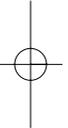
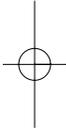


Reach for Unbleached!

The Pulp Pollution Primer



Introduction

Pulp and paper mills still pollute our water, air, and soil. This guide explains how mills pollute, gives a vision for a sustainable pulp industry, and shows how British Columbia's "Zero AOX" law can help achieve a pulp and paper industry that sustains the environment, healthy communities, and jobs. This Pulp Pollution Primer explains the basic facts of pulp mill pollution, presents alternatives, and examines industry's resistance to change.

Pulp pollution remains a serious problem. The pulp and paper industry is one of the largest and most polluting industries in the world; it is the third most polluting industry in North America. There are about 500 kraft mills, and many thousands of other types of pulp and paper mills, in the world. Primary concerns include the use of chlorine-based bleaches and resultant toxic emissions to air, water, and soil. With global annual growth forecast at 2.5%, the industry and its negative impacts could double by 2025. While society needs paper products, we also need to move to sustainable, environmentally safe production.



Why Does Pulp Pollution Matter?

AOX means Adsorbable Organic Halides. The AOX test measures organic (carbon-based) compounds that have halides attached and that adsorb, or stick, to an activated carbon filter. Halides are highly reactive elements in the Halogen family: fluorine, chlorine, bromine, and iodine. These elements bond easily with organic substances, allowing quick entry into the environment and the food chain. Because chlorine is by far the most common halide present in a pulp mill, the AOX test essentially measures chlorinated organic compounds, also called organochlorines.

Pulp and paper is the third largest industrial polluter to air, water, and land in both Canada and the United States, and releases well over a hundred million kg of toxic pollution each year (National Pollutant Release Inventory, 1996).

In 1995, the Canadian industry said it spent close to \$1 billion for environmental protection, largely to comply with environmental regulations. What industry did not say is that this money also financed expansion.

Water Pollution

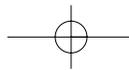
Pulp mills are voracious water users. Their consumption of fresh water can seriously harm habitat near mills, reduce water levels necessary for fish, and alter water temperature, a critical environmental factor for fish. Mill owners say they are unable to institute water conservation and recycling because the concentrated effluent would kill fish (COFI Pollution Prevention Workshop, June 1997).

In BC, 17 kraft mills discharge about 641 billion litres (141 billion gallons) of liquid effluent each year (Environment Canada, Environmental Effects Monitoring Report). While this liquid effluent is much less toxic than it was 10 years ago, "accidents" still kill test fish at one or two BC mills nearly every month. Even after the pollution control investments of the mid-1990s, the Fraser River, BC's largest watershed and one of the best wild salmon rivers in the world, is still 1% pulp mill effluent for 600 km during winter low water!

Mill wastewater continues to wreak havoc on surrounding ecosystems. In laboratory tests, mill effluent causes reproductive impairment in zooplankton, invertebrates (both these are food for fish), and shellfish, and genetic damage and immune system reactions in fish (Easton et al. 1997. EEM Cycle One. "Genetic Toxicity of Pulp Mill Effluent on Juvenile Chinook Salmon (*Onchorhynchus tshawytscha*) Using Flow Cytometry," Elsevier Science Ltd., Vol. 35, #2-3).

Kraft pulping, also known as sulphate, or chemical pulping, uses sulphur to get fibre out of trees. The sulphur chemicals account for the rotten egg smell of many pulp mills. Kraft pulping uses less than 50% of the tree. The rest ends up as sludge which is burned, spread on land or landfilled. A bonus of kraft pulping is that the chemicals can be recycled and re-used in the mill. Another is that kraft fibre is exceptionally strong ("kraft" means "strong" in German). Magazines, printing and graphics papers, grocery bags and corrugated packaging are examples of products made with kraft pulp. Kraft pulp is usually dark and is often bleached with chlorine compounds.

Mechanical pulping mills physically shred trees into pulp with grindstones and/or heat. Mechanical processes use about 90% of the tree. Unfortunately, mechanical pulp has weaker fibres, tends to discolour over time, and the process uses a lot of water and energy. Mechanical pulp is commonly used for newspapers and is often bleached with hydrogen peroxide or other chlorine-free alternatives.



