



Resource for Greening Upholstered Household Furniture Manufacturing Pollution Prevention Information

**Version 1.0
December 2010**

DISCLAIMER: This guide is for educational and informational purposes only. The City of Toronto assumes no liability for the accuracy or completeness of these materials. Readers are responsible for ensuring compliance with Toronto's Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423). These materials should not be relied upon as a substitute for legal or professional advice. Readers should seek their own legal or professional advice in regard to their use of the information contained in the guide.

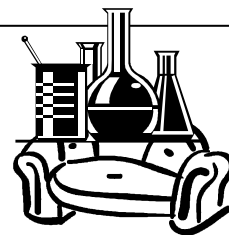


Greening Upholstered Household Furniture Manufacturing

Toronto's ChemTRAC program includes an Environmental Reporting and Disclosure Bylaw (Municipal Code Chapter 423) that requires local businesses to track and report their use and release of 25 priority substances. The ChemTRAC program provides an opportunity for you to identify strategies for improving your environmental performance. Strategies include those that reduce the use and release of the 25 priority substances. Strategies may also reduce the use and release of other chemicals that may have a health and/or an environmental impact. This Greening Resource for Upholstered Household Furniture Manufacturing will help you understand the chemicals that you are using and find ways to reduce or eliminate their use. For additional resources, including a Guide to Reporting visit <http://www.toronto.ca/chemtrac/>.

Upholstered Household Furniture Manufacturing

This sector includes businesses that primarily manufacture upholstered household-type furniture on a stock or custom basis. This manufacturing sector upholsters forms and frames with fabric and/or leather and/or foam and may also manufacture the actual household furniture forms and frames. Couches, dining room chairs, living room chairs, loveseats and ottomans are common examples of upholstered household furniture.



Priority Substances and Other Chemicals of Concern

Toronto Public Health has identified 25 substances of priority health concern that are commonly used and released by businesses in the City of Toronto. As part of ChemTRAC, the Environmental Reporting and Disclosure Bylaw requires businesses and facilities to track and report on any of the listed priority substances that a facility manufactures, uses or releases to the environment if the amounts are equal to or above the reporting limits. In addition to the priority substances, industrial processes commonly use and release other chemicals of concern that may have a health and/or an environmental impact that are not subject to the by-law.

The Upholstered Household Furniture Manufacturing sector uses and produces some of these priority substances and other chemicals of concern. Each of these chemicals may have an impact on human health and/or the environment. Below are the substances that may be used or produced by your facility and its operation. This is not an exhaustive list.

Substances that may be used or produced by your upholstered furniture manufacturing facility and its general operations

Chemical Sources	Priority Substances Tracked by ChemTRAC	Other Chemicals of Concern*
<p>Items such as adhesives, pre-finishing and finishing products, and cleaning products used during the manufacturing process may contain:</p>	<ul style="list-style-type: none"> • 1, 2 – Dichloromethane (methylene chloride) • Formaldehyde • Trichloroethylene • Volatile Organic Compounds (VOCs¹) (such as toluene, xylene, methyl ethyl ketone (MEK), methyl isobutyl ketone (MIBK), methanol, methylene chloride, heptanes, hexane, acetone) • Benzene • Chloroform • Carbon tetrachloride 	<ul style="list-style-type: none"> • Acids, such as: <ul style="list-style-type: none"> - Sulfuric Acid (reducing agent – may not be used extensively in this sector); - Hydrochloric Acid (used for acid cleaning, or pickling, to prepare the surface of metal products); - Nitric Acid (used to form a protective film on metals by immersion into an acid solution, used in etching processes) - Phosphoric Acid (used to clean metal and in plating) • Ammonia (used as a cleaning agent in metal manufacturing) • Copper (e.g. waste metal in solution from copper plating) • Zinc (e.g. used in electroplating and may be used as an undercoat prior to doing further metal finishing/painting/coating step) • Flame retardants in low-density, flexible furniture polyurethane foam (e.g. pentabromodiphenyl ether (pentaBDE), Melamine) • Sulfur Oxides (SO_x) from combustion equipment • Suspended solids in wastewater from water contact with metal finishing machinery • Wastewater with a pH below 7 from mixing with acids used in processing
<p>Paints and other coatings used during the manufacturing process may contain:</p>	<ul style="list-style-type: none"> • Heavy metals: <ul style="list-style-type: none"> - Cadmium - Chromium (hexavalent) (as anti-corrosion and conversion coatings) - Chromium (non-hexavalent) (used for coating metal) - Lead - Nickel - Mercury - Manganese - Particulate Matter² (PM_{2.5}) (depending on how the paint is applied) 	

Chemical Sources	Priority Substances Tracked by ChemTRAC	Other Chemicals of Concern*
Drying, processing, assembly, pre-finishing and finishing action may release these chemicals:	<ul style="list-style-type: none"> • Nitrogen oxides (NO_x) • Particulate Matter (PM_{2.5}) • Polycyclic aromatic hydrocarbons (PAHs) • VOCs 	
Equipment cleaning / maintenance operations may use or produce:	<ul style="list-style-type: none"> • VOCs • Trichloroethylene 	

Notes:

* Chemicals that may have a health and/or an environmental impact.

1. VOCs are emitted as gases from certain solids or liquids. Smog forms when VOCs are combined with nitrous oxides (NO_x) in sunlight.
2. Particulate matter (PM) consists of airborne particles in solid or liquid form (e.g., dust). PM_{2.5} is airborne particulate matter with a mass median diameter less than 2.5 µm.

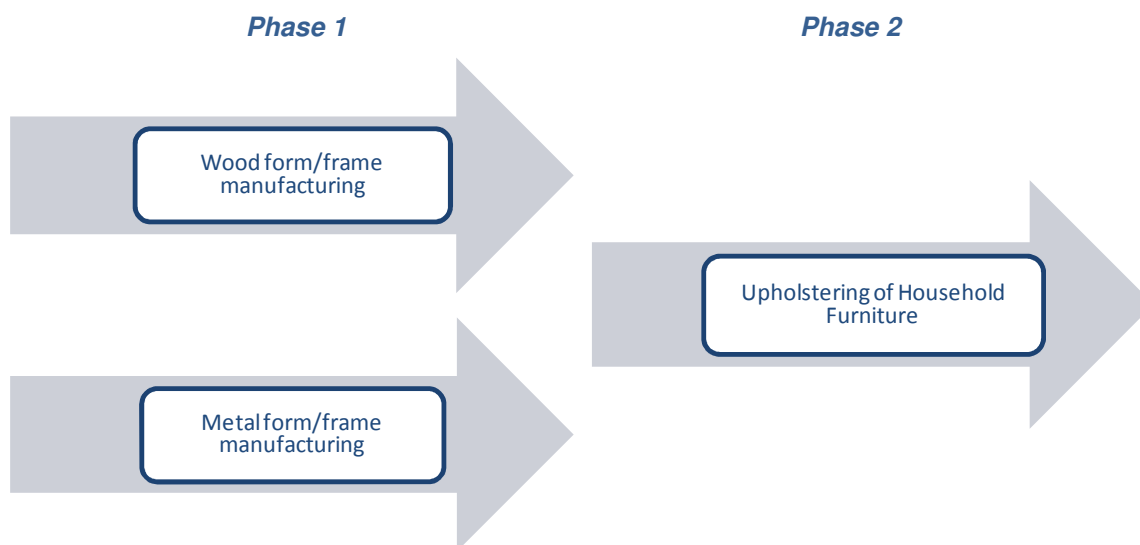
Understanding Your Company's Impacts: Upholstered Household Furniture Manufacturing

In upholstered household furniture manufacturing, there is a range of activities or processes that contribute to the use and/or release of priority substances and other chemicals of concern. The use and release of chemicals depends on the type of process, as well as the materials that are used.

