November 19, 2024

**To:** Jessica Cohen, Chief of Staff, Senate President Scutari

**From:** PRINTING United Alliance

**Re:** Oppose S-3398 Packaging Product Stewardship Act

Dear Ms. Jessica Cohen,

PRINTING United Alliance is writing to express our strong opposition to S-3398 Packaging Product Stewardship Act, which requires producers to reduce the amount of plastic packaging and single-use plastic items sold or distributed in New Jersey. It also bans substances such as carbon black and other chemicals and excludes advanced recycling technologies from the definition of recycling. The source reduction mandates, and various restrictions and limitations, are not feasible to implement.

As background, PRINTING United Alliance represents the interests of facilities engaged in producing a wide variety of products through screen printing, digital imaging, flexographic, and lithographic print processes. The print industry is comprised primarily of small businesses, with approximately 95 percent of the printing companies falling under the definition of a small business as described by the Small Business Administration.

In the state of New Jersey, the economic impact of manufacturing or packaging and labeling converting is significant. There are 224 firms located in the state that are involved in packaging or label converting. These companies employ more than 9,400 people with a payroll exceeding $498 Million. The annual value of packaging produced in the state is nearly $3.4 billion and a blanket ban on carbon black puts all these jobs and economic activity in jeopardy.

**Chemical/Substance Bans**

This legislation seeks to prohibit the sale of any product, package, or packaging component including inks, dyes, pigments, adhesives, stabilizers, or any other additives containing various substances in the absence of clear health or environmental evidence to necessitate such a ban.

One of the chemicals captured in this ban, carbon black, is a prime example of a chemical that should not be included as a “toxic” chemical because it has been determined that when incorporated into an ink, is not toxic. OSHA and California’s Office of Environmental Health Hazard Assessment, the agency responsible for implementing Proposition 65, have documented the lack of toxicity when carbon black is incorporated into matrices such as ink. FDA also allows the use of carbon black-based pigments in certain food-contact applications and medical devices.

Carbon black is the primary pigment used in almost all black ink. The ban will prohibit using black ink to print on either a package or a package label. The ban would prevent any information that uses black ink or any images that use the four-color process printing. The inability to use an ink containing carbon black to print directly on a package or on a label that is applied to a package will have significant,

adverse consequences for the consumer of the product. Critically important health and safety information such as product name, ingredients, instructions, warnings, manufacturer information, expiration dates, etc. will not be communicated to the end user. Given the role of black in four-color process printing, the ban will also prohibit the printing of most products and other images designed to communicate the contents of the package and which can include instructions.

One significant unintended consequence posed by a ban on carbon black would be the disruption of using recycled substrates for packaging. This is in direct conflict with the objectives of the legislation, especially the mandate for the post-consumer fiber content for corrugated packaging.

There are at least three substrates made from recycled materials that would be banned due to the presence of carbon black and some of the other chemicals identified in the legislation because they could be found in inks in a trace concentration. Those substrates are recycled paperboard such as those used in food and other packaging, recycled corrugated aka cardboard, and recycled black plastic.

When recycled paperboard and corrugated are manufactured, they are made primarily from recovered paper, paperboard, and corrugated, respectively and they are not deinked prior to repulping. Once the paper is repulped, it is processed with screening and introduced into the board or corrugated machine. Because the paper is not deinked, there will be carbon black and other chemicals on the banned list, which about half of them could be present as a trace contaminant in the recycled paperboard and corrugated. Therefore, they will also be banned and will prohibit the ability of producers to meet the recycled content mandates in the legislation.

Likewise, some black plastic is produced from recovered feedstock of various colors. The difficulty in separating the colored plastics means these materials get blended together to make black plastic. Carbon black is usually added to enrich the color. Banning carbon black will also prevent the use of this recycled material.

Imposing wide bans on the mere presence of chemicals in packaging, without clear environmental or public health justification disregards sound science and is not a means to create a safe, effective, and efficient packaging program. Additionally, banning any presence of certain chemicals in packaging that have been deemed to be nontoxic or without providing for any de minimis levels to account for substances that were not intentionally added, undermines the potential use of recycled content in products and makes this legislation impractical.

