



## **Carbon Black Ban: Legislation and Impact on the Printing Industry**

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## Executive Summary

In 2023, New York State introduced legislation that would ban the use of certain chemicals in packaging. One of the proposed materials included in the ban is carbon black, the primary pigment in black printing inks. Banning the use of carbon black in printing inks would have a devastating impact on the printing and packaging converting industry from both a manufacturing and subsequent use perspective.

In the state of New York, the economic impact of manufacturing or converting packaging is significant. There are 260 printing and packaging firms located in the state that employ more than 8,000 people with a payroll exceeding \$400 Million. The annual value of packaging produced in the state is nearly \$2.8 Billion and a blanket ban on carbon black puts all these jobs and economic activity in jeopardy.

Furthermore, the inability to use black ink to either print directly onto a package or on a label that is applied to the package will also have significant consequences for the consumer and workplace. Critical information such as product name, ingredients, instructions, warnings, manufacturer information, expiration dates, etc. will not be communicated to the end user.

Based on the language of this bill there appears to be three main driving factors for the ban on carbon black:

- Toxicity concerns associated with carbon black. The concern with carbon black toxicity is based on the form in which it is being used. In a powder form, it presents concerns. However, carbon black is not found in a powder form when it is incorporated into an ink or as a colorant for a package. This very critical distinction has been recognized by both the Occupational Safety and Health Administration and under California's Proposition 65 program. <sup>4</sup>
- Interference of black plastics in the mechanical recycling process. Black plastic, particularly those that use carbon black as the primary pigment are difficult to detect with the near-infrared (NIR) optical sorters used in recycling facilities. However, there have been several technological advances that have overcome this problem and they allow black plastic to be identified and properly sorted. As this technology becomes more commonplace, banning black plastic or packaging containing carbon black is not necessary and would eliminate a viable packaging option that provides unique benefits to the product being sold or distributed.
- Concerns about ink “bleeding” occurring during the mechanical recycling process. A “bleeding” ink is one where water dispersible or water-soluble inks are released during the recycling process that can result in discolored wash water and potentially contaminate or stain the recycled material. However, this problem has also been addressed through new technology and ink reformulation. These changes have eliminated the contamination resulting from ink bleeding.

The state of the art with respect to new resins, additives, and recycling technology is rapidly evolving as various groups including business, academia, and government entities are researching and discovering innovations. Legislation that is based on the current state of technology will quickly become outdated as progress on many fronts continues to evolve and accelerate.

The current draft language in the bill needs to be revised with respect to their inclusion in a ban on materials that can be used in packaging, especially due to their impact on the use of printing inks. The identification of carbon black as a toxic material without any qualifying statements regarding its form is not accurate as carbon black only presents toxicity concerns in a powder and unencapsulated form. Any legislative restriction or prohibition on specific chemicals or materials should explicitly exclude printing inks and packaging containing carbon black.

## Introduction

The quest to address the recyclability of various types of packaging has given rise to a lot of activity by various stakeholders in the packaging life cycle. This includes suppliers of materials, designers, packaging and label converters, recyclers, brands, consumers, and federal, state, and local governments. The actions by all the stakeholders have produced new materials, improvements of existing recycling technologies, new recycling technologies, guidance documents, and new laws and regulations. The most significant challenge with laws and regulations is that they only represent a “snapshot in time” and are generally not structured to allow for the needed flexibility to address a rapidly evolving situation with many variables.

In February of 2023 legislators in the New York State Assembly and Senate introduced Senate Bill S4246A and Assembly Bill A4333, Packaging Reduction and Recycling Infrastructure Act that would have created an Extended Producer Responsibility (EPR) program for packaging and banning the use of certain toxic chemicals in packaging. One of the materials proposed to be banned is carbon black. This legislation has the potential of having serious ramifications on packaging and the printing industry because carbon black is one of the most predominant black pigments used in black printing inks. The ban would prevent the use of black ink to print critical information on packaging.

For products that contain chemicals, labels provide important information about the dangers of the chemicals and the recommended protective measures. Without labels, people would not be able to identify the contents of the containers, the hazards they pose, or how to handle them safely. This could lead to accidents, injuries, illnesses, or even fatalities.

Labels also help to avoid abandoned containers of unknown materials that may be expensive or instructions on safe disposal. Labels also help to keep track of where things belong and prevent confusion or misuse of products. Therefore, labels are essential for ensuring a safe and efficient home and workplace.

If this legislation is passed and signed into law, the impact on the printing industry in New York State would be devastating. Any printing performed in these states and any printed product shipped into these states will be affected due to the ban on carbon black. There are 260 printing and packaging firms located in the state that employ more than 8,000 people with a payroll exceeding \$400 Million. The annual value of packaging produced in the state is nearly \$2.8 Billion and a blanket ban on carbon black puts all these jobs and economic activity in jeopardy. The printing industry is a vital part of the state’s economy and a blanket ban on carbon black puts all these jobs and economic activity in jeopardy.

The draft language for New York State is summarized below.

### New York<sup>1</sup>

§ 27-3425. Prohibition on certain toxic substances and materials.

1. *Beginning two years after the promulgation of rules and regulations pursuant to this title, no person or entity shall sell, offer for sale, or distribute into the state any packaging containing any of the following toxic substances:*

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<sup>1</sup> S4246A - <https://www.nysenate.gov/legislation/bills/2023/S4246/amendment/A>

*(k) carbon black*

§ 27-3431. Recyclability criteria and packaging recycling requirements.

*1. Beginning two years after the effective date of this section, packaging materials used by a producer shall meet the following recyclability criteria:*

*does not contain the following:*

*(i) non-detectable pigments, including but not limited to carbon black;*

*(ii) the toxic substances set forth in subdivision one of section 4 27-3425 of this title and those designated by the toxic packaging task force pursuant to subdivision two of section 27-3425 of this title;*

*(vi) label constructions, including adhesives, inks, materials and formats, or features that render a package non-recyclable or disruptive to the recycling process, as determined by the department in consultation with the advisory council;*

## **Analysis**

Based on the language in the bills there are three main driving factors for the ban on carbon black. First, the toxicity concerns associated with carbon black in powder form. Second, is the interference of black plastic with optical sorters in mechanical recycling processes. The last reason is the interference of some printing inks with the recycling process that result in ink “bleeding” causing discoloration of the recovered resins.

Unfortunately, the ban on carbon black, which can be a nondetectable pigment, is so broad it includes the use of carbon black in black printing inks that are used to either print directly on a package or on a label that is applied to the package. Ink is an integral part of the printing and manufacturing industries. Almost every manufacturing process that results in the production of a tangible product will likely include packaging, labels, or leaflets.<sup>2</sup> On food and pharmaceutical products for example, instructions and storage methods are displayed, reducing the chance of waste being produced. In its most specialized uses inks can conduct electricity, change color based on temperature, and prevent counterfeit fraud. Ink plays a vital role in our everyday lives to educate and inform us.<sup>3</sup>

One of the first publications to identify the toxicity of carbon black in powder form came in 1996 from the International Agency for Research on Cancer’s (IARC) Monograph 65 on Printing Processes and Printing inks, Carbon Black, and Some Nitro Compounds.<sup>4</sup> The IARC categorized carbon black as a Group 2B carcinogen meaning carbon black powder is possibly carcinogenic to humans. However, monograph 65 also specifies that:

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<sup>2</sup> Ink World 2020 - [https://www.inkworldmagazine.com/issues/2020-05-01/view\\_online-exclusives/the-importance-of-the-ink-industry-in-everyday-life/](https://www.inkworldmagazine.com/issues/2020-05-01/view_online-exclusives/the-importance-of-the-ink-industry-in-everyday-life/)

<sup>3</sup> UEPIA - <https://www.eupia.org/about-us/the-value-of-printing-inks/#:~:text=On%20food%20packaging%20for%20example,and%20warning%20us%20of%20danger.>

<sup>4</sup> IARC Monograph 65 - <https://publications.iarc.fr/Book-And-Report-Series/Iarc-Monographs-On-The-Identification-Of-Carcinogenic-Hazards-To-Humans/Printing-Processes-And-Printing-Inks-Carbon-Black-And-Some-Nitro-Compounds-1996>

*“End users of these products (rubber, ink, or paint) are not exposed to carbon black per se, since it is bound in a matrix.”<sup>4</sup>*

After this publication was released by IARC, the National Association of Printing Ink Manufacturers (NAPIM) contacted the Occupational Safety and Health Administration (OSHA) in July of 1996 regarding the Group 2B classification of carbon black and its impact on printing inks. In their letter NAPIM pointed out that the Hazard Communication Standard (HCS) prefers to use health hazard data on mixtures over health hazards on individual mixture components [29 CFR 1910.1200(g)(2)(i)(B)].<sup>5</sup> In this case, the Group 3 classification of printing inks, meaning not classifiable as carcinogenic to humans, by the same IARC monograph<sup>4</sup> would take precedence over the Group 2B classification of carbon black powder for any printing ink mixture containing dispersed carbon black. In their 1996 response, OSHA agreed with NAPIM and stated:

*“The HCS requires that, when mixtures have been tested as a whole, the results of such testing shall be used to determine whether the mixture is hazardous. Furthermore, in the case of the printing inks, the carbon black is not present in such a form so as to present an exposure problem for employees.”<sup>6</sup>*

OSHA’s response to the request from NAPIM shows that carbon black encapsulated in printing ink does not have the same health concerns that carbon black powder presents.

The same situation exists with the listing of carbon black under California's Proposition 65.<sup>7</sup> California’s Proposition 65 requires businesses to provide warnings to the public about significant exposures to reproductive toxicants and carcinogens. The notice of listing addressing carbon black was released on February 21, 2003<sup>8</sup>, and it specifically states:

*“The listing only pertains to airborne, unbound carbon black particles of respirable size”<sup>8</sup> and “Exposure to carbon black does not occur, per se, when bound within a product matrix, such as rubber, ink or paint.”<sup>8</sup>*

California’s Proposition 65 is administered by the Office of Environmental Health Hazard Assessment (OEHHA). OEHHA is an independent agency with several responsibilities. OEHHA continually monitors the scientific literature, publications of research organizations, governmental entities and academia, and other information sources to fulfill its mission. Since there has not been any revisions to OEHHA position about carbon black exposure from inks, inks with carbon black do not pose a threat to human health and the environment.

The second reason for banning carbon black is the incompatibility with optical sorters in mechanical recycling processes when incorporated into plastic as a colorant. Plastic that has been colored black is referred to as black plastic. Black plastic, especially those that have carbon black as the primary pigment, are difficult to detect with mechanical optical sorters because they use near infra-red (NIR) technology to

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<sup>5</sup> NAPIM Letter to OSHA 1996 – copy available upon request

<sup>6</sup> OSHA Response Letter 1996 – copy available upon request

<sup>7</sup> California Proposition 65 - [https://leginfo.legislature.ca.gov/faces/codes\\_displayText.xhtml?lawCode=HSC&division=20.&title=&part=&chapter=6.6.&article](https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=20.&title=&part=&chapter=6.6.&article)

<sup>8</sup> Listing Notice for Carbon Black - <https://oehha.ca.gov/proposition-65/chemicals/carbon-black-airborne-unbound-particles-respirable-size>

detect materials to be separated for recycling. Carbon black interferes with this technology absorbing most of the light emitted by the optical sorter instead of reflecting it, making it invisible to the sorter.<sup>9</sup> This means that even though black plastic is recyclable, it is not easily separated with some of the most common sorting technology and most of it gets incinerated or landfilled.

However, technological advances are making it easier to sort black plastics. A German company, Steinert, has developed the UniSort BlackEye which is able to successfully separate black plastics.<sup>10</sup> This new type of sorter uses hyper spectral imaging (HIS) technology which evaluates 256, rather than the usual 16, measuring points in the electromagnetic spectrum and can detect even the slightest differences in the chemical composition of the materials being processed.<sup>11</sup> This new technology does allow for the identification and separation of black plastic by color and polymer. Separation by polymer is also very important because if the sorter ejects all black plastics materials together, there could be as many as 15 different polymers in the mix making the remanufacturing process harder.<sup>9</sup>

Another new technology that has just been introduced is Deep Laiser by the Norwegian company TOMRA<sup>12</sup>. This new technology also makes it possible to identify and sort black plastic. Deep Laiser works in concert with existing NIR sensors and detects any material on the conveyor belt that the NIR is incapable of identifying, like black plastic and glass. The technology uses artificial intelligence (AI) and laser line scanning to create a digital copy of objects that can be used for advanced data-driven decision making. Deep Laiser enables 3D object recognition and enhanced classification of materials to provide high accuracy sorting across many applications.<sup>13</sup>

The last potential concern for inks and mechanical recycling is ink “bleeding”. A “bleeding” ink is one where water dispersible or soluble inks are released during the recycling process that can result in discolored wash water and potentially contaminate or stain the recycled material.<sup>14</sup> Ink “bleeding” occurs during the caustic bath wash portion of the recycling process.<sup>15</sup>

Discoloration is a bigger problem for some plastics than others because plastics like PE and HDPE are already colored when being recycled. However, since end use is not known beforehand, inks that do not bleed during the recycling process should be the preferred ink choice. To avoid ink bleeding, ink companies are working on revisions to their formulations to avoid this problem. For example, Sun Chemical<sup>15</sup> and INX<sup>16</sup> have developed washable inks that do not interfere with the recycling process. The Association of Plastic Recyclers (APR) developed and released a test method, Natural HDPE Flake Washing Test, for determining if an ink will “bleed” during the recycling process.<sup>14</sup> This test is a good predictive indicator to determine the behavior of an ink in the mechanical recycling process.

