calculation

Off-spec rubber compound product is occasionally disposed of off site. The composition of Cobalt in the off-spec material is calculated based on the total MPO quantity of each compound as a fraction of the total rubber produced. The percent composition of the rubber is then multiplied by the total amount of waste rubber shipped off site as tracked by AirBoss to determine quantities of compound being disposed off site in the waste rubber product.

B. Best Available Method Rationale

Amount Transferred Off Site for Disposal from Waste Rubber

The engineering calculation is considered the best available method as it uses the total usage of each toxic substance and the total amount of rubber produced to determine a percent composition of the rubber recipe which is then applied to the total waste rubber transferred off site for disposal.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

Calculation of Off-Site Transfer for Disposal of Cobalt from the Milling or extruding Process:

Cobalt:

Percent Cobalt = 1,723.4 kg of Cobalt used ÷ 69,816,839.5 kg of total rubber used = 0.002%
D_2 = Cobalt transferred off site for disposal from Milling or extruding Process in 2016
D_2 = 27,723.4 kg of total waste rubber x 0.002% concentration of Cobalt
D_2 = 0.7 kg of Cobalt transferred off site for disposal

3.4.3 Milling or extruding Process (Contained In Product)

A. Tracking and Quantification Method

Quantification Method: Mass Balance – see Section 3.1.1

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The amount of Cobalt contained in product is equal the amount that entered the Milling or extruding Process from the Mixing Process and was not transferred off site for disposal as part of waste rubber.

Cobalt:

P = Cobalt contained in product after Mixing Process
P = P_4 = U_4 – D_2
P_4 = 1,723.4 kg – 0.7 kg
P_3 = 1,722.7 kg

3.4.4 Input/Output Balance

To ensure that all Cobalt has been accounted for in this process, an input/output calculation was completed using the following equation:

Use + Creation = Transformed + Destroyed + Contained in Product + On Site or Off Site

Release (to Air, Land, Water) + Off-Site Transfers (for treatment, recycling) + Disposals

Note: This process only contains materials used and material contained in product (to next process)

Cobalt:

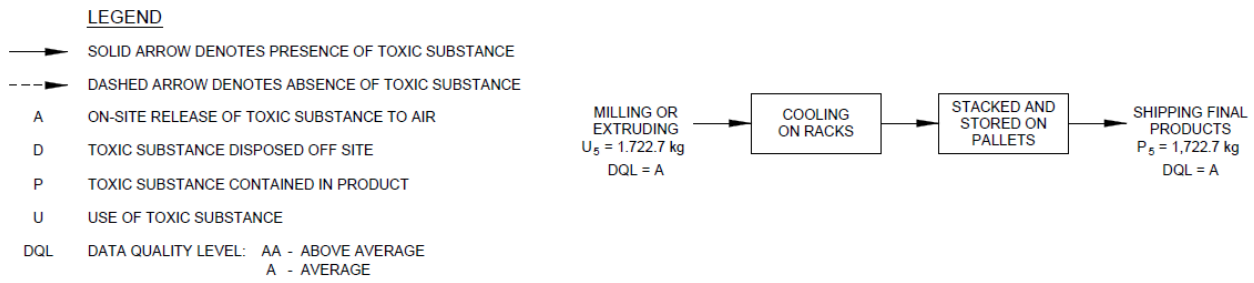
U_4 – D_2 = P_4
1,723.4 kg – 0.7 kg = 1,722.7 kg
Unaccounted Material = 0 kg

After evaluating the input/output balance, no material sources were found to be missing and no calculation errors were identified. Therefore, given the data quality of the values used in the input/output balance, the results are considered to be approximately equal.

3.5 Cooling and Product Storage Process

Following the milling or extruding process, the rubber sheets are coated with an anti-stick solution in the dip tank and are cooled on cooling rack. Finally, the sheets are stacked and stored on pallets until shipment to the customer.

