CALL FOR COMMENTS

Proposal for Revisions to the

GS-1 Standard for Sanitary Paper Products

July 20, 2021. Green Seal® is inviting feedback on proposed revisions to the GS-1 Standard for Sanitary Paper Products. We are seeking comments from all stakeholders including industry experts, public health researchers, product designers, raw material suppliers, product testing laboratories, purchasers, end users, and the public. Instructions for submitting comments are on Page 3 of this document.

Summary of Proposed Revisions:

> **Revising Requirements for a Chlorine Free Papermaking Process:** Green Seal proposes to allow the use of chlorine-based additives in the re-pulping stage to break down wet-strength resins present in recycled material. By allowing flexibility in what chemical additives manufacturers use, Green Seal is supporting industry's ability to meet leadership levels of recovered and post-consumer content, decrease greenhouse gas emissions, meet requirements for functional performance, and achieve minimized packaging.

Green Seal® is the leading U.S. ecolabel, symbolizing transparency, integrity, and proven environmental leadership. We develop life-cycle-based standards and certify products and services that can prove they meet our strict criteria for human health, reduced environmental impacts, and effective performance. Operating as a nonprofit since its founding in 1989, Green Seal has certified thousands of products and services in over 450 categories, and is specified by countless schools, government agencies, businesses and institutions.

Document Guide

Section I. Instructions for Submitting Comments

Green Seal develops standards though an open, transparent process that prioritizes public and stakeholder input. Public comment periods are carried out to solicit input and define Green Seal's intended outcomes for product certification against the new or revised criteria.

Guidelines for Submitting Comment

- Comments should be specific in nature.
- Comments should include a technical or market-focused justification.
- Comments should include references from reputable sources.
- Comments should include actionable solutions.

Public Comment Closing Date

This comment period is open for 30 calendar days. The comment period closes on August 19, 2021.

Submit Comments via Email

Submit all comments to standards@greenseal.org using the subject line: "GS-1 Standard Revision."

Requests for Comment Period Extension

Any request for comment period extensions should be submitted via email to standards@greenseal.org. If granted, extensions will be publicly announced on Green Seal's website.

Comment Review Process

Upon receiving comments, Green Seal will confirm receipt and may reach out to schedule a brief conference call to request clarifications.

Within 90 days of the close of the comment period, Green Seal publishes a Response to Comments document which includes the text of all written comments submitted during the Public Comment Period and summarizes any actions taken or justifications for inaction regarding the changes to the standard.

For Questions About this Process

For other inquiries, contact Brittany Maule, Manager, Science and Standards, at bmaule@greenseal.org.

Section II. Proposal Overview

In 2019, Green Seal proposed a revision to the GS-1 Standard that included multiple updates including changes to performance parameters and allowance for products made from 100% agricultural residue. During this time, Green Seal engaged with several stakeholders and received feedback on the criteria prohibiting chlorine and chlorine-based additives in certain stages of the papermaking process. Green Seal was made aware that prohibiting chlorine in the re-pulping stage of the papermaking process when using recovered material was not a feasible solution for some manufacturers due to factors such as cost, slower re-pulping rates, and uncertainty regarding a critical outcome: measurable environmental benefits from using non-chlorine re-pulping additives. Green Seal is now proposing to adjust the requirements for a chlorine free papermaking process to provide multiple options when using recovered material with wet-strength resins to meet Green Seal's leadership levels of recycled and post-consumer content, which address a key sustainability target of the GS-1 Standard: reduced carbon emissions. See the Intended Outcomes section below for more details.

In 2020, Green Seal performed a review of the chlorine free criteria that involved a market scan, outreach to stakeholders, and environmental impacts research. The results of that review highlighted a necessary issue for revision:

> **Proposed Exemption for Chlorine Additives in Re-pulping of Wet-Strength Resins:** Certain types of paper products, such as paper towels and napkins, are produced with wet-strength resins – additives that make paper durable even when wet. When these paper products are collected as waste material for re-processing, those resins must be broken down before the paper waste can be made into new products. Current practices to break down wet-strength resins include using heat and/or adding chemicals. A common chemical additive is sodium hypochlorite (chlorine bleach), which is also used in many other industrial practices, such as water disinfection. Green Seal has determined that the allowance of chlorine-based additives into the re-pulping stage to address wet-strength resins does not present a significant environmental risk and allows for greater incorporation of recycled fibers.

