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AN ASSESSMENT OF THE HAZARDOUS WASTE MANAGEMENT PRACTICES WITHIN THE WOOD PRESERVATION INDUSTRY IN THE ATLANTIC PROVINCES

~~(NOTE: THIS IS RESTRICTED INFORMATION)~~

by
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SUMMARY

This report summarizes the quantities of hazardous waste generated by the wood preserving sector in the Atlantic Region, discusses the present disposal practices for these wastes and assesses some of the alternative disposal methods available to the industry.

A total of 68 tonnes of hazardous waste are generated annually by the five plants in the Region. The majority of these wastes are organic sludges from creosote and pentachlorophenol use. The principal disposal methods are storage, shipment to central Canada for treatment (incineration, solidification and landfilling) and dumping.

There are an additional 110 tonnes of similar wastes from previous years stored on-site at two of the five plants in the Region. These wastes will be shipped to central Canada for treatment.

Recommendations concerning the disposal problems that may have a potential impact on the environment are given.

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1. INTRODUCTION

A Maritime hazardous waste inventory, completed in November 1980 by the Environmental Protection Service (EPS), Atlantic Region, indicated that the wood industries sector (mainly the wood preservation industries) produces close to 178 tonnes of hazardous wastes annually. All other wood sector industries in the region were considered to be non-producers of hazardous wastes.

A similar inventory of Newfoundland and Labrador in 1983 by EPS indicated that the wood industries sector in that province produced approximately 22 tonnes of hazardous waste annually.

The purpose of this report is to define the constitutents and verify the sources and quantities of hazardous wastes generated by the wood preserving industry in the Atlantic Provinces, to describe the disposal practices presently being used and to suggest more environmentally acceptable disposal methods where needed. The wood preserving industry was chosen because of the hazardous characteristics of its feedstock chemicals and the wastes produced.

There are five wood preserving industries in the Atlantic Region. These are located in: Bible Hill, Nova Scotia; Upper Stewiacke, Nova Scotia; Tracy, New Brunswick; Newcastle, New Brunswick; and Clarenville, Newfoundland. All the plants were inspected in order to obtain the needed information. As well, information was obtained from recent provincial hazardous waste surveys (NBE, 1981; NSDOE, 1982), the EPS 1983 report for Newfoundland and Labrador and the EPS, Atlantic Region, inventory report (1980).

2. WOOD PRESERVING INDUSTRY

The five wood preserving plants in the Atlantic Region all employ pressure treating wood preserving processes. Two of the plants (Upper Stewiacke, Nova Scotia and Tracy, New Brunswick) use chromated copper arsenate (CCA - Type C) as their wood preservative, while the other three treat wood with creosote and/or pentachlorophenol (PCP). Of these last three, two (Bible Hill, Nova Scotia and Newcastle, New Brunswick) also treat with ammoniacal copper arsenate (ACA) (about 5% of total).

2.1 Wood Treatment

2.1.1 Wood Preservation

The wood preservation process consists of first preparing and then preserving the wood. Wood preparation involves debarking, forming and drying to reduce the moisture content and condition the wood. Preservation consists of impregnating the wood with a chemical that inhibits the utilization of the wood fibre as a food source by various organisms thus preventing decay. This process significantly prolongs the life of the wood. A general process diagram is shown in Figure 1.

The treatment apparatus consists of a long cylinder (20 to 166 ft. [6-51 m] in length, 2 to 7½ ft. [.5-3 m] in diameter) with a hinged door at one end (EPS, 1978). The wood is moved into and out of the cylinder on metal trams running on tracks. These cylinders are capable of withstanding a pressure of 200 psi (1380 KPa) (FEC, 1978).

Conditioning

The debarked and sized wood is conditioned by either air drying, kiln drying or drying in the cylinder. Drying the wood in the cylinder results in much greater wastewater generation from the plant than if dried wood were used in the process.

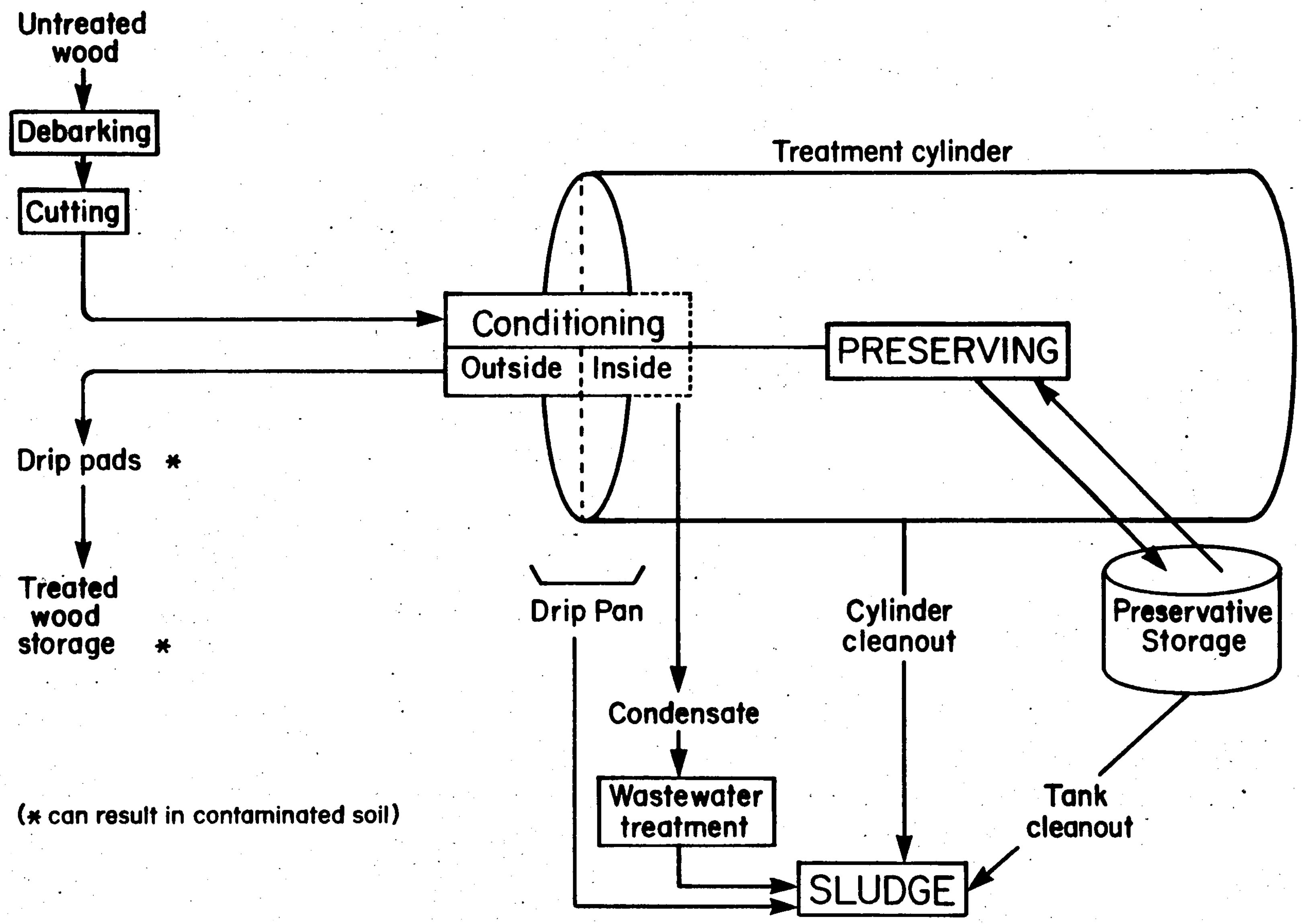

Figure I. Wood preserving waste streams

Air drying or kiln drying occurs prior to placement of wood in the cylinder. Conditioning of the wood in the cylinder takes place before preserving. The purpose of conditioning is to open the pores of the wood to allow for greater penetration of the preservative. There are two basic cylinder conditioning methods (FEC, 1978):

(1) steaming - open or closed
(2) boultonizing (boiling under vacuum - BUV).