Figure 6 Cobalt in Cooling and Product Storage Process



3.5.1 Cooling and Product Storage Process (Use)

A. Tracking and Quantification Method

Quantification Method: Mass Balance

The amount of Cobalt used in the Cooling and Product Storage Process is the same as the amount contained in product when leaving the Milling or extruding process (see Section 3.4.3).

B. Best Available Method Rationale

Cobalt and Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The quantification of the amount used in the Cooling and Product Storage Process was assumed to be equal to the amount that was contained in product following the Milling or extruding Process.

U_5 = Cobalt used in the Milling or extruding Process: 1,722.7 kg

3.5.2 Cooling and Product Storage Process (Contained In Product)

A. Tracking and Quantification Method

Quantification Method: Mass Balance – see Section 3.1.1

B. Best Available Method Rationale

Cobalt Concentration in Raw Materials

Refer to Section 3.1.1.

Raw Material Quantities

Refer to Section 3.1.1.

C. Quantification of Toxic Substance

The amount of Cobalt contained in product was assumed to be equal to the amount that entered cooling and product storage stage, as there were no emissions or transfers of the materials during this process.

Cobalt:

P = Cobalt contained in product after Cooling and Product Storage Process
P = P_5 = 1,722.7 kg

3.5.3 Input/Output Balance

To ensure that all Cobalt has been accounted for in this process, an input/output calculation was completed using the following equation:

Use + Creation = Transformed + Destroyed + Contained in Product + On Site or Off Site

Release (to Air, Land, Water) +Off-Site Transfers (for treatment, recycling) + Disposals

Note: This process only contains materials used and material contained in product (to next process)

$U_5 = P_5$

Cobalt:

1,722.7 kg = 1,722.7 kg

Unaccounted Material = 0 kg

After evaluating the input/output balance, no material sources were found to be missing and no calculation errors were identified. Therefore, given the data quality of the values used in the input/output balance, the results are considered to be approximately equal.

4. Facility-Wide Accounting Information

4.1 Use

The total facility wide use is equal to the amount of Cobalt which is contained in the raw materials which is received from the suppliers in 2016.

Cobalt:

$U = U_{1A} + U_{1B} + U_{1C} = 32.5 \text{ kg} + 920.8 \text{ kg} + 772.6 \text{ kg} = 1,725.9 \text{ kg}$

4.2 Creation

There were zero creations of Cobalt on site in 2016.

4.3 Transformation

There were zero transformations of Cobalt on site in 2016.

4.4 Destruction

There were zero destructions of Cobalt on site in 2016.

4.5 Contained In Product

The total facility wide amount of Cobalt contained in product during 2016 is the following:

Cobalt:

C = 1,722.7 kg

4.6 Releases to Air

The total amount of Cobalt released to air during 2016 is the following:

Facility wide release to air = A_1 = 0.0025 kg

4.7 Releases to Land

There were zero releases to land of Cobalt on site in 2016.

4.8 Releases to Water

There were zero releases to water of Cobalt on site in 2016.

4.9 Disposals (On Site)

There were zero on-site disposals of Cobalt in 2016.

4.10 Disposals (Off Site)

The total facility wide off-site disposal of Cobalt is equal to the amount contained in collected dust which is transferred off site and the amount contained in waste rubber which is transferred off site during 2016.

Cobalt:

$D = D_1 + D_2 = 2.5\ kg + 0.7\ kg = 3.2\ kg$

4.11 Off-Site Discharges (Treatment)

There were zero off-site discharges of Cobalt in 2016.

5. Direct and Indirect Cost Analysis

Below is a summary of all direct costs associated specifically with the use, release, transfer, disposal, and amounts contained in product of Cobalt.

