Toxics Reduction Plan Summary for TC Industries

(Prepared in Compliance with the Toxics Reduction Act, 2009 & Ontario Regulation 455/09)

December 2012
Ref: 3106-04

Prepared for:

TC Industries
Guelph, Ontario

Prepared by:

Enviro-Stewards
Engineers & Scientists

Enviro-Stewards Inc.
1 Union Street
Elmira, Ontario

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BASIC FACILITY INFORMATION		
Substance name(s) & CAS No.(s)	**Substance Name**	**CAS No.**
	Xylene	1330-20-7
	Manganese	7439-96-5
	Copper	7440-50-8
	Nickel	7440-02-0
	Chromium	7440-47-3
	Lead	7439-92-1
NPRI ID No.	7630	
O. Reg 127/01 ID No.	-	
Legal name of owner	TC Industries of Canada	
Trade name of owner	-	
Legal name of operator (if different)	-	
Trade name of operator (if different)	-	
Mailing address of owner	249 Speedvale Avenue, Guelph, ON N1H 1C5	
Mailing address of operator (if different)	-	
2-digit NAICS code	33	
4-digit NAICS code	3328	
6-digit NAICS code	332810	
Spatial coordinates (UTM & NAD83)	Latitude: 43.5472 Longitude: -80.2857 Datum: 1983	
Parent Company (if applicable)	-	
Legal name	-	
Mailing address (if different from facility)	-	
Percent owned by parent company	-	
Canada Customs & Revenue Agency No.	-	
Mailing address	-	
TECHNICAL CONTACT		
Name	Richard Goodchild	
Position	Process Systems Manager	
Phone number	(519) 836-7100	
Email	richg@tcindustries.com	
Mailing address (if different)	-	
PERSON WHO COORDINATED THE PLAN		
Name	Lloyd Hipel	
Position	Project Manager	
Phone number	(519) 578-5100	
Email	lhipel@enviro-stewards.com	
Mailing address (if different)	1 Union Street, Elmira, ON N3B 3J9	
PERSON WHO PREPARED THE PLAN		
Name	Lloyd Hipel	
Position	Project Manager	
Phone number	(519) 578-5100	
Email	lhipel@enviro-stewards.com	
Mailing address (if different)	1 Union Street, Elmira, ON N3B 3J9	

HIGHEST RANKING EMPLOYEE	
Name	Jeff Quarrie
Position	VP GM TC Industries of Canada
Phone number	519-836-7100
Email	jeffq@tcindustries.com
Mailing address (if different)	-

PLAN SUMMARY		
Substance name	**Substance Name**	**CAS No.**
	Xylene	1330-20-7
Statement of Intent & Objectives	TC Industries intends to reduce the use of xylene through spill prevention, onsite reuse, and through staff training and improved operating practices.	
Toxic Substance Accounting Records (methods used to track & quantify, quantifications, input output balance, etc.)	Refer to Attachment A.	
Toxic Substance Reduction Plan (cost estimates, options to reduce, reduction estimates, technical & economic feasibility analyses, etc.)	Refer to Attachment B.	
Implementation Plan of Options		
Total Reductions	Xylene	5,361 kg/yr (40%)
Implementation Category	**iv. Spill & Leak Prevention**	
Implementation Option	Use caps on gun holding tubes	
Steps to Implement	• Order caps - Q1 2013 • Install caps on tubes – Q1 2013 • Operator training – Q1 to Q2 2013	
Estimated Reduction	Xylene: 31 kg/year (0.2%) to air	
Dates for achieving reduction	• Reductions should be achieved within one year (December 2013)	
Implementation Category	**v. On-site reuse or recycling**	
Implementation Option	Spray xylene used to flush black line guns into storage tubes to keep guns soft	
Steps to Implement	• Develop standard operating procedures – Q1 to Q2 2013 • Operator training – Q2 to Q4 2013	
Estimated Reduction	Xylene: 174 kg/year (1%) to air	
Dates for achieving reduction	• Reductions should be achieved within one year (December 2013)	
Implementation Category	**vii. Training or improved operating practices**	
Implementation Option	Spray training for operators to minimize overspray	
Steps to Implement	• Contact All Colour or Anadale (or other) to see if they offer training – Q1 2013 • Operator training – Q2 2013	
Estimated Reduction	Xylene: 1,544 kg/year (12%) to air	
Dates for achieving reduction	• Reductions should be achieved in one year (December 2013)	
Implementation Option	Add minimum required xylene to thin grey paint	
Steps to Implement	• Trial new xylene quantity – Q1 to Q2 2013 • Develop standard operating procedures for xylene addition –Q3 2013 • Operator training – Q4 2013	
Estimated Reduction	Xylene: 395 kg/year (3%) to air	
Dates for achieving reduction	• Reductions should be achieved within one year (December 2013)	

Implementation Option	Test spray tips for wear every month & replace to minimize paint consumption
Steps to Implement	• Measure orifice of used tip with new tip after one month of use – Q1 2013 • Determine optimum frequency of tip replacement based on trials and how often colour is used– Q2 2013 • Develop standard operating procedures for tip replacement based on number of months in use – Q3 2013 • Operator training – Q4 2013
Estimated Reduction	Xylene: 3,217 kg/year (25%) to air
Dates for achieving reduction	• Reductions should be achieved within one year (December 2013)

PLAN SUMMARY

Substance name	**Substance Name**	**CAS No.**
	Metal constituents:	
	Manganese	7439-96-5
	Copper	7440-50-8
	Nickel	7440-02-0
	Chromium	7440-47-3
	Lead	7439-92-1
Statement of Intent & Objectives	TC Industries intends to reduce the use of metal constituents through on-site reuse, improved purchasing techniques, and through improved operating practices.	
Toxic Substance Accounting Records (methods used to track & quantify, quantifications, input output balance, etc.)	Refer to Attachment A.	
Toxic Substance Reduction Plan (cost estimates, options to reduce, reduction estimates, technical & economic feasibility analyses, etc.)	Refer to Attachment B.	
Implementation Plan of Options		
Total Reductions	Manganese	665 kg/yr (0.3%)
	Copper	74 kg/yr (0.3%)
	Nickel	64 kg/yr (0.3%)
	Chromium	168 kg/yr (0.3%)
	Lead	4 kg/yr (0.3%)
Implementation Category	**v. On-site reuse or recycling**	
Implementation Option	Reuse drop-offs to make other parts	
Steps to Implement	• Already completed in 2012	
Estimated Reduction	Manganese:	12 kg/yr (0.01%) to offsite recycling
	Copper:	1 kg/yr (0.01%) to offsite recycling
	Nickel:	1 kg/yr (0.01%) to offsite recycling
	Chromium:	3 kg/yr (0.01%) to offsite recycling
	Lead:	0.1 kg/yr (0.01%) to offsite recycling
Dates for achieving reduction	• Reductions should be achieved within one year (December 2013)	