Air Pollution

Air pollution from pulp mills is not well studied. Mills should be, but usually are not, monitored for a range of air emissions, such as particulate matter, carbon dioxide, sulphur dioxide, hydrogen sulphide, volatile organic compounds (VOCs), chlorine, chloroform, and chlorine dioxide. Incomplete data from BC's Environment ministry indicates that in 1997, BC mills emitted 17,000 tonnes (t) of particulates and 2.7 million t of carbon dioxide, along with other unreported emissions.



Air discharges from pulp mills contain hormone-disrupting and carcinogenic chemicals, such as chlorinated phenols, polycyclic aromatic hydrocarbons (PAHs), and VOCs. BC's coastal pulp mills are the largest provincial source of airborne dioxins and furans, which are among the most carcinogenic substances known.

Sludge, the Triple Threat

Each Canadian mill produces an average 40 oven dry tonnes of sludge per day, which is de-watered and then either landfilled or burned. Each year, BC mills create over a half a million t of sludge from secondary treatment plants, power boiler ash, chemical processing, waste fibre, sawmills, and other sources. Because of the different disposal methods, sludge pollutes soil, air, and water.

Many mills in Canada currently burn their sludge, but are eager to spread it on forests, parks, and farm lands as "fertiliser." Recently, a multi-stakeholder committee in BC explored criteria for land spreading, but the Council of Forest Industries withdrew from the committee when it was agreed that rigorous testing would be required before permitting this practice.

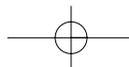
The Laws

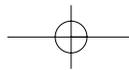
What Laws Control Pulp Mill Pollution?



The Canadian federal government regulates dioxins and furans, as well as other human health and fisheries-related contaminants, in mill effluent. The province of BC passed its Zero AOX law in 1992, which requires the elimination of organochlorines (AOX) by 2002. These laws deal exclusively with liquid waste. Emissions to air and land are dealt with by individual mill permits. There are no legally binding Canadian federal or provincial regulations for air emissions from pulp mills, for indoor air quality (except for Workers' Compensation Board regulations), or for ambient air quality. Solid waste landfills in BC are permitted by Ministry of Environment regional managers under the Special Waste Regulation of the *Waste Management Act*. Numerous

loopholes and inadequacies exist in this legislation.





Compliance to all laws and regulations is largely reliant on self-reporting by the mills. Enforcement, particularly in recent years, appears to be negligible.

The "Agreement on the Administration of Federal and Provincial Legislation for the Control of Liquid Effluents from Pulp and Paper Mills in the Province of British Columbia" was signed in September 1994 and expired March 31, 1996. It was supposed to "harmonise" federal and provincial pulp mill effluent regulations. No concrete standards or clear policies were developed, and no staff were designated to carry out testing, reporting, inspections, or enforcement. This Harmonisation Agreement actually resulted in less effective government monitoring and enforcement. Brian Emmett, Commissioner of the Environment and Sustainable Development in the Office of the Auditor General of Canada, recently evaluated the Harmonisation Agreement and concluded:



The British Columbia pulp and paper administrative agreement...had not worked as intended....BC and Quebec pulp and paper environmental monitoring and enforcement has been compromised....Environment Canada has neither plans nor resources in place if the provinces don't carry out federal environmental law.... Voluntary environmental measures are not working well enough.

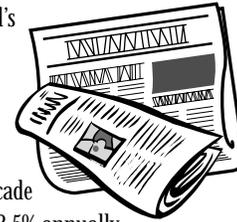
The Economic "Big Picture"

TCF, or Totally Chlorine Free, signifies virgin pulp (not recycled) that has been bleached with no chlorine compounds. The common TCF bleaches are all oxygen-based chemicals; oxygen, ozone, and hydrogen peroxide.

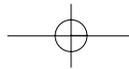
PCF, or Process Chlorine Free, indicates that a product is made with recycled fibres and that no chlorine compounds have been used in the recycling process. The original paper may or may not have been bleached with chlorine. This is almost impossible to determine until all virgin pulp and paper is made by TCF processes. PCF products combine the benefits of recycling and oxygen-based bleaching.