(1) Steaming

Open Steaming

Steam is introduced into the cylinder and condenses while heating the wood. The condensate, containing some water soluble components of the wood and preservative from the previous charge, is withdrawn (continuously or in batch).

Closed Steaming

Water is introduced into the cylinder until the heating coils within are covered. The water is then heated by passing steam through these coils, producing steam in the cylinder. The condensate is removed after the conditioning process is complete. Closed steaming requires a longer time for conditioning than open steaming, but produces less wastewater (about 90% less).

(2) Boultonizing

The cylinder is filled with preservative. The preservative is then heated to approximately 100°C (by passing steam through the coils) and a vacuum applied to the system. The vapour removed is composed of water, oils, organic compounds and carbohydrates from the wood (USEPA, 1980). As with closed steaming, the time requirement is high, but the volume of condensate low.

Preservation

There are two basic types of treatment processes (EPS, 1978):

(1) empty cell (Reuping and Lowry processes)
(2) full cell (Bethell).

(1) Empty Cell

(a) The Reuping Process - After conditioning, air is introduced to the cylinder, followed by addition of the treating solution at a higher pressure. As a result, the air is trapped and compressed in the wood cells. The cylinder is heated to about 200°C for 1 hr to 8 hrs. The pressure is then released, causing the air in the cells to expand, forcing most of the preservative out ("kick-back"). This results in a thin film of preservative being left on the cell walls.

(b) The Lowry Process - This process is essentially the same as the Reuping Process except air is not introduced at the start. Therefore "kick-back" is not as great as in the Reuping Process.

(2) Full Cell

This is the most common practice in industries using water borne preservatives (e.g. ACA, CCA). After conditioning, a vacuum is drawn on the cylinder. This withdraws as much air as possible from the wood cells. The preservative is then introduced to the cylinder under vacuum. Pressure is applied followed by a final vacuum to free the wood of dripping preservative.

2.1.2 Wood Protection

This is practiced at many wood utilization plants (e.g. sawmills, shingle mills, plywood mills). In this process the wood is simply dipped in or sprayed with preservative. Most protection plants in Canada use water borne preservatives, chiefly sodium tetrachlorophenate or pentachlorophenate.

Although protection processes use comparatively less preservative than the preservation industries, due to the large number of plants their contribution to the total hazardous waste stream from the wood industry sector may be significant, and should be documented.

2.2 The Preservatives

2.2.1 Creosote

Creosote used in the wood preserving industry is defined by the American Wood Preservers Institute (1977) as:

> "... a distillate of coal-tar produced by the high high temperature carbonization of bituminous coal. Creosote consists principally of liquid and solid aromatic hydrocarbons and contains some tar acids and tar bases; it is heavier than water and has a continuous boiling range beginning at about 200°C."

Creosote consists of more than 200 separate compounds (Dillon, 1981). A partial listing is shown in Table 1. It should be noted that many of the constituents (especially the polyaromatic hydrocarbons) of creosote are toxic, carcinogenic, teratogenic and mutagenic (EPA, 1980). For example chrysene is a known carcinogen, while phenanthrene, the largest single component, is a suspected carcinogen (Dillon, 1981). Creosote is not highly acutely toxic to birds and is moderately toxic to fish (EPS, 1978).

Table 1 - A partial list of the constituents of creosote.

Acenaphthene	Methylfluorenes
Acridine	Methylphenanthrenes
Anthracene	Naphthalene
Benzo(a)anthracene	Octadecane
Benzo(b)fluoranthene	Phenanthrene
Benzofluorenes	Pyrene
Benzo(a)pyrene	Quinonine
Biphenyl	Tar Acids
Carbazole	Tar Bases
Chrysene	1-ethylnaphthalene
Dibenzofuran	1-methylnaphthalene
Dimethylnaphthalenes	1-naphthol
Diphenyleneoxide	1-phenylnaphthalene
Diphenyloxide	2-methylnaphthalene
Fluoranthene	2-phenylnaphthalene
Fluorene	9-ethylanthracene
Methylanthracenes	

Many constituents of creosote have proven capable of migration (USEPA, 1980). These include chrysene, naphthalene and benzo(a)anthracene. As well, many of these constituents such as chrysene and benzo(a)anthracene are persistent (USEPA, 1980).

As well as being mobile and persistent, some constituents of creosote are highly bioaccumulative. For example, benzo(a)anthracene has an octanol/water partition coefficient of 426,579 (USEPA, 1980). The octanol/water partition coefficient serves as an indicator of a compound's organic solubility. Compounds with a high partition coefficient are quite soluble in organic materials and often can easily be taken up and bound in organisms. PAH's can be biologically degraded, but the rate appears to be slow (Dillon, 1981).

Creosote used in the wood preserving industry can be used as is or mixed with coal tar, petroleum or pentachlorophenol. An overall downward trend in the use of creosote is evident reflecting both a preference for non-oily wood and the cost-competitiveness of other preservatives. The main product treated with creosote is railway ties.

Creosote and some of its components (benzo(a)anthracene, benzo(b)-fluoranthene, naphthalene, chrysene, benzo(a)pyrene) are identified as the constitutents which caused creosote wood preserving wastes to be listed as hazardous under RCRA (U.S. Federal Regulations, Vol. 45, #98, May 19, 1980, p. 33131).

2.2.2 Pentachlorophenol

Pentachlorophenol (PCP) is a crystalline compound formed by the reaction of chlorine and phenol. It is usually shipped in solid form (in bags or as blocks), and mixed with organic solvents (5 to 7.5% solution) prior to use. The advantages of PCP are its low cost and cleanliness (unless petroleum is used as a solvent).

PCP is the most acutely toxic chlorophenol known (NRC, 1978). The oral LD_{50} (rat) for PCP is 50 mg/kg. Sax (1984) defines its hazard via oral, inhalation, skin, intraperitoneal and subcutaneous administration as high. It is an experimental teratogen and possible carcinogen. It also has central nervous system effects and is a skin irritant. Chronic exposure can cause liver and kidney injury. It does not bioconcentrate significantly in the human body.

PCP has a high acute lethal and fetotoxicity for several mammalian species. It is also highly toxic to aquatic fauna. Although degradable in the aqueous medium, it accumulates and bioconcentrates somewhat in the tissue of aquatic biota (EPA, 1980).

PCP is degradable in water and under special circumstances will biodegrade in soil (Brockway et el., 1984; Côté, 1972; EPA, 1980; Dillon, 1984). Ninety-eight percent biodegradation in soil in 200 days required the following conditions (EPA, 1980):

(1) aeration
(2) low concentrations of PCP (200 ppm or less)
(3) acclimatization of micro-organisms to PCP.