Implementation Category	**vi. Improved inventory or purchasing techniques**	
Implementation Option	Purchase custom plate sizes to minimize scrap	
Steps to Implement	• Already completed in 2012	
Estimated Reduction	Manganese:	78 kg/yr (0.03%) to offsite recycling
	Copper:	9 kg/yr (0.03%) to offsite recycling
	Nickel:	7 kg/yr (0.03%) to offsite recycling
	Chromium:	20 kg/yr (0.03%) to offsite recycling
	Lead:	0.4 kg/yr (0.03%) to offsite recycling
Dates for achieving reduction	• Reductions should be achieved within one year (December 2013)	
Implementation Category	**vii. Training or improved operating practices**	
Implementation Option	Track off-spec product and have incident reports to identify root causes	
Steps to Implement	• Began in 2012 • Ongoing	
Estimated Reduction	Manganese:	575 kg/yr (0.24%) to offsite recycling
	Copper:	64 kg/yr (0.24%) to offsite recycling
	Nickel:	55 kg/yr (0.24%) to offsite recycling
	Chromium:	145 kg/yr (0.24%) to offsite recycling
	Lead:	3 kg/yr (0.24%) to offsite recycling
Dates for achieving reduction	• Reductions should be achieved within 3 to 5 years (2015 – 2017)	

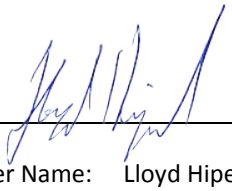
CERTIFICATIONS

Toxics Reduction Planner Certification

As of December 18, 2012,

I, Lloyd Hipel certify that I am familiar with the processes at TC Industries 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 2012 and that the plan complies with that act and Ontario Regulation 455/09 (General) made under that Act.

- *Xylene, manganese, copper, nickel, chromium, lead, vanadium*

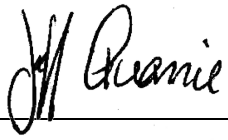
X 

Planner Name: Lloyd Hipel
License No.: TSRP0211

Highest Ranking Employee Certification

As of December 19, 2012 I, Jeff Quarrie*, certify that I have read the reports on the toxic substance reduction plans for the toxic substances referred to below and am familiar with their contents, and to my knowledge the information contained in the reports is factually accurate and the reports comply with the Toxics Reduction Act, 2009 and Ontario Regulation 455/09 (General) made under that Act.*

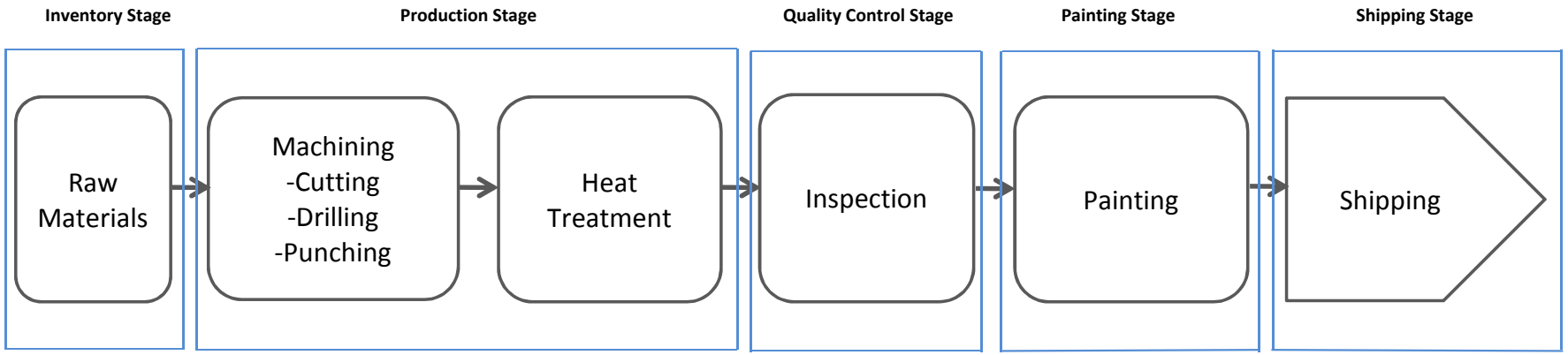
- *Xylene, manganese, copper, nickel, chromium, lead, vanadium*

X 

Highest Ranking Employee Name: Jeff Quarrie

Attachment A

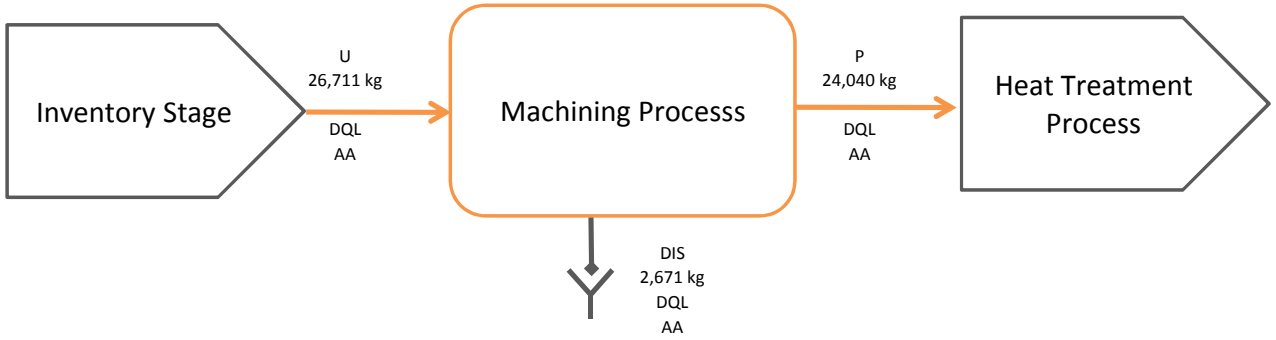
Overall Process Flow Diagram



TOXIC SUBSTANCE(S):
TITLE: Overall PFD
DATE: 20-Jun-12

PROCESS DESCRIPTION: Copper

TC industries used 21,099 tonnes of steel (Bar, Plate and Track Shoe) in 2011. The quality of steel is checked before receiving and stored. The stored steel is then taken for production consisting of machining process and heat treatment process. Machining process consisted of a few sub-processes such as cutting, drilling, punching and beveling. The machined product is then moved forward to heat treatment process. Of the total steel used in 2011, 19,181 tonnes was shipped and 1,918 tonnes was scrapped. The steel contained an average of 0.1253%w/w of copper . Hence, the equivalent quantity of copper in used steel, product and scrapped steel was 26,444 kg, 24,040 kg and 2,404 kg, respectively. Scrapped metal is sent out for



LEGEND

- **Absence** of toxic substance
- Onsite or offsite release, or offsite transfer of a toxic substance, either in its original form or in another form
- **Presence** of toxic substance