Table 2 Direct Costs Associated with Cobalt

Item	Description	Total
Processing Costs	**1510:** Percent of Compounds Mixed 5.71 Total Hours Available 3,614.47 Cost Per Hour $1.295.91 **Total cost $267,339.70** **1505:** Percent of Compounds Mixed 5.79 Total Hours Available 3,614.47 Cost Per Hour $1,295.91 **Total cost $270,972.24** **Total Cost of Cobalt**	**$538,311.95**

Table 3 Indirect Costs Associated with Cobalt

Item	Description	Total
Environmental Reporting/Compliance	TRA Plans, NPRI/TRA Reporting, Annual Summary of Activities Report	$ 7,400.00
TOTAL		**$ 7,400.00**

6. Toxic Substance Use Reduction Options

6.1 Material or Feedstock Substitution Options

6.1.1 Identification of Options

AirBoss is required to order specific products to meet their client specifications. The facility utilizes the necessary raw materials on a per batch basis to manufacture rubber products containing the required properties prior to shipping the final products off to the customers. AirBoss does not have the ability to change the feedstock material or its composition because it is essential in the manufacturing of rubber products being purchased from the Facility. Therefore, no possible reduction options for material or feedstock substitutions were identified.

6.1.2 Estimated Reductions

Not Applicable.

6.1.3 Technical Feasibility

Not Applicable.

6.1.4 Economic Feasibility

Not Applicable.

6.2 Product Redesign or Reformulation

6.2.1 Identification of Options

Cobalt is a constituent ingredient in products that are used for the manufacturing of certain rubber products. These rubber products are manufactured according to customer specifications and these products are used in specific quantities to provide certain required properties to the rubber products. The necessary properties of the rubber products are specified by the customers and AirBoss does not have the ability to redesign the finished products. No further changes to the product design or reformulation is possible under the current conditions at the Facility.

6.2.2 Estimated Reductions

Not Applicable.

6.2.3 Technical Feasibility

Not Applicable.

6.2.4 Economic Feasibility

Not Applicable.

6.3 Equipment or Process Modifications

6.3.1 Identification of Options

AirBoss currently uses industry standard equipment for the various processes associated with the use of Cobalt. At this time, there are no potential equipment replacements or process modifications that would provide a potential reduction in the amount of toxic substances used at the facility.

6.3.2 Estimated Reductions

Not Applicable.

6.3.3 Technical Feasibility

Not Applicable.

6.3.4 Economic Feasibility

Not Applicable.

6.4 Spill and Leak Prevention

6.4.1 Identification of Options

AirBoss conducts regular preventive maintenance on all equipment to ensure it is operating efficiently. AirBoss has a documented procedure to limit spills of raw materials in the spill control and prevention plan. The products are added to the manufacturing process in a controlled manner which limits the potential of any spills. It has been determined that no further measures can be taken to prevent any spills or leaks at the Facility. Therefore, no possible reduction options for spill and leak prevention were identified.

6.4.2 Estimated Reductions

Not Applicable.

6.4.3 Technical Feasibility

Not Applicable.

6.4.4 Economic Feasibility

Not Applicable.

6.5 On-Site Reuse and Recycling

6.5.1 Identification of Options

AirBoss creates waste rubber when the products are shaped to sizes specified by the customers. AirBoss reuses excess rubber that is a by-product from the operations to be used for rubber products whenever possible. Due to the specifications given by the customers AirBoss is forced to produce waste rubber and so there are no options available to AirBoss to limit their quantity of waste rubber. Therefore, no possible reduction options for on-site reuse and recycling were identified.

6.5.2 Estimated Reductions

Not Applicable.

6.5.3 Technical Feasibility

Not Applicable.

6.5.4 Economic Feasibility

Not Applicable.

6.6 Improved Inventory Management/Purchasing Techniques

6.6.1 Identification of Options

The raw materials arrive on site as required based on physical inventory. The amount purchased is based on the actual consumption and estimated demand. The products containing Cobalt are received by truck in bags or totes, which are stored on bins and on pallets. The products are transferred to the production area as required by the batch recipe. Any modification to the purchasing techniques would only affect the time that the products are received and would not affect the required amount used at the facility. The Facility is unable to identify a reduction option related to improved inventory management or purchasing techniques as they are already doing everything possible in this category.

6.6.2 Estimated Reductions

Not Applicable.

6.6.3 Technical Feasibility

Not Applicable.