Banning specific chemicals could have other unanticipated consequences as manufacturers may be unable to find appropriate alternative substances that work as effectively. Specific chemicals may have unique properties that make them stable or extend the shelf life of products. This is especially important in food and beverage packaging.

In other instances, there are no acceptable substitutes for some of the chemicals on the list. For example, there is no substitute for carbon black. There is no other pigment or combination of pigments that provide the physical and performance characteristics of carbon black. Even though carbon black can be made from several different feedstocks and even those made from bio-based sources such as algae,

are still carbon black and thus would be banned under the bill. The attached position statement from the National Association of Printing Ink Manufacturers (NAPIM) provides more details as to why there is no substitute for carbon black. Additionally, we also include another position statement from NAPIM on why the banning of benzophenone is not appropriate as it has several critical environmental benefits and it becomes trapped in the cured printing ink film on the package.

Additionally, this bill establishes a Toxic Packaging Task Force within NJDEP to review the toxicity of packaging in the State, and to recommend the designation of additional toxic substances to be subject to the same prohibitions as the substances included in the bill. Upon recommendation of the task force, NJDEP can designate additional substances to be prohibited from being included in packaging and packaging components. It is concerning that a small number of taskforce members would have the authority with no technical or economic limitations to make decisions that would impact and disrupt national and global commerce.

**Advanced Recycling**

This legislation excludes advanced recycling technologies from the definition of recycling. Advanced recycling, also called chemical recycling, is a process that allows waste plastic to be broken down to its molecular building blocks and then reused. Advanced recycling is **NOT** incineration and instead converts post-use plastics into their original building blocks, specialty polymers, feedstocks for new plastics, waxes, and other valuable products. This process takes place in the absence of oxygen. Incineration is the combustion of unsorted municipal solid waste to turn into electricity. Combustion requires oxygen.

Advanced recycling allows for the recycling of plastics that are currently ending up in landfills, waterways, and incinerators, since there is currently no marketplace for these hard to recycle plastics. Advanced recycling technologies can expand the scope of materials that can be recycled thus contributing significantly to a circular economy. It helps preserve the value of resources in our economy and bridge the gap between the supply and demand for high-quality recycled plastics. Ongoing and emerging advances in mechanical recycling are capturing more types of post-use plastics, while advanced recycling is poised to capture primarily used plastics that are not widely recycled today.

This is particularly important to those companies that need to meet the recycled content demands as identified in the legislation.

Another benefit that advanced recycling provides is that its end product is a feedstock that will replace the byproducts of natural gas, which industry is currently using to make virgin plastic - thus reducing industry's reliance on fossil fuels. Currently twenty-five states have passed legislation which enables them to attract the development of advanced recycling facilities in their states. These laws have been passed with bi-partisan support and signed by governors of both political parties.

**Overly Aggressive and Unworkable Mandates and Timelines**

This legislation includes mandates for (1) reduction of non-reusable packaging; (2) recycling of non-reusable packaging; and (3) inclusion of post-consumer content. However, there has not been a dialogue

with stakeholders, cost analysis or completed market impact studies to determine the feasibility or practicality of these mandates.

Setting statutorily mandated recycling, recycled content, source reduction or other goals is an extremely challenging exercise, especially without any reliable data to support what these goals might be in the State. Goals should be developed following proper study of the recycling system through a statewide needs assessment and determination that the infrastructure exists that can produce the packaging materials with the specifications for recycled content that is identified in the legislation.

Setting an extremely aggressive set of rates and packaging reduction mandates, like S-3398 does might look like progress, but without a true vision of what that future might look like either dooms the law to fail or will result in companies going out of business in the State. We strongly encourage a full evaluation and consideration of these and other factors as part of the discussion around how to address packaging waste.