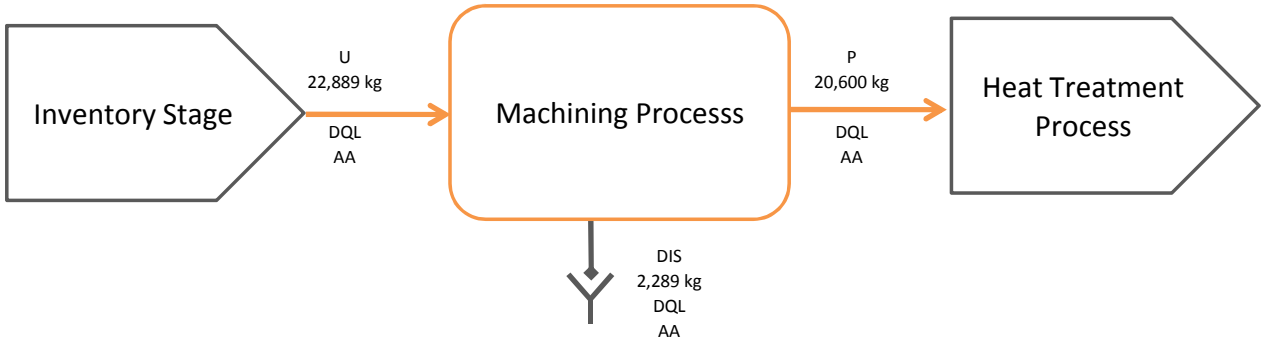
D	*Destruction* of toxic substance
A	Onsite release of toxic substance to *Air*
C	*Creation* of toxic substance
DIS	Onsite or offsite *disposal* of toxic substance
U	*Use* of a toxic substance
I	*Input* of a toxic substance from another process
O	Output of a toxic substance to another process
t	*Transfer* of a toxic substance within this process
DQL	Data Quality Level
AA	Above average
A	Average

Enviro-Stewards
Engineers & Scientists

TOXIC SUBSTANCE(S):	Copper
DRAWING TITLE:	Machining PFD
DATE OF ISSUE:	20-Jun-12

PROCESS DESCRIPTION: Nickel

TC industries used 21,099 tonnes of steel (Bar, Plate and Track Shoe) in 2011. The quality of steel is checked before receiving and stored. The stored steel is then taken for production consisting of machining process and heat treatment process. Machining process consisted of a few sub-processes such as cutting, drilling, punching and beveling. The machined product is then moved forward to heat treatment process. Of the total steel used in 2011, 19,181 tonnes was shipped and 1,918 tonnes was scrapped. The steel contained an average of 0.1074%w/w of nickel . Hence, the equivalent quantity of nickel in used steel, product and scrapped steel was 22,660 kg, 20,600 kg and 2,060 kg, respectively. Scrapped metal is sent out



LEGEND

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◆———	Onsite or offsite release, or offsite transfer of a toxic substance, either in its original form or in another form
———→	**Presence** of toxic substance
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DIS	Onsite or offsite *disposal* of toxic substance
U	*Use* of a toxic substance
I	*Input* of a toxic substance from another process
O	Output of a toxic substance to another process
t	*Transfer* of a toxic substance within this process
DQL	Data Quality Level
AA	Above average
A	Average

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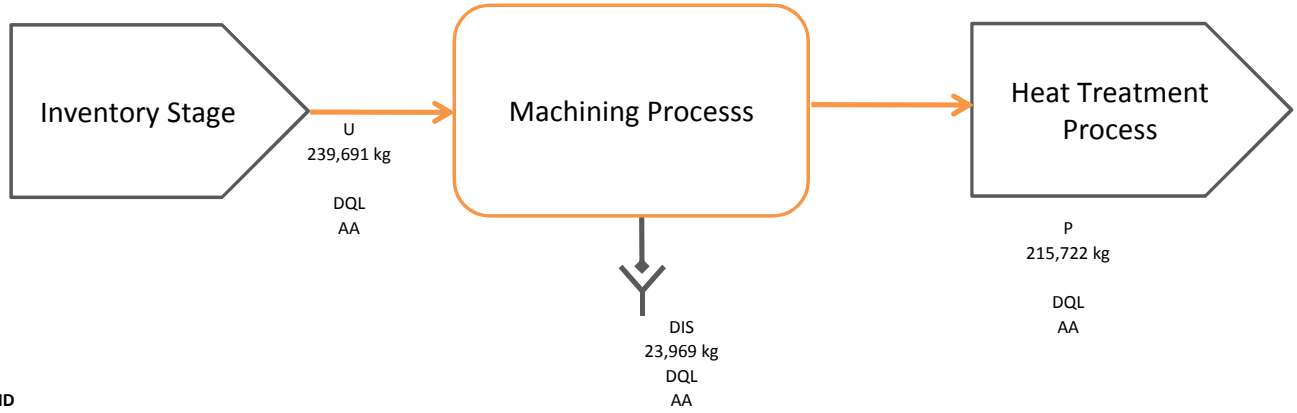
TOXIC SUBSTANCE(S):	Nickel
DRAWING TITLE:	Machining PFD
DATE OF ISSUE:	15-Jun-11

PROCESS DESCRIPTION: Manganese

TC industries used 21,099 tonnes of steel (Bar, Plate and Track Shoe) in 2011. The quality of steel is checked before receiving and stored. The stored steel is then taken for production consisting of machining process and heat treatment process. Machining process consisted of a few sub-processes such as cutting, drilling, punching and beveling. The machined product is then moved forward to heat treatment process. Of the total steel used, 19,181 tonnes was shipped and 1,918 tonnes was scrapped. The steel contained an average of 1.1246% w/w of manganese . Hence, the equivalent quantity of manganese in used steel, product and scrapped steel was 237,295 kg, 215,722 kg and 21,572 kg , respectively.



LEGEND

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——◆	Onsite or offsite release, or offsite transfer of a toxic substance, either in its original form or in another form
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DQL	Data Quality Level
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A	Average

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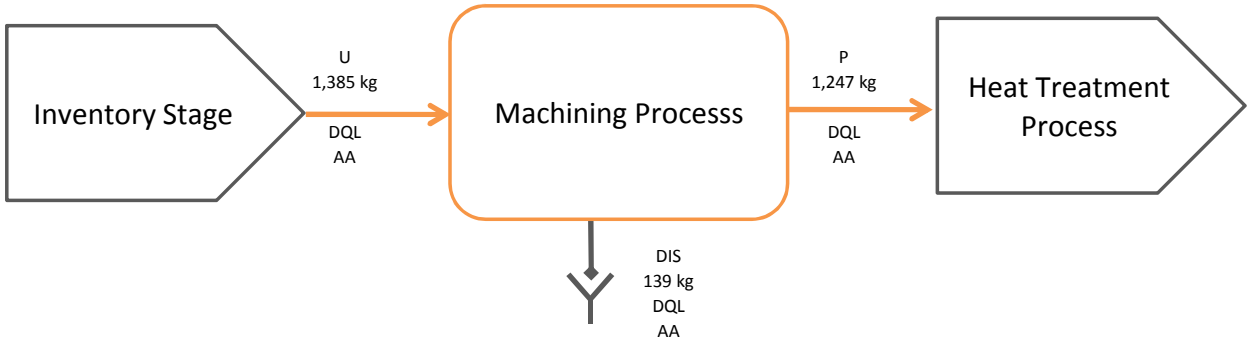
TOXIC SUBSTANCE(S):	Manganese
DRAWING TITLE:	Machining PFD
DATE OF ISSUE:	20-Jun-12

PROCESS DESCRIPTION: Lead

TC industries used 21,099 tonnes of steel (Bar, Plate and Track Shoe) in 2011. The quality of steel is checked before receiving and stored. The stored steel is then taken for production consisting of machining process and heat treatment process. Machining process consisted of a few sub-processes such as cutting, drilling, punching and beveling. The machined product is then moved forward to heat treatment process. Of the total steel used in 2011, 19,181 tonnes was shipped and 1,918 tonnes was scrapped. The steel contained an average of 0.007%w/w of lead . Hence, the equivalent quantity of lead in used steel, product and scrapped steel was 1,371 kg, 1,247 kg and 943 kg, respectively. Scrapped