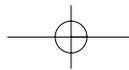
ECF, or Elemental Chlorine Free, is a pulp industry term created to describe pulp bleached without "elemental" chlorine gas, but this process still uses chlorine compounds. ECF usually refers to chlorine dioxide. The term is misleading because some elemental chlorine is found in chlorine dioxide mills. While toxic by-products are reduced by ECF, they are not eliminated.

Pulp and paper is one of the world's largest industries, producing 178 million t of pulp, 278 million t of paper and paperboard, and consuming 670 million t of pulpwood. Growth for the next decade is expected to be between 2% and 3.5% annually, which would require an increase in logging of 1 to 2 million hectares (2 to 5 million acres) of forest a year.



Fast-growing plantations in the Pacific Rim and Latin America are expected to provide most of this fibre. New Asia Pacific pulp mills can supply good quality pulp about one-third cheaper than BC mills, especially BC coastal mills, due to lower costs of fibre and shipping, and because of international currency exchange rates. Another factor reducing our competitiveness is that Canada's mills are essentially old and inefficient. Waste and inefficiency are two additional reasons we are losing market competitiveness.





Exports Drive the Pulp Industry in Canada

Canada is the world's largest forest products exporter, with all exports worth about \$39 billion. British Columbia has the mill capacity (4.8 million t) to supply over 20% of all the northern bleached softwood kraft pulp (the highest grade) on the world market. In BC, about two-thirds of production is geared to "kraft," the other third is mechanical pulp. Nearly all of this is exported as a base commodity instead of being converted into value-added products. This situation makes the Canadian industry extremely vulnerable to global market fluctuations, such as the recent "Asian Flu."

Until recently, BC had an edge because our pulp was made largely from old-growth fir (primarily waste from saw logs), which is very strong and in high demand. Now, however, old-growth is running out, and it is neither economically nor environmentally sound to turn it into pulp. In addition, new technologies and wood mixtures in other countries make our pulp neither special nor price-competitive. On top of running out of a free ride on old-growth and facing tough competition in the Pacific Rim, integration and mergers are changing the industry globally and reducing the profits from "free market" sale of BC pulp.



Although the US makes a lot more pulp, it consumes almost all of it domestically. Canada, with about one-quarter as many mills, sells 90% of its pulp and newsprint on the world market. Because Canadian pulp and paper are export products, they are sensitive to global economic trends and environmental issues. This is a strong incentive for Canada to be a leader in market diversification and development.

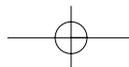
By increasing value-added paper production and developing TCF markets, particularly in the US, which doesn't have surplus pulp, we could compensate for other market factors. In fact, modernising our mills and developing TCF markets are primary ways to build a stable, long-term pulp and paper industry in Canada and in BC. Because of the rising public appreciation, not to mention demand, for environmental considerations, Zero AOX and Zero Discharge are the keys to the future of this industry.

Our Vision

Totally Chlorine Free, Zero Discharge Pulp Mills

We support a pulp industry with both a clean, healthy environment and safe, sustainable jobs. We have done extensive research on how to make that happen. Here is what we found:

- ❖ **Totally Chlorine Free, Zero Discharge pulp mills, which produce no liquid effluent and minimise the quantity and toxicity of air pollution and solid waste, are a desirable and achievable goal.**





- ❖ **Genetic damage and toxicity to fish and essential micro-organisms still occur with treated effluent from mills that use chlorine dioxide as a bleaching agent.** Eliminating all chlorine goes furthest to safeguard water quality, human and environmental health, and community safety.
- ❖ **Closed-loop operations will eliminate all toxicity to aquatic environments by eliminating all discharge into them.** This is important because some toxicity continues to cause harm, even in mills using no chlorinated compounds. Additionally, water use will be significantly reduced, leaving more water for fish habitat and other uses.
- ❖ **Practices that eliminate water pollution also greatly improve air quality.** In addition to ending chlorine-caused air pollution, TCF closed-loop mills prevent foul-smelling, toxic air pollution and increase workplace safety. These changes will directly benefit workers and people in mill towns, who are exposed to bleaching chemicals, process gases, emissions from treatment ponds, and bacteria and fungi on wood chips and sludge.
- ❖ **Oxygen-based kraft pulps show no appreciable shortcomings in pulp quality compared to products bleached with chlorine dioxide.**

- ❖ **Meeting British Columbia's "Zero AOX" law addresses many of these problems by ending the use of all chlorine-based bleaching compounds.** TCF mills have the lowest wastewater toxicity and by not using dangerous chlorine compounds, closed-loop systems are more feasible. Oxygen-based mills are the world leaders in low toxicity and water conservation.