Upholstered household furniture manufacturing generally involves two phases:

- Manufacturing of the household furniture forms and frames (wood and/or metal), and
- Upholstering the forms and frames with fabric and/or leather and/or foam.

Figure 1: Upholstered Household Furniture Manufacturing



There are three primary types of furniture-manufacturing facilities:

- Facilities that upholster pre-made forms and frames
- Facilities that manufacture either wood or metal forms/frames and upholster the furniture, and
- Facilities that manufacture both wood and metal forms/frames and upholster the furniture.¹

This guide outlines the general processes for upholstered furniture manufacturing, indicating where the priority substances and chemicals of concern may be used or released. Your facility may have more specialized processes or only engage in some of these processes; however, it is possible that these priority substances or chemicals of concern may still be present.

¹ Plastic furniture may also be upholstered for household use. The processes for plastic manufacturing are not covered in this guide, but may be found in the Greening of Plastics and Rubber Products Manufacturing Pollution Prevention Information document.

The following diagrams show the raw materials that go into each process associated with each phase of the manufacturing of upholstered household furniture (wood and/or metal furniture manufacturing and upholstery) and the pollution (waste) that comes out of each process. Symbols show whether the wastes typically go to air, landfill, sewer systems and/or treatment facilities (as liquid or hazardous wastes).

Phase 1 Manufacturing

A. Wood Form/Frame Manufacturing

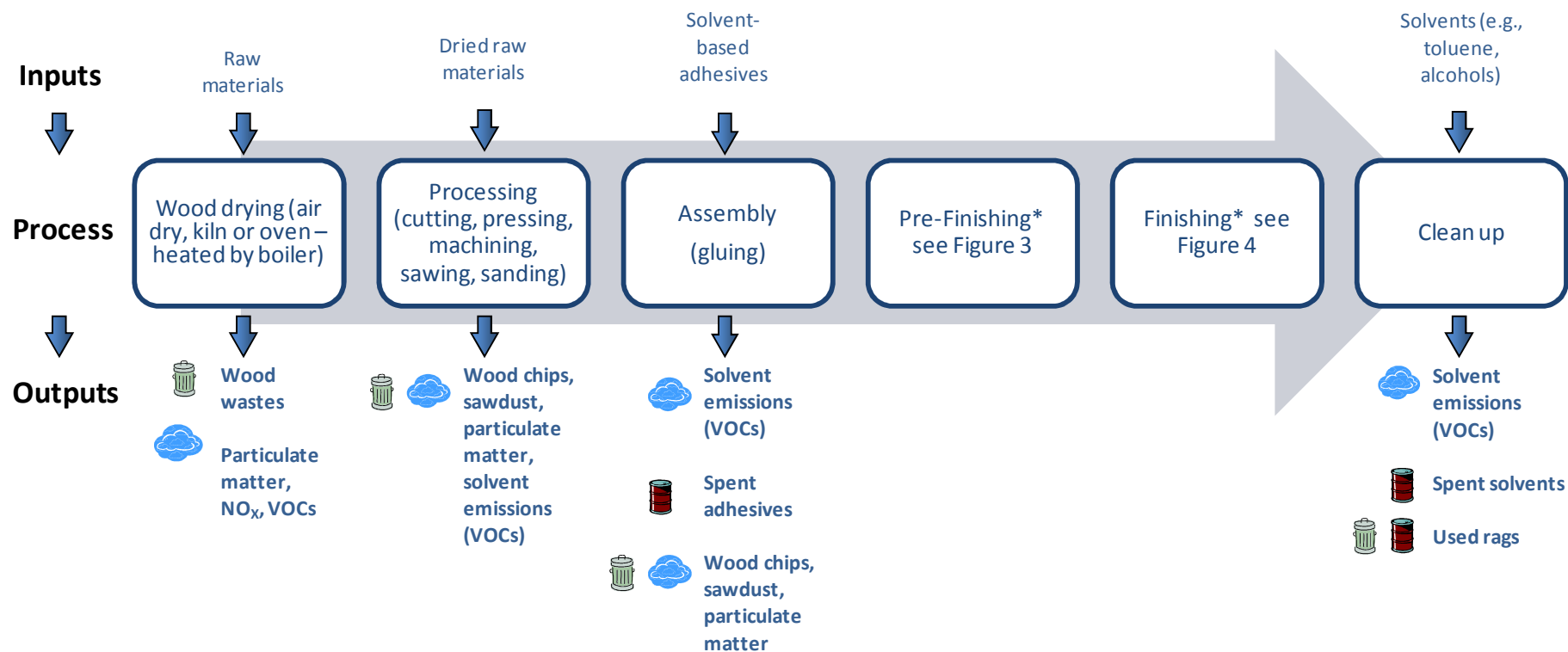
There are three types of wood products typically used in furniture manufacturing: lumber, veneer, and particleboard. The main manufacturing processes for wood household furniture include drying, processing (cutting, pressing, etc.), assembly (gluing), pre-finishing, and other finishing steps (sanding, staining, painting, etc.). Some additional processes are required for veneer and particleboard (e.g. steaming, peeling, stacking, pressing and banding). Process can vary depending on the lumber purchased.

Some facilities purchase dried lumber, while others purchase raw lumber and dry it in a kiln or oven, fired by a boiler. Dried wood is sawed into the approximate dimensions for furniture assembly, which produces wood chips and sawdust wastes. Synthetic or natural glues are then used to glue wood pieces together, contributing solvents to the air. Sawdust is also released during the assembly process, a result of the preliminary sanding of furniture pieces.

During the pre-finishing process, the wood surface is exposed to water and dried. A solution of glue or resin is then applied and allowed to dry. Furniture pieces are sanded again, resulting in wood and glue/resin particles. Derosination may be used to remove excess resins. Spent acetone and ammonia are the primary wastes of this process. Pieces are then sprayed, sponged or dipped into a bleaching agent such as hydrogen peroxide.

