combined.

Releases of PCB from the use of broke depended on four primary factors:

1. The fraction of Broke produced in the Valley that was deinked and recycled in the Valley and by whom.

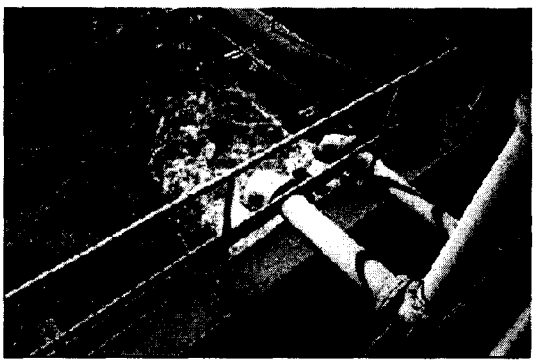
2. The fraction of PCB which was clinging (partitioning) to the deinked fibers instead of leaving with the wastewater stream. It is estimated that anywhere from 25-75% of the PCBs stayed with the fibers during the recycling process, and these PCBs were incorporated into the final paper products. Corrugated papers probably retained more PCBs.

3. The effectiveness of PCB removal during wastewater treatment of the deinking waste streams.

4. The fiber loss (with clinging PCB) during paper making operations using the deinked fiber. Many of these PCBs would stay with the solid waste fiber sludges collected during the first stage of wastewater treatment.

Most if not all of the NCR Paper broke likely was deinked and recycled in the Fox Valley. A substantial amount of deinking capacity was available in the Valley and shipping costs would have made it uneconomical to ship the broke material to distant mills. Equally likely is the possibility that NCR Paper broke produced outside the Valley was shipped into Fox River Deinking mills. The movement of NCR Paper broke to other locations undoubtedly accounts for PCB sediment deposits in several other areas around the country.

Appleton Coated Papers was not the only source of NCR Paper broke. Mead Paper, located in Ohio, also produced NCR paper and would have produced broke as well. Some of this broke may have ended up in the Fox Valley due to the high availability of deinking and recycling capacity here. Also, broke may have been shipped out of the Fox Valley to other deinkers. However, it is very unlikely that large quantities would have routinely been shipped long distances.



The Wisconsin Dept. of Natural Resources estimates that total cumulative PCB discharges between 1954 and 1998 were in the range of 420,000 to 825,000 lbs. Over 98% of the PCB loads were discharged to the river prior to 1972, with the highest years being 1969 and 1970.

Most paper recyclers on the Fox River reduced their wastewater PCB levels to non-detectable levels by the 1980s, but the Fort Howard Paper Company (which merged into Fort James and now Georgia Pacific) continued to discharge significant quantities with wastewater from its Green Bay mill, at a rate of roughly 50 pounds of PCBs yearly in the 1980s. This mill uses more lower-grade mixed post-consumer waste paper than other mills, which makes it more susceptible to PCB contamination as homes and offices dump old paper files still contaminated with PCBs. In the 1990s, Fort Howard improved its wastewater treatment and PCBs are mostly non-detectable now. (Unfortunately, we are still concerned about continued PCB releases to the air via paper mill sludge landspreading or sludge dryers and incinerators in the Fox River region.)

(All but the last paragraph is condensed from information contained in: ***"Fox River and Green Bay PCB Fate and Transport Model Evaluation, Technical Memorandum 2d,***

Compilation and Estimation of Historical Discharges of Total Suspended Solids and PCB from Fox River Point Sources, Draft" *by Dale J. Patterson, Wisconsin Dept. of Natural Resources, June 3, 1998. 30 pps & appendices.)*

To read the full document, go to:
http://www.dnr.state.wi.us/org/water/wm/ lowerfox/rifs/modeldocs/tm2d.pdf

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Fox River Watch is a project of

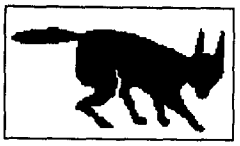
Clean Water Action Council
1270 Main Street, Suite 120, Green Bay, WI 54302
Phone: 920-437-7304, Fax: 920-437-7326
E-mail: CleanWater@cwac.net



FOR MORE INFO
CONTACT CWAC

CONTENT BY: Rebecca Leighton Katers
WEB DESIGN BY: DataScouts
WEB HOSTING BY: Doteasy

PCB sources which contaminated the Fox River and Green Bay.

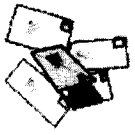


Sources of PCBs in the Fox River

How *YOU* Can Help Clean The River and Bay!

ACTION ALERT!

Please send your comment letter today!



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Message Board

The bulk of the PCB discharge to the Fox River resulted from the production and recycling of carbonless copy paper which included PCB coatings on the back.

Early experiments with carbonless copy paper occurred around 1950 to 1953. Commercial production began in the Fox Valley in 1954, and continued until the early 1970s when Monsanto stopped selling PCBs for uses "open to the environment."

(Carbonless copy papers continue to be produced today with other chemical coatings, some of which have also raised health concerns. For more information, visit: http://www.carbonless.org)

AT&T Global Solutions Company (formerly known as National Cash Register Company) invented carbonless copy paper as a result of their search for a paper for cash registers not needing an ink ribbon. Barrett K. Green, an NCR researcher, demonstrated a paper that would image upon impact, but had little shelf life until a method was found to encapsulate the dye materials.