PCP is tightly bound to soil particles, limiting the possibility for migration (EPA, 1980).

Contaminants

Some commercially manufactured PCP is contaminated with highly toxic polychlorodibenzodioxins at the parts per million level (Canada, December, 1980). The major ones are the hexa, hepta and octa dioxins. These contaminants are highly persistent, can bioaccumulate and cause a number of lethal and sublethal effects in birds, mammals and fish. Some are known to be carcinogenic promoters in mammals.

Some of the hazardous constituents found in sludges generated by wood preserving plants using PCP include phenolics such as phenol, 2-chlorophenol, PCP, 2-4-dimethylphenol and 2,4,5-trichlorophenol and dioxins (at the ppm level) (EPA, 1980). These are the constituents used by EPA as justification for listing PCP wastewater or sludge as hazardous (EPA, Hazardous Waste No. K001). Phenolics are toxic and in some cases bioaccumulative, carcinogenic, mobile and persistent (EPA, 1980).

2.2.3 **Arsenicals**

Arsenicals include a number of arsenic based salts. These are:

(1) Chromated Copper Arsenate (CCA) - Type A
- Type B
- Type C - Wolman CCA

(2) Ammoniacal Copper Arsenate (ACA)

(3) Fluor chrome Arsenate Phenol (FCAP).

CCA Type C (Wolman) and ACA are the two arsenicals used in the Atlantic Region.

Arsenicals are lower in cost than creosote, and are non-staining (allowing for easy painting of the finished products). Use of arsenicals results in material that is light green in colour. The main use of arsenicals is in treating building lumber.

CCA contains arsenic pentoxide, copper (II) oxide and chromic acid. ACA contains arsenic pentoxide, copper oxide and ammonia (AWPI, 1977).

Arsenic pentoxide has an LD_{50} (rat-oral) of 8 mg/kg. Sax (1984) rates it as highly toxic via the oral and intravenous routes. As well it is a human carcinogen (Sax, 1984).

Pentavalent arsenic is metabolized in the environment, however one of the degradation products is a highly toxic compound - dimethyl arsine (Shields J.K. and Stranks, D.W, 1978). Arsenic bioaccumulates to some extent and it is the cumulative toxicity of arsenic that poses the greatest risk (Westlake, 1978).

Copper (II) oxide is an irritant (Sax, 1984). Copper metal itself is classed as having a high human toxicity. It also has a high aquatic toxicity.

Chromic acid is primarily a corrosive agent causing skin irritation. Chromium is also a cumulative poison like arsenic. There is some evidence that chromium may be a carcinogen (Henning and Konasewich, 1984).

2.3 Hazardous Waste Streams

2.3.1 Listing

In Canada, the Transportation of Dangerous Goods Act (1980) Regulations list as dangerous "bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or PCP." (Number NA9316) as well, pentachlorophenol is listed as a dangerous good (NA2020).

Arsenical preservative wastes are not explicitly listed under the TDGA Regulations. However, based on toxicity criteria they may be classed as toxic (TDGA Class 6.1, Danger Group II or Class 9.3/III). Some are also corrosive (pH greater than 12).

2.3.2 Specific Waste Streams

Wood preserving plants, depending on the process employed, may produce some or all of the following basic wastes:

(1) sludge from treatment of wastewaters
(2) sludge from storage tanks and retort (when cleaned)
(3) contaminated soils from vicinity of treating area
(4) containers used to ship preservatives (bags, drums).

The composition of these wastes will vary depending upon the preservatives used. The use of creosote and PCP will result in organic sludges containing light oils, creosote, PCP and some solids with a pH of about 6 to 7. Use of ACA will result in inorganic alkaline sludges (pH greater than 12) containing salts of copper, arsenic, iron, calcium, wood residues, soil, sand, and water. The CCA process is completely closed, with little waste being produced.

Although only sludge from the treatment of wastewaters is listed as hazardous, all other waste streams identified above have the potential for being hazardous due to toxicity. These streams contain varying amounts of the same components that serve as the basis for listing of the wastewater sludges.

2.4 Hazardous Waste Generation Rates and Disposal Practices of Pressure-Treating Plants in the Atlantic Region

Table 2 summarizes the waste generation rates in the wood preserving sector. A total of 68 tonnes (assuming 1 L = 1 kg) is produced annually, of which about 8% is disposed of inadequately. The sludges generated annually are not necessarily collected annually.

In addition to the 68 tonnes that is be produced annually, there is approximately 110 tonnes of waste which has been produced in the past and remains in storage (see Table 3). This emphasizes the problem many industries have in finding suitable means of waste disposal in Atlantic Canada.

Table 4 summarizes the hazardous waste generation rates as determined by various sources. The EPS (1980, 1983, 1984), NSDOE and ENB results were determined from on-site inspections. Of all these figures the 1984 ones should be viewed as the most accurate as they were obtained from detailed on-site inspections of these industries in conjunction with provincial authorities. No extrapolations were made. The Gore and Storrie

Table 2 - Wood preserving sector, hazardous wastes generation rate (annually).

Waste Type	Quantity (litres)*			
	N.B.	N.S.	Nfld.	Total
Organic sludge				
- (Waste NA9316-TDGA)	39,100	7,820	7,160	54,100
- Sludge from treatment of PCP and creosote wastewater				
- Tank bottoms				
Inorganic sludge	2,700	1,180	-	3,900
PCP Bags**	3,600 bags	3,370 bags	2,700 bags	9,700 bags
Contaminated soil				
- Organic	-	-	-	-
Others - Boiler blowdown sludge	-	9,100	-	9,100
- Spent Carbon	-	900	-	900
TOTAL (tonnes)**	42	19	7.2	68

* Assuming 1 l = 1 kg.
** Numbers may not total due to rounding.

Table 3 - Hazardous wastes in storage (July, 1984).

Waste Type	Quantity (litres)*			
	N.B.	N.S.	Nfld.	Total
Organic sludge				
- (Waste NA9316-TDGA)	70,000	20,500	-	91,000
- Sludge from treatment of PCP and creosote wastewater				
- Tank bottoms				
Inorganic sludge	11,250	-	-	11,250
PCP Bags**	-	-	-	-
Contaminated soil - Organic	800	-	-	800
Others - Boiler blowdown sludge	-	-	-	-
- Spent Carbon	-	6,800	-	6,800
TOTAL (tonnes)**	82	27	-	110

* Assuming 1 l = 1 kg.

** Numbers may not total due to rounding.

Table 4 - Hazardous waste generation rates - comparison.

	Waste Quantities (tonnes)				
	EPS (1980) (1983, Nfld.)	NSDOE (1982)	ENB (1982)	Gore & Storrie (1982)	EPS (1984)
Nova Scotia:					
- Domtar	58	61	-	NI	18
- Marwood	9	NI	-	8	1.18
	--	--		--	-----
Total	67	61	-	8	19.2
New Brunswick:					
- Domtar	69	-	45	NI	41
- Atl. P.T.	29	-	NI	26	0.4
	--		--	--	----
Total	98	-	45	26	41.4
Newfoundland:					
- Nfld. Hardwoods	13	-	-	92	7.2
	--			--	---
Total	13	-	-	92	7.2
TOTAL (Atlantic Region)	178	-	-	126	68

NI = not inventoried.

results were based on the U.S. EPA approach involving the development of hazardous waste generation to total production ratios for several sectors. The ratio used for the wood preserving sector is 1.5. This factor is multiplied by the number of employees to give total hazardous waste generation rates. Difficulties arise in this approach: the number of employees used in the Gore and Storrie report for two of the surveyed plants differs significantly from the actual number, and the use of a universal code for the whole sector does not take into account the differences in the preservatives and the treatment processes. For this reason the Gore and Storrie figures should not be given as much weight as the others.