Extensive scientific evidence supports our conclusion that oxygen-based bleaching is safest for workers, communities, and the environment. **Oxygen-based, closed-loop pulp mills are the best route forward to a successful and ecologically responsible pulp industry.**

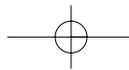
Why Doesn't Industry Want to Go This Route?



There are a variety of reasons why pulp companies resist laws requiring TCF closed-loop mills. The main reason is money. Preventing pollution can cost more up front, even though it benefits workers, communities, and shareholders in the long run. Other common reasons for resistance include:

- ❖ Industry says there is no market for Totally Chlorine-Free (TCF) pulp.
- ❖ Companies that manufacture chlorine chemicals are economically linked with pulp companies.
- ❖ Converting an existing mill to a TCF mill requires significant capital investment.
- ❖ Many companies feel they can get "clean enough" simply by switching to chlorine dioxide and not making further improvements.

Reach for Unbleached!



Worried communities and workers ask: "Won't companies close down mills?" This is the third time BC's pulp industry has claimed pollution laws would cause closure of every mill in the province. Instead, the industry has had some of its most profitable years in decades. We cannot let over-simplistic arguments or job loss fear-mongering steer us off course or reduce our expectations for increased worker health and safety and much-needed environmental improvements.

BC's Zero AOX Law as a Way Forward

A Bit of Background



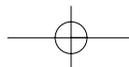
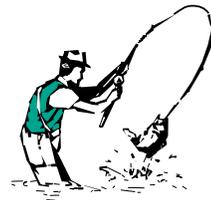
In the 1980s and early 1990s, BC experienced shellfish harvesting closures because of pollution by dioxins and furans. Dioxins and furans are highly toxic organochlorines produced when chlorine compounds are used to bleach pulp. These deadly chemicals were found in high concentrations near coastal communities having pulp mills (Powell River, Squamish, Duncan, Nanaimo, and Campbell River).

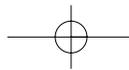
In 1992, after five years of intensive organising by workers and citizens, British Columbia passed one of its most

important pieces of environmental legislation: the *Pulp Mill and Pulp and Paper Mill Liquid Effluent Control Regulation*, also known as the "Zero AOX" law. The law gave mills 10 years to eliminate organochlorines (AOX) from their liquid effluent.

The law has two stages. The first stage required pulp mills to reduce the amount of organochlorines in wastewater from an average of 10 kg per air-dried tonne (kg/adt) of pulp to 1.5 kg/adt by 1995. This first stage has been successfully accomplished.

The second stage requires that there be no organochlorines (Zero AOX) in mill effluent by 2002. So far, only seven of BC's 26 mills appear to be able or willing to meet this goal. The seven complying mills are either kraft mills that never used any bleach or they are mechanical mills that make newsprint (RFU! Charts, 1999. In: *Pulp & Paper Mills in BC*, COFI/EC-EEM). Today, about three years from the deadline, industry has stalled at around 0.7 kg/adt AOX and is pressuring government to do away with the Zero AOX requirement.





We still have a long way to go!

BC's pulp mills have cleaned up a lot in the past decade, but they were among North America's dirtiest mills when environmental legislation forced the change. Despite improvements, BC's pulp and paper mills still:

- ❖ pour 7 tonnes (t) of AOX into surface waters every day;
- ❖ threaten fish habitat by dumping nearly 100 t of solid waste into our rivers and ocean every day;
- ❖ add well over 2 million t of greenhouse gases to our air every year, adding to global warming; and
- ❖ belch 30 t per year of foul-smelling sulphur compounds; a major source of acid rain and community and worker health problems.



Pulp mill pollution continues to effect our environment in the following ways:



- ❖ kill fish, kelp, and important aquatic invertebrates;
- ❖ emit cancer-causing and hormone-disrupting chemicals into the environment;
- ❖ consume millions of litres of fresh water; and
- ❖ put communities at risk from chemical spills, such as the 1994 chlorine dioxide spill in Powell River.