Intended Outcomes

Reducing Lifecycle Carbon Emissions and Preserving Boreal and Tropical Forests

Carbon emissions is one of the most significant environmental impacts across the life cycle of conventional sanitary paper products, which are commonly made from virgin wood fiber. Greenhouse gases are emitted during the timber harvesting, pulp processing, and disposal of products made from virgin wood fiber. The collection and re-processing of recovered materials, e.g., paper products that have been diverted from waste streams, results in reduced carbon emissions across the product lifecycle, in particular by preserving forests, which serve as carbon sinks, and diverting materials from to landfills where discarded products emit methane, a potent greenhouse gas. [1]

To decrease these negative sustainability impacts, Green Seal requires all sanitary paper products to be made from 100% recovered materials. Using more recovered material can require additional steps, temperature conditions, and additives based on the products in the material, such as when it contains wet-strength resins. By allowing flexibility in what chemical additives manufacturers use, Green Seal is supporting industry's ability to meet leadership levels of recovered and post-consumer content and decrease greenhouse gas emissions in addition to its requirements for functional performance, hazard prohibitions for papermaking additives, and minimized packaging.

Recognizing Sanitary Paper Produced via Chlorine-Free Bleaching

Bleaching in the papermaking process is a well-known sustainability issue. Due to the potential for formation of harmful by-products, paper mills began shifting away from using elemental chlorine and chlorine-based compounds to bleach paper beginning in the 1990s. However, several manufacturers still use chlorine dioxide in bleaching – highlighting the need for continued focus on reducing chlorine in the bleaching process. Paper products made with recycled content are typically "processed-chlorine free" in which no additional chlorine-based compounds are used to bleach the paper, but the recovered material itself may have been originally bleached as virgin fiber.[2] Any paper products must be made from 100% recovered material in a Processed Chlorine Free process to meet Green Seal's requirements.[3] Reducing chlorine in the bleaching stage prevents the largest potential for formation of harmful by-products.

Following Standard Development Best Practices

Green Seal systematically reviews standards in accordance with international best practices to ensure standards remain relevant, feasible for all types of enterprises, and reflect good sustainability practices. Standard revisions are carried out within a transparent, stakeholder-engaged process.

[1] National Climate Assessment: Forests. https://nca2014.globalchange.gov/report/sectors/forests
[2] Chlorine-Free Paper. https://www.calrecycle.ca.gov/paper/chlorinefree
[3] Green Seal Standard for Sanitary Paper Products. https://greenseal.org/green-seal-standards/gs-1

Section III. Red-Lined Tracked Changes

Green Seal proposes the following revision to the GS-1 Standard for Sanitary Paper Products:

Text in the box below show the details of the proposed revision.
The red text shows proposed additions. Any text ~~with strikethrough lines~~ are proposed deletions.

3.5. Material Processing

3.5.1 Chlorine Free. Products made from recovered fibers shall be *Processed Chlorine Free (PCF)*. Products made from agricultural residue shall be *Totally Chlorine Free (TCF).*

Additionally, chlorine or chlorine derivatives (e.g., elemental chlorine, chlorine dioxide, sodium hypochlorite, sodium chlorite) shall not be used during the following steps of the *papermaking process*: re-pulping, screening, deinking, and washing.

Exemption: Chlorine and chlorine derivatives can be used during the re-pulping process if necessary to break down *recovered material* with wet-strength resins.

Section IV. Research Record

The following section summarizes market and technical research on the impacts of chlorine-based additives in the re-pulping stage of the papermaking process and availability of alternative chemicals.