LEGEND

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DQL	Data Quality Level
AA	Above average
A	Average

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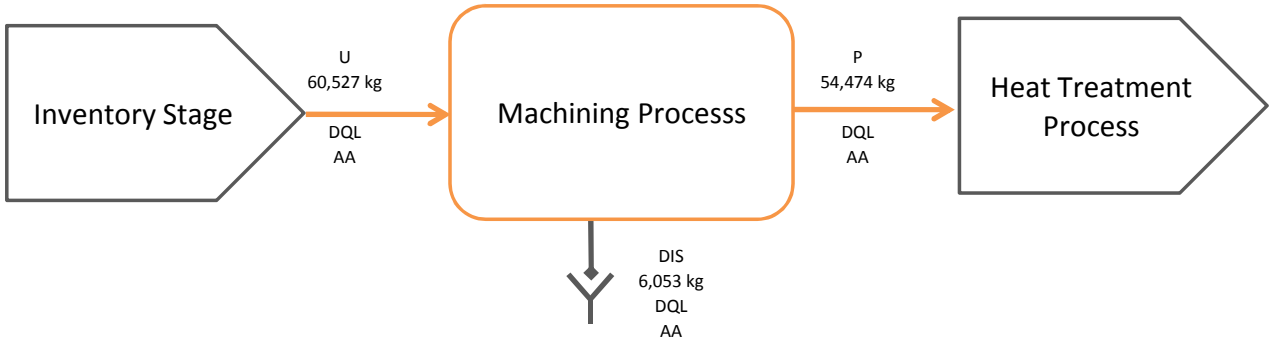
TOXIC SUBSTANCE(S):	Lead
DRAWING TITLE:	Machining PFD
DATE OF ISSUE:	15-Jun-11

PROCESS DESCRIPTION: Chromium

TC industries used 21,099 tonnes of steel (Bar, Plate and Track Shoe) in 2011. The quality of steel is checked before receiving and stored. The stored steel is then taken for production consisting of machining process and heat treatment process. Machining process consisted of a few sub-processes such as cutting, drilling, punching and beveling. The machined product is then moved forward to heat treatment process. Of the total steel used in 2011, 19,181 tonnes was shipped and 1,918 tonnes was scrapped. The steel contained an average of 0.284%w/w of lead . Hence, the equivalent quantity of lead in used steel, product and scrapped steel was 59,921 kg, 54,474 kg and 5,447 kg, respectively. Scrapped metal is sent out for



LEGEND

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A	Average

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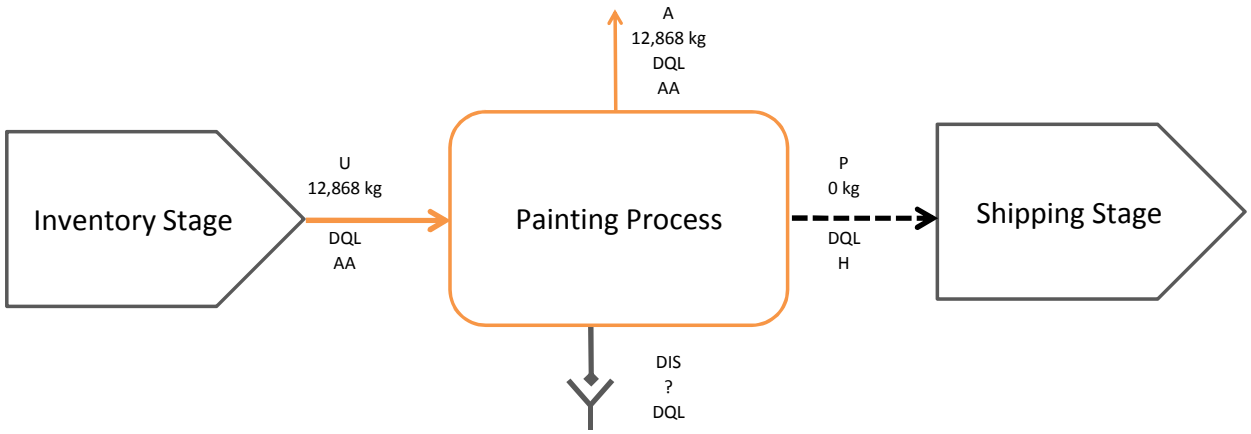
TOXIC SUBSTANCE(S):	Chromium
DRAWING TITLE:	Machining PFD
DATE OF ISSUE:	15-Jun-11

PROCESS DESCRIPTION: Xylene

Some of the machined products are painted. Part of the products are spray painted in a paint booth (solvent based paint sprayed on machined products) and part of the machined products are dipped into the tank containing the water based paint. Solvent based paint is mechanically mixed in the drums and is pumped to the paint booth. Xylene contained in the paint is released to the air onsite during the mixing and paining process.



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TOXIC SUBSTANCE(S):	Xylene
DRAWING TITLE:	Painting PFD
DATE OF ISSUE:	15-Jun-11

Manganese Balance for Machining Process

Input					Sub-Process	Output				
	Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Item		Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Comments
U	From Inventory Stage	239,691	Engineering Estimate	AA	Cutting Drilling Punching Beveling	P	Contained in product	215,722	Engineering Estimate	AA	
						DIS	Offsite disposal for recycling	23,969	Engineering Estimate and Mass Balance	AA	Punch scrap, shavings etc.
						Subtotal		**215,722**			
Total Inputs		**239,691**				**Total Outputs**		**239,691**			
Input/Output Balance		0		**Reasonable?**	Yes						

Notes:

Quantity in 2011 (Source: TC Industries)

Total weight shipped:	19,181	tonnes/year
Total weight scrapped:	2,131	tonnes/year
Total weight used:	21,312	tonnes/year

DATA QUALITY LEVEL

DQL	Data Quality Level
AA	Above average
A	Average
H	High

NOMENCLATURE

D	*Destruction* of toxic substance
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Copper Balance for Machining Process

Input				Sub-Process	Output				
	Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Item		Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Comments
U	From Inventory Stage	26,711	Engineering Estimate	AA	Cutting Drilling Punching Beveling	P	Contained in product	24,040	Engineering Estimate	AA	
						DIS	Offsite disposal for recycling	2,671	Engineering Estimate and Mass Balance	AA	Punch scrap, shavings etc.
						Subtotal		**24,040**			
Total Inputs		**26,711**				**Total Outputs**		**26,711**			
Input/Output Balance		0		**Reasonable?**	Yes						

Notes:

Quantity in 2011 (Source: TC Industries)

Total weight shipped:	19,181	tonnes/year
Total weight scrapped:	2,131	tonnes/year
Total weight used:	21,312	tonnes/year

DATA QUALITY LEVEL

DQL	Data Quality Level
AA	Above average
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NOMENCLATURE

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Nickel Balance for Machining Process

Input				Sub-Process	Output				
	Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Item		Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Comments
U	From Inventory Stage	22,889	Engineering Estimate	AA	Cutting Drilling Punching Beveling	P	Contained in product	20,600	Engineering Estimate	AA	
						DIS	Offsite disposal for recycling	2,289	Engineering Estimate and Mass Balance	AA	Punch scrap, shavings etc.
Total Inputs		**22,889**				**Total Outputs**		**22,889**			
Input/Output Balance		0		**Reasonable?**	Yes						

