BLOOM ON-SITE TECHNICAL ASSISTANCE PROGRAM FOR MANUFACTURERS

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» Pollution Prevention Case Study

Cast Iron Auto Parts

COMPANY OVERVIEW

This case study highlights the pollution prevention, toxics reduction, and other cost saving opportunities identified at an Ontario-based manufacturer of cast iron auto parts, through its participation in The Bloom Centre for Sustainability (BLOOM) On-site Technical Assistance Program for Manufacturers.

P2/TR ASSESSMENT PROCESS

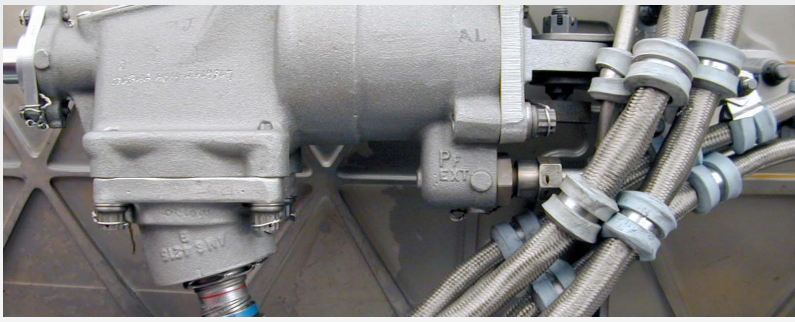
The manufacturer retained a pollution prevention consultant, Enviro-Stewards, to complete a comprehensive pollution prevention and toxics reduction (P2/TR) assessment of its facility. The key driver to undertake the assessment was the reporting and planning requirements for Ontario's *Toxics Reduction Act, 2009* (TRA). Management was also motivated to run their operations more efficiently and sustainably.

Based on in-plant studies and discussion between the consultant and facility staff, potential reduction, reuse, and recycling opportunities were identified. Selected opportunities were then assessed technically and evaluated economically for their feasibility. Finally, an implementation schedule was developed based on payback periods and cost/benefit analysis for each opportunity.

SUMMARY OF FINDINGS

Producing cast iron auto parts involves a number of concurrent and step processes, including core making, moulding, metal melting and pouring, cooling and shakeout. The toxic substance of concern at the facility is cumene hydroperoxide (CHP), a 30 percent constituent of the resin used to bind the sand in the core making process, and a Phase II substance under the TRA and Regulation 455/09.

To make cores, resin is mixed with sand, put into the core box to form the cores and then they are cured in the sutter. Once cured, some cores are washed and all are put through an oven to dry. The cores are then sent to the mould department where they are placed in the centre of the moulds. Molten iron is then poured into the moulds and when the iron is cool, the moulds go through shakeout and the castings are separated from the sand. The sand is collected for on-site reuse or sent off-site to be used as a raw material. Not all of the CHP is destroyed in the core curing process or when molten iron comes into contact with the sand, such that some CHP ends up reused in the plant, collected as dust and sent for disposal as solid waste, and reused off-site.



Most loose sand (both cured and uncured) and all broken cores are collected and sent to an aggregate facility as a raw material. If a dedicated elevator is installed to collect loose, uncured sand, the sand (and associated CHP) can be reused to make more cores. This implementation will reduce process waste sand by 970 tonnes, CHP use by 2 tonnes, and save $130,000 annually with a payback of less than one month.

When cores are cured, sulphur dioxide (SO_2) and nitrogen gas are passed through the cores in the sutter. The SO_2 needs to be removed from the exhaust prior to being discharged to the atmosphere, so the gas is passed through scrubbers. This process creates a large amount of effluent that is sent for disposal as hazardous waste. If a second stage of scrubber is added, this effluent can be turned into a saleable product (sodium bisulphite), the need to pay for disposal of effluent will be eliminated, and natural gas will not be needed to evaporate the effluent. The combined annual savings will be over $200,000 with a payback of seven months.

There were numerous recommendations provided by the consultant to reduce toxics, VOCs, hazardous waste, process waste, water, energy consumption, greenhouse gases and costs, selections of which are highlighted in the table on the following page.

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P2/TR Solutions, Environmental Results and Related Cost Savings

The table below summarizes select P2/TR projects being undertaken by the auto parts manufacturer from the list of recommendations outlined in the assessment report. When implementation is complete, the P2/TR measures are projected to reduce annually:

- **2 tonnes TRA toxics**
- **3 tonnes CEPA toxics**
- **1,200 tonnes hazardous waste**
- **1,200 tonnes process waste**
- **152,000 m³ natural gas**
- **260 MWh electricity**
- **93 tonnes GHGs**
- **36 kilotonnes water**

Total quantified annual savings of **$420,000** and an overall payback of **6 months**.

PROCESS	P2/TR SOLUTIONS	ENVIRONMENTAL REDUCTIONS	COST SAVINGS & PAYBACK
CORE MAKING Targeted Pollutants/Waste: **TRA and CEPA Toxics (cumene hydroperoxide (CHP))** **VOCs** **Hazardous Waste** **Process Waste** **Natural Gas** **GHGs**	Install dedicated elevator to increase reuse of loose uncured sand	2 tonnes/yr TRA and CEPA toxics (CHP) 970 tonnes/yr process waste	Annual savings: $130 K Capital cost: $10 K Payback: < 1 month
	Add second stage scrubber equipment and make sodium bisulphite from scrubber effluent	490 kg/yr CEPA toxics (CACs) 13 kg/yr VOCs 1,200 tonnes/yr hazardous waste (class 212H) 147 tonnes/yr process waste 152,000 m³/yr natural gas 0.3 tonnes/yr GHGs	Annual savings: $210 K Capital cost: $120 K Payback: 7 months
	Mix only quantity of sand needed to make cores	230 kg/yr TRA and CEPA toxics (CHP) 107 tonnes/yr process waste	Annual savings, capital cost and payback TBD
ANCILLARY Targeted Pollutants/Waste: **Process Waste** **Water** **Electricity** **GHGs**	Reuse glycol/water mixture from furnace heat exchanger – install refractometer before storage tank	7 tonnes/yr liquid industrial waste (class 212L) 4,500 tonnes/yr water 9 tonnes/yr GHGs	Annual savings: $23 K Capital cost: $22 K Payback: 11 months
	Upgrade less efficient lighting fixtures	260 MWh/yr electricity 78 tonnes/yr GHGs	Annual savings: $24 K Capital cost: $30 K Payback: 1.3 years
	Replace paper towels with high efficiency hand dryers	3 tonnes/yr solid waste	Annual savings: $10 K Capital cost: $14 K Payback: 1.8 years
	Reuse air compressor cooling water – install temperature regulating valve	31,000 tonnes/yr water 6 tonnes/yr GHGs	Annual savings: $19 K Capital cost: $21 K Payback: 1.1 years
	Install smaller more efficient motors to replace larger motors	Electricity and GHG reductions TBD	Annual savings, capital cost and payback TBD
	Increase rate of recycling of ICI waste by 10%	250 tonnes/yr solid waste	Annual savings, capital cost and payback TBD

Program delivered by: bloom Sustainability Applied™

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