6.6.4 Economic Feasibility

Not Applicable.

6.7 Training or Improved Operating Practices

6.7.1 Identification of Options

The staff is trained to inspect and monitor process operations to ensure all process equipment is operating properly. Additionally, training is given to the employees to take all the necessary precautions when using process equipment and materials. Equipment maintenance programs and training on Standard Operating Procedures (SOPs) are in place to ensure efficient operating practices. The continuous improvement policy of the company includes operating practices based on their related standard operating procedures. There is no potential for the implementation of further training for the floor workers that would result in improved operational efficiency.

6.7.2 Estimated Reductions

Not Applicable.

6.7.3 Technical Feasibility

Not Applicable.

6.7.4 Economic Feasibility

Not Applicable.

7. Options to Be Implemented

There were no options identified that can be implemented by AirBoss to reduce the use of Cobalt.

8. Plan Certifications

Certification By Highest Ranking Employee

As of December 11, 2017, I, Chris Bitsakakis, 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.

Cobalt

Chris Bitsakakis, President
AirBoss Rubber Solutions

12-17-17
Date

Certification By Licensed Planner

As of December 11, 2017, I, Erik Martinez, certify that I am familiar with the processes at AirBoss 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 2016 and that the plan complies with that Act and Ontario Regulation 455/09 (General) made under that Act.

Cobalt

Erik Martinez, P.Eng.
Planner License # TSRP0005
GHD

December 17, 2017
Date

Appendices

Appendix A
Planner Recommendations

December 20, 2017 Reference No. 018651

Mr. Jesse Baldwin
AirBoss Rubber Solutions Division
101 Glasgow Street
Kitchener, Ontario
N2G 4X8

Dear Mr. Baldwin:

Re: Toxics Reduction Plan – Cobalt
Planner Recommendations

1. Introduction

The Toxics Reduction Act and Ontario Regulation (O. Reg.) 455/09 require that each toxic substance reduction plan be reviewed and certified by a Licensed Toxic Substance Reduction Planner (Planner). Section 18 of O. Reg. 455/09 requires the Planner to provide recommendations, with supporting rationale, for the purposes of improving all aspects of the plan including the potential for reducing the use and creation of the toxic substance at the facility and the business rationale for implementing the plan.

The Planner is required to provide recommendations for any of the following relevant issues, or a written explanation of why a recommendation is not necessary:

1. Whether improvements could be made in the expertise relied on in preparing the plan.
2. Whether improvements could be made in:
    i. The data and methods used for accounting purposes.
    ii. The process flow diagrams.
    iii. Reasons why the input and output balances are not approximately equal.
    iv. A description of how, when, where and why the substance is used or created.
3. Whether there are technically and economically feasible options for reducing the use and creation of the substance at the facility that have not been identified in the plan that would result in reductions that are equal to or greater than those already identified in the plan.
4. Whether improvements could be made in:
    i. The estimates of anticipated reduction of use or creation, releases to environment and contained in product of the substance.
    ii. In determination of the technical feasibility of options.
    iii. In determination of the economic feasibility of options.

5. Whether improvements could be made to the estimates of the direct and indirect costs.

6. Whether the steps and timetable set out in the implementation plan are likely to be achieved.

2. Expertise Relied On In Preparing the Plan

This Toxic Substance Reduction Plan (Plan) was developed by a planning team that included Jesse Baldwin from AirBoss Rubber Solutions Division (AirBoss); Gavin Moore, an environmental consultant; and Erik Martinez, a Licensed Toxics Reduction Planner.

Jesse Baldwin is knowledgeable in all aspects of the production processes at AirBoss and was able to provide the information required to develop the Plan. All relevant data was collected from the appropriate departments. Gavin Moore has worked with AirBoss, providing engineering consulting services on environmental projects. He is familiar with the processes at the AirBoss Facility located at 101 Glasgow Street in Kitchener, Ontario (Facility).