Some of these substances are currently under review or regulation by the FDA, EPA, or other federal agencies, which continuously review substances used in consumer products. Federal agencies are the appropriate regulatory authorities to make determinations about safety in products produced for national and global markets. A patchwork of state-level laws reduces consistency, disrupts interstate commerce, and ultimately increases the costs of products. One of the chemicals captured in this legislation, PFAS, is also being actively addressed in New Jersey as the Senate is advancing legislation to regulate PFAS in various areas, including water, packaging, household products, and fire-fighting foam. Chemicals in packaging should not be addressed through general packaging legislation, but through the existing regulatory and statutory framework.

**Funding Mechanism**

The funding mechanism in a successful EPR program must be reasonable and constructed in a way that shares costs between producers and municipalities for fair and reasonable allocations of services and costs. We oppose funding mechanisms that would provide for 100% cost reimbursement from producers to municipalities or private entities for collection, recovery, recycling, and processing of packaging materials – especially without providing for incentives or best practices for improving recycling. Improving the recycling system is a shared responsibility and funds should primarily support infrastructure development and reimbursements should only be used to return a material to a neutral market value – not cover the entire recycling system as it exists today.

**Enforcement**

EPR systems must be efficient and effective, without undue administrative structures and unfair enforcement practices. This bill would create an Office of Plastics and Packaging Management in NJDEP and would include a new salaried position of Inspector General. Creating wholly punitive enforcement departments that duplicate existing enforcement mechanisms serves no useful purpose and subtracts from funding that could be used to improve recycling in New Jersey.

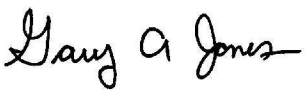
**Summary and Conclusion**

In addition to the substantive concerns about the ban on carbon black and other chemicals, ban on advanced recycling, and unrealistic packaging requirements, we have additional concerns about the approach taken to advancing this legislation. This legislation was put forth without meaningful stakeholder input or robust detailed discussion of the complex provisions. There is limited opportunity for stakeholders to provide public comments and for legislators to consider comments and evaluate the bill on its merits.

S-3398 is a multipart policy initiative that involves many stakeholders and has broad impacts on many industries as well as residents/consumers in the state. While the Alliance recognizes improving the recycling system is critical, this legislation has many concerning provisions. This bill has far-reaching impacts. It therefore warrants full and fair consideration and adequate debate.

For the above reasons, we respectfully request that you OPPOSE S-3398.

Sincerely,



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

May 8, 2024

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**Executive Summary**

In 2024, the state of New Jersey introduced legislation that would ban the use of certain chemicals in packaging. One of the proposed materials included in the ban is carbon black. Carbon black, as a pigment, is commonly used in the majority of black printing inks formulated for modern printing technologies. Banning the use of carbon black in printing inks would have a devastating impact on the printing and the packaging converting industries.

The package manufacturing or "converting" industry is a significant economic contributor to the New Jersey economy. There are 224 printing and packaging firms located in the state employing more than 9,400 people with a payroll exceeding $498 Million. The annual value of packaging produced in the state is nearly $3.4 billion. A blanket ban or restriction on the use of carbon black as a packaging component has the potential to put these jobs and related economic activity in jeopardy.

Furthermore, the inability to use an ink containing carbon black to print directly on a package or on a label that is applied to a package will also have significant, adverse consequences for the consumer of the product. Critically important health and safety information such as product name, ingredients, instructions, warnings, manufacturer information, expiration dates, etc. will not be communicated to the end user. Given the role of black in 4-color process printing, the ban will also prohibit the printing of most products and other images designed to communicate the contents of the package and which can include instructions.

Based on the language of this bill there appears to be two 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 potential 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 as they have stated carbon black incorporated into a matrix is not toxic. [4]

- 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 older 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.

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/dry 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 passing laws and regulations based on the current situation 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 April of 2024, legislators in the New Jersey Senate introduced Senate Bill S-3135, the Toxic Packaging Reduction Act which would ban the use of certain material on 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 the most predominant black pigment used in black printing inks. The ban would prevent the use of black ink to print critical information on packaging.