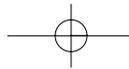
BC's Zero AOX law has enabled tremendous strides toward reducing environmental and health damage from pulp and paper mill pollution. Even so, soil, water, sediments, and human and animal tissues are still contaminated with persistent organochlorines from past and current releases (Dioxins and Furans Canada-Wide Standards Development Committee, 1999). In order to eventually rid our environment and the food chain of these toxic chemicals, we must ensure government continues with the timetable and does not back down on the goal of Zero AOX by 2002.

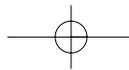
Why Should We Care About AOX?



We should care about AOX in our environment because many organochlorines have been shown to have toxic effects. Remember, only a small number of AOX compounds have been tested. Organochlorines are a significant component of effluent from pulp mills that still use chlorine compounds to bleach.

Many organochlorines have been linked to health problems, such as cancer, birth defects, endometriosis, low sperm counts, and impaired foetal development. Organochlorines have also been shown to cause genetic damage and low survival rates of salmon and other fish. Organochlorines can last a long time in the environment (they are persistent) and build up in soils and animal, including human, tissues (they bioaccumulate). Eliminating pollution from organochlorines is an important way to protect our health and the environment.





Why Do We Need Zero AOX?

We need Zero AOX because organochlorines can be toxic at levels below standard test measurements. The only sure way to protect ourselves and our environment is to eliminate the use of the chlorine-based chemicals at the source.

AOX is a good indicator of technological advancement. Because of the improvements required to eliminate AOX, mills achieving Zero AOX are among the most technologically advanced. They make efficient use of energy, water, and other resources. World-wide, mills capable of Zero AOX are also those mills capable of extremely low or Zero Discharge (closed-loop recycling) of their liquid wastes. Lower AOX measurements indicate that money and effort have been invested in pollution prevention and efficient production.

Here are some of the great things the pulp industry could accomplish if it stopped using all forms of chlorine:

- ❖ eliminate all chlorinated organic pollutants in pulp effluent, not just make them “non-detectable” to current test equipment;
- ❖ improve worker and community health and safety;
- ❖ reduce contamination of fish, shellfish, and other organisms in the food chain;
- ❖ eliminate air emissions of chlorinated compounds (e.g., chloroform and many other gases that cause or contribute to serious respiratory problems);
- ❖ reduce other pollution (e.g., colour and suspended particles) that damage salmon spawning beds and other aquatic habitats.

TCF Markets - The Solution

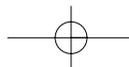
The Myth That Won't Die: There's No Totally Chlorine-Free Market

The quickest and easiest way for BC mills to meet the 2002 Zero AOX target is to switch to Totally Chlorine-Free (TCF) production. If they do, will there be a market for chlorine-free pulp and paper? Yes—most definitely! The fact that manufacturers of pulp bleached with chlorine dioxide bill it as Elemental Chlorine Free (ECF)—along with our own market research—tells us that there is a market. Many paper buyers, from individuals to institutions, think ECF means all chlorine chemicals have been eliminated! The words chlorine-free, even when misused in this way, are a clear attraction for consumers.

TCF Pulp Is “The Wave of the Future”

The explosive growth of Totally Chlorine Free (TCF) pulp has slowed, but not before gaining close to 25% of European sales in less than a decade (CFPA Today, Spring 1999). Sales are currently greatest in Germany, Scandinavia, and England. The companies producing TCF pulp are the only ones that have increased European market share while the pulp market there has otherwise been stagnant.

World market for TCF hardwood and softwood pulp and paper of all types is about 5 million tonnes, 6% of a global market of 78.5 million tonnes in 1998. Half of this TCF pulp is produced in Sweden, where TCF is 40% of total pulp production. Sweden's Sodra Cell is the world's largest producer of TCF pulp and it is expanding TCF production by another 250,000 tonnes in 1999. Sodra's



Monstera mill has just undergone massive expansion and has agreed to meet some of the toughest pollution permit levels in the world. The company was partly driven into TCF by regulation. "In Sweden you can only get a permit to expand your mill if you can increase output without any incremental increase in effluent. We couldn't turn back on TCF now..." (Papermaker, April 1999. *TCF is alive and well and living in Scandinavia*).

When BC's mills could not meet the environmental standards demanded by European consumers, they shifted to Asian markets. As a result, BC mills and communities suffered greatly during the Asian financial crisis.