The finishing process involves coating, drying, and sanding furniture pieces. Many coating application methods use high concentrations of volatile organic compounds (VOCs). Solvents are used in stains, paints, inks and finishes and can also be used for cleaning machinery and surrounding surface areas.

Figure 2: Wood Furniture Manufacturing Process – Chemical Inputs and Associated Wastes



Symbols used in the flow diagrams





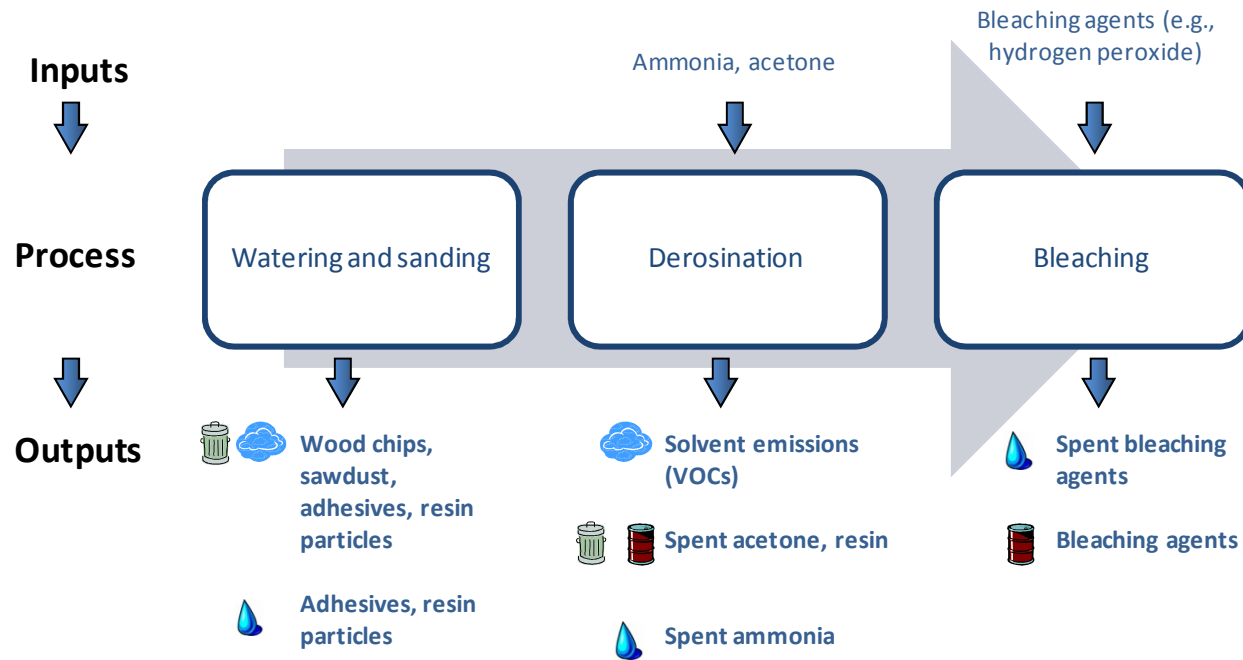
-  Air emissions
-  Landfill wastes
-  Wastewater (sewers)
-  Liquid or hazardous wastes

Figure 3: Pre-Finishing Process of Wood Furniture Manufacturing – Chemical Inputs and Associated Wastes



Symbols used in the flow diagrams





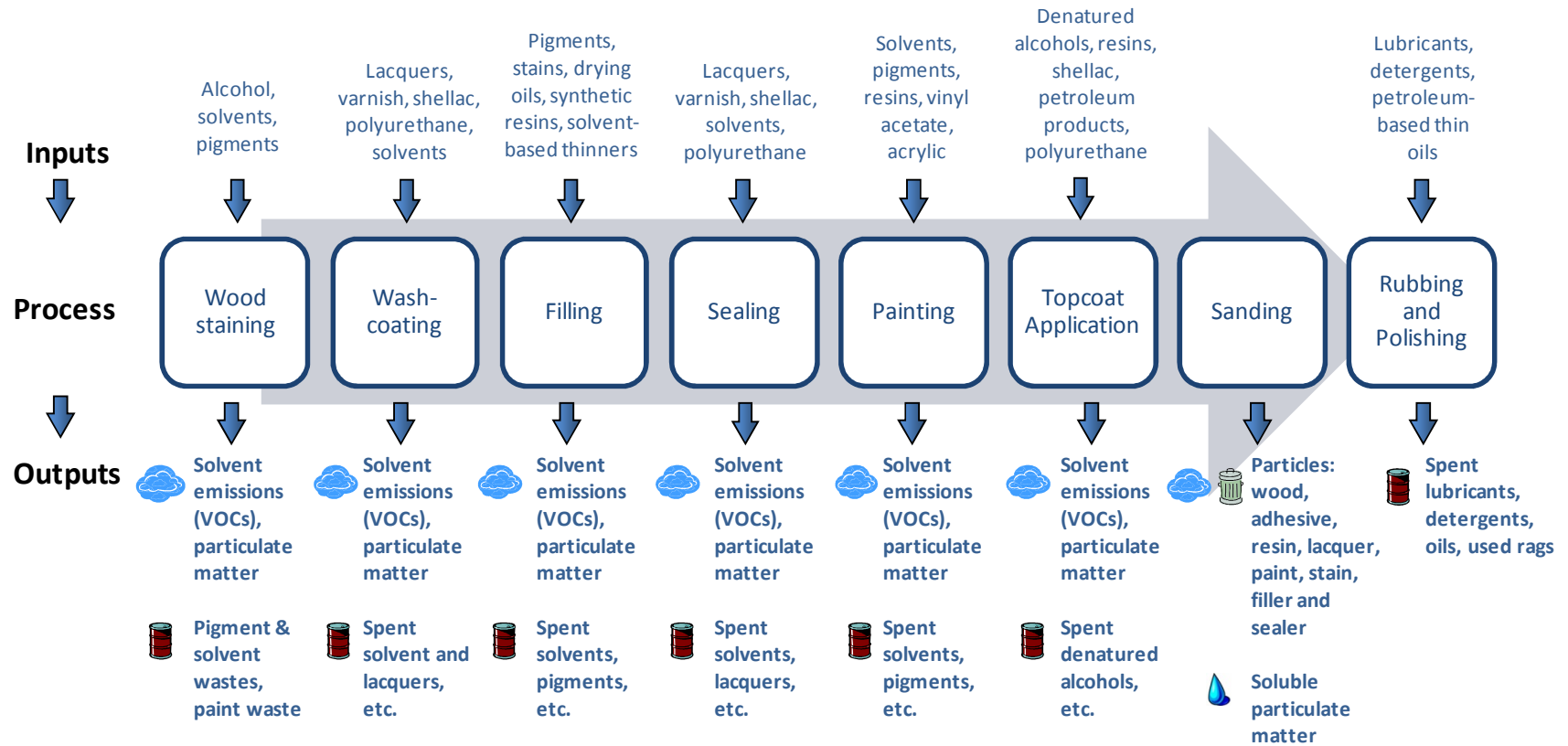




-  Air emissions
-  Landfill wastes
-  Wastewater (sewers)
-  Liquid or hazardous wastes