2.4.1 Inorganic Preservative Industries

There are two plants in the Atlantic Region that use the chromated copper arsenate (CCA) process. These are Atlantic Pressure Treating Limited, Tracy, New Brunswick and Marwood Limited, Upper Stewiacke, Nova Scotia.

The CCA (Wolman) process is virtually a closed system with little preservative lost to the environment. The preservative reacts with the wood sugars and becomes permanently fixed (Koppers Company, Inc., 1978). Leaching tests have shown that very little preservative is lost to the environment from treated products.

The CCA preserving process involves a number of stages (see Section 2.1.1). Treatment continues until the wood is saturated. At this point a final vacuum is drawn on the cylinder to remove excess preservative and actually dry the wood. After the final vacuum there is a drainage stage to void the cylinder of preservative. Preservative is removed from the cylinder during treatment along with that removed after the final drain is recycled to the original preservative storage tanks.

2.4.1.1 **Atlantic Pressure Treating Limited**

Atlantic Pressure Treating Limited is one of two plants in the Maritimes employing the chromated copper arsenate (CCA) process. Located in Tracy, New Brunswick (just outside of Fredericton), it produces a range of treated products, including utility poles, pilings, posts, lumber, timber, wood foundations, plywood, and fire resistant wood. It also serves as a distribution centre for pentachlorophenol treated wood that has been treated elsewhere.

Hazardous Wastes

The sources of wastes in this system are few. Very little sludge is produced in either the storage tanks or the cylinders. The chemicals are kept in solution by continual use of the preservative tanks (hence, continual disturbance and mixing). The process is run at room temperature, which avoids the precipitation problems that occur with CCA use at higher temperatures.

The level of sludge in the storage tanks is monitored once a year. If there is a sludge problem (to date there has been none), the preservative supplier (Koppers Company, Pennslyvania, U.S.) would clean out the tanks and dispose of the sludge at their facility in the U.S. At this point the close association Koppers maintains with their clients is worth noting. Koppers provides them with most of the engineering and laboratory expertise their clients require.

The only point of preservative escape to the environment during the treatment process is after the final drain, during the removal of the charge from the cylinder. Concrete pits are present immediately under the cylinder opening and these drain back into the system. As well, a concrete drip pad is present for about 20 ft. (6 m) beyond these pits. This is angled to drain back into the pits. The drainage solution is not filtered prior to its return to the preservative storage tanks.

Cleaning of the drip pads, cylinder pits and other work areas generates the only hazardous waste produced at this plant. The quantity of this waste is estimated to be 400 litres (90 gallons) annually. This waste is added to the sawdust piles. All of the wood waste (sawdust, bark, etc.) is sent to Georgia Pacific Company in the U.S. for incineration.

The values determined for Atlantic Pressure Treating Limited in the 1984 survey are much lower than the EPS (1980) and Gore and Storrie figures. However, the EPS (1980) and Gore and Storrie figures were extrapolated and do not take into account the closed nature of the system used at the plant.

Overall, the Atlantic Pressure Treating Limited operation is quite clean.

Acceptability of Waste Management Practices

Due to the small quantities of wastes produced, the problems discussed below are minimal when compared to some problems of the larger waste generators.

There is a problem with mud accumulating on the concrete drip pads adjacent to the cylinder. Pooling of the preservative on the drip pad was observed. Maintenance of a relatively clean drip pad would allow for better flow of the preservative into the cylinder pits.

As well, there is concern over the impacts of incineration of the CCA waste sludge mixed with the sawdust pile. Atlantic Pressure Treating Limited themselves discourage incineration by their clients of any treated wood waste. The level of contamination in the resulting ash is the main concern. Studies indicate that this ash could have high concentrations of toxic soluble arsenic and chromium (Dobbs et al., in EPS, 1978). Landfilling or burying is the method recommended by Atlantic Pressure Treating Limited to their clients for disposal of any treated wood that is not used.

Since only a small amount of this CCA sludge is sent for incineration, it would be relatively easy to dispose of this waste using alternative practices (i.e. drumming, storage and shipment to Koppers).

Concern was also raised over the lack of dykes around the preservative storage tank. Although not a waste problem in itself, the lack of adequate measures could result in a definite waste problem in the event of a spill. This concern is being examined by the provincial authorities.

Recommendations

The following recommendations are made with respect to waste management practices at Atlantic Pressure Treating Limited:

(a) Until evidence is presented to validate the acceptability of the present practice, the wastes collected from the cylinder pit, presently mixed with the sawdust pile, should be drummed and stored then sent to Koppers or a solidification facility in central Canada.

(b) The waste (mud and preservative accumulation) on the drip pad area should be collected frequently to avoid surface runoff.

(c) Dykes should be constructed as soon as possible.

2.4.1.2 **Marwood Industries**

Marwood Industries is the other plant in the Maritimes that employs the chromated copper arsenate (CCA) process. Located in Upper Stewiacke, Nova Scotia, it produces treated lumber (2-3 x 10^6 fbm/yr), timber and other wood products.

Hazardous Wastes

The only source of waste at this plant is the contaminated debris collected from around the cylinder. There is a pit at the vacuum chamber door in which drippings are collected during removal of the treated wood. Approximately 20 litres (5 gallons) are collected weekly (1,180 litres [260 gallons] per year). This debris is discarded by depositing on the plant's wood shavings pile which is left untreated on-site.

The values determined for Marwood in the 1984 survey are much lower than the EPS (1980) and Gore and Storrie figures. However, these latter figures were extrapolated and do not take into account the closed nature of the system in operation at Marwood.

Other concerns noted during inspection were:

(a) A leaking seal on one of the pumps had resulted in some spilled preservative.

(b) There would be no protection in the event of an overflow or spill from the preservative storage or mixing tanks (i.e. no dykes).

(c) There is no collection of preservative drippings from the treated wood after removal from the cylinder (i.e. no drip pads).

(d) The product being used had no evident Canadian Pest Control Product registration number.

Acceptability of Waste Management Practices

The past disposal of the inorganic sludge on the shavings pile poses no major concern as long as the site remains in operation. The possibility of runoff from the pile should be considered, but is probably minor due to binding of the preservative with the wood sugars. Closure will require soil testing and removal of any contaminated soil in the shavings area. Further sludge collected should not be disposed of in this manner but should be drummed and stored on site for shipment to either Koppers or a solidification facility in central Canada when a large enough quantity is collected.

The company is opening a new plant at Brookfield. The above mentioned problems should be addressed at this new plant. At present, Marwood has constructed their new plant but it is not operational. Provincial authorities are checking with the company to determine whether proper waste disposal methods are established. Soil testing should be done at the old site to determine the extent of contamination.

