

Washington State PFAS in Food Packaging Alternatives Assessment (AA)
Performance Assessment Approach & Decision Rules
Draft: 6/18/2020

1. Background

The performance assessment approach for this AA will follow the [IC2 Guidelines](#) for a Level 1 Basic Performance Evaluation. This approach uses readily available qualitative descriptions and marketing information to answer several questions so the “assessor can make a reasonable evaluation of the alternative’s technical feasibility.”

According to the IC2, the goal of this assessment is to determine whether the PFAS alternatives perform the required function. This approach is being used to fulfill the requirements under RCW 70.95G.070 which states that alternatives “perform as well as or better than PFAS chemicals in a specific food packaging application”. The chemicals and products that will undergo performance evaluation have been prioritized based on the information highlighted in the [Ecology PFAS Product and Alternatives Scoping Paper \(2/24/2020\)](#). For the purposes of this assessment, the performance requirements will focus primarily on the product level.

2. Assessment Approach Outline

IC2 Level 1, Question 1. What are the performance requirements at the chemical level and material level?

Based on the available technical information on food packaging and serviceware and discussions with stakeholders, the chemicals under evaluation in this assessment need to perform **at least one of three functions** at the chemical level to meet product performance requirements:

1. Creates a surface barrier between the substrate (i.e. fiber) that can resist oil, grease, and moisture. Achieved by dry-end processes where a coating or extruded layer is applied to the surface of the substrate. (Trier et al. 2017)
2. Acts as an internal sizing agent, in which the spaces between the substrate fibers are decreased, thus decreasing permeability. This is often achieved via wet-end processes where the chemical is added directly to the pulp before molding and drying (Trier et al. 2017).
3. Creates a foam, plastic, or metal solid substrate/material that is impermeable to oil, grease, and moisture.

PFAS are added to paper- and fiber-based food packaging to add oil, grease, and moisture resistant properties to the paper substrate. Therefore, at the material-level, the chemical alternatives must also perform this function. In addition, alternatives such as uncoated, mechanically densified paper or reusable plastic- or metal-ware would meet these material performance requirements without the addition of chemicals.

Table 1. Summary of Chemical-Level Functional Requirements & Material-Level Performance Requirements				
	Chemical-Level Function			Material-Level Performance
PFAS food packaging function & performance	Creates surface barrier [†]	Acts as a sizing agent [†]	Creates foam, plastic, metal solid	Resists oil, grease, and moisture
Chemical Alternatives				
Silicone/Siloxane	✓	✓		✓
Polyvinyl alcohol (PVOH)	✓	✓	✓*	✓
Poly lactide (PLA)	✓	✓	✓	✓
Polyethylene (PE)	✓	✓	✓*	✓
Polyethylene terephthalate (PET)	✓	✓	✓*	✓
Petroleum wax	✓			✓
Bio-based wax	✓			✓
Kaolin clay	✓			✓
Aluminum metal	✓		✓	✓
Non-Chemical Alternatives				
Uncoated paper (mechanically densified)	n/a			✓
Reusable plastic- or metal-ware	n/a			✓

[†] Trier et al. 2017

* Single-use plastics made of PVOH, PE, and PET are outside the scope of this assessment. See [Ecology PFAS Product and Alternatives Scoping Paper](#) for further details.

IC2 Level 1, Question 1. What are the performance requirements at the product level?

The performance requirements at the product level will be the primary focus of this assessment. Based on the IC2 Guide, product performance requirements will be assessed by answering several questions regarding each performance requirement. The two main product performance requirements that will be addressed under this portion of the assessment are:

1. **Oil and grease resistance (OGR)**
 - A. Ability of a product to resist the permeation of grease through a substrate as evidenced by a reduction or lack of spotting, staining, or spreading.
2. **Leak/spill resistance (as applicable)**
 - A. Ability of a product to resist grease or other fluid by either the ability to reduce permeation AND transfer through the substrate, or the ability to resist leaks through folds or seals (e.g. folded paperboard products)

- B. For the purposes of this assessment, leak/spill resistance will be applied to the following products:
- i. Wraps
 - ii. Sleeves
 - iii. Bowls
 - iv. Clamshells
 - v. Takeout boxes

For each chemical and non-chemical alternative, these attributes will be addressed using questions A-G in the table below in order determine if the product meets these requirements.

These questions are paraphrased from the IC2 Guide:

- A. Being used for same or similar function?
- B. Available on the commercial market?
- C. Promotional materials state this provides the desired function?
- D. Based on A, B, and C is this a favorable alternative? [If yes, the assessment is complete, and the product is determined to be favorable]
- E. Has an authoritative body demonstrated the alternative functions adequately?
- F. Are there indications that the alternative does not perform as well?
- G. Has an expert identified the alternative as unfavorable for performance?

These questions will be answered on a yes/no basis based on qualitative description and marketing data. The IC2 Guide states that the performance evaluation is complete if the answer to the first three questions (A, B, and C) is favorable. However, if there is indication that these products do not perform as well, then the assessment continues by answering the additional questions. Question E refers to an authoritative body that has demonstrated that the alternative functions adequately. An authoritative body that meets the IC2 definition was not identified for the food packaging industry, therefore, the answer to this question for any product would be “no”. If applicable, the assessment will include publically available data or information performance under Question F.