Prohibiting Chlorine Bleaching

For several decades until the 1990s, elemental chlorine, chlorine dioxide and sodium hypochlorite were used to bleach printing and office paper and tissue products to make those products appear bright and white instead of their natural brown and beige colors. However, in the mid-1980s, it was discovered that when chlorine interacts with the organic compounds in wood products it can form harmful by-products such as dioxins that have negative impacts on the environment and human health (described more in the next section). This discovery led to many industry leaders voluntarily reducing or phasing out elemental chlorine and chlorine compounds in the bleaching stage, with "complete elimination of all chlorine compounds in pulp bleaching in favor of oxygen, peroxide and other nonchlorine containing chemicals…termed 'totally chlorine free' (TCF) bleaching."[4] As a result of the shift towards reduced use of chlorine in bleaching, there have been notable decreases in the concentration of pollutants from industrial effluent that enters the environment downstream of paper mills.[5,6]

However, several manufacturers, particularly on the household market, still bleach products with chlorine dioxide.[7] While this method can reduce the potential for toxins to enter the environment, eliminating chlorine from the bleaching process can bring this risk down to zero.[8] Several industry and sustainability groups focused on this issue cite reducing the use of chlorine compounds in the bleaching process a relevant and important goal for industry.[9,10,11,12]

According to Green Seal's estimates based on outreach to subject matter experts in this industry, the use of sodium hypochlorite in the re-pulping stage has been reported to be 5-7 times less than the amount used for bleaching, per ton of paper. Additionally, industry experts have noted that the primary application and greatest need for sodium hypochlorite is for the re-pulping of a mill's own waste paper, for example, surplus and scraps of paper towel products – estimated as accounting for 2% of all re-pulping at one mill surveyed.[13] As a result, Green Seal has determined that the greatest impact reduction

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[4] Effects of Recycled Fiber Use on Chlorinated Compounds. http://www.paperenvironment.org/PDF/recycling/chcompounds/R_C_Bleach.pdf

[5] Review of Scientific Basis for AOX Effluent Standard in British Columbia. https://www.environment.gov.au/epbc/notices/assessments/2007/3385/pubs/20dioxins.pdf

[6] National Council for Air and Stream Improvement. 2013. Environmental Footprint Comparison Tool: A tool for understanding environmental decisions related to the pulp and paper industry. 1-68.

[7] The Issue with Tissue 2.0: How the tree-to-toilet pipeline fuels our climate crisis. https://www.nrdc.org/sites/default/files/issue-with-tissue-2-report.pdf

[8] Effects of Recycled Fiber Use on Chlorinated Compounds. http://www.paperenvironment.org/PDF/recycling/chcompounds/R_C_Bleach.pdf

[9] Environmental Paper Network: The Global Paper Vision. https://environmentalpaper.org/epn-vision/vision/

[10] Conservatree: Chlorine Free Processing. http://www.conservatree.org/paper/PaperTypes/CFDisc.shtml

[11] The State of the Global Paper Industry. Shifting Seas: New Challenges and Opportunities for Forests, People and the Climate. https://environmentalpaper.org/wp-content/uploads/2018/04/StateOfTheGlobalPaperIndustry2018_FullReport-Final-1.pdf

[12] World Resources Institute: Responsible Purchasing. https://www.wri.org/sustainability-wri/responsible-purchasing

[13] Industry feedback received in outreach process.

opportunities are realized via a prohibition of chlorine in bleaching and environmental impacts are anticipated to be insignificant for the re-pulping stage.

Formation of By-Products in Re-pulping

The environmental concerns associated with using chlorine-based additives are the formation of by-products such as dioxins, chloroform, and other halogenated organic compounds. Commonly, this group of compounds is referred to and measured as adsorbable organically bound halogens (AOX).[14] The main pathway of environmental exposure of these compounds from using chlorine-based additives in re-pulping is through wastewater effluent discharged by paper mills. Dixons are persistent organic pollutants that bioaccumulate in the food chain in addition to being highly toxic to humans and aquatic life.[15] Chloroform is a carcinogen that can have multiple health effects.[16]

However, due to the pH conditions and composition of products used during the re-pulping stage, is it unlikely that dioxins form. The pH during the re-pulping stage directly impacts the quality of product produced when using chlorine-based additives like sodium hypochlorite. Sodium hypochlorite can degrade the cellulose in paper products if pH values fall below 9.[17] At higher pH levels, the chemical process to create dioxin does not occur: "Since pH is always alkaline no formation of dioxins would be expected."[18] Some studies even note that as long as the pH is above 6, dioxins are undetected.[19,20] For dioxins to form, lignin – a compound found in wood – would also need to be present in the re-pulping stage. Lignin contains chemical structures that interact with chlorine that can lead to the creation of dioxins. However, the amount of lignin present in recovered material that has already undergone previous processing and bleaching is expected to be low, and thus very low levels of substrate would be present for chlorine to react with. In real-life measurements of treated effluent from recycling mills that did not employ chlorine-based bleaching, dioxins were shown to be below analytical minimum levels in all cases.[21] Thus, the conditions needed to produce quality paper, and the substrate present when using sodium hypochlorite in re-pulping do not support the formation of dioxins as a harmful by-product.