Recommendations

The following recommendations are made with respect to the waste management practices at Marwood Industries:

(a) The waste sludge should be drummed and sent to Koppers for disposal or to a solidification facility in central Canada.

(b) Adequate safeguards (i.e. drip pads, tank dyking) should be incorporated into the new plant.

(c) Testing for soil contamination should be done during site closure and any contaminated soil, debris, etc., should be removed and disposed of in an environmentally acceptable manner.

2.4.2 **Organic Preservative Industries**

There are three plants in the Atlantic Region that use organic preservatives (creosote, pentachlorophenol and various mixtures of the two). These are Domtar Chemicals Group, Newcastle, New Brunswick; Domtar Chemicals Group, Truro, Nova Scotia; and Newfoundland Hardwoods Limited, Clarenville, Newfoundland.

The types of processes used by these plants varies. Unlike the CCA process, organic preservation of wood does not result in the preservative being chemically bound to wood components.

Both Domtar plants also do some inorganic preserving with ammoniacal copper arsenate.

2.4.2.1 **Domtar Chemicals Group**
Wood Preserving Division, Newcastle, New Brunswick

Domtar, Newcastle, uses three types of preservatives: creosote, pentachlorophenol and ammoniacal copper arsenate. The plant produces utility poles and lumber.

Hazardous Wastes

The treatment process involves an initial steam conditioning stage to treat the green wood used by the plant. This creates a wastewater stream. As well, any preservative drips during charge removal are pumped into the wastewater treatment plant. The plant is installing a new water treatment system (expected to be operational in 1985) which will create a sludge waste and spent activated carbon waste. Currently, the wastewater treatment system in place (separation tanks and an evaporator) produces a few drums of organic flocculated sludge per year. This is included with the other oily waste (see below) for shipment to Tricil, Quebec.

The wastes produced by Domtar, Newcastle and their disposal pratices are summarized in Table 5. The major sources of hazardous wastes are:

(a) the cleanout of the storage tanks and cylinders
(b) the wastewater treatment system
(c) the empty PCP bags.

Table 5 - Summary of wastes/disposal practices - Domtar, Newcastle, New Brunswick.

1. Organic - Pumpable Sludge

   - from PCP storage tank and cylinder cleanout and wastewater treatment system
   - 53% water, 45% oil, 1.6% solids
   - 36,000 L (8,000 gallons) per year
   - 55,000 L (12,000 gallons) in storage
   - to be sent to Tricil Limited for incineration or landfill

2. Organic - Non-Pumpable Sludge

   - from creosote storage tank and cylinder cleanout and wastewater treatment system
   - 80% oil, 20% solids
   - 3070 L (675 gallons) per year*
   - 10,200-15,340 L (2,250-3,375 gallons) in storage*
   - to be sent to Tricil Limited for incineration

3. Inorganic Sludge

   - from ACA storage tanks and cylinder cleanout
   - 56.7% water, 1.6% ammonia, 41.7% dry solids
   - 2,300 L (500 gallons) per year (collected every 5 years)**
   - 11,250 L (2,475 gallons) in storage*

4. Contaminated Soil

   - from plant area and Bunker C oil spill cleanup
   - 800 L (180 gallons) in storage

5. Treated Wood Waste

   - stored in yard

6. PCP Bags

   - 3,600 bags (stored in bags in drums)

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* Based on numbers of 45 gallon drums.
** Based on division of total collected over five years.

Note: Sludges are not collected annually for every operation. Annual generation rates are averages estimated by company.

The tanks, etc., are not necessarily cleaned annually. Therefore, the amount of waste produced annually does not necessarily represent the amount of waste collected annually. For example, 55,000 L of organic pumpable sludge was stored on-site as of July, 1984. An estimated additional 36,000 L was to be produced every year after the last tank cleanout (date unknown).

(a) Tank Sludges

Depending on the nature of the chemical in the tanks, cylinders and wastewater, three types of sludges result. One is a pumpable oily waste, containing light oils, pentachlorophenol and water. The sludge is quite fluid, consisting of approximately 53% water, 45% oil and 1.6% solids. Approximately 36,000 litres of this sludge are generated annually. It is stored in a tank on-site until a sufficient amount is accumulated (presently there are about 55,000 litres stored on site). The sludge is collected in tank cars by a shipper and transported to Tricil Limited's Quebec facility for treatment. Depending on the chloride concentration, this waste may be treated on-site (i.e. incinerated) or sent to Tricil's Sarnia plant where it is landfilled. Tricil does not incinerate wastes with a high chloride content (greater than 2%) due to the hazards associated with production of hydrochloric acid and the lack of an adequate scrubber system on the incinerator. Usually the chloride concentration is below the 2% limit and the sludge is treated in Quebec (sludge is tested by Domtar and Tricil).

The second type of sludge produced is a non-pumpable oily sludge. It contains creosote, sand and dirt from cleanup of the creosote tank bottoms, treatment cylinder and wastewater system. It consists of approximately 80% oil and 20% solids. Some of the oil floats to the top of the mixture and is recovered. About 3,070 litres (15 drums) of this sludge are generated annually and stored on-site (about 10,200 L-15,340 L [2,250-3,375 gallons]). The plant intends to ship this waste to Tricil in the near future.

The third type of sludge is an inorganic sludge produced by the ammoniacal copper arsenate storage and treatment system. This system has been in operation since 1976 and to date there has been only one tank clean-out. The sludge consisted of 56.7% water, 1.6% ammonia and 41.7% solids (arsenic, coper, iron and ash). This sludge was stored in drums on-site (11,250 L). In August, 1984, the sludge was transferred to truck and taken to Quebec by a private hauler. It was confirmed by provincial authorities that it had been sent to Stablex (Blainville, Quebec) for solidification. The empty drums were rinsed and along with drum liners were disposed of in a secure landfill. Rinse water was returned to the preservative mix tank at the plant.

(b) Contaminated Soil

Another waste generated by the plant is contaminated soil. At present there is no collection of the soil, however, future excavation plans will produce some wastes. Currently, wastes from a Bunker C oil spill are stored on-site (about 800 litres). Plans exist for cleanup of the cylinder area and drum storage area (mainly surface contamination). Domtar's head office (Montreal) is currently examining the feasibility of hiring a soil treatment firm to dispose of these wastes.

(c) Empty Containers

Approximately 3,600 empty PCP bags are presently stored on-site in barrels. These will be shipped to Tricil for disposal. Compaction techniques are being tested at Domtar's Truro plant and a viable technique will be applied at this site.

(d) Treated Wood Waste

Treated wood wastes are stored in the yard.

(e) Storage

All the drums are stored on pallets in an uncovered area on the site. There was evidence of leakage in about 50% of the drums observed, some of which has resulted in contamination of surrounding soil.

The ENB 1982 and EPS 1984 waste generation estimates are similar. EPS's (1980) figures are higher than both of these. This can be accounted for by the higher 1980 organic sludge estimate (55 tonnes for EPS, 1980). This extra sludge is probably now accounted for in the estimate of stored sludge.

Acceptability of Waste Management Practices

Inadequate storage facilities exist at Domtar, Newcastle. Past and present storage methods at the plant have resulted in the release of PCP, creosote and ammoniacal copper arsenate to the environment. Short term company plans include redrumming the wastes, covering them with a tarp and shipping to treatment facilities in central Canada. The provincial environment officials are assisting the company in finding a carrier, and checking on the progress of waste redrumming.