For packaging that contains chemicals, information printed directly on the package or on labels provides important guidance about the dangers of the chemicals and the recommended protective measures. Without labels, consumers 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 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 packaging and label converting industry in New Jersey would be devastating. Any printing performed in the state and any printed product shipped into this state will be affected due to the ban on carbon black. In the state of New Jersey, the economic impact of manufacturing or packaging and labeling converting is significant. There are 224 firms located in the state that are involved in packaging or label converting. These companies employ more than 9,400 people with a payroll exceeding $498 Million. The annual value of packaging produced in the state is nearly $3.4 billion and a blanket ban on carbon black puts all these jobs and economic activity in jeopardy.

The draft language for New Jersey is summarized below.

**New Jersey**[1]

*d. Commencing two years after the effective date, no person shall sell, offer for sell, or offer for promotional purposes in this State any package or packaging component, or any product contained in package, which includes, in the package itself or any packaging components, inks, dyes, pigments, adhesives, stabilizers or any other additives containing any of the following substances, which has been intentionally introduced as a chemical element during manufacturing or distribution as opposed to the incidental presence of any of these elements:*

*(1) perfluoroalkyl and polyfluoroalkyl substances (PFAS);*

[1] S.3398

*(2) ortho-phthalates;*
*(3) bisphenols;*
*(4) halogenated and organophosphorus flame retardants (HFRS, OPFRS);*
*(5) **non-detectable pigments including carbon black;***
*(6) oxo-degradable additives including oxo-biodegradable additives;*
*(7) UV-328, 2-(2h-benzotriazol-2-yl)-4, 6-di-tert-pentylphenol, or any other ultraviolet light absorbers including benzophenone and its derivatives;*
*(8) short-, medium-, and long-chained chlorinated paraffins;*
*(9) toxic metals other than lead, cadmium, mercury, and hexavalent chromium;*
*(10) antimony trioxide;*
*(11) formaldehyde;*
*(12) perchlorate;*
*(13) toluene; or*
*(14) vinyl chloride, including polyvinylidene chloride.*

**Analysis**

Unfortunately, the ban on carbon black, which can be a nondetectable pigment based on the vintage of separation technology being employed, 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 envelopes.[2] On food and other covered products 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.[3]

Black ink plays an essential role in 4-color process printing. When images are printed of objects such as an automobile, food, or other items, the original which is a continuous tone image such as those found in photographs, cannot be directly reproduced. These images need to be separated into 4 basic colors of Cyan, Magenta, Yellow and Black, also known as CMYK. The ink colors are printed as tiny, overlapping dots that blend together to create the full color spectrum. Without black ink, 4-color process printing is not possible.

Based on the language in the bill it appears that there are two main driving factors for the ban on carbon black. These are the toxicity concerns associated with carbon black in powder form and the interference of black plastic with optical sorters in mechanical recycling processes. In the following, we will provide commentary on each of these factors.

<u>Toxicity Concerns</u>

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

[2] Ink World 2020 - https://www.inkworldmagazine.com/issues/2020-05-01/view_online-exclusives/the-importance-of-the-ink-industry-in-everyday-life/
[3] UEPIA - https://www.eupia.org/about-us/the-value-of-printing-inks/#:~:text=On%20food%20packaging%20for%20example,and%20warning%20us%20of%20danger.

Printing inks, Carbon Black, and Some Nitro Compounds.[4] 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:

> "*End users of these products (rubber, ink, or paint) are not exposed to carbon black per se, since it is bound in a matrix.*" [4]

It should be noted that the IARC 2B carcinogen classification for carbon black is based on inhalation studies conducted in rats using high concentrations of carbon black that cause lung overload. This mechanism of toxicity in rats has also been seen with other poorly soluble low toxicity (PSLT) particles such as titanium dioxide, and is not considered relevant to humans[5,6,7]. This is also the reason why carbon black is generally not classified as a carcinogen under the Globally Harmonized System of Classification and Labelling of Chemicals (GHS)[8]. As noted above, carbon black used in printing ink and packaging is bound in a matrix and there is no inhalation exposure to carbon black powder. Skin contact with carbon black has low potential for toxicity[9]. Any other black particle that might be considered a replacement for carbon black is likely to have similar concerns.