The addition of chlorine-based additives is also not expected to create significant levels of additional chloroform. Using recovered material in the papermaking process inherently produces some level of chloroform. Wet-strength resins (the glue that holds together the paper fibers) themselves contain chlorinated compounds, including chloroform, that can be released during the re-pulping stage, which is

[14] European Environment Agency: Halogenated Organic Compounds (AOX). https://www.eea.europa.eu/help/glossary/eper-chemicals-glossary/halogenated-organic-compounds-aox
[15] EPA: Learn About Dioxin. https://www.epa.gov/dioxin/learn-about-dioxin
[16] The National Institute for Occupational Safety and Health (NIOSH): Chloroform. https://www.cdc.gov/niosh/topics/chloroform/
[17] Bleaching Agents – Pulp and Paper Industry. https://smartech.gatech.edu/bitstream/handle/1853/2461/tps-394.pdf
[18] European Union Risk Assessment Report Sodium Hypochlorite. https://echa.europa.eu/documents/10162/330fee6d-3220-4db1-add3-3df9bbc2e5e5
[19] Hise R.G. and Hintz H. L. 1989. "Effect of Brownstock Washing on Formation of Chlorinated Dioxins and Furans During Bleaching," Proceedings, 1989 TAPPI Pulping Conference.
[20] Berry R.M., Allen L.H., Fleming B.I.,. Voss R.H, Luthe C.E., Wrist P.E.. 1989. "Toward Preventing the Formation of Dioxins During Chemical Pulp Bleaching," *Pulp and Paper Canada*, 90(8): 48-58.
[21] Effects of Recycled Fiber Use on Chlorinated Compounds. http://www.paperenvironment.org/PDF/recycling/chcompounds/R_C_Bleach.pdf

expected regardless of the chemical additive used to break down the resins.[22] Additionally, water entering the mill that is treated with chlorine as a disinfectant may also contain by-products that can be measured as chloroform in effluent. As noted above, sodium hypochlorite reacts with lignin (expected to be present in low levels in recovered pulp) to produce chlorinated organic by-products. Sodium hypochlorite can also react with cellulose but that reaction occurs much more slowly, and any chloroform that forms that does not emit to the air prior to reaching the wastewater treatment plant, is then volatized and degraded during effluent treatment before the water is discharged to the environment.[22]

In addition to the expectation that formation of these by-products is low, papermaking processes take place in closed systems in which wastewater is directed to a sewage treatment plant before reaching the environment directly. These systems convert sodium hypochlorite into sodium chloride (also known as table salt). As a result, it is expected that "no hypochlorite reaches the environment and consequently the [Predicted Environmental Concentration] is null."[22] In the U.S., the potential by-products from use of chlorine-based additives are also measured and regulated to acceptable levels in paper mill wastewater.[23]

It is Green Seal's position that there is sufficient evidence showing formation of these pollutants is unlikely to result from the use of sodium hypochlorite in the re-pulping stage, or formation occurs at such low levels as to be considered insignificant when compared to lifecycle impacts of sanitary paper products, in particular, chlorine used in the bleaching stage.

Environmental Benefits of Recycled Paper

In general, the papermaking process is resource intensive, with the largest environmental impacts resulting from the production of paper and disposal of paper at its end-of-life use.[24] For example, harvesting virgin fiber reduces available forest resources. Forests serve as "carbon sinks" that store carbon by turning carbon dioxide in the atmosphere into a food source. It is estimated that forests in the U.S. store 14% of the annual carbon dioxide emissions from the national economy.[25] At the end-of-life stage, paper and paperboard materials were the largest component of solid waste in the U.S., with over 17.2 million tons accounting for 11.8% of all landfilled material in 2018.[26] When paper products in landfills breakdown, they produce another potent greenhouse gas: methane.[27]

Encouraging the use of recovered content has been identified as a way to reduce life cycle impacts. In the GS-1 Standard, Green Seal requires all sanitary paper products to be made from 100% recovered material – a requirement that goes beyond other ecolabels and procurement guidelines in North America and Europe.[28] The main benefits of using recovered content in the papermaking process are decreased greenhouse gas emissions from harvesting and the end-of-life disposal of virgin fiber products. One study

[22] European Union Risk Assessment Report Sodium Hypochlorite. https://echa.europa.eu/documents/10162/330fee6d-3220-4db1-add3-3df9bbc2e5e5
[23] EPA: Pulp, Paper and Paperboard Effluent Guidelines. https://www.epa.gov/eg/pulp-paper-and-paperboard-effluent-guidelines#pollutants
[24] American Forest & Paper Association: Printing and Writing Papers Life-Cycle Assessment. https://www.afandpa.org/docs/default-source/default-document-library/final-faq-document-12-3-10.pdf?sfvrsn=0
[25] National Climate Assessment: Forests. https://nca2014.globalchange.gov/report/sectors/forests
[26] EPA: Paper and Paperboard: Material-Specific Data. https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/paper-and-paperboard-material-specific-data
[27] Subak S., and Craighill, A. 1999. The contribution of the paper cycle to global warming. *Mitigation and Adaptation Strategies for Global Change*, 4: 113-136. https://doi.org/10.1023/A:1009683311366
[28] EU Ecolabel paper products. https://ec.europa.eu/environment/ecolabel/documents/Factsheet_Paper.pdf

notes that in a side-by-side comparison of using 100% recycled content vs. 100% virgin fiber that using recovered content results in an 80% reduction of pounds of CO_2 emissions.[29] Others have noted that recycled paper products have half or less the climate impact of virgin paper, and that tissue products have 70% less impact than tissue products made from virgin sources.[30] Industry has identified that using sodium hypochlorite in the re-pulping stage allows them to directly re-use the waste from their own production processes – diverting products from landfills and decreasing the need for virgin fiber.

With climate change a continued threat, it is imperative that industry continue to utilize strategies to reduce greenhouse gas emissions. As a result, Green Seal sees it as important to provide flexible options for recycled content processing that still meet Green Seal's strict environmental requirements.

Alternatives to Chlorine-Based Additives

Alternatives to chlorine-based additives do exist and are available in some markets. Some manufacturers can perform re-pulping of wet-strength resins without using chlorine-based additives; however, it is noted that these alternatives may not be feasible for all manufacturers for several reasons. Total chlorine free bleaching may not produce certain grades of paper, may not be economical for manufacturers that do large amounts of on-site converting, and may require the application of heat– a negative sustainability impact that uses more energy. [31,32] Additionally, speed of re-pulping is also a major consideration for papermaking companies, and chlorine-based additives are found to be faster than alternatives at breaking down wet-strength resins.[33] Green Seal supports green chemistry developments and encourages the use of alternatives to chlorine when feasible; however, it is Green Seal's position that providing flexibility in the GS-1 Standard criteria will result in minimal to no environmental harm, decreased carbon emissions and diverted waste from landfills by incentivizing and rewarding the use of recovered material. Green Seal implements systematic maintenance of standards and supporting evidence. In the case that new evidence emerges on the availability, performance, and economical feasibility of alternatives to chlorine additives, Green Seal will consider revisions to existing criteria.

[29] NCASI Fact Sheet Paper Calculator 4.0. https://www.ncasi.org/wp-content/uploads/2019/05/Paper-Calculator-4.0.pdf

[30] The State of the Global Paper Industry. Shifting Seas: New Challenges and Opportunities for Forests, People and the Climate. https://environmentalpaper.org/wp-content/uploads/2018/04/StateOfTheGlobalPaperIndustry2018_FullReport-Final-1.pdf

[31] Environmental impact of pulp and paper mills. DOI: 10.30638/eemj.2012.012

[32] Industry feedback received in outreach process.

[33] Lanxess Oxone™ in Repulping. https://www.chempoint.com/insights/lanxess-oxone-in-repulping