The intended disposal methods (i.e. incineration and solidification) appear satisfactory.

Recommendations

The following recommendations are made with respect to waste management practices at Domtar Chemicals Group, Newcastle:

(a) Government authorities should monitor the progress of the shipment of wastes to central Canada to ensure prompt disposal.

(b) The wastes should be redrummed and an adequate storage area constructed as soon as possible.

(c) Tank dyking should be constructed.

(d) Efforts should be made to develop waste reduction techniques. The company is presently examining various possibilities.

2.4.2.2 **Domtar Chemicals Group**
Wood Preserving Division, Truro, Nova Scotia

Domtar, Truro, uses three types of preservatives: creosote, pentachlorophenol and ammoniacal copper arsenate. The plant produces railway ties, poles, timbers, wharf crib work and other treated wood products.

The plant uses dried wood in its treatment process and therefore does not have the large wastewater production problem associated with treatment of green wood. The plant has a system in place which treats condenser cooling water and boiler blowdown water. This system consists of a series of settling tanks, API separators and carbon absorption towers.

Hazardous Wastes

Table 6 summarizes the wastes produced and disposal methods at the Domtar plant in Truro, Nova Scotia.

(1) Organic Sludge - Non-Pumpable

There are two types of non-pumpable sludges produced at the plant:

(a) Filter Cake - This is produced by the filtering of pentachlorophenol. Approximately 6800 L (1,500 gallons) per year are

Table 6 - Summary of wastes/disposal practices - Domtar, Truro, Nova Scotia.

1. Organic - Non-Pumpable Sludges

   (a) Filter Cake

   - from filtering of PCP preservative
   - 5-10% chloride
   - 6800 L (1,500 gallons) per year
   - to be sent to Tricil Limited for landfilling

   (b) Creosote Tank Bottoms and Cylinder Cleanout

   - 1020 L (225 gallons) per year
   - 20,500 L (4,500 gallons) in storage (in drums and sludge tank)
   - to be sent to Tricil Limited (6800 L) in early 1985

2. Inorganic Sludge

   There has been no cleaning of the ACA cylinder or storage tanks since start-up of ACA operation in 1973. Any such sludge that may be collected in the future would probably be sent to a solidification facility such as Stablex in Quebec.

3. Boiler Blowdown Sludge

   - 6800-9100 L (1,500-2,000 gallons) per year
   - 20-30% water
   - mixed with wood shavings

4. Contaminated Soil

   - estimated 30-40 m^3 (40-50 yd^3) to be collected during future excavations
   - disposal option undecided, either secure landfill or shipment to central Canada

5. Drums - returned to supplier or used to store spent carbon (CuO drums)

6. PCP Bags

   - 3,370 bags per year
   - drummed to be sent to Tricil

7. Spent Carbon

   - 900 kg (2,000 pounds) per year
   - 5680-6800 L (1,250-1,500 gallons) in storage
   - sent to supplier in the U.S. for regeneration

produced. This sludge has a chloride content of 5-10%. It is now being redrummed and the plant intends to send the waste to Tricil for disposal at their Sarnia facility.

(b) Creosote Tank Bottoms and Cylinder Clean-Out - Approximately 1020 L are produced annually. There are presently about 6800 L (1,500 gallons) in drums and 13,600 L (3,000 gallons) in the storage tank. This sludge consists mainly of pure creosote. Sludge from the settling tanks is also included in this category. The company intends to send the drummed waste to Tricil by the end of 1984.

(2) Boiler Blowdown Sludge

Boiler blowdown sludge is produced during settling of the boiler blowdown prior to clarified effluent discharge. Approximately 6800-9100 L (1,500-2,000 gallons) are generated annually. It consists of water (20-30%), silica and ash. The sludge is buried in the wood shavings pile on-site.

(3) Spent Carbon

About 900 kg (2,000 lbs) of spent carbon are generated annually. Presently there are between 5680-6800 L (1,250-1,500 gallons) stored on-site. These wastes will be sent to the supplier in Pennsylvannia for regeneration.

(4) Contaminated Soil

The plant has not removed any contaminated soil since 1981 or 1982. At that time, the soil was sent to the Truro landfill. Excavations planned for the near future will result in the collection of 30-40 m^3 (40-50 yards^3). A disposal method for this soil is, at present, undecided. Domtar's head office in Montreal is examining a number of soil recovery/disposal options offered by various American firms. Should this not be feasible, provincial authorities have indicated either secure landfilling or shipment out of province as the only alternatives.

(5) Drums

Empty copper oxide drums are either returned to the supplier or used to store spent carbon.

(6) PCP Bags

About 3,370 empty PCP bags are discarded annually. These are drummed and sent to Tricil for incineration or landfill. The plant plans to switch to block PCP which will greatly reduce the bag disposal problem.

(7) Treated Wood Waste

Any unusable treated wood waste is disposed of in the shavings pile.

(8) Other

No inorganic sludges result from the clean-out of either the ACA storage tank or treatment cylinders. The ACA treatment has only been in operation since 1973, and as a result there has been no appreciable sludge deposit. Any inorganic sludge generated in the future will probably be sent to Stablex for solidification.

As well, the Truro facility generates no pumpable oily sludge waste (which results from PCP tank and cylinder clean-out). All such sludges are returned to the system for treatment of railway ties.

(9) Storage

All wastes at the facility are stored inside the old drying shed. There are no spill containment structures (dykes, berms) in place in this area.

The EPS (1984) waste generation estimates for Domtar, Nova Scotia, are lower than either the EPS (1980) figures or the NSDOE (1982) figures (see Table 4, page 15). This discrepancy is primarily due to the major difference in amount of contaminated soil reported (none in 1984 as opposed to 45 tonnes in 1980 and 1982).

Other problems at the plant include the lack of spill containment structures around the preservative storage tanks, the absence of drip pads in the cylinder unloading area and generally poor housekeeping.

Acceptability of Waste Management Practices

The waste storage facilities are adequate, however berming the area to prevent release of spilled material is an additional safeguard that would minimize the risk to the environment.

Shipment of waste sludges to central Canada for disposal is environmentally acceptable, providing adequate precautions are taken during transport. Economically it is not the most desirable option for the company and they are looking into means of waste reduction such as dewatering and oil recovery.

Disposal in the Truro landfill of any contaminated soil collected in the future should be discouraged. Sanitary landfills do not provide the optimum conditions for biodegradation and therefore leaching of such wastes is a definite possibilty.

Recommendations

The following recommendations are made with respect to waste management practices at Domtar Chemicals Group, Truro:

(a) Progress in the shipment of wastes to central Canada should be monitored.

(b) The feasibility of berming the waste storage facility should be examined.

(c) Storage tank dyking and drip pads should be constructed to avoid any further environmental contamination.

(d) Alternatives to landfilling of contaminated soil should be investigated.

(e) The company should be encouraged in its waste reduction efforts.

(f) The present examination of the Truro landfill by the Nova Scotia Department of Environment and the Town of Truro should include monitoring for the presence of chlorophenols and polyaromatic hydrocarbons since Domtar's waste were at one time landfilled. Recent indications by provincial authorities are that this will be done.