Question G refers to “expert sources” identifying this product as unfavorable. For the purposes of this assessment, expert sources who can determine whether a product functions, are the producers who *make that specific product (not producers of competing products)* and end-users who have used the product.

For the purposes of this assessment, End-Users will be defined as businesses, individuals, or entities that purchase or use food packaging for their intended use. This can include consumers, retailers, grocers providing prepared foods, cafes, restaurants (quick-service, fast-casual, and dine-in), cafeterias, government agencies, and others.

Draft Performance Matrix – Candidate Alternative Name – For Illustration Only

Product Categories	Alternative Product	Oil & Grease Resistance							Leak Resistance (as applicable)							Favorable ?
		A	B	C	D	E	F	G	A	B	C	D	E	F	G	
Wraps, bags, etc.	Wraps	✓	✓	✓	✓	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Yes
	Liners					n/a							n/a			
	Bags					n/a							n/a			
	Sleeves					n/a							n/a			
Dinnerware	Plates	✓	✓	N	N	n/a	✓	✓	✓	✓	N	N	n/a	✓	✓	No
	Bowls					n/a							n/a			
	Trays					n/a							n/a			
	Boats					n/a							n/a			
Foodservice containers	Clamshells					n/a							n/a			
	Pizza boxes					n/a							n/a			
	French Fry cartons					n/a							n/a			
	Bakery boxes					n/a							n/a			
	Takeout boxes					n/a							n/a			

A. Being used for same or similar function?

B. Available on the commercial market?

C. Promotional materials state this provides the desired function?

D. Based on A, B, and C is this a favorable alternative? [If yes, the assessment is complete, and the product is determined to be favorable]

E. Has an authoritative body demonstrated the alternative functions adequately?

F. Are there indications that the alternative does not perform as well?

G. Has an expert identified the alternative as unfavorable for performance?

✓ = There is evidence that the alternative product meets the performance attributes

N = Insufficient evidence that the alternative meets the performance attributes

n/a = Not applicable

Stakeholders have communicated during discussions and the 4/14/20 webinar hosted by Ecology that oil and grease resistance (OGR) and leak proofing are the most important properties for selecting food packaging. This is consistent with the Food Packaging Institute's 2019 U.S. Consumer Survey results which reported that "stopping oil and grease stains" and "leak/spill proof" are the most important single-use item attributes (FPI, 2019a). These results were based on 800 respondents approximately split between the U.S. and Canada, ranging in a balance of age (18 – 60+), income, education level, gender, and region (FPI, 2019b).

Although other performance attributes such as printability, keeping foods hot and crispy (relating to insulation and vapor transmission), and heat resistance are commonly highlighted in marketing materials, these will not be considered in this evaluation of performance for two main reasons. The first being that PFAS are primarily added to food packaging primarily to improve oil, grease, and moisture resistance (Trier et al. 2017); therefore, it is most important to determine if the existing alternatives can meet these primary functions. Although, PFAS performs well at a wide range of temperatures, it is not imperative that all alternatives meet this criterion. Insulation is also primarily a performance requirement of the substrate, rather than the coating material.

Secondly, assessing many performance parameters will likely over-complicate the assessment and may not result in an accurate reflection of the current food packaging market. There is a large amount of customization in the market where packaging producers develop customized products based on the end-user needs. In the 4/14/20 webinar, 30% of the respondent's performance requirements "depends on the product". In the same webinar, a case-study presented the development of a burrito wrapper for a fast food chain that could be placed directly on the grill for cooking, suggesting that performance expectations can be unique, complex, and unexpected (Specialty Packaging Inc, 2020).

Addressing PFAS Performance and Over-Engineering

Due to their molecular structure containing highly stable carbon-fluorine bonds, PFAS are very effective as oil, grease, and moisture resistance agents. Several stakeholders have mentioned throughout this process that products containing PFAS can provide oil and grease resistance (OGR) properties that exceed what is necessary to perform the function and that the use of PFAS in these products have set an unnecessarily high standard for performance. Since this assessment is comparative in nature, this makes identifying functional alternatives difficult.

Although several technical performance test methods are available, the selection of products is also subjective in nature. Other factors besides performance, such as cost, aesthetics, storage, and environmentally preferred purchasing policies further complicate the selection of products by end-users. It is up to the end-users to decide if performance is acceptable for their specific use. An in-depth technical review of performance is outside the scope of this assessment. The

identification of favorable performance will be a yes/no determination, with the intention to identify any obvious gaps in performance for alternative products.

Separate from the scope of the Ecology AA, many businesses and organizations have additional environmental management system attributes that are important to their own sustainability programs, including compostability, recyclability, and recycled content criteria based on corporate or organizational policies, or required by local government ordinances.

Government agencies may be bound by environmentally preferred purchasing programs that prioritize all or some of these attributes. Some stakeholders believe that these environmