



Path of Toxic Pollution

How making
“forever chemicals”
for food packaging
threatens people
and the climate

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SEPTEMBER 2021

In Brief

When PFAS (per- and polyfluoroalkyl substances) treatments are used in food packaging, they provide a temporary benefit: grease resistance during the short time the packaging holds food. Behind that benefit, however, lies massive pollution that devastates communities such as North Alabama, contributes significantly to climate change and the destruction of the ozone layer, and contaminates communities worldwide with chemicals that last forever.

This report traces the path of American PFAS in food packaging back to one manufacturing company, Daikin America, which manufactures in Decatur, Alabama. We found that in 2019, Daikin's Decatur PFAS manufacturing plants reported releasing 240,584 pounds of a potent greenhouse gas and ozone-depleting chemical, HCFC-22. These emissions make them the nation's #2 polluter of HCFC-22, and in greenhouse gas terms, equate to emissions from driving 125,000 passenger cars for a year. Daikin's process for making PFAS also threatens workers' lives: at least three workers have been killed on the job in Decatur. The drinking water for communities downstream of Daikin's facilities has been contaminated by Daikin and another facility, with Daikin paying \$5 million to the local water utility to address the contamination. And when paper mills apply Daikin's PFAS treatment to paper, they can release PFAS in wastewater, contaminating rivers and sludge.

PFAS are a class of chemicals that companies put in a variety of products, despite evidence that some threaten our health. Companies use them to make products non-stick or to make them resistant to stains, grease, and moisture. Certain PFAS are considered dangerous to humans and wildlife and have contaminated the drinking water of millions of Americans.^{1,2}

Testing has found that many food packaging items contain PFAS, despite growing consumer demand and legislative action for the phaseout of these chemicals. In 2020, laboratory test results found that numerous food packaging items from popular chains were likely treated with PFAS, based on the levels of fluorine detected.³ This included the packaging for such iconic products as Burger King's Whopper (about 620 million sold each year) and McDonald's Big Mac (about 560 million sold in the U.S. each year).^{4,5} McDonald's recently agreed to phase out the use of PFAS in guest packaging materials.

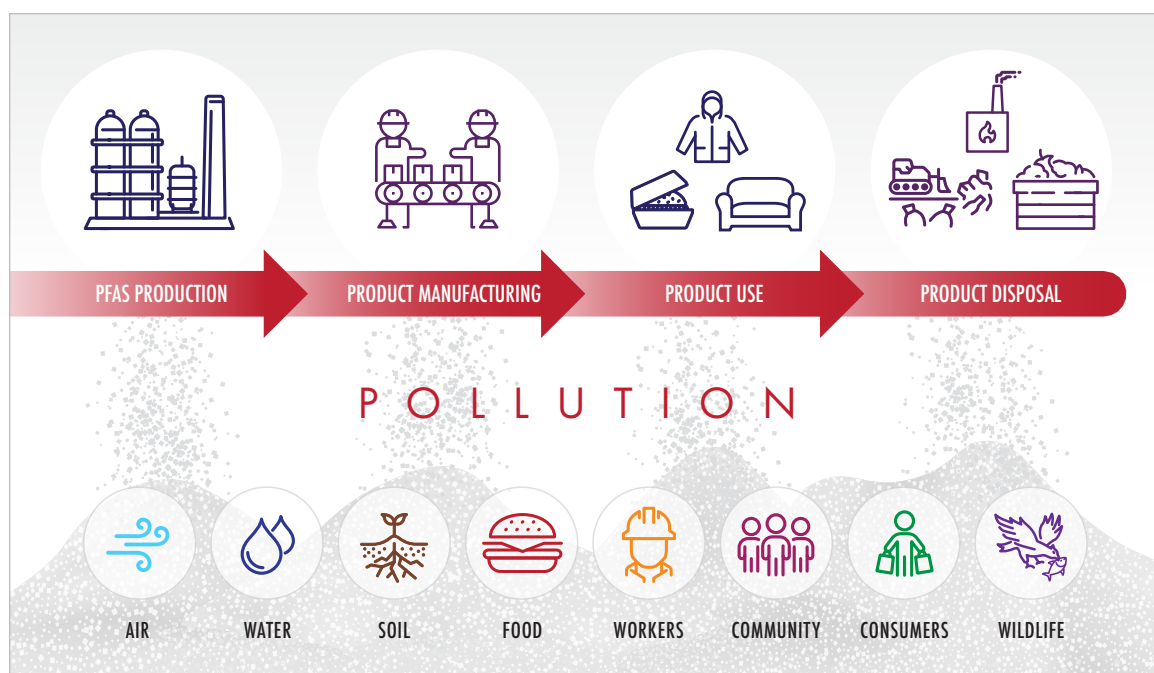
A major use of greaseproof paper is to hold fast-food sandwiches, including the millions of Whoppers and Big Macs served each day. Based on Daikin's submittals to the Food and Drug Administration (FDA) stating the application rate for its PFAS for paper, we estimate about 21,900 pounds of PFAS treatment have been used for Burger King's Whopper wrappers each year, and 24,700 pounds in packaging for McDonald's Big Mac each year (see Appendix 1 for details). While these estimates are based on information from Daikin, it is possible that the packaging for these fast-food companies is made using a treatment from a different PFAS manufacturer.

Just a handful of companies supply the U.S. fast-food paper packaging market with PFAS. Daikin America’s plant in Decatur, Alabama, appears to be the only U.S. plant making PFAS for fast-food packaging. Solvay, AGC, and Archroma manufacture PFAS-containing paper treatments that are permitted in the U.S., but they make them in Italy, Japan, and Germany, respectively.^{6,7,8} While DuPont and its fluorochemicals spinoff, Chemours, supplied grease-resistance treatments for food packaging in the past, in June 2019, Chemours “voluntarily ceased” introducing them

into commerce.⁹ That leaves Daikin’s Decatur plant—to our knowledge—as the only U.S. manufacturer of PFAS for food packaging.

Daikin calls the food packaging PFAS chemical it makes in Decatur *Unidyne*, marketing it as able to “routinely exceed the difficult performance requirements for oil, grease, glue, alcohol, and water repellency.”¹⁰ In this report, we will refer to this product as Daikin’s “PFAS for paper.” Daikin also manufactures similar treatments for textiles at its Decatur plant.

Figure 1. PFAS pollutes at all four stages of its lifecycle



How Daikin’s Decatur facilities contribute to the climate crisis and depletion of the ozone layer

Daikin’s Decatur operations have achieved a level of notoriety for releasing PFAS into the environment, polluting local waterways and drinking water. Less well-known, but impacting the entire planet, are its production releases of potent greenhouse gases that deplete the ozone layer.

Daikin is one of a number of companies that have

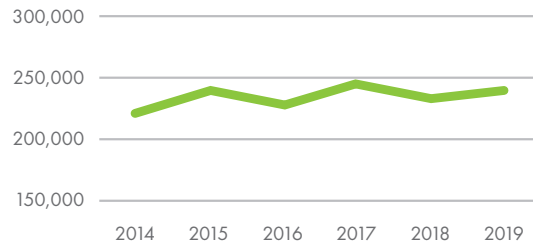
produced chlorofluorocarbons (CFCs), which came into wide use as refrigerants in the 1950s and 1960s.¹¹ By the 1970s, scientists discovered that these chemicals could destroy ozone, allowing increased amounts of harmful UV radiation to reach the earth.¹² The Montreal Protocol, a global treaty, aimed to phase out the use of these chemicals beginning in the 1990s.¹³

Under the Montreal Protocol, the U.S. committed to phasing out certain ozone-depleting substances beginning in 1994, starting with the most potent until the end of all production and import in 2030. An unfortunate regulatory loophole, however, allows companies to continue to produce ozone-depleting chemicals as long as they are intermediates in producing another chemical.ⁱ Using this loophole, Daikin can continue to produce, use, and release a potent ozone-depleting chemical known as chlorodifluoromethane (HCFC-22), used in its manufacture of PFAS. Based on the most recent finalized public data, Daikin’s operation in Alabama (which includes the MDA facility, wholly owned by Daikin since 2014) ranks as the country’s #2 source of HCFC-22 air pollution.¹⁴

Daikin’s production of its PFAS for paper begins with the delivery of highly toxic and dangerous materials to Decatur. Rail cars bring hydrogen fluoride and chloroform, which Daikin reacts to produce HCFC-22.¹⁵ For 2019, Daikin reported releasing a total of 240,584 pounds of HCFC-22 from its Decatur operations.¹⁴

This pollutant damages Earth’s atmosphere in two ways. First, HCFC-22 depletes the atmospheric ozone layer, which protects against harmful

Figure 2. Daikin in Decatur: HCFC-22 air releases, pounds

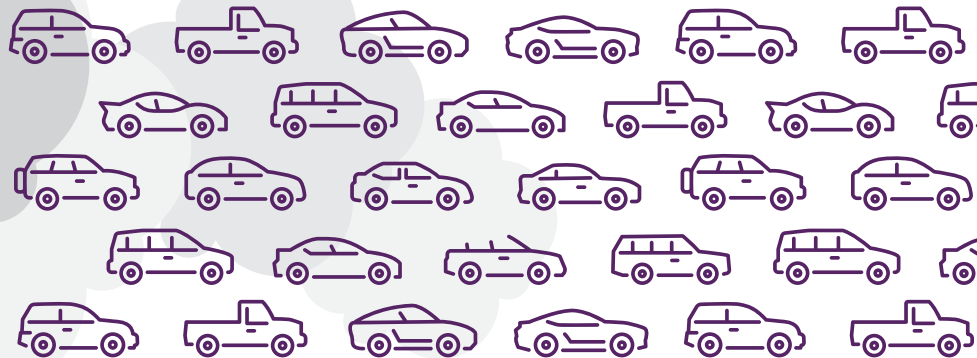


Daikin reports releasing large amounts of the potent greenhouse gas HCFC-22 from its Decatur facilities.

solar radiation that may cause skin cancer and cataracts.^{16, 17} Second, it is a potent greenhouse gas—its global warming potential is estimated at 5,280 times that of carbon dioxide (considering a 20-year time horizon).¹⁸ That makes Daikin’s reported Decatur releases in 2019 the greenhouse gas equivalent of more than one billion pounds of carbon dioxide. On an annual basis, Daikin’s releases constitute the greenhouse gas equivalent of driving 125,000 passenger cars for a year.¹⁹

Shockingly, Daikin is not the only maker of PFAS that releases HCFC-22. Chemours’ Louisville plant ranks as the nation’s #1 releaser of HCFC-22, with 652,688 pounds reported released in 2019; Chemours’ Washington Works plant in West Virginia reported releasing 22,610 pounds of HCFC-22 in 2019.¹⁴

Daikin’s Decatur facilities’ annual greenhouse gas emissions are equivalent to driving 125,000 passenger cars for a year



ⁱ See Article 1, Definitions, which excludes chemicals “entirely used as feedstock in the manufacture of other chemicals.”

A toxic manufacturing process: How Daikin’s chemicals threaten workers’ lives and the Decatur community

In its production of PFAS from HCFC-22, Daikin’s Decatur plant releases large quantities of another fluorinated chemical—tetrafluoroethylene (TFE), which it makes from HCFC-22 and releases into air at a reported rate of about 55,000 pounds per year.^{20, 21} TFE is a basic building block for PFAS such as Daikin’s PFAS for paper, but a dangerous one. In addition to being a carcinogen, tetrafluoroethylene is highly flammable and explosive.^{22, 23} In 1999, a tower containing TFE exploded, killing three employees and badly burning another Daikin worker in Decatur.^{24, 25} The plant also emits vinyl chloride, a carcinogen that’s associated with liver diseases.^{20, 26, 27, 28}

Daikin uses TFE as a starting point for synthesizing PFAS, including in what is known as the telomerization process to create the fluorotelomers that are the basis of surface coatings like the company’s PFAS for paper.²¹

Threats to workers’ lives persist at this non-unionized facility. On April 10, 2020, the Occupational Safety and Health Administration (OSHA) issued penalties against Daikin for alleged serious violations of process safety management of highly

hazardous chemicals and respiratory protection standards at the Decatur plant. Daikin is contesting the penalties, which total only \$40,482.²⁹

Table 1: Demographics of area around Daikin’s Decatur plant

Race Breakdown: Persons	
African-American	51%
White	36%
Hispanic-Origin	14%
Other/Multiracial	12%
Asian/Pacific Islander	1%

Income Breakdown: Households	
Less than \$ 15,000	21.0%
\$ 15,000 - \$ 25,000	22.5%
\$ 25,000 - \$ 50,000	27.9%
\$ 50,000 - \$ 75,000	11.0%

U.S. Environmental Protection Agency (EPA) data show that the community within three miles of the Daikin facility is majority African-American and most incomes are below \$50,000.³⁰

PFAS from local manufacturing contaminate air, drinking water, and farms in the Decatur area

Pollution from Daikin’s Decatur plant has contributed to drinking water contamination throughout North Alabama. With the combination of Daikin’s releases and pollution from the adjacent 3M plant, Decatur has become one of the nation’s hotspots of PFAS contamination.²

Daikin’s wastes, discharged to Decatur’s wastewater treatment plant (Decatur Utilities WWTP), ultimately become the community’s burden.³¹ The treatment plant discharges liquid effluent,

shown in the past to contain PFAS, into the Tennessee River—the water source for Decatur and other North Alabama communities.³² The local water authority downstream of Decatur’s industrial zone, West Morgan-East Lawrence, found PFAS in its treated drinking water until it installed an expensive filtration system, and federal health researchers tied elevated levels of several PFAS compounds in local residents’ blood with drinking this water or private well water contaminated with PFAS.^{33, 34, 35} Daikin agreed to pay

the authority \$5 million in a settlement reached in 2017.^{ii, 34}

The plant's sludge, also containing PFAS, goes to the Morgan County landfill.³⁵ Since the landfill leachate (the liquid waste from the landfill) goes back to the wastewater treatment plant, the PFAS in the landfilled sludge have another opportunity for discharge to the Tennessee River.

Sludge has also taken a more direct path to

contaminating the community, as a result of spreading on farms that took place from 1995 to 2008. In 2011, the U.S. Environmental Protection Agency (EPA) published results of well-water and surface-water tests near farms that had received sludge from the Decatur wastewater treatment plant. EPA found elevated PFAS levels in the water (total PFAS concentrations up to 19,354 parts per trillion), showing that especially current-use PFAS migrated from the sludge-amended soils to contaminate water.³⁶

A toxic application process: How paper mills treating paper with PFAS for food packaging pollute their communities and neighbors

After Daikin produces its PFAS for paper, specialty paper mills use the PFAS treatment to create oil- and grease-resistant paper. Such mills are present around the country, from Georgia to Maine. The mills use Daikin's PFAS for paper to treat paper used for fast-food and other packaging. Along the way, the mills release PFAS into wastewater, air, and sludge, some of which has been spread onto farms.

According to Daikin, mills use its PFAS for paper "as grease proofing agents for food-contact paper and paperboard at levels of up to 0.8% (by weight of dry paper)."³⁷

Any mill that uses Daikin's PFAS for paper is a potential PFAS pollution hotspot. According to information provided to FDA by Daikin, paper mills discharge up to 12% of the PFAS treatment they use for certain applications.^{iii, 37} For those applications, in order to achieve target retention rates of 0.8% in the paper, mills overload pulp slurry with slightly higher concentrations (0.91%, according to Daikin). They eventually discharge

the leftover PFAS treatment into wastewater.

The typical mill, according to Daikin, produces about 1.65 million pounds of treated paper per day and uses about 15,000 pounds of Daikin's PFAS for paper in the process.³⁷ Using the estimated percentage that would remain in the pulp slurry, each mill could then deliver up to about 1,800 pounds of the PFAS treatment daily to wastewater treatment. Of that, Daikin posits that 90% of the leftover treatment could partition to sludge, and 10% to liquid effluent.

Using Daikin's assumptions, each PFAS-applying mill could be responsible every day for the discharge of up to about 180 pounds of PFAS directly to surface water, along with up to about 1,620 pounds that wind up in sludge.

There are no apparent efforts to monitor rivers or wastewater treatment plants for PFAS released from specialty paper mills. These PFAS discharges are not covered by the Clean Water Act or other pollution-related regulations.^{iv}

ii 3M has also settled with the utility, for \$35 million.

iii Daikin's submission to the FDA estimates discharges for PFAS application "prior to sheet formation." When PFAS is applied as a coating, Daikin estimates zero discharge.

iv See, for example, this permit that does not address PFAS: http://storage.googleapis.com/ns697-merdr/EPA_Region1_NPDES_permits/me/final/ME0001937_finalme0001937permit.pdf

Recommendations

Restaurant and grocery chains and other food retailers should do the following:

1. Adopt and implement a public policy with clear quantifiable goals and timelines for reducing and eliminating PFAS in all food contact materials in restaurants and supply chains.
2. Ensure substitutes are safer, at a minimum free of any [Green-Screen Benchmark 1](#) chemicals and any organohalogen compounds.
3. Provide safe reusable food serviceware and train staff to make this the default for customers.
4. Publicly report on progress and announce when the food contact materials are PFAS-free.
5. Develop a comprehensive safer chemicals policy to reduce and eliminate other toxic chemicals, such as *ortho*-phthalates, in food contact materials and other products.

Other parties also have a role to play:

1. Federal, state, and local governments should ban PFAS, as well as other substances made using organohalogens, in food contact materials; ensure safer alternatives; and leverage their institutional purchasing power to buy safer PFAS-free food serviceware.
2. EPA should close the loophole that allows the dangerous climate pollutant HCFC-22 to be used as an intermediate in the manufacture of PFAS.
3. Polluters like Daikin should pay for the cleanup of PFAS in communities that have been affected by manufacturing, use, and disposal.
4. FDA should withdraw its approvals for all PFAS in food contact materials and not approve any new PFAS.
5. Commercial composting facilities should accept only food packaging that is certified PFAS-free (i.e. certified by the Biodegradable Products Institute or the Compost Manufacturing Alliance).
6. Individuals should call on food retailers and elected officials to ban PFAS in food contact materials.

Acknowledgements

We wish to express our appreciation to members of the North Alabama communities who have worked to hold these polluters accountable, especially Concerned Citizens of WMEL Water Authority and Tennessee Riverkeeper. We thank the experts who generously shared their time and expertise to review or advise on this report: Shari Franjevic, Brenda Hampton, Michael

Lazarus, Sonya Lunder, Dr. Maricel Maffini, Dr. Heather Price, Dr. Ian Ross, and Dr. Heather Stapleton. Funders who made this work possible include the Blaustein Foundation, the Forsythia Foundation, John Merck Fund, New York Community Trust, and the Park Foundation.

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Appendix 1: Calculations for PFAS used in burger packaging

Our estimates for the amount of PFAS treatment used in burger packaging are based on Daikin's submittals to the Food and Drug Administration. In those submittals, Daikin reports an application rate of between 0.2% and 1%; we used the lowest application rate, 0.2%, for our estimate. With weights of 8 grams for the Whopper wrapper and 10 grams for the Big Mac container, our estimate for the total PFAS contained per item is 0.016 grams for the Whopper wrapper and 0.020 grams for the Big Mac wrapper. We used Daikin's information as it appears to be the only manufacturer of PFAS for paper food packaging, but the packaging for these products may be made with a PFAS treatment made by a different manufacturer and/or used at a different application rate.

Burger King reportedly sells about 234 Whoppers each day at each of its 7,257 U.S. locations, for a total of about 620 million Whoppers each year.^v McDonald's sells about 560 million Big Macs per year.^{vi} Using the estimated quantity of PFAS per item, yearly estimates are 9,920 kilograms, or 21,900 pounds of PFAS in Whopper wrappers and 11,200 kilograms, or 24,700 pounds for the Big Mac container.

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