Notes:

Quantity in 2011 (Source: TC Industries)

Total weight shipped:	19,181	tonnes/year
Total weight scrapped:	2,131	tonnes/year
Total weight used:	21,312	tonnes/year

DATA QUALITY LEVEL

DQL	Data Quality Level
AA	Above average
A	Average
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NOMENCLATURE

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Chromium Balance for Machining Process

Input				Sub-Process	Output				
	Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Item		Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Comments
U	From Inventory Stage	60,527	Engineering Estimate	AA	Cutting Drilling Punching Beveling	P	Contained in product	54,474	Engineering Estimate		
						DIS	Offsite disposal for recycling	6,053	Engineering Estimate and Mass Balance		Punch scrap, shavings etc.
Total Inputs		**60,527**				**Total Outputs**		**60,527**			
Input/Output Balance		0		**Reasonable?**	Yes						

Notes:

Quantity in 2011 (Source: TC Industries)

Total weight shipped:	19,181	tonnes/year
Total weight scrapped:	2,131	tonnes/year
Total weight used:	21,312	tonnes/year

DATA QUALITY LEVEL

DQL	Data Quality Level
AA	Above average
A	Average
H	High

NOMENCLATURE

D	*Destruction* of toxic substance
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Lead Balance for Machining Process

Input				Sub-Process	Output				
	Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Item		Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Comments
U	From Inventory Stage	1,385	Engineering Estimate	AA	Cutting Drilling Punching Beveling	P	Contained in product	1,247	Engineering Estimate	AA	
						DIS	Offsite disposal for recycling	139	Engineering Estimate and Mass Balance	AA	Punch scrap, shavings etc.
Total Inputs		**1,385**				**Total Outputs**		**1,385**			
Input/Output Balance		0		**Reasonable?**	Yes						

Notes:

Quantity in 2011 (Source: TC Industries)

Total weight shipped:	19,181	tonnes/year
Total weight scrapped:	2,131	tonnes/year
Total weight used:	21,312	tonnes/year

DATA QUALITY LEVEL

DQL	Data Quality Level
AA	Above average
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NOMENCLATURE

D	*Destruction* of toxic substance
A	Onsite release of toxic substance to *Air*
C	*Creation* of toxic substance
DIS	Onsite or offsite *disposal* of toxic substance
U	*Use* of a toxic substance
I	*Input* of a toxic substance from another process
O	Output of a toxic substance to another process
t	*Transfer* of a toxic substance within this process

Xylene Balance
Guelph facility

Input				Process	Output				
Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Item	Item	Quantity (kg/yr)	Estimation Method Used	Data Quality	Comments
U Xylene in Paint	11,452	Engineering Estimate	AA	Paint Booth	P Contained in Product	0		H	Volatile material
					A Onsite releases to air[1]	11,452	Engineering Estimate	AA	
					DIS Offsite recycling	0			
					Sub-total	**11,452**			
U Xylene in Chemicals	1,416				P Contained in Product	0		H	Volatile material
					A Onsite releases to air[2]	1,416	Engineering Estimate	AA	
					DIS Offsite recycling	0			
					Sub-total	**1416**			
Total Inputs	**12,868**				**Total Outputs**	**12,868**			
Input/Output Balance	**0**		**Reasonable?**	Yes					

[1,2]Assumption: 100% of Xylene contained in paint is volatilized onsite (released to air).

DATA QUALITY LEVEL

DQL	Data Quality Level
AA	Above average
A	Average

NOMENCLATURE

D	*Destruction* of toxic substance
A	Onsite release of toxic substance to *Air*
C	*Creation* of toxic substance
DIS	Onsite or offsite *disposal* of toxic substance
U	*Use* of a toxic substance
I	*Input* of a toxic substance from another process
O	Output of a toxic substance to another process
t	*Transfer* of a toxic substance within this process

Paint Usage in 2011
Guelph Facility

Paint	US Gallon	Litres	Specific Gravity[1]	Kg	Xylene %w/w[†]	Xylene kg	Ethyl Benzene %w/w	Ethyl Benzene kg	Titanium Dioxide %w/w	Titanium Dioxide kg	Talc %w/w	Talc kg	Alkylarylalkoxylate %w/w	Alkylarylalkoxylate kg	2-Butanol %w/w	2-Butanol kg	DB Glycol Ether %w/w	DB Glycol Ether kg	Limestone %w/w	Limestone kg	Triehylamine %w/w	Triehylamine kg	Zinc Phosphate %w/w	Zinc Phosphate kg	2-butoxyethanol %w/w	2-butoxyethanol kg
Yellow Dip	6,863	25,976	1.105	28,704	0%	0	0.0%	0	7.5%	2,153	0	0	0.6%	172	3.83%	1099	7.5%	2,153	20%	5,741	1.29%	370	3%	861	13.11%	3,763
Black Dip	0	0		0		0		0				0		0		0		0		0		0		0		
Grey Dip	0	0		0		0		0		0		0		0		0		0		0		0		0		
Yellow Spray	4,761	18,020	1.105	19,913	46.22%	9,204	4.44%	884	3%	597	7.5%	1,493		0	0.48%	96		0		0		0		0		
Black Spray	50	189		0		0		0		0		0		0		0		0		0		0		0		
Grey Spray	1,247	4,720	1.038	4,899	45.89%	2,248	9.84%	482	3%	147	7.5%	367		0	0.35%	17		0		0		0		0		
	12,921	**48,906**		**53,516**		**11,452**		**1,366**		**2,897**		**1,861**		**172**		**1,212**		**2,153**		**5,741**		**370**		**861**		**3,763**

Chemicals Used

Xylene	425	1,609	0.8802	1,416	100%	1,416
	425	**1,609**		**1,416**		**1,416**

[1]MSDS

[†]Average Value (Range: 30-60% w/w) - Source: MSDS

Selkirk Facility

Paint	US Gallon	Litres	Specific Gravity[1]	Kg	Xylene %w/w[†]	Xylene Total kg	Ethyl Benzene %w/w	Ethyl Benzene kg	Titanium Dioxide %w/w	Titanium Dioxide kg	Talc %w/w	Talc kg	Alkylarylalkoxylate %w/w	Alkylarylalkoxylate kg	2-Butanol %w/w	2-Butanol kg	DB Glycol Ether %w/w	DB Glycol Ether kg	Limestone %w/w	Limestone kg	Triehylamnine %w/w	Triehylamnine kg	Zinc Phosphate %w/w	Zinc Phosphate kg	2-butoxyethanol %w/w	2-butoxyethanol kg
Yellow Dip	0	0	1.105	0	0%	0																				
Black Dip	0	0		0		0																				
Grey Dip	0	0		0		0																				
Yellow Spray	16,777	63,501	1.105	70,169	45%	31,576	4.44%	3115.483	3%	2105	7.5%	5,263		0	0.48%	337		0		0		0		0		
Black Spray	0	0		0		0																				
Grey Spray	0	0	1.038	0	45%	0																				
	16,777	**63,501**		**70,169**		**31,576**		**3115.48**		**2105.1**		**5263**		**0.00**		**336.809**		**0**		**0**		**0**		**0**		**0**

Chemicals Used

Xylene	0	0	0.8802	0	100%	0
	0	**0**		**0**		**0**

[1]MSDS

[†]Average Value (Ref. MSDS).