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<sup>9</sup> Recycling Magazine 2022 - <https://www.recycling-magazine.com/2022/09/22/black-plastics-recycling-towards-a-circular-economy/>

<sup>10</sup> Steinert 2016 - <https://steinertglobal.com/news/news-in-detail/steinert-launches-system-for-separation-of-black-plastics-at-ifat-2016/>

<sup>11</sup> Recycling International 2019 - <https://recyclinginternational.com/plastics/steinerts-black-plastics-technology-closes-the-gap-between-waste-and-new-products/27434/>

<sup>12</sup> Van Dyk Recycling Solutions - <https://vdrs.com/tomra-optical-sorting/>

<sup>13</sup> TOMRA - <https://www.tomra.com/en/waste-metal-recycling/products/technologies>

<sup>14</sup> APR 2021 - <https://plasticsrecycling.org/images/Design-Guidance-Tests/APR-HDPE-S-01-bleeding-label.pdf>

<sup>15</sup> Plastics Technology 2022 - <https://www.ptonline.com/articles/solvent-based-inks-boost-pet-recycling>

<sup>16</sup> APR 2021 - <https://plasticsrecycling.org/images/Critical-Guidance-Letters/APR-CGR-PET-label-sleeve-inx-2020.pdf>

Other companies have developed primers and coatings to make inks compatible with the recycling process. For example, Siegwirk<sup>17</sup> and Flint Group<sup>18</sup> have developed deinking primers. These primers are printed on the label before the ink and keep a strong adhesion throughout the life of the label. The label is then released during the caustic wash, and this results in more than 99% of the material being recycled into something new. Flint Group<sup>18</sup> has also developed a varnish that is applied after the colors and printed that ensures the inks remain on the label throughout the recycling process. The varnish is a specialized layer of coating that prevents bleeding and during the caustic wash portion of the recycling process can be skimmed off with the label.

Finally, the company Magomer<sup>19</sup> has developed magnetizable coatings that make it easy to separate the label from the bottle. Because these coatings are printed just like any other color, they are cost effective and compatible with current high speed printing operations. During the recycling process bottles and labels are shredded into flakes. With the use of Magmar SS coatings the label can be efficiently separated from bottle flakes by magnetic separators already present and recycling facilities.

### **A Call for Revisions to Legislative Provisions**

The current draft language in the bills needs to be revised with respect to their inclusion of a ban on carbon black and materials that can be used in packaging, especially when they are used in printing inks. The identification of carbon black as a toxic material without any qualifying statements regarding its form is not appropriate or accurate as carbon black only presents toxicity concerns in an unencapsulated powder form. Several independent agencies have studied this issue and came to their own conclusions that carbon black that is encapsulated or bound in a matrix such as an ink does not share the same toxicity profile as the powder form. There is no threat to human health and the environment due to the presence of carbon black used to color printing inks.

Any legislative restriction or prohibition on specific chemicals or materials should explicitly exclude printing inks containing carbon black. Furthermore, changes in separation technology are quickly solving the problem of black plastic not getting separated by optical sorters. As this technology becomes more commonplace, banning black plastic or packaging containing carbon black is not necessary and would eliminate a viable packaging option that provides unique benefits to the product being sold or distributed.

The current structure of the draft legislation banning certain materials clearly indicates that outright bans on these materials are not accurate, especially carbon black, and it creates unintended consequences. Prescriptive legislation such as that which is contained in the drafts is very inflexible, and it can create significant disincentives and stymie innovation and technological evolution.

The state of the art with respect to new resins, additives, and recycling technology is rapidly evolving as various groups including business, academia, and government entities are researching and discovering innovations. Legislation that is based on the current state of technology will quickly become outdated as progress on many fronts continues to evolve and accelerate.

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<sup>17</sup> Ink World 2022 - [https://www.inkworldmagazine.com/contents/view\\_breaking-news/2022-06-09/siegwerks-deinking-primer-improves-packaging-recyclability-circularity/](https://www.inkworldmagazine.com/contents/view_breaking-news/2022-06-09/siegwerks-deinking-primer-improves-packaging-recyclability-circularity/)

<sup>18</sup> Flint Group - <https://www.flintgrp.com/en/divisions/packageing-narrow-web/narrow-web/evolution/>

<sup>19</sup> Magomer - <https://magomer.in/>

A more appropriate approach is to create a review panel with representatives from key stakeholder groups that will periodically meet, and review issues and concerns causing interferences in recycling or pose an unacceptable threat to human health and the environment based on sound science. Topics for discussion may include ingredients, components, separation, and recycling technologies.

Therefore, the legislation needs to be restructured to acknowledge the rapid changes that are occurring and allow for the development of innovative solutions, rather than stymie them. Solving the packaging recycling problem requires inventive approaches and the legislation in New York with possibly more states to follow, is drafted in a manner that would impede, rather than foster innovation.