Figure 4: Finishing Process of Wood Furniture Manufacturing – Chemical Inputs and Associated Wastes



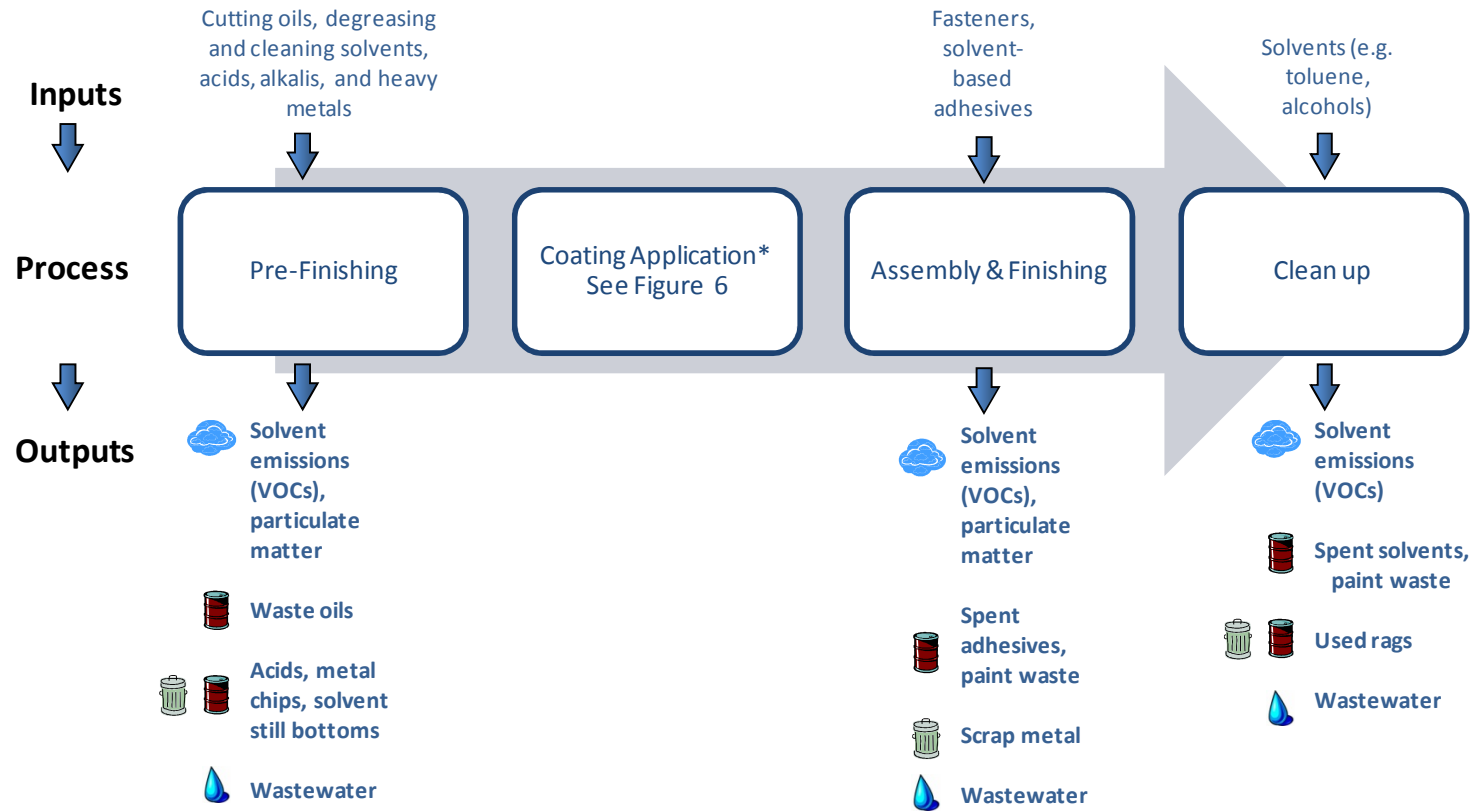
Symbols used in the flow diagrams

-  Air emissions
-  Landfill wastes
-  Wastewater (sewers)
-  Liquid or hazardous wastes

B. Metal Form/Frame Manufacturing

The industrial activities at metal furniture manufacturing facilities tend to be site-specific and depend on the desired metal furniture piece. The main processes in metal household furniture manufacturing include pre-finishing, application of coating, assembly and finishing, and clean-up operations. Typical wastes generated in the manufacturing of metal household furniture include VOCs from the evaporation of organic solvents used during the surface coating operations, spent acid waste from metal finishing, and paint and solvent wastes. The foundry, metalworking, and machining processes for metal are not covered in this guide.

Figure 5: Metal Furniture Manufacturing Process - Chemical Inputs and Associated Wastes