The Customers Are Lining Up

There has been no serious effort by the pulp industry to develop North American markets for TCF products. Yet our research shows that North America is an important place for niche markets that can sustain BC pulp and paper in a world where competitiveness on price alone is in serious doubt. While industry likes to claim there is no market for TCF pulp, we have found a waiting market, frustrated by a lack of available products. A significant number of US cities, states, and companies have purchasing policies that give preference to TCF paper products. These committed customers-in-waiting include the cities of Chicago and Seattle; the state governments of Maine, Minnesota, Oregon, and Vermont; universities; credit unions; and companies like Kinko's, IKEA, and McDonalds (contact Reach for Unbleached for a current list). BC's mills could supply these products and further develop these markets. The market advantage would not only protect our environment and economy, it would enable industry to comply with the Zero AOX law.



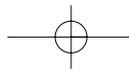
Conclusion

Totally Chlorine Free, Zero Discharge pulp and paper mills can support a healthier environment and a vibrant, diversified economy.

Pulp mill pollution continues to harm our health and the environment. Alternative production methods exist that will eliminate organochlorine pollution (Zero AOX) and lead to Zero Discharge, further protecting our precious oceans and fresh water. Alternative markets exist that will provide stability to the Canadian pulp industry in a competitive world. Our governments need to enforce existing legislation and promote a modern, sustainable pulp and paper industry.

What you can do

- ❖ DEMAND chlorine-free recycled or non-wood (PCF/TCF) paper products wherever you shop; the local supermarket, the copy shop, or major paper distributors. Contact RFU for more info.
- ❖ INSIST that the BC government enforce its Zero AOX law. Write to the Premier, the Minister of Environment, and your MLA.
- ❖ SUPPORT Reach for Unbleached! and other environmental organisations in their work to promote Clean Paper.



Contact information:

Reach for Unbleached!, Box 39, Whaletown, BC, V0P 1Z0 Canada
Ph/Fax: (250) 935-6992 Email: info@rfu.org Internet: www.rfu.org
or: 2nd Floor, 1672 East Tenth Ave., Vancouver, BC, V5N 1X5 Canada
Ph: (604) 879-2992 Fax: (604) 879-2272



Organisational information:

Reach for Unbleached! began in 1991 after dioxin contamination from pulp mills using chlorine compounds closed many shellfish beds on BC's coast. Along with consumer education in Canada, we immediately focused on networking with American environmental organisations because the US market is crucial to Canadian pulp mills. Our campaign began as an effort to encourage consumer acceptance of unbleached or oxygen-bleached paper for many routine uses. The campaign now encourages other aspects of the "wise use of paper," such as reduction and recycling, and includes a broad focus on toxics in its work towards sustainability in the pulp and paper industry.

Projects sponsored by Reach for Unbleached! include:

Bulk Paper Buying Club—Since January 1998, Reach has been operating a bulk paper buying club that orders office paper quarterly. The aims of the club are threefold: to make environmental office paper more affordable and accessible, to send a message to manufacturers and distributors that there is a market for this type of paper, and to convince a mill in BC to start making TCF/PCF paper.



MillWatch—A monthly print and electronic newsletter that is read by pulp mill community activists, industry insiders, academics, and government regulators. Up-to-date news and analyses of all aspects of the pulp and paper industry.

Pollution Prevention Report Card—A tool to help workers, mill town residents, and mill managers evaluate the environmental, technological, and economic strengths and weaknesses of their local mills. The Report Card's goal is to give the involved parties a way to talk about, and plan for, continuing environmental improvements.

Pulp Info Centre—Since May 1998, Reach has offered the services of its Pulp Info Centre. A wide range of scientific, technical, regulatory, and economic articles and reports are catalogued on a searchable database and available to the public.

Report Publications—*Monitoring Pulp and Paper Mills in British Columbia: A Citizen's Handbook*, January 1997; *Zero Discharge: Technological Progress Towards Eliminating Kraft Pulp Mill Liquid Effluent, Minimising Remaining Waste Streams and Advancing Worker Safety*, October 1998.

Web Page—<http://www.rfu.org>. Everything you ever wanted to know about environmental issues relating to the pulp and paper industry.