Relative Responsibility for Fox River PCB Contamination

Company Name	Percent of PCB Releases
Appleton Papers/NCR Corporation	39.7 % (up to 70%)
P.H. Glatfelter Company (formerly Bergstrom Paper)	27.1
Georgia-Pacific (formerly Fort James Corp., formerly Fort Howard Corp.)	22.5
SCA -- Svenska Cellulosa Aktiebolaget (formerly Georgia-Pacific, or Wisconsin Tissue)	9.1
Riverside Paper Company	1
Sonoco (formerly U.S. Paper Mills Corporation)	1

Such a method was demonstrated successfully by him in 1950, using microcapsules of a waxy material to enclose a colorless dye dissolved in PCBs. This material was made as an emulsion and could be coated onto the back side of a sheet of paper. A second special reactive coating was then put on the front side of a second sheet of paper. Impact on the front sheet would rupture the capsules and allow the dye to react with the coating on the front of the second sheet, thereby leaving an image. Because the capsules were fragile, special coating methods, such as air knife coaters, were required to produce the paper. Appleton Coated Papers was one of a very few coaters that had the necessary equipment and skill to handle the emulsion.

NCR produced the capsule emulsion in Dayton, Ohio and later in Portage, Wisconsin. The emulsion was sold to Mead Paper Company in Ohio and to Appleton Coated Papers in Appleton, Wisconsin. The finished product was bought back by NCR for distribution and sale. Production records provided by NCR indicate that about 67% of the emulsion was sold to Appleton Coated Papers during the period when PCBs were used in the capsules.



Guestbook

Make a Donation

At least four types of coating operations were used to make NCR Paper. Coated Back (CB) paper was used as the front sheet in a form and consisted of paper coated with the PCB containing emulsion on the back of the paper. Coated Front (CF) paper was used for the back page of a form and was coated on the front side with the reactive coating that did not contain PCB. Coated Front and Back (CFB) was used for middle pages in a form and was coated with reactive materials on the front and PCB emulsion on the back. Self Contained (SC) paper was coated with both layers on the front side of the paper and was meant to be used as a second sheet in a form and could be used with any type of paper as the cover sheet. Only CB, CFB and SC paper used PCB in the coating material.

Carbonless copy paper production increased nearly exponentially during the 50s and 60s. By 1971, Robert Shade, of Shade Information Systems, Inc., estimated that 7.5% of all office forms produced up to 1971 were carbonless copy paper. ("NCR Paper" will refer to carbonless copy paper produced using PCB emulsions during the period of 1954 to early 1971.)

NCR Paper made with PCBs contained up to 3.4% PCB by weight. PCB got into mill discharges primarily through the direct recycling of "broke" material (trimmings) coming directly from the manufacture of NCR Paper, or recycling of post-consumer waste paper that contained some NCR Paper. In addition, some PCB losses occurred in the NCR Paper coating operation (as they do in any paper coating operation). The Appleton Coating Mill discharged to the Appleton public sewage treatment plant, which in turn discharged PCBs to the Fox River.Data shows many types of paper products manufactured during the 60s and 70s contained significant amounts of PCB because they were manufactured in part with fiber derived from NCR Paper broke. In addition, post consumer paper contained some NCR Paper thrown out with discarded files and also inks on some papers containing PCBs. All these sources contributed to PCB release.

PRODUCTION RELEASES OF PCBS --- NCR Paper production occurred in the Fox Valley primarily at Appleton Papers -Appleton Coated Mill. A second mill located in Ohio also produced NCR Paper and NCR split PCB emulsion to the 2 mills. Data indicates that the yearly amount sent to the Appleton mills ranged from 26% in 1954 to a high of 71% in 1969. The overall usage indicated that just over 65% of the PCB emulsion was used at the Appleton Coated Papers facility. A few other facilities also began or experimented with manufacture of PCB-based carbonless copy paper around 1965. However, total production of carbonless copy paper at these facilities was small compared to Appleton Coated and the Ohio mill.

The percentage of PCB in the emulsion varied somewhat, but was consistently at or near 57% PCB by weight. Between 29.6 and 30.2 million pounds of PCB came to the Fox Valley in the emulsion. All of this PCB was Aroclor 1242. Assuming a 3% to 5% range of loss during production results in 28.7 million pounds coated on paper and broke with 888,000 to 1.5 million pounds lost to sewers during production. The Wisconsin DNR estimates that after wastewater treatment the PCB discharges to the Fox River due to production losses ranged from 81,000 kg to 138,000 kg. (178,572 lbs. to 304,235 lbs)

BROKE DEINKING RELEASE OF PCBS -- - The majority of PCB discharged to the Fox River was the result of NCR Paper broke use. It is estimated that a few million pounds of PCB was tied up in the NCR Paper broke. Use of this broke by deinking mills almost certainly released a great deal of the PCB into the wastewater stream of the mill. It would take only a small fraction of this PCB mass to result in more discharge of PCB to the Fox River than the total discharge from the other two methods