Symbols used in the flow diagrams





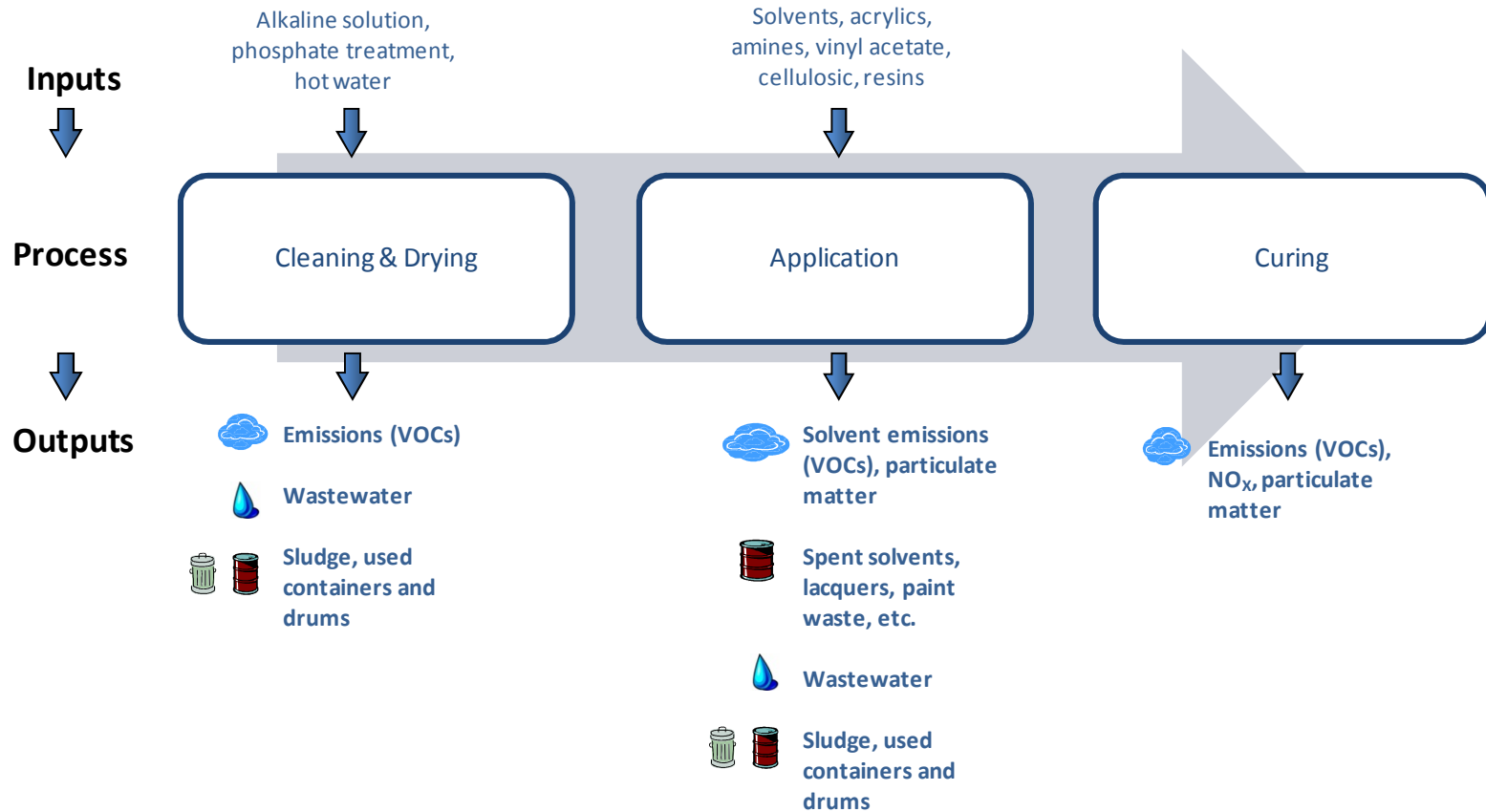




-  Air emissions
-  Landfill wastes
-  Wastewater (sewers)
-  Liquid or hazardous wastes

Figure 6: Spray Coating Process of Metal Furniture Manufacturing - Chemical Inputs and Associated Wastes



Symbols used in the flow diagrams

-  Air emissions
-  Landfill wastes
-  Wastewater (sewers)
-  Liquid or hazardous wastes

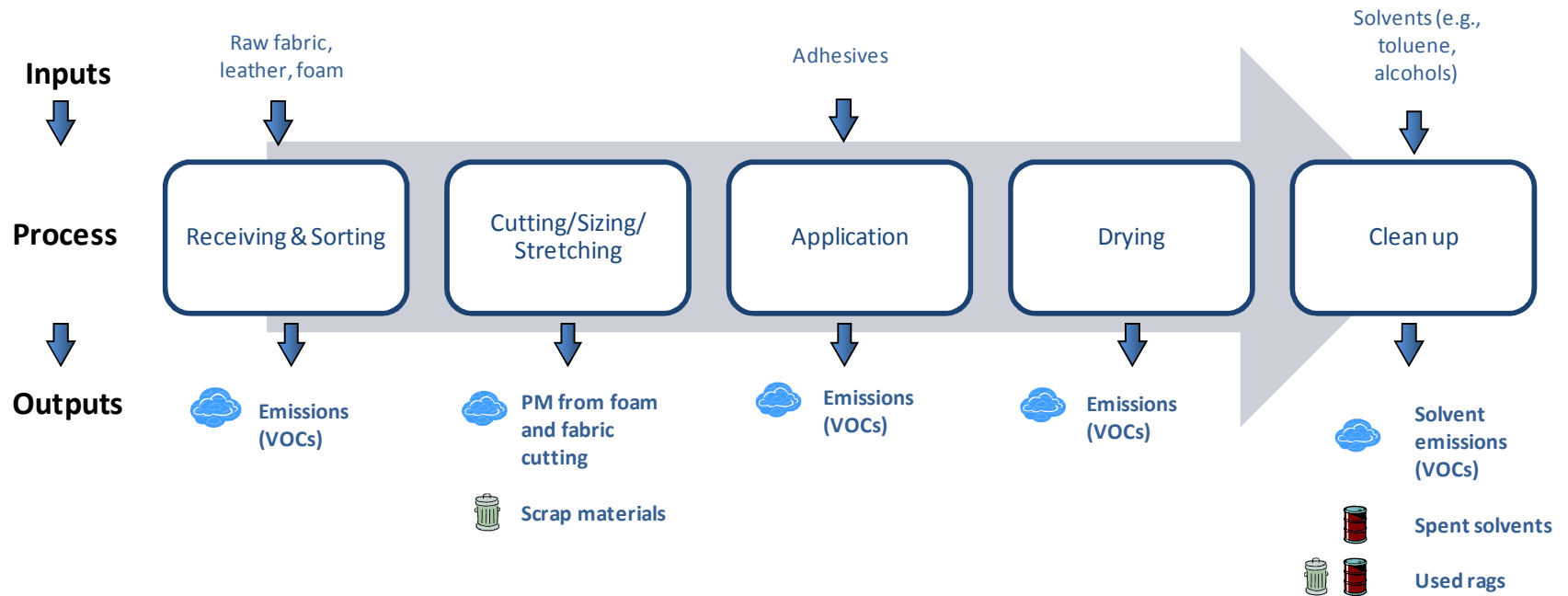
Phase 2

Furniture Upholstery





Once the furniture frames and forms are manufactured, they undergo upholstery and final assembly. Facilities that manufacture upholstered furniture may manufacture their own household furniture forms and/or frames, or they may purchase dried or sized furniture materials from a separate manufacturer.

Upholstery materials are first sized, cut, and stretched and then synthetic or natural glues are used to adhere fabric, leather and/or foam pieces to the forms or frames. Typical wastes generated in the upholstery process include: fugitive dust and vapours from raw materials (e.g., fabric and foam), scrap solid wastes, and VOCs from adhesives. Upholstered furniture manufacturers also may transport, handle, store, and/or process natural and/or synthetic fibers used for the upholstery. Some facilities may add fire protection agents or flame retardants to fabrics. Flame retardants delay ignition and are commonly added to materials used in upholstered furniture, mattresses, bedding, carpet underlay and other articles. Because flame retardants are added to the products rather than chemically bound into them, they can be slowly and continuously released from the products during their manufacture, while in use, or after their disposal. In 2006, the Government of Canada declared polybrominated diphenyl ether flame retardants (PBDEs) "toxic" under the *Canadian Environmental Protection Act, 1999*. The [*Polybrominated Diphenyl Ethers Regulations*](#), which came into effect in 2008, prohibit the manufacturing of specific PBDEs and prohibit the use, sale, offer for sale and import of those specific PBDEs that meet the criteria for virtual elimination. The regulations require the replacement of PBDEs with inherently safer products and processes.