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)].[10] In this case, the Group 3 classification of printing inks, meaning not classifiable as carcinogenic to humans, by the same IARC monograph[4] 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."* [11]

Based on OSHA's response to NAPIM that carbon black contained in printing ink formulation is not covered under the requirements of the Federal Hazard Communication Standard, it can be inferred that carbon black does not have the same adverse health concerns that carbon black powder presents.

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[4] 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

[5] Warheit, 2016. - https://www.sciencedirect.com/science/article/pii/S0300483X1630292X?via%3Dihub

[6] Driscoll, 2020. - https://www.tandfonline.com/doi/full/10.1080/08958378.2020.1735581

[7] Driscoll, 2022. - https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2022.907318/full

[8] International Carbon Black Association document "Recommendation for No Classification of Carbon Black for Carcinogenicity", November 2023 – copy available upon request.

[9] Carbon Black User's Guide, 2016. Pg. 13 - https://www.carbon-black.org/s/2016-ICBA-Carbon-Black-User-Guide_english.pdf

[10] NAPIM Letter to OSHA 1996 – copy available upon request.

[11] OSHA Response Letter 1996 – copy available upon request.

Th U.S Federal Food and Drug Administration (USFDA) also allows for the use of carbon-black based pigments in certain food-contact applications and medical devices. In 21 CFR 178.3296, which regulates food additives, it is stated that any of the listed substances "may be safely used as a colorant in the manufacturing of articles of components of articles intended for use in producing, manufacturing, packing, processing, preparing, treating, packaging, transporting, or holding food". One of the materials included in this list is carbon black.[12] Furthermore, in 21 CFR 74.3054, which regulates color additives in medical devices, the FDA specifically allows the presence of D&C Black No.4, a high-purity carbon black, on the medical devices and their respective labels.[13]

The same situation exists with the listing of carbon black under California's Proposition 65.[14] 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[15], and it specifically states:

> *"The listing only pertains to airborne, unbound carbon black particles of respirable size"* [15] and *"Exposure to carbon black does not occur, per se, when bound within a product matrix, such as rubber, ink or paint."* [14]

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 have not been any revisions to the OEHHA position on carbon black exposure from inks, inks with carbon black are not required to comply with the California Proposition 65 requirements.

Concerns have also been raised regarding the presence of Polycyclic Aromatic Hydrocarbons (PAHs) in some forms of carbon black. PAHs are a group of naturally occurring chemicals in coal, crude oil, tar, and gasoline. These chemicals are not intentionally added to consumer products, and they do not serve any specific function, but are produced as a result of the incomplete combustion of organic substances.[16] The concerns about PAHs in carbon black were examined by Münster Analytical Solutions in 2019 and they found that any traces of PAHs found in carbon black that is already bound in a polymeric matrix, like ink, are not bioavailable and do not migrate into aqueous stimulants representing typical human or environmental liquids like sweat, saliva, or rainwater.[17] Studies have found that the only way to extract

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[12] FDA 21 CFR 178.3296 - https://www.ecfr.gov/current/title-21/chapter-I/subchapter-B/part-178/subpart-D/section-178.3297

[13] FDA 21 CFR 74.3954 - https://www.ecfr.gov/current/title-21/chapter-I/subchapter-A/part-74/subpart-D/section-74.3054

[14] California Proposition 65 - https://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=HSC&division=20.&title=&part=&chapter= 6.6.&article

[15] Listing Notice for Carbon Black - https://oehha.ca.gov/proposition-65/chemicals/carbon-black-airborne-unbound-particles-respirable-size