Average % Composition Of Elements in Steel
Guelph Facility

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	B	N	Sn	Ti	Pb	V	Al
spec																
15B27 B	0.27	1.2	0.1	0.11	0.3	0.26	0.09	0.35	0.028	0.0035						
50B27 B	0.26	1.18	0.12	0.007	0.27	0.32	0.1	0.33	0.029	0.0034						
1816 B	0.26	1.17	0.012	0.008	0.27	0.33	0.1	0.33	0.02	0.0041	0.0055	0.01	0.05	0.01		
679 B	0.32	0.9	0.02	0.009	0.27	0.31	0.1	0.16	0.02	0.0036	0	0.009	0.056	0.003		
15B30 B	0.31	0.98	0.014	0.01	0.27	0.3	0.09	0.16	0.024	0.0039						
670 P	0.31	1.24	0.015	0.008	0.29	0.04	0.02	0.27	0.06	0.0016		0.002	0.047		0.005	0.045
TCI-6 P	0.31	1.24	0.015	0.008	0.29	0.04	0.02	0.27	0.06	0.0016		0.002	0.047		0.005	0.045
808 P	0.31	1.17	0.009	0.004	0.25	0.03	0.01	0.16	0.03	0.0018		0.002	0.047		0.006	0.046
TCI-8 P	0.31	1.17	0.009	0.004	0.25	0.03	0.01	0.16	0.03	0.0018		0.002			0.006	0.046
Algo 500 P	0.3	0.71	0.013	0.003	0.28	0.05	0.49	0.52	0.25	0.0018					0.003	0.023
Algo 450 P	0.23	1.1	0.012	0.006	0.21	0.11	0.22	0.31	0.45	0.0015					0.006	0.038
1816 TS	0.25	1.27	0.21	0.025	0.25	0.03	0.3	0.4	0.02	0.0021			0.033			0.027
1812 TS	0.26	1.2	0.02	0.024	0.29	0.01	0.021	0.26	0	0.0001			0.002			0.038
1813 TS	0.27	1.2	0.012	0.022	0.28	0.01	0.02	0.11	0.01	0.002			0.053			0.039
1998 TS	0.26	1.14	0.016	0.003	0.25	0.01	0.02	0.47	0.01	0.0022			0.042			0.036
Average %	**0.282**	**1.124667**	**0.0398**	**0.0167**	**0.268**	**0.1253**	**0.1074**	**0.284**	**0.0694**	**0.0023**	**0.0028**	**0.0045**	**0.0419**	**0.0065**	**0.0052**	**0.0383**
Contained in shipped metal	54.09	215.72	7.63	3.21	51.41	24.04	20.60	54.47	13.31	0.45	0.53	0.86	8.03	1.25	0.99	7.35	**tonnes/year**
Contained in Scrapped metal	6.01	23.97	0.85	0.36	5.71	2.67	2.29	6.05	1.48	0.05	0.06	0.10	0.89	0.14	0.11	0.82	**tonnes/year**
Cotained in total metal used	60.10	**239.69**	8.48	3.57	57.12	26.71	22.89	60.53	14.79	0.50	0.59	0.96	8.93	1.39	1.10	8.16	**tonnes/year**

19,181 Total Weight shipped in tonnes for 2011

2,131 Total Weight scrapped in tonnes for 2011 (10% material is scrapped)

21,312 Total Weight used in tonnes for 2011

Attachment B

DIRECT & INDIRECT COSTS

Item	Units	Cost
Xylene	($/L)	$4.20
Yellow spray	($/L)	$4.11
Black Spray	($/L)	$5.23
Grey spray	($/L)	$4.60
LTX517 tip	$/ea.	$40.20
Scrap	$/kg	$1.04
Labour	($/hr)	$68.00

METALS (m)

Reduction Category		Reduction Option(s)	Estimated Reductions											
			Manganese		Copper		Nickel		Chromium		Lead		Vanadium	
			(kg/yr)	(%)	(kg/yr)	(%)	(kg/yr)	(%)	(kg/yr)	(%)	(kg/yr)	(%)	(kg/yr)	(%)
1 Material or feedstock substitution	a	None b/c chemistry ranges of steel is specified by customer	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
2 Product design or reformulation	a	Go to single row of holes on Volvo parts instead of two rows	1,643	1%	183	1%	157	1%	415	1%	9	1%	8	1%
3 Equipment or process modification	a	None b/c all equipment is currently optimized to reduce scrap	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
4 Spill & leak prevention	a	None b/c all scrap is collected in bins and sent for offsite recycling	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
5 On-site reuse or recycling	a	Reuse drop-offs to make other parts	12	0.01%	1	0.01%	1	0.01%	3	0.01%	0.1	0.01%	0.1	0.01%
6 Improved inventory or purchasing techniques	a	Purchase custom plate sizes to minimize scrap	78	0.03%	9	0.03%	7	0.03%	20	0.03%	0.4	0.03%	0.4	0.03%
7 Training or improved operating practices	a	Track off-spec product and have incident reports to identify root causes	575	0.24%	64	0.24%	55	0.24%	145	0.24%	3	0.24%	3	0.24%

Total Metals Used or Created in 2011 = 21,312,222 kg
Manganese = 239,691 kg
Copper = 26,711 kg
Nickel = 22,889 kg
Chromium = 60,527 kg
Lead = 1,385 kg
Vanadium = 1,101 kg

Technical Analysis of Options: Metals

Opportunity	Technical Analysis Considerations							Presently Technically feasible?
	Status or Reliability of Technology	Success Rate of Opportunity	Impact on Quality or Productivity	Noise Level	Multi-media Considerations	Training Requirements	Space Requirements	
2a Go to single row of holes on Volvo parts instead of two rows	Good	Medium	Requires approval from Vovlvo	-	-	Operator training	-	No
5a Reuse drop-offs to make other parts	-	High	None	-	-	Operator training	-	Yes
6a Purchase custom plate sizes to minimize scrap	Good	High	None	-	-	New nesting patterns	-	Yes
7a Track off-spec product and have incident reports to identify root causes	-	Medium	None	-	-	Operator training	-	Yes

Associated reductions:

Manganese =	665 kg/yr	0.3%
Copper =	74 kg/yr	0.3%
Nickel =	64 kg/yr	0.3%
Chromium =	168 kg/yr	0.3%
Lead =	4 kg/yr	0.3%
Vanadium =	3 kg/yr	0.3%

ECONOMIC ANALYSIS OF OPTIONS FOR METALS

Reduction Option(s)	Estimated Cost ($)	Estimated Savings ($/yr)	Payback (years)
5a Reuse drop-offs to make other parts	$2,720.00	$1,104.16	2.46
6a Purchase custom plate sizes to minimize scrap	$5,440.00	$7,169.65	0.76
7a Track off-spec product and have incident reports to identify root causes	$2,720.00	$53,000	0.05
TOTALS	**$10,880.00**	**$61,273.34**	0.18

Notes:

Avg. metal purchase cost = $1.04 per kg

5a Assumes 40 hrs @ $68/hr to implement system for reuse.

6a Assumes 80 hrs @ $68/hr.

7a Estimated cost assumes 40 hours @ $68/yr to set up tracking system.