Figure 7: Process for Upholstering of Furniture Forms and Frames - Chemical Inputs and Associated Wastes



Symbols used in the flow diagrams

-  Air emissions
-  Landfill wastes
-  Wastewater (sewers)
-  Liquid or hazardous wastes

Pollution Prevention Steps You Can Take

This resource identifies steps you can take to reduce or eliminate your use of the priority substances and other chemicals that may have a health and/or an environmental impact, and prevent pollution in the Upholstered Household Furniture Manufacturing sector.

The pollution prevention measures identified in this information sheet can reduce costs and/or increase profits.



Pollution Prevention Assessments – A Good First Step

Before you go too far with any given measure, you may want to do a Pollution Prevention Assessment of your business. You may need an outside expert to help. A typical Pollution Prevention Assessment will include mapping process flows, reviewing equipment uses, evaluating the way you use and store chemicals, evaluating the way you use energy, as well as reviewing waste handling practices and discharges. This assessment helps you to identify many pollution prevention opportunities (and any regulatory compliance issues) and decide which steps to take first.

Pollution Prevention - A Key to Good Management

Good management of your chemical purchases, chemical use and waste disposal is very important. You can improve your environmental performance through Pollution Prevention by:




- identifying how you are using the priority substances and other chemicals of concern that may have a health and/or an environmental impact
- figuring out how much you are using of each chemical and estimating the related emissions (see the earlier description for more information on how to estimate chemical use and emissions)
- discussing the options to reduce or to eliminate these chemicals and, where feasible, taking action. Actions could include:
 - using a different product
 - changing how you apply or clean up the chemical product/waste
 - training staff on how best to apply and clean up the chemical product/waste, or
 - installing new technology
 - maintaining equipment to ensure that leaks and general efficiencies are managed
- tracking the amount of chemicals you use and see if it goes down over time, and
- reviewing progress and identifying whether or not you need to make changes to the company's practices and procedures.

Changes you could make in your facility











The following table lists many options to help you reduce or stop using the priority substances and other chemicals of concern in your facility. Some measures will cost more than others, and some will be easier to implement than others. Operators can implement certain measures by making minor changes in their day-to-day approaches; while others will require management to invest in new technologies.




The table provides a quick and simple way to take stock of what measures your business has already put into place and those measures that your business could apply. In completing the table, you are encouraged to prioritize the actions you would take. While it is not exhaustive, the table identifies many pollution prevention opportunities for the Upholstered Household Furniture Manufacturing sector. When assessing the options, please consider your facility-specific conditions and how each option might affect pollution releases to the air, land and water.











The table identifies three general types of options and distinguishes each with a symbol:




	Low-cost, good operating procedures – These measures involve operational and managerial changes that can reduce chemical use. They include simple changes to normal practices, process improvements, as well as training and good housekeeping opportunities. This measure does not need new technology purchases.
	Choosing an alternative chemical – These measures involve replacing traditional products (such as paints and cleaning products) with products that have less harmful properties. The ease and cost of these measures depends on the product and the process used.
	New technology or system – These measures involve the installation of a new system, machine or process. The cost varies depending on the technology / system.












See **More Resources** for a list of helpful resources related to pollution prevention in the Upholstered Household Furniture Manufacturing sector.




Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A			
Wood Furniture Manufacturing Process							
Wood Drying							
Improve combustion equipment efficiency to reduce air emissions.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Switch to a cleaner fuel.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Make sure that dryers are operating efficiently to reduce fuel consumption and reduce air emissions.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Processing							
Reduce particulate matter by using: <ul style="list-style-type: none"> • mechanical collectors • wet scrubbers • electrostatic precipitators • fabric filters 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Assembly							
Use low-VOC glue (e.g., water-based contact adhesives).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use proper gluing techniques (e.g., a conventional air spray gun) to increase transfer efficiency, reduce materials and lower emissions.	 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Pre-Finishing and Finishing							
If paint stripping is required, follow these pollution prevention practices: <ul style="list-style-type: none"> • Use paint strippers with lower dichloromethane content when possible. Talk to your supplier to understand available options. • Strip excess coats of paint with a scraper or sandpaper to reduce the quantity of paint stripper required. • Use paint stripper within the optimal temperature range, usually between 13°C and 18°C, whenever possible. Stripping paint in this temperature range allows for a rapid reaction time and minimizes evaporation. 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L














	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------




Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A	H	M	L
Stain or paint all products the same colour at the same time to reduce cleaning of equipment.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Schedule batch processing of lighter shades of paint before darker shades of paint so that equipment does not need to be cleaned between batches.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Substitute paper/cardboard filters with metal filters for all coating operations to eliminate contaminated paper/cardboard waste.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use low-VOC coatings and cleaning products. Some options include: <ul style="list-style-type: none"> • high solids and waterborne coatings • UV-curable coatings • electrostatically-applied powder coatings • water-based or citrus-based cleaner 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Substitute solvent-based inks and paints with water-based inks and paints and choose solvents with low or no VOC content.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Consider using paints and coatings with less hazardous ingredients (e.g. low heavy metal concentrations).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use High Volume Low Pressure (HVLP) spray guns to increase transfer efficiency, decrease overspray and reduce energy requirements.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use smaller diameter tubing in solvent spray guns to limit the amount of solvent used.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use heat instead of adding solvent to change the viscosity (thickness) for proper application of finishes, stains and adhesives.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Replace water-based paint booth filters with dry filters (dry filters will double paint booth life and allow more efficient treatment of waste water).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L














	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------




Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A	H	M	L
Minimize overspray if using a paint sprayer to reduce VOCs.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Purchase a small solvent distillation unit to recycle paint thinners and solvents.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Train employees on paint application in order to reduce application and associated VOCs.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Ensure that there is adequate ventilation for workers. However, creating major air disturbances in the work area can increase solvent emissions by accelerating evaporation. Ensure that the amount of ventilation is sufficient, but not so excessive as to create major air disturbances. Replace filters regularly.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Metal Furniture Manufacturing Process							
Surface coating application							
Use control devices (e.g., carbon absorbers and thermal or catalytic incinerators) to recover or destroy VOCs.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use low VOC-content coatings (e.g., waterborne coatings, powder coatings, and higher solid coatings).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use a system with increased transfer efficiency (e.g., electrostatic spraying).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Appropriately dispose of paint booth filters if they meet hazardous waste characteristics based on the acceptability limit of the sanitary landfill in your jurisdiction.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Substitute paper/cardboard filters with metal filters for all coating operations to eliminate contaminated paper/cardboard waste.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Paint all products the same colour at the same time to reduce the frequency of equipment cleaning.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Schedule batch processing that allows wastes or residues from one batch to be used as an input for the subsequent batch (e.g., paint lighter to darker shades).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Upholstering Process							