[16] Penta Carbon 2019 - https://pentacarbon.de/wp-content/uploads/2023/09/PentaCarbon-Carbon-Black-PAH-and-Regulations.pdf

[17] CABOT 2019 - https://www.cabotcorp.com/~/media/files/product-stewardship/certifications-and-declarations/polycyclic-aromatic-hydrocarbons-pah-carbon-black.pdf

PAH's from the surface of carbon black is through forceful laboratory conditions that include strong solvents and extreme temperatures.[16,17]

Interference with Optical Sorters

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 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.[18] 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.[19] This new type of sorter uses hyper spectral imaging (HSI) 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.[20] 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.[18]

Mid-wave infrared (MWIR) HSI imaging is another revolutionary technology that can address the black the challenges of sorting black plastic.[21] The Specim FX50 hyperspectral camera is an innovative tool designed to tackle the long-standing recycling challenges of black plastics across industries like automotive, electronics, and packaging. Unlike traditional near-infrared (NIR) systems, the Specim FX50 operates in the MWIR spectrum (2.7–5.3 µm). This range captures the distinct "spectral fingerprints" of black plastics, enabling precise identification and high-speed sorting. Equipped with push-broom technology, the FX50 can process up to 300 kg of plastic flakes per minute with nearly 99% accuracy, making it highly efficient for industrial applications on conveyor systems.

Another new technology that has just been introduced is Deep Laiser by the Norwegian company TOMRA[22]. 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

[18] Recycling Magazine 2022 - https://www.recycling-magazine.com/2022/09/22/black-plastics-recycling-towards-a-circular-economy/
[19] Steinert 2016 - https://steinertglobal.com/news/news-in-detail/steinert-launches-system-for-separation-of-black-plastics-at-ifat-2016/
[20] Recycling International 2019 - https://recyclinginternational.com/plastics/steinerts-black-plastics-technology-closes-the-gap-between-waste-and-new-products/27434/
[21] Automation.com 2024 - https://www.automation.com/en-us/articles/october-2024/overcoming-black-plastic-recycling-challenges
[22] Van Dyk Recycling Solutions - https://vdrs.com/tomra-optical-sorting/

making. Deep Laiser enables 3D object recognition and enhanced classification of materials to provide high accuracy sorting across many applications.[23]

**Impact on Availability of Recycled Substrates**

One significant unintended consequence posed by a ban on carbon black would be the disruption of using recycled substrates for packaging, which would be counterproductive with the objectives of the legislation. The three substrates made from recycled materials that would be banned are recycled paperboard such as those used in food packaging, recycled corrugated aka cardboard, and recycled black plastic. When recycled paperboard and corrugated are manufactured, they are made primarily from recovered paper, paperboard, and corrugated, respectively. The recovered paper is not deinked prior to repulping. Once the paper is repulped, it is processed with screening and introduced into the board or corrugated machine. Because the paper is not deinked, there will be carbon black and other chemicals on the banned list, which about half them could be present as a trace contaminant, present in the recycled paperboard and recycled corrugated. Therefore, they will also be banned and will limit the ability of producers to meet the recycled content mandates in the legislation.

Likewise, some black plastic is produced from recovered feedstock of various colors. The difficulty in separating the colored plastics means these materials get blended together to make black plastic. Carbon black is usually added to enrich the color. Banning carbon black will also prevent the use of this recycled material.

**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 other chemicals 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 government agencies have formally stated that carbon black bound in a liquid matrix (i.e. a printing ink) does not represent a human health hazard.

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 styme 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

[23] TOMRA - https://www.tomra.com/en/waste-metal-recycling/products/technologies

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.

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 chemicals, 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.

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**April 2024**

**Ref. NAPIM Position on Banning of Carbon Black in Packaging**

**Executive Summary**

Banning or otherwise restricting the use of carbon black in printing ink would cause extreme disruption in the graphic arts space. Although it may be possible (at significantly higher cost) in some applications to replace carbon black with another color technology it is very unlikely that this type of replacement would provide the properties required for the enormous number of unique printing applications.