XYLENE (x)

Reduction Category		Reduction Option(s)	Estimated Reductions (kg/yr)	(%)
1 Material or feedstock substitution	a	Switch to powder coating process	12,868	100%
2 Product design or reformulation	a	Use lower VOC paints	5,726	44%
	b	Switch to water-based paints	12,868	100%
	c	Switch to epoxy-based paint	12,868	100%
3 Equipment or process modification	a	Switch to HVLP system	1,158	9%
4 Spill & leak prevention	a	Use caps on gun holding tubes	31	0.2%
5 On-site reuse or recycling	a	Recycle onsite the spent xylene used in black line cleaning	16	0.1%
	b	Spray xylene used to flush black line guns into storage tubes to keep guns soft	174	1%
6 Improved inventory or purchasing techniques	a	Switch to supplier with lower VOC paint formulation	5,726	44%
7 Training or improved operating practices	a	Spray training for operators to minimize overspray	1,544	12%
	b	Add minimum required xylene to thin grey paint	395	3%
	c	Test spray tips for wear every month & replace to minimize paint consumption	3,217	25%

Total Xylene Used or Created in 2011 = 12,868 kg

Notes:

2 Enginering estimate assumes a 50% reduction in xylene in the paint formulation.

3 Enginnering estimate assumes a 9% increase in paint transfer (40% to 49%) as per EPA article: http://www.epa.gov/dfe/pubs/auto/trainers/sprayandsave.htm

4 Engineering estimate assumes 36 kg/yr total emissions from 3 tubes @ 6" dia. and that 85% of these emissions could be reduced with lids.
Reference: http://www.p2pays.org/ref/17/ttn/volume02/ii08.pdf (Surface Evaporation - Page 8.4-20)

5a Engineering estimate assumes 0.5L of xylene @ 3x/mo is currently used to keep black lines clean (since they are seldom used).

b Engineering estimate assumes 4L/wk @ 50 wks/yr of xylene is currently used to keep guns soft.

7a Engineering estimate assumes a 12% increase in paint transfer as per EPA article: http://www.epa.gov/dfe/pubs/auto/trainers/sprayandsave.htm

b Engineering estimate assumes a reduction in the initial 5 gallons of xylene added to grey paint twice per month (454 L/year at 0.87 mg/L).

c Engineering estimate assumes a 25-30% increase in paint consumption through worn orifices as per equipment supplier (Anadale).

Technical Analysis of Options: Xylene

Opportunity	Technical Analysis Considerations								Presently Technically feasible?
	Status or Reliability of Technology	Success Rate of Opportunity	Impact on Quality or Productivity	Noise Level	Multi-media Considerations	Training Requirements	Space Requirements	General Comments	
1 Switch to powder coating process	Good	Likely high if customers accept change	May have some impact on quality (durability, colour match)	Medium to high	Would need dryer & separate enclosed spray room with exhaust	High	Currently not enough space	Looked at 5 years ago, but too expensive ($750k to convert dip line to powder system)	No
2a Use lower VOC paints	Currently limited proven options for industrial coatings	Low according to All Colour "VOC - Legislation Update" document	Potentially inferior durability, longer drying times	n/a	Dryer & exhaust may be required	Medium	Not enough space for dryer	Currently no feasible lower VOC formulation available from All Colour	No
2b Switch to water-based paints	Fairly good	High	Would need 8-hour storage for drying or a dryer	n/a	Dryer & exhaust may be required	Medium	Currently not enough space for dryer or 8-hour storage	None	No
2c Switch to epoxy-based paint	Good	Medium	Slower process (mixing is required), hardens quickly	n/a	May require enclosed room & exhaust	High	Likely none	None	No
3 Switch to HVLP system	High	Medium (trials required)	Likely none	n/a	None	Medium	None	None	No
4 Use caps on gun holding tubes	High	High	Likley none	n/a	None	Low	None	None	Yes
5a Recycle onsite the spent xylene used in black line cleaning	Fairly good	High, but only applies to black line (minimal usage)	Minor	n/a	Still exhaust, may require additional PPE	High	Likely none	May present explosion hazard, volumes likely too low to justify still	No
5b Spray xylene used to flush black line guns into storage tubes to keep guns soft	n/a	High	Minor	n/a	None	Medium	None	Trial is recommended	Yes
6a Switch to supplier with lower VOC paint formulation	n/a	High if alternate can be found	Likely none	n/a	None	None	None	Lower VOC formulations for industrial coatings are not currently feasible	No
7a Spray training for operators to minimize overspray	High	High	Increased quality & productivity	n/a	None	High	None	None	Yes
7b Add minimum required xylene to thin grey paint	n/a	High	May impact paint quality	n/a	Less handling of xylene	Low	None	Trial recommended to ensure paint quality is maintained	Yes
7c Test spray tips for wear every month & replace to minimize paint consumption	High	Medium	May slightly slow paint application due to narrower orifices	n/a	None	Medium	None	Trial recommended to quanitfy actual savings	Yes

Xylene = 5361 kg/yr 42%

ECONOMIC ANALYSIS OF OPTIONS FOR XYLENE

Reduction Option(s)	Estimated Cost ($)	Estimated Savings ($/yr)	Payback (years)
4 Use caps on gun holding tubes	$150.00	$128	1.17
5b Spray xylene used to flush black line guns into storage tubes to keep guns soft	$34.00	$174	0.2
7a Spray training for operators to minimize overspray	$272.00	$12,781	0.02
7b Add minimum required xylene to thin grey paint	$0.00	$1,660	Immediate
7c Test spray tips for wear every month & replace to minimize paint consumption	$2,263.20	$26,627	0.08
TOTALS	**$2,719.20**	**$41,370.19**	0.07

Notes:

Xylene purchase cost = $4.20 per L

Total paint usage = 22,930 L

4 Assumes caps are $50 ea. (x3)

5b Assumes 10 minutes per gun at $68/hr.

7a Assumes spray training available at no cost from Allcolour, training of four employees for 1 hour @ $68/hr.

7c Assumes annual cost for replacing 3 tips per month (may be less frequent after in-plant study).