The level of expertise relied on during the preparation of the Plan was sufficient in that the involvement of any additional parties with relevant technical experience would not have improved the plan or increased the potential to reduce the use or release of cobalt.

3. Accounting

Data and Methods Used

The quantity of Cobalt is determined based on work order processes and the concentration of each pure ingredient in all received products as presented in the Materials Safety Data Sheets. The amount cobalt used is calculated based on the amount of each product, the weight percent of each product provided on each MSDS, and the weight fraction of each pure contaminant. The MSDS information showing the constituent compositions is an above average source of data as the concentrations provided are specific numbers. The total amount of each chemical product used in the processes was determined based on actual usage and the facility's internal inventory records.

The amount of Cobalt transferred off site for disposal was quantified based on the total amount of dust from the dust collector tracked by AirBoss transferred off site and the concentration of Cobalt in the dust. The engineering calculation is considered a conservative estimate because it calculates the concentration of cobalt in the dust based on the total usage of cobalt as a fraction of the total powders. It is known that the carbon black usage quantity accounts for approximately 85 percent (%) of all incoming materials in powder form. Therefore, the concentration of Cobalt in the dust is determined by ratio of the total MPO quantity and the total amount of incoming powder.

The on-site release to air of cobalt from the mixing process is based on the total amount of cobalt contained in the dust being disposed off site, and the efficiency of the dust collector treating the emitted dust from the mixers. The amount of cobalt released to air was calculated using an engineering

calculation approach. The estimated air emissions of Cobalt were based on the percent composition of the metal in the dust transferred off site for disposal and the efficiency of the dust collectors provided by AirBoss. This is considered a conservative approach as it calculates the concentration of Cobalt in the dust based on the total usage of Cobalt as a fraction of the total powders.

Off-spec rubber compound product is occasionally disposed of off site. The composition of Cobalt in the off-spec material is calculated based on the total MPO quantity of each compound as a fraction of the total rubber produced. The percent composition of the rubber is then multiplied by the total amount of waste rubber shipped off site as tracked by AirBoss to determine quantities of compound being disposed off site in the waste rubber product. The engineering calculation is considered the best available method as it uses the total usage of each toxic substance and the total amount of rubber produced to determine a percent composition of the rubber recipe, which is then applied to the total waste rubber transferred off site for disposal.

The facility could conduct laboratory analysis to determine the percent of cobalt in the dust and in the waste rubber to improve the data quality of the amount of cobalt being transferred off-site from dust disposal and waste rubber. The laboratory analysis would also improve the data quality for the calculated amount of cobalt being emitted to air.

Process Flow Diagrams

GHD created a process flow chart for all stages of production through discussions and previous visits at the Facility. The process flow diagram provided for the purposes of this Plan is considered comprehensive and accurate. This level of detail provides a comprehensive understanding of the flow of material through the process. The Plan satisfies this condition of the Regulation and a recommendation is not necessary. The accounting quantities of cobalt have been calculated for each applicable process at the Facility.

Input/Output Balance

The input and output balances were calculated using a mass balance approach. Therefore, the inputs are equal to the outputs, and a recommendation is not necessary.

Description of How, When, Where, and Why the Substance Is Used or Created

The Plan satisfies this condition of the Regulation and a recommendation is not necessary.

4. Toxic Substance Reduction Options

AirBoss engaged in a detailed review of each reduction category, and ultimately was not able to identify an option that would reduce the use or release to air of the toxic substance, due to the nature of the business and the manufacturing operation.

5. Direct and Indirect Costs

All direct costs associated with the use of cobalt were calculated based on the processing costs required for each of the materials containing cobalt. The indirect costs associated with cobalt was determined based on the environmental reporting and compliance efforts required by the facility.

The Plan satisfies this condition of the Regulation and I have no recommendations to improve the Plan regarding this requirement.

6. Implementation Plan

As previously stated, AirBoss will not be implementing any reduction options at this time as a detailed review of each reduction category yielded no option that would reduce any of the toxic substances at this time.

Should you have any questions on the above, please do not hesitate to contact us.