Conservatively, there are hundreds of thousands of ink formulations currently in commerce in the U.S. Each printing ink formulation is specifically constructed to meet the cost and performance requirements for a designated printing application. The overwhelming majority of printing inks are produced for four color process (CMYK -Cyan, Magenta, Yellow and Black) printing. The black (K) component is, in the vast majority of formulations, produced by a carbon black-based pigment.

It is also important to note that U.S. federal regulatory agencies have designated carbon black as safe and non-hazardous when incorporated into in an ink, printed matter, coating or plastic.

**Printing Inks and Carbon Black**

Overview

Carbon black pigment is a widely utilized component in the printing ink industry for producing high-quality, long-lasting colored inks. It is used in all forms of printed materials including magazines, newspapers, packaging of all types and other printed products.

It is used to provide a broad spectrum of colors ranging from light gray to deep black and is a widely used colorant in the production of almost all colored inks.

By blending carbon black with other pigments, a wide spectrum of colors can be achieved. Importantly, carbon black acts as a primary pigment, enhancing dispersibility, depth and intensity of color. In addition, it improves color consistency and color stability, weatherability, thermal stability, acid and alkali resistance, fade resistance and/or discoloration over time and enhancement of overall print quality.

Carbon black is also known for its chemical resistance, which prevents deterioration/discoloration when exposed to various chemicals or solvents. Additionally, carbon black provides good abrasion resistance, ensuring that printed materials withstand handling and friction without losing their quality or appearance.

Another significant advantage of carbon black pigment is its conductivity - a property of great importance in the growing market of electronic or conductive inks.

**Alternatives to Carbon Black in Printing Inks:**

Overview

Compared to other coloring and tinting materials, carbon black provides higher efficiency in combination with excellent fastness against light, temperature and various chemical substances. The overwhelming majority of modern printing is four color process printing commonly known as CMYK (Cyan, Magenta, Yellow and Black) representing the 4 primary colors. There would be certain colors that very likely could not be produced without the black color.

Pigment Black 7 (PB7 carbon black) provides the greatest (compare to other pigments) jetness (ability to impart a black color) at the commonly used printing viscosities in graphic arts applications. There are other chemistries (PB9, bone black) PB1 (aniline black), but they suffer from significant performance drawbacks. PB1 is a copper chromium complex which is rarely used because of its metal content. PB9 is from calcined animal bones (closer in gray shade), but it suffers from poor hiding power at graphic arts coating weights and print viscosities.

Other Alternative Chemistries

Trichromatic Black : A black color can be made using blue, red, yellow organic pigments. However, they generally have weaker color strength, are significantly more expensive to produce and do not work well in CMYK systems.

Iron Oxide Black: This pigment type is primarily used in magnetic ink character recognition (MICR) inks, but little used in other ink systems due to its abrasive quality and heat instability. .

Mixed Metal Oxides : there are multiple black pigments in this category used primarily for coatings (e.g. IR reflective coatings, etc.) ranging in composition from ferrous titanates to chromium compounds. These have generally been shown to be too weak to be useful in an ink, and usually too abrasive.

**Carbon Black – U.S. Health and Safety Regulations**

Occupational Safety and Health Administration (OSHA)

Carbon black, when incorporated into an ink formulation, is not regulated (classified as non-hazardous) under the Federal Hazard Communication (29 CFR 1910.1200). This is because there is no potential for inhalation exposure to dry carbon black when incorporated into a liquid matrix. This carbon black classification would also be applicable to printed matter or plastics/polymers containing carbon black.

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Food and Drug Administration

Various forms of carbon black-based pigments are permitted by the U.S. Food and Drug Administration (FDA) in certain food contact applications and medical devices. For example, Title 21 of the Code of Federal Regulations (CFR) Section 178.3297 Colorants for Polymers of the indirect food additive regulations; provides two clearances for carbon black applicable to its use in food contact materials, such as your polyethylene bags and sheets.
In addition in Title 21 CFR Section 74.3054 (color additive regulations) provides for the safe use of D&C Black No. 4 (carbon black) for coloring ultra-high molecular weight polyethylene (UHMWPE) non-absorbable sutures for use in general surgery.