Average % Composition Of Elements in Steel
Guelph Facility

	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	B	N	Sn	Ti	Pb	V	Al
spec																
15B27 B	0.27	1.2	0.1	0.11	0.3	0.26	0.09	0.35	0.028	0.0035						
50B27 B	0.26	1.18	0.12	0.007	0.27	0.32	0.1	0.33	0.029	0.0034						
1816 B	0.26	1.17	0.012	0.008	0.27	0.33	0.1	0.33	0.02	0.0041	0.0055	0.01	0.05	0.01		
679 B	0.32	0.9	0.02	0.009	0.27	0.31	0.1	0.16	0.02	0.0036	0	0.009	0.056	0.003		
15B30 B	0.31	0.98	0.014	0.01	0.27	0.3	0.09	0.16	0.024	0.0039						
670 P	0.31	1.24	0.015	0.008	0.29	0.04	0.02	0.27	0.06	0.0016		0.002	0.047		0.005	0.045
TCI-6 P	0.31	1.24	0.015	0.008	0.29	0.04	0.02	0.27	0.06	0.0016		0.002	0.047		0.005	0.045
808 P	0.31	1.17	0.009	0.004	0.25	0.03	0.01	0.16	0.03	0.0018		0.002	0.047		0.006	0.046
TCI-8 P	0.31	1.17	0.009	0.004	0.25	0.03	0.01	0.16	0.03	0.0018		0.002			0.006	0.046
Algo 500 P	0.3	0.71	0.013	0.003	0.28	0.05	0.49	0.52	0.25	0.0018					0.003	0.023
Algo 450 P	0.23	1.1	0.012	0.006	0.21	0.11	0.22	0.31	0.45	0.0015					0.006	0.038
1816 TS	0.25	1.27	0.21	0.025	0.25	0.03	0.3	0.4	0.02	0.0021			0.033			0.027
1812 TS	0.26	1.2	0.02	0.024	0.29	0.01	0.021	0.26	0	0.0001			0.002			0.038
1813 TS	0.27	1.2	0.012	0.022	0.28	0.01	0.02	0.11	0.01	0.002			0.053			0.039
1998 TS	0.26	1.14	0.016	0.003	0.25	0.01	0.02	0.47	0.01	0.0022			0.042			0.036
Average %	**0.282**	**1.124667**	**0.0398**	**0.0167**	**0.268**	**0.1253**	**0.1074**	**0.284**	**0.0694**	**0.0023**	**0.0028**	**0.0045**	**0.0419**	**0.0065**	**0.0052**	**0.0383**
Contained in shipped metal	54.09	215.72	7.63	3.21	51.41	24.04	20.60	54.47	13.31	0.45	0.53	0.86	8.03	1.25	0.99	7.35
Contained in Scrapped metal	6.01	23.97	0.85	0.36	5.71	2.67	2.29	6.05	1.48	0.05	0.06	0.10	0.89	0.14	0.11	0.82
Cotained in total metal used	60.10	**239.69**	8.48	3.57	57.12	26.71	22.89	60.53	14.79	0.50	0.59	0.96	8.93	1.39	1.10	8.16

19,181 Total Weight shipped in tonnes for 2011

2,131 Total Weight scrapped in tonnes for 2011 (10% material is scrapped)

21,312 Total Weight used in tonnes for 2011

Paint Usage in 2011
Guelph Facility

Paint	US Gallon	Litres	Specific Gravity[1]	Kg	Xylene %w/w[†]	Xylene kg	Ethyl Benzene %w/w	Ethyl Benzene kg	Titanium Dioxide %w/w	Titanium Dioxide kg	Talc %w/w	Talc kg	Alkylarylalkoxylate %w/w	Alkylarylalkoxylate kg	2-Butanol %w/w	2-Butanol kg	DB Glycol Ether %w/w	DB Glycol Ether kg	Limestone %w/w	Limestone kg	Triehylamine %w/w	Triehylamine kg	Zinc Phosphate %w/w	Zinc Phosphate kg	2-butoxyethanol %w/w	2-butoxyethanol kg
Yellow Dip	6,863	25,976	1.105	28,704	0%	0	0.0%	0	7.5%	2,153	0	0	0.6%	172	3.83%	1099	7.5%	2,153	20%	5,741	1.29%	370	3%	861	13.11%	3,763
Black Dip	0	0		0		0		0				0		0		0		0		0		0		0		
Grey Dip	0	0		0		0		0		0		0		0		0		0		0		0		0		
Yellow Spray	4,761	18,020	1.105	19,913	46.22%	9,204	4.44%	884	3%	597	7.5%	1,493		0	0.48%	96		0		0		0		0		
Black Spray	50	189		0		0		0		0		0		0		0		0		0		0		0		
Grey Spray	1,247	4,720	1.038	4,899	45.89%	2,248	9.84%	482	3%	147	7.5%	367		0	0.35%	17		0		0		0		0		
	12,921	**48,906**		**53,516**		**11,452**		**1,366**		**2,897**		**1,861**		**172**		**1,212**		**2,153**		**5,741**		**370**		**861**		**3,763**

Chemicals Used

Xylene	425	1,609	0.8802	1,416	100%	1,416	
	425	**1,609**		**1,416**		**1,416**	454.2

[1]MSDS

[†]Average Value (Range: 30-60% w/w) - Source: MSDS

Selkirk Facility

Paint	US Gallon	Litres	Specific Gravity[1]	Kg	Xylene %w/w[†]	Xylene Total kg	Ethyl Benzene %w/w	Ethyl Benzene kg	Titanium Dioxide %w/w	Titanium Dioxide kg	Talc %w/w	Talc kg	Alkylarylalkoxylate %w/w	Alkylarylalkoxylate kg	2-Butanol %w/w	2-Butanol kg	DB Glycol Ether %w/w	DB Glycol Ether kg	Limestone %w/w	Limestone kg	Triehylamnine %w/w	Triehylamnine kg	Zinc Phosphate %w/w	Zinc Phosphate kg	2-butoxyethanol %w/w	2-butoxyethanol kg
Yellow Dip	0	0	1.105	0	0%	0																				
Black Dip	0	0		0		0																				
Grey Dip	0	0		0		0																				
Yellow Spray	16,777	63,501	1.105	70,169	45%	31,576	4.44%	3115.483	3%	2105	7.5%	5,263		0	0.48%	337		0		0		0		0		
Black Spray	0	0		0		0																				
Grey Spray	0	0	1.038	0	45%	0																				
	16,777	**63,501**		**70,169**		**31,576**		**3115.48**		**2105.1**		**5263**		**0.00**		**336.809**		**0**		**0**		**0**		**0**		**0**

Chemicals Used

Xylene	0	0	0.8802	0	100%	0	
	0	**0**		**0**		**0**	

[1]MSDS

[†]Average Value (Ref. MSDS).

Emission Estimation of xylene from gun holding tubes (Surface Evaporation)

Tube dimensions (estimate)	Diameter	6	Inch
	Height	6.0	Inch

Emission Estimation for xylene from paint gun holding tubes

E_X (Emission of mixed solvent, lb/yr)=	$(M_x*K_x*A*P_x*3600*H/(R*T))*B$

K_x (Gas-phase mass transfer coefficient for mixed solvent, ft/sec) =	0.00438*U^0.78*(18/M_x)^(1/3)

Given,

Batch Time	Hrs	24	H	
No. of Batches	Batches/yr	365	B	
Average wind speed	miles/hr	0.1	U	*Assumed*
Average Temperature	Deg F	72	T	532 Deg R
Surface Area of exposure or opening of the tube	ft2	1.77	A	*x3 tubes*
Molecular weight of xylene	lb/lb-mole	106.16	M_x	
Partial vapour pressure of xylene at 72 Deg F	psia	0.19	P_x	
Universal Gas Constant at 1 atmosphere of pressure	psia-ft3/Deg R-lb Mole	10.73	R	

K_x =	0.000402 ft/sec

E_x =	79.2	lb/yr	
or,	36.0	kg/yr	
Emission of Xylene	**36**	**kg/yr**	

This means,

98.61	gm/day	
118.81	cm3/day	*(Sp. Gr. of mixed solvent = 830 kg/m3)*
118.81	mL/day	

Reference: http://www.p2pays.org/ref/17/ttn/volume02/ii08.pdf (Surface Evaporation - Page 8.4-20)

Emission Rate (Calculated)

20.38	kg/ft2/yr
219.27	kg/m2/yr
0.42	g/m2/min