	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------




Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A	H	M	L
Sort upholstery fabrics, leather and foams away from adhesives and other chemicals.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use water-based adhesives that contain no VOCs.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Ensure assembly and drying areas are well ventilated.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Ensure proper storage of adhesives by following manufacturers' recommendations.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Recycle fabrics and foams. Foams can be ground into a powder to produce new foam or be used for other padding products.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use alternatives to brominated flame retardants such as: <ul style="list-style-type: none"> • Substituting non-brominated chemical additives • Substituting product materials that do not require PBDEs • Changing design and construction of products so they are inherently less flammable 	 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Waste, Wastewater and Residue							
Separate solid waste materials (salvageable fabric, leather, foam, wood, metal), from other wastes for reuse and recycling. Mixing wastes may make recycling impossible.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Hazardous waste disposal information is communicated on the Material Safety Data Sheets. Refer to these sheets for further instruction.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Transport hazardous materials and wastes in completely sealed containers to avoid the possibility of fugitive emissions of VOCs into the atmosphere.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Ensure stripping and refinishing areas have: <ul style="list-style-type: none"> • containment • impermeable floors • no direct access to outside the facility. 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
If your facility has a direct sewage discharge, apply an appropriate pre-treatment method (e.g., solids/oil/water separator or DAF unit). Ensure compliance with the City of Toronto's Sewer Use Bylaw if applicable.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Regularly check operation of these units and remove collected contaminants. Dispose collected contaminants at an approved waste management facility.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Maintenance, Management and Good Housekeeping							













	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------

Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A	H	M	L
Purchasing and Inventory							
Review suppliers' products regularly and select the most environmentally-responsible products when available.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Keep an accurate inventory of products used (including chemical name, manufacturer, and MSDS sheet).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Order solvents, paints and other product containers sized for minimum storage time to reduce waste from expired products.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Work with suppliers to take back unused product.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Apply in-house procedures for the safe receipt and handling of chemicals used for cleaning and furniture production.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Record the quantity of solvents used per year. <ul style="list-style-type: none"> Record specific actions implemented to reduce the quantity of solvents used, and record the date the actions were taken. 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Cleaning							
Substitute cleaning products for less harmful cleaning products, such as water-based biodegradable cleaners (no-VOC or low-VOC) or use recyclable solvents.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Keep track of solvent use by process to identify sources of excessive use and waste.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Improve manual cleaning practices: <ul style="list-style-type: none"> Only use as much solvent as needed; do not excessively soak rags or cloths in solvent Use a spray bottle or plunger Reuse shop towels or wipes for repetitive tasks 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Either launder towels on-site to recover solvent, or collect and send to a laundry facility off-site.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Do not allow rags to dry before being placed in collection cans and keep lids tightly closed to stop the VOCs from going into the air.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Regularly maintain and clean machines/equipment to reduce cleaning effort, to extend equipment life, and to reduce solvent use.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use a two-stage cleaning process. Flush equipment with used solvent before cleaning with new solvent.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L




	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------

Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A	H	M	L
Use solvents until they lose their effectiveness, as opposed to when they look dirty.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Solvent recovery							
Store shop towels in a double-bottom drum to allow solvent to be collected.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Recover solvents on-site from towels using the following methods: <ul style="list-style-type: none"> • gravity drain • mechanical wringing • centrifuge • a solvent still 		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Reuse solvents or purchase solvents from a company that will pick up and recycle the spent solvent.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Storage							
Store chemicals according to manufacturer's recommendations.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Do not store hazardous material near floor drains.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Store chemicals according to need, with minimum inventory kept on hand.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Use secondary containment for liquid storage.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Keep solvent, paint, stain, etc. containers tightly covered at all times. Storing liquids properly reduces air emissions and waste products.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Eliminate all open buckets. Provide solvent in easily used, closed containers.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Date containers when opened to ensure you use them before products expire. Recycle containers when empty.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Mark all containers to identify the contents to avoid improper handling or disposal.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Training							

	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------

Pollution Prevention Opportunities	Type of Activity	Is the opportunity in place?			If 'No', indicate the level of priority for action (High, Medium or Low)		
		Yes	No	N/A	H	M	L
Ensure employees are properly trained (WHMIS).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Train workers to follow the standard work procedures (such as cleaning and set up), good housekeeping, and correct material handling methods to make sure all operators follow the same steps to reduce chemical use and waste.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Train spray gun operators in proper spray techniques to minimize coating waste generation.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Spills							
Use spigots and pumps when dispensing new materials and funnels when transferring wastes to storage containers to reduce spillage.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Develop a spill response plan and post it so that it is available for all employees.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Make spill kits available at the chemical storage rooms or racks for easy access.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Train workers in emergency spill response.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Other							
Ask employees for pollution prevention suggestions.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Fleet for Collecting and Delivering Items							
Train fleet drivers to reduce unnecessary idling of vehicles (there is 3 minute idle limit in the City of Toronto under the Idling Control Bylaw).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Consider the purchase of fuel efficient and/or alternative fuel vehicles.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Optimize your collection / delivery routes for increased fuel efficiency.		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L
Keep vehicles well-maintained (e.g., keep tires inflated; purchase 'Energy Conserving' oil; regularly replace oil).		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	H	M	L

Contact us to provide your feedback on this resource or to suggest any additional pollution prevention resources (email chemtrac@toronto.ca or call 416-338-7600).

	Low-cost, good operating procedures		Choosing an alternative chemical		New technology or system
---	-------------------------------------	---	----------------------------------	---	--------------------------

More Resources

American Chemistry Council. Center for the Polyurethane Industry.

http://www.polyurethane.org/s_api/sec.asp?CID=867&DID=3520&dowhat=&css=print

- A website and short guidance piece on reducing and recycling polyurethane.

Canadian Council of Ministers of the Environment (CCME). 2004.

http://www.ccme.ca/assets/pdf/pn_1336_e.pdf

- Guidelines for the reduction of volatile organic compound (VOC) emissions in the wood furniture manufacturing sector were developed under the authority of the Canadian Council of Ministers of the Environment in January 2004. The overall goal of these guidelines is to achieve a maximum reduction of VOC emissions from the wood furniture manufacturing sector in Canada while conforming to the principle of best available technologies economically achievable. These guidelines are meant to provide a basis for provincial and regional governments in developing management instruments to achieve their own specific VOC emission reduction objectives.
- Specific guidance and detailed checklists for: Solvent Management, Returnable and Non-Returnable Containers, Equipment Operation, Maintenance and Cleaning (e.g. Paint System Flushing, Spray Booth Cleaning).

Canadian Pollution Prevention Information Clearing House (CPPIC). 2010. Home Page.

<http://www.ec.gc.ca/cppic/En/index.cfm>

- The CPPIC provides a comprehensive list of pollution prevention resources for Canadian sectors and industries, such as best management practices, fact sheets and sector profiles. Conduct a 'Sector Search' to find resources most relevant to your industry (Furniture Manufacturing is found under the 'Manufacturing' sector link).