Carbon black with certain limitations is also allowed as a colorant in cosmetics as D&C Black No. 2. (Title 21 CFR Section 74.2052).

**Summary and Conclusion**

Modern printing inks are highly engineered, complex chemical formulations specifically designed to meeting specific end use performance requirements. Each component of the ink formulation is selected and tested to insure a safe and performant formulation. Carbon black is an essential component of the majority of printing ink formulations in use in modern printing and package converting technologies. Text and images printed using these inks impart critically important information to the consumer.

It is important to note that carbon black pigment when contained in a printing ink formulation (or any application where exposure to dry carbon black powder does not occur) has been recognized by U.S. government state and federal regulatory agencies as safe and non-hazardous to human health.

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**April 2024**

**Addendum to April 2024 NAPIM Position on Banning of Carbon Black in Packaging**

This addendum addresses carbon black pigments produced through biomass (including algae) feedstocks and their potential impact on the recycling of rigid plastic or paper packaging.

1. Biomass derived black pigments, including algae-based pigments or pigments from vegetable oils are produced by combustion in an oxygen depleted atmosphere and hence they contain similar substances of concern with respect to dry form, conventional carbon black. Carbon black in a dried ink film is non-hazardous according to U.S. Federal agencies.

2. These biomass-derived black pigments would very likely also be banned by the state legislation that bans carbon black as these pigments may still fall into the general category of carbon black.

3. Similar to conventional carbon black these pigments are not near infrared (NIR) transparent. Accordingly, their usage does not address the concern about interference with recycling waste stream sortation.

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**November 2024**

**Ref. NJ S3398 - Banning of Benzophenone and its Derivatives**

**National Association of Printing Ink Manufacturers (NAPIM)**

NAPIM is a trade association representing the United States manufacturers of letterpress, gravure, lithographic, flexographic and digital printing inks. The association was formed in 1917 and represents 80+% of U.S. manufactured printing inks.

**Overview**

The inclusion of *benzophenone and its derivatives* in section (d) of the New Jersey Packaging Product Stewardship Act (S3398) would have severe and adverse impacts on important and very commonly used print processes.

**Energy Curable Inks and Printing**

Energy curable (ultraviolet UV light cured) printing is an important and widely used print process in both commercial and package printing. The ink systems used in this process change instantaneously from a liquid phase to a solid phase upon exposure to a UV light source. All of these ink systems require a photoinitiator[1] which can be a *benzophenone derivative*.

Energy curable printing provides very important qualities and properties to printed products:

- High abrasion and scratch resistance
- Solvent and chemical resistance
- Gloss or matte finish
- Better surface adhesion

**Exposure**

When the benzophenone containing ink or coating is properly cured according to the manufacturers' specifications the benzophenone is trapped within the cured ink or coating minimizing the potential for human or environmental exposure.

**Background**

Energy curable inks and printing reduce/minimize volatile organic compound (VOC) air emissions from printing facilities. VOC emissions are tightly regulated to reduce ground-level ozone formation. Energy curable printing is used across all print platforms (e.g. lithographic, flexographic, gravure, digital, etc.)

These inks do not contain traditional solvents (i.e. VOC) and rapidly harden into a tough film when the photoinitiator in the ink system is exposed to an ultraviolet light source. Although some of the components in these inks and coatings may have some very limited volatility, the system does not depend on evaporation to dry the printed product.

[1] Photoinitiators are a type of chemical compound that is commonly used in ultraviolet (UV) curing applications. These compounds are capable of initiating a chemical reaction when exposed to UV light, which makes them extremely useful in a variety of industrial and manufacturing processes.

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**Conclusion**

As currently drafted NJ S3398 would essentially eliminate a very important, widely used and highly efficient print process which has strong environmental benefits.