2.4.2.3 **Newfoundland Hardwoods Limited, Clarenville, Newfoundland**

Newfoundland Hardwoods Limited uses two types of preservatives, creosote and pentachlorophenol. The plant produces asphalt emulsions and treated wood products (mainly timber and poles).

The plant has a single cylinder in operation about nine months of the year. The standard treatment cycle consists of Boultonizing for 4-5 hours followed by pressure treatment with preservative at 190-200°F. A vacuum is held on the cylinder for about one hour prior to withdrawing the charge.

Oily condensates from the Boultonizing stage are evaporated and the oil recovered. Any excess preservative in the tank following treatment is returned to the preservative holding tank. Drips during unloading of the charges are collected in a drip pad under the cylinder door and are occasionally recovered for reuse in the process.

Hazardous Wastes

(1) Organic Sludge

Waste sludge is produced during clean-out of the cylinder. This occurs about three times per year when switching preservatives and for winter inspection. Approximately 7160 L (1,575 gallons) are produced annually. This sludge is drummed and sent to the operator of the Clarenville landfill, with whom the company maintains a disposal contract. At the time of plant inspection, company personnel believed the landfill operator used a separate part of the landfill to dispose of these sludges.

Preservative storage tanks have not been cleaned out to date. The plant has been in operation since the late 1940's.

(2) Contaminated Soil

There have been no major soil excavation projects to date; however, there is occasional soil removal around the cylinder tracks (there are no drip pads in place). This waste is added to the cylinder sludge and sent to the landfill.

(3) Empty PCP Bags

Approximately 2,700 empty PCP bags are disposed of annually. These are sent to the local landfill as they are emptied.

The site itself is relatively clean when compared to other organic wood preservers in the region.

Acceptability of Waste Management Practices

Disposal of cylinder clean-out sludges and PCP bags in the Clarenville landfill is unacceptable. A brief inspection of the landfill indicated a lack of leachate monitoring or containment facilities. A flow of oily material running from a dump pile into a nearby drainage ditch was noted, suggesting a problem with surface runoff at the site. As well, even though some of the sludge constituents (e.g. PCP) may be biodegradable under optimum conditions such conditions are usually not present in a landfill.

Soil disposal in the landfill is a comparatively minor problem. While it is not a practice to be encouraged, it is of low priority when compared to the sludge disposal problem.

Of concern is the lack of dyking around the preservative storage tanks. A leak in one of the tanks could result in a release to the environment and a resulting contaminated soil disposal problem.

Recommendations

The following recommendations are made with respect to waste management practices at Newfoundland Hardwoods Limited:

(a) Disposal of cylinder clean-out sludge and empty PCP bags in the Clarenville landfill should cease. In the absence of any readily available alternative, storage is a better option.

(b) A preliminary assessment of contamination by chlorophenols and PAH's (creosote) in the Clarenville landfill should be conducted. This should involve soil and leachate sampling to determine the extent of contamination.

(c) Long term disposal alternatives for sludges and empty PCP bags should be found. Shipment to the mainland (New Brunswick) via the creosote supplier's ship should be considered. From New Brunswick, the sludge can be sent to central Canada. Perhaps it can be sent to Domtar, Newcastle, to be sent to Tricil with that plant's wastes.

2.5 Hazardous Waste Disposal Practices of Pressure-Treating Plants in Canada and the U.S.

There are about 37 pressure-treating plants in Canada (Shields, 1976). In general in 1976, Canadian plants dispose of the sludges produced by their preservation process in three ways (Shields, 1976):

(a) landfilling
(b) incineration
(c) burial.

In the U.S. there are 415 wood preserving plants that generate bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or PCP (Berkowitz et al., 1982). Together they generate between 800-1500 tonnes/year with an average per plant of 2-4 tonnes annually. The major means of sludge disposal are (USEPA, 1980):

(a) off-site disposal in landfills
(b) incineration.

2.6 Evaluation of Disposal Practices

2.6.1 Presently Used

In Atlantic Canada, the two main methods of disposal of sludges from wood preserving plants are landfilling and incineration.

(a) Landfilling.

The inherent hazard of landfilling is the potential for leaching of toxic chemicals in the sludge into the groundwater if the landfill is improperly designed or operated. As discussed in Sections 2.2 and 2.3, there are a variety of toxic components in the preservatives and waste sludges. Many of the constituents of these wastes are non-degradable and/or highly mobile. For example, naphthalene has been identified in finished drinking water (USEPA, 1980). Migratory potential and persistence of phenols has also been demonstrated by their movement from old dump sites into groundwater and soil (USEPA, 1980). Many of the highly mobile and persistent compounds of concern are also bioaccumulative.

Pentachlorophenol's migration potential is thought to be low as it tends to be bound by the soil (USEPA, 1980).

In the U.S., under the recently reauthorized Resource, Conservation and Recovery Act (1976), landfilling of halogenated organics will be banned if alternatives are available.

(b) Incineration

Improper incineration of pentachlorophenol, creosote and inorganic arsenical sludges also presents problems. Toxic polychlorodibenzo-p-dioxins are believed to be formed when pentachlorophenol is heated to temperatures higher than 200°C (Shields, 1976; Sachdev and Marvan, 1983). Highly toxic tetrachlorodibenzo-p-dioxins may be produced when impure chlorophenol mixtures are incinerated in the temperature range of 300°C-500°C (Rappe, 1978 cited in Sachdev and Marvan, 1983). Sachdev and Marvan (1983) suggest that temperatures in excess of 900°C and/or residence times of more than three seconds will result in significant destruction of dioxins and dibenzo furans.

The Canadian Federal Interdepartmental Committee on Toxic Chemicals advocates the use of high temperature incineration as a means of disposal for PCP manufacturing wastes (ICTC, 1983). A joint provincial/federal/industry task group is presently studying incineration of chlorophenol wastes. The focus of the study is to resolve uncertainties about the production of polychlorinated dibenzo-p-dioxins and dibenzo furans during thermal destruction of chlorophenol compounds. This group will eventually develop recommendations for proper disposal of wastes containing these compounds.

High temperature incineration of concentrated pentachlorophenol waste is recommended by Ottinger et al. (1973) as the best means for their disposal in the U.S. They indicate that care must be taken to avoid excess liberation of hydrogen chloride, and suggest that the chlorine may actually be recovered.

Release of hazardous constituents as a result of incomplete combustion is also a problem associated with incineration of creosote (CPA, 1980).

2.6.2 Alternatives

This section describes the waste management alternatives available to and used by some of the wood preservation industries in the Atlantic Region. Feasibility of each of these alternatives depends primarily on overall economics.

(a) Waste Reduction

One of the major problems facing the larger hazardous waste generators in the wood preserving industry in Atlantic Canada is the bulk of the wastes produced. For example, at the Domtar, Newcastle plant the PCP sludge contains about 53% water and the inorganic arsenical sludge is approximately 57% water. The high percentage of water alone increases the problem and costs of storing, shipping and disposing of these wastes.

Domtar is investigating various waste reduction methods. The most feasible method they have found to date is the use of a filter press to dewater sludge. Another alternative is the use of previously dried wood (see Section 2.1.1).

(b) Reuse/Recycling

Some reuse of materials does occur at a number of the wood preserving plants. At the CCA plants preservative drained from the cylinder after treatment is reused. At the Domtar, Truro operation any pumpable oily waste is reused for treating railway ties. As well, oil is recovered from wastewater and reused at both the Domtar facilities.