Environment Canada. 2010. Code of Practice for the Reduction of Dichloromethane Emissions from the Use of Paint Strippers in Commercial Furniture Refinishing and Other Stripping Applications.

<http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&xml=CBEB9260-8FFA-151D-0224-FA8B54EFDFA7>

- Provides guidance for commercial paint stripping operations regarding actions that can serve to reduce emissions and use of dichloromethane.
- Applies to furniture restoration facilities that use:
 - gel-based paint stripper that is brushed onto the furniture surface; and/or
 - liquid-based paint stripper that is used in a flow-over system.
- Outlines work practices designed to reduce the dichloromethane evaporation rate of the paint stripping formulation.

Environment Canada. 2006. Canadian Pollution Prevention Information Clearinghouse.

<http://www.ec.gc.ca/cppic/En/sectSearch.cfm?sectSearch=step2&catId=4§Id=288>

- The Canadian Pollution Prevention Information Clearinghouse (CPPIC) is Environment Canada's online pollution prevention database and comprehensive resource providing access to pollution prevention information for a number of audiences including industry, educators, community groups, consumers, youth, government, and the general public.
- Website provides an online tool of pollution prevention opportunities in the manufacturing sectors, such as energy conservation, material substitution, re-use and recycling of materials onsite, development of new technology, and changes to operating processes to increase production efficiency.
- The Business Section provides quick access to a wealth of information on a number of environmental-based business concepts, funding programs, Canadian legislation, and Canadian business achievements in pollution prevention, as well as a section specifically tailored to small- and medium-sized enterprises (SMEs).

Environment Canada. 2010. National Pollutant Release Inventory.
<http://www.ec.gc.ca/inrp-npri/default.asp?lang=En&n=4A577BB9-1>

- The National Pollutant Release Inventory (NPRI) is Canada's legislated, publicly accessible inventory of pollutant releases (to air, water and land), disposals and transfers for recycling. It is a key resource for:
 - identifying pollution prevention priorities;
 - supporting the assessment and risk management of chemicals, and air quality modelling;
 - helping develop targeted regulations for reducing releases of toxic substances and air pollutants;
 - encouraging actions to reduce the release of pollutants into the environment; and
 - improving public understanding.

Environment Australia. 1999. Emissions Estimation Techniques Manual for Furniture and Fixtures Manufacturing.

<http://www.npi.gov.au/publications/emission-estimation-technique/pubs/ffurniture.pdf>

- This manual describes the procedures and recommended approaches for estimating emissions from facilities engaged in furniture and fixture manufacturing. Activities covered by this Manual include wooden structural component manufacturing, wooden furniture and upholstered seat manufacturing, and metal furniture and fittings manufacture.

Florida State Government. 1995. Wood and Metal Furniture and Fixture Manufacturing Facilities Fact Sheet.

<http://www.dep.state.fl.us/water/stormwater/npdes/docs/msgp/wfp.pdf>

- A document that provides an industry profile and sources of pollution through associated manufacturing activities with a specific focus on stormwater.
- Includes stormwater best management practices for furniture and fixture manufacturing facilities related to:
 - Outdoor loading and unloading; and,
 - Outdoor material storage.

Government of Canada. 2008. Fact Sheet - Polybrominated Diphenyl Ethers (PBDEs)

<http://www.chemicalsubstanceschimiques.gc.ca/fact-fait/pbde-eng.php>

- The Government of Canada finalized the *Polybrominated Diphenyl Ethers Regulations*, which came into force on June 19, 2008. These Regulations prohibit the manufacture of all PBDEs in Canada, and restrict the import, use and sale of PBDEs found in commercial mixtures of greatest concern (Penta- and OctaBDE).

Institute for Research and Technical Assistance (IRTA). 2000. Cleaner Technology Substitutes Assessment Case Studies: Upholstered Furniture.

<http://wsppn.org/foam/uphfurncasestudy2.pdf>

- An assessment of the alternative adhesive technologies for the upholstered furniture industry.
- Case studies of selected companies are presented including:
 - La-z-Boy
 - Sit-on-it
 - AmericanSeating
 - Country Roads Public Seating

Regional Municipality of Waterloo Water Services Division. 1998. Water Pollution Prevention Fact Sheet.

[http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/638562DB788565538525762400438089/\\$file/furn.pdf?openelement](http://www.region.waterloo.on.ca/web/region.nsf/8ef02c0fded0c82a85256e590071a3ce/638562DB788565538525762400438089/$file/furn.pdf?openelement)

- A brief document listing several methods of reducing water pollution in the furniture and fixture manufacturing process.

Tennessee Valley Authority (TVA) & U.S. EPA. 1994. Waste Reduction Guide Wood Furniture Industries. <http://www.p2pays.org/ref/01/00418.pdf>

- This workbook provides a simple, easy to use reference of waste reduction opportunities for the Wood Household Furniture Industry, with a primary focus on Wood Household Furniture.
- Provides a compilation of waste reduction ideas that can reduce costs and improve customer satisfaction and company image. It will also prevent the pollution of the environment, and in many cases maintain a safe workplace.

U.S. EPA. 1995. EPA Office of Compliance Sector Notebook Project – Profile of the Fabricated Metal Products Industry.

<http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/fabmetsn.pdf>

- A comprehensive report on the metal products industry.
- Provides detailed information on the industrial processes and pollution prevention opportunities.
- Provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the Fabricated Metal Products industry.
- Provides information from real activities that can, or are being implemented by this sector -- including a discussion of associated costs, time frames, and expected rates of return.

U.S. EPA. 1995. EPA Office of Compliance Sector Notebook Project – Profile of the Wood Furniture and Fixtures Industry.

<http://www.epa.gov/compliance/resources/publications/assistance/sectors/notebooks/wdfurnsn.pdf>

- A comprehensive report on the wood furniture products industry.
- Provides detailed information on the industrial processes and pollution prevention opportunities.
- Provides both general and company-specific descriptions of some pollution prevention advances that have been implemented within the Wood Furniture Products industry.
- Provides information from real activities that can, or are being implemented by this sector -- including a discussion of associated costs, time frames, and expected rates of return.

U.S. EPA. 2005. Furniture Flame Retardancy Partnership: Environmental Profiles of Chemical Flame-Retardant Alternatives for Low-Density Polyurethane Foam.

<http://www.epa.gov/dfe/pubs/flameret/altrep-v1/altrepv1-f1c.pdf>

- Volume 1 of 2 explores the environmental impacts of polyurethane foams and alternative products that may improve the safety of furniture manufacturing.

Washington State Department of Health. 2008. Alternatives to Deca-BDE in Televisions and Computers and Residential Upholstered Furniture. <http://www.ecy.wa.gov/pubs/0907041.pdf>

- Report on alternatives to Deca-BDE in upholstered furniture. This report focuses on design alternatives that use inherently flame resistant materials, rather than evaluate options that use added chemical flame retardants.