Yours truly,

GHD

Erik Martinez, P. Eng.
Certified Toxics Reduction Planner – License #TSRP0005

GM/jp/5

Appendix B
Plan Summary for Cobalt

Appendix B TRA Plan Summary – Cobalt

Basic Facility Information		
Name & CAS # of Substance	Cobalt	7440-48-4 (NA-05)
Substances for which other Plans have been prepared	No other substances for 2016	Not Applicable

Facility Identification and Site Address	
Company Name	AirBoss of America Corporation
Facility Name	Rubber Solutions Division
Facility Address	101 Glasgow Street Kitchener, Ontario N2G 4X8
Spatial Coordination of Facility (UTM Coordinates)	
Number of Employees	
NPRI ID	7004
9-digit business number	

Parent Company (PC) Information	
PC Name	AirBoss of America Corporation
PC Address	16441 Yonge Street Newmarket, Ontario L3X 2G8
Percent Ownership for PC	100%

Primary North American Industrial Classification System Code (NAICS)	
2 Digit NAICS Code	32 – Manufacturing
4 Digit NAICS Code	3262 - Rubber Product Manufacturing
6 Digit NAICS Code	326290 - Other Rubber Product Manufacturing

Company Contact Information	
Facility Public Contact	Jesse Baldwin, Environmental Manager
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	Phone: (519) 576-5565 ext. 3109
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Facility Technical Contact	Jesse Baldwin, Environmental Manager
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Company Coordinator Contact	Jesse Baldwin, Environmental Manager
	jbaldwin@airbossofamerica.com
	Phone: (519) 576-5565 ext. 3109
	Fax: (519) 576-1315

Company Contact Information	
Person who Prepared the Plan (if different from the Coordinator)	Gavin Moore GHD 651 Colby Drive Waterloo, Ontario N2V 1C2 gavin.moore@ghd.com Phone: (519) 884-0510 ext. 2277 Fax: (519) 884-0525
Highest Ranking Employee	Chris Bitsakakis, President cbitsakakis@airboss.ca Phone: (519) 576-5565 Fax: (519) 576-1315

Planner Information:	
Planner Responsible for Making Recommendations	Erik Martinez, P.Eng Planner License No: TSRP0005 GHD 651 Colby Drive Waterloo, Ontario N2V 1C2 erik.martinez@ghd.com Phone: (519) 884-0510 ext. 2342 Fax: (519) 884-0525
Planner Responsible for Certification	Erik Martinez, P.Eng erik.martinez@ghd.com Phone: (519) 884-0510 ext. 2342 Fax: (519) 884-0525

Toxic Reduction Policy Statement of Intent

The AirBoss of America Corporation (AirBoss) Rubber Solutions Division (Facility) is currently using cobalt in two products (three total CAS RN numbers). These products all serve the same function, which is to improve rubber adhesion to metal. These products repel water for the rubber matrix, which enables long-term adhesion as opposed to the instantaneous adhesion that is required for the rubber to adhere to metal rubber when the part is being manufactured.

After consideration of all reduction options it has been determined that, the Facility is not currently capable of reducing the use of Cobalt, as they are essential additive materials for the manufacturing of rubber products. AirBoss does not create Cobalt; therefore, this plan will not address reducing its creation.

Reduction Objectives

AirBoss was unable to identify any reduction options; therefore, there is no reduction objective in this plan.

Description of Facility

The AirBoss Facility is a rubber product manufacturing facility. Rubber mixes at Airboss differ depending upon the desired characteristics of the product being manufactured. The rubber product manufacturing process begins with the production of a rubber mix from polymers (raw and/or synthetic polymer), carbon black (the primary filler used in making a rubber mixture), oils, and miscellaneous chemicals. The

miscellaneous chemicals include processing aids, activators, accelerators, age resistors, fillers, softeners, and specialty materials.

The main processes at the facility which will be discussed in further detail throughout the report begins with receiving the raw materials such as natural rubber, synthetic rubber, carbon black, oils, and other miscellaneous chemicals. The received materials are handled and stored prior to being loaded into one of the five Banbury mixers. The mixed rubber is then discharged to a mill, which forms it into a long strip or sheet. Some of the rubber may then go to the cold fed extruder, which transforms the rubber into various shapes or profiles by forcing it through dies via a rotating screw. The rubber products are then allowed to cool before being stored until ready to be shipped off site to the customers. The Facility's North American Industrial Classification Service (NAICS) Code is 326290 - "Other Rubber Product Manufacturing".

Toxic Substance Reduction Options

After looking into the seven categories of toxic substance reduction options, no options were identified. Explanations are provided in the table below to detail why an option could not be identified in each category.

Toxic Substance Reduction Category	Option: Identification and Description
1) Materials or feedstock substitution	**No option identified:** AirBoss is required to order specific products to meet their client specifications. The facility utilizes the necessary raw materials on a per batch basis to manufacture rubber products containing the required properties prior to shipping the final products off to the customers. AirBoss does not have the ability to change the feedstock material or its composition because it is essential in the manufacturing of rubber products being purchased from the Facility. Therefore, no possible reduction options for material or feedstock substitutions were identified.
2) Product design or reformulation	**No option identified:** Cobalt is a constituent ingredient in products that are used for the manufacturing of certain rubber products. These rubber products are manufactured according to customer specifications and these products are used in specific quantities to provide certain required properties to the rubber products. The necessary properties of the rubber products are specified by the customers and AirBoss does not have the ability to redesign the finished products. No further changes to the product design or reformulation is possible under the current conditions at the Facility.
3) Equipment or Process Modification	**No option identified:** AirBoss currently uses industry standard equipment for the various processes associated with the use of Cobalt. At this time, there are no potential equipment replacements or process modifications that would provide a potential reduction in the amount of toxic substances used at the facility.
4) Spill and Leak prevention	**No option identified:** AirBoss conducts regular preventive maintenance on all equipment to ensure it is operating efficiently. AirBoss has a documented procedure to limit spills of raw materials in the spill control and prevention plan. The products are added to the manufacturing process in a controlled manner which limits the potential of any spills. It has been determined that no further measures can be taken to prevent any spills or leaks at the Facility. Therefore, no possible reduction options for spill and leak prevention were identified.

Toxic Substance Reduction Category	Option: Identification and Description
5) On-site reuse or recycling	**No option identified:** AirBoss creates waste rubber when the products are shaped to sizes specified by the customers. AirBoss reuses excess rubber that is a by-product from the operations to be used for rubber products whenever possible. Due to the specifications given by the customers AirBoss is forced to produce waste rubber and so there are no options available to AirBoss to limit their quantity of waste rubber. Therefore, no possible reduction options for on-site reuse and recycling were identified.
6) Improve inventory management or purchasing techniques	**No option identified:** The raw materials arrive on site as required based on physical inventory. The amount purchased is based on the actual consumption and estimated demand. The products containing Cobalt are received by truck in bags or totes, which are stored on bins and on pallets. The products are transferred to the production area as required by the batch recipe. Any modification to the purchasing techniques would only affect the time that the products are received and would not affect the required amount used at the facility. The Facility is unable to identify a reduction option related to improved inventory management or purchasing techniques as they are already doing everything possible in this category.
7) Training or improved operating practices	**No option identified** The staff is trained to inspect and monitor process operations to ensure all process equipment is operating properly. Additionally, training is given to the employees to take all the necessary precautions when using process equipment and materials. Equipment maintenance programs and training on Standard Operating Procedures (SOPs) are in place to ensure efficient operating practices. The continuous improvement policy of the company includes operating practices based on their related standard operating procedures. There is no potential for the implementation of further training for the floor workers that would result in improved operational efficiency.

Plan Summary Statement

This plan summary accurately reflects the content of the toxic substance reduction plan for the use of cobalt.

Certification by Highest Ranking Employee

Attached.

Certification by Licensed Planner

Attached.

www.ghd.com