(c) Recovery

Spent carbon is the only waste produced by the organic wood preserving industries that is recovered.

(d) Exchange

For a minimal fee, industries can list their wastes in the Canadian Waste Materials Exchange (CWME) Bulletin, operated by the Ontario Research Foundation. To date there has been no listing of waste from any wood preserving industry with the Canadian Waste Materials Exchange.

(e) Landfarming

The use of landfarming as a technique for disposal of hazardous waste is increasing. One of the major users of this method is the petroleum industry, who use landfarming to dispose of their oily sludges.

Recently, landfarming as a disposal technique has been considered for a variety of other waste types such as sludge from creosote and pentachlorophenol wood preserving operations (U.S. #K001, Canada #NA9316; Berkowitz et al., 1982; Dillon, 1984).

There is some disagreement in the literature as to the degradability of pentachlorophenol. A number of studies suggest PCP is readily biodegradable (Shields and Stranks in EPS, 1978; Dillon, 1984;

Arsenault, 1976), others indicate it is only biodegradable under specific conditions (EPA, 1980; Jones, 1984; Kirsch et al., 1973; NRC, 1982). The Environmental Protection Agency, in the document outlining the reasons for listing these wastes under the Resource Conservation and Recovery Act (1976), indicate that studies on biodegradability suggest that pentachlorophenol is only biodegradable under ideal conditions.

When pentachlorophenol is applied to soil in concentrations of 200 ppm or less, at least 98% of the compound can be destroyed in about 200 days (EPA, 1980). However, typical concentrations of PCP in most sludges range from 5% to 20% (EPA, 1980). At high concentrations, microbial degradation is not expected to have a significant effect on the concentration of pentachlorophenol because it is highly toxic to the bacteria (NRC, 1982). As well, biodegradation is only feasible if the micro-organisms have been acclimated to pentachlorophenol (EPA, 1980; Kirsch et al., 1973). The Kirsch et al. (1980) study indicates that pentachlorophenol serves as a secondary substrate that does not compete favourably with more easily degradable materials.

PCP is thought to be tightly bound to soil organic matter (EPA, 1980; Shields and Stranks in EPS, 1978). This may limit the possibility for migration.

Some fractions of creosote are biodegradable. The microbial degradative pathway of polycyclic aromatic hydrocarbons has been described (Dillon, 1984). However, there are some highly toxic constituents which are quite persistent (EPA, 1980).

Overloading of creosote sludge, as with pentachlorophenol sludge, can result in depletion of the microbial population.

Landfarming under carefully controlled conditions (with monitored application rates, leachate collection and minitoring, and degradation rate determination is technically feasible. However, the economics of the method as they relate to the Atlantic Region's wood preserving plants have not been determined and are probably prohibitive in terms of efficiency.

3. CONCLUSIONS AND RECOMMENDATIONS

Approximately 68 tonnes of hazardous wastes are produced annually in the Atlantic Region by wood preserving industries. As well, there are 110 tonnes of waste in storage (illustrating the difficulty many plants have with disposal of their wastes). The majority of these wastes are organic sludges from the treatment of wastewaters and cleanout of storage tanks and treatment cylinders.

Most of the waste produced (92%) is being or will be disposed of in an adequate manner. At present the major problems with waste management practices in the industry are:

(a) inadequate disposal of organic sludge from the Newfoundland Hardwoods plant. About 7 tonnes of sludge are disposed of annually in a municipal landfill;

(b) inadequate storage facilities at the Domtar, Newcastle, plant that have resulted in contamination of the surrounding environment.

There are other relatively minor problems at each plant. These were discussed in Section 2.4.

Suggested Disposal Practices

The following practices are recommended for disposal of the major hazardous wastes produced by the wood preserving industries.

(a) Organic Sludges - High Temperature Incineration

Incineration of both the creosote and pentachlorophenol sludges (chloride, less than 2%) at a sufficiently high temperature (1200°C) and long enough residence time (2-3 seconds) should provide adequate destruction of the toxic components. Care should be taken to contain any hazardous air emissions (e.g. hydrochloric acid) from the thermal destruction of pentachlorophenol.

For these sludges with a chloride level higher than that suitable for incineration at present Canadian facilities, alternative disposal methods must be examined. Presently these wastes are landfilled, however, due to the toxicity and persistence of these wastes and their potential for escape from the landfill, this practice should be discouraged. Extraction of the PCP from the sludges for reuse in the preserving process should be examined.

(b) Inorganic Sludges

All inorganic sludges should be solidified.

(c) Contaminated Soils

Highly contaminated soil should be disposed of in the same manner as the corresponding sludges if a viable alternative is not available. Domtar, Inc. is investigating possible alternatives for management of contaminated soil collected at their two plants in the Maritimes. These include solidification with potential for reuse, solidification for landfill and fluidized bed combustion.

(d) Empty Preservative Containers

Empty drums should be triple rinsed, and then either landfilled or recycled (recommended by USEPA; Dillon, 1981). The washing liquid should be used as makeup for the preservative solution.

Empty bags should be thoroughly cleaned (for example, by vacuum) if they are to be landfilled. If they are not thoroughly cleaned, an alternative disposal method should be used (e.g., incineration).

Other Recommendations

General

(a) Housekeeping practices at most of the five wood preserving plants in the Atlantic Region should be improved to ensure minimal contamination of the surrounding environment. This includes installation of drip pads where necessary and the regular, frequent cleaning.

(b) A preliminary assessment of contamination by chlorophenols and polyaromatic hydrocarbons in the Clarenville landfill should be conducted.

(c) Assessment of the Truro landfill (presently being carried out) should include monitoring for chlorophenols and polyaromatic hydrocarbons.

Storage

(c) Installation of dykes and curbs in raw material storage areas should be completed at those plants where these structures are missing.

(d) Curbs should be installed at the Domtar, Truro waste storage facility. Domtar, Newcastle needs to construct an adequate storage facility with curbed area, some form of drum cover (e.g. a plastic tarpaulin) and containment of leachate.

(e) The sludges at the Domtar, Newcastle, plant should be transferred immediately to intact drums.

Disposal

(f) The following unacceptable hazardous waste disposal practices should be stopped:

- Export of chromated copper arsenate contaminated material by Atlantic Pressure Treating Limited to Georgia-Pacific in the northeastern U.S. At the least, Georgia-Pacific should be informed of the nature of this contamination. This waste sludge should be drummed instead and sent to either the chemical supplier or a solidification facility in central Canada.

- Disposal of CCA sludge in the sawdust pile at Marwood Industries. This sludge could be easily drummed and stored for shipment to Koppers or another facility when sufficient quantities are accumulated.

- Disposal of organic sludge and empty PCP bags from Newfoundland Hardwoods Limited in the local municipal landfill. Wastes should be stored until a viable alternative (e.g. shipment to central Canada) can be found.

(g) The progress of disposal of organic and inorganic sludges from Domtar Inc.'s two plants should be monitored.

(h) The three organic preserving plants should be encouraged and assisted in developing suitable waste reduction techniques.

Plant Closure

(i) Soil testing should be performed prior to closure of any of the wood preserving plants, and any contaminated soil should be removed and disposed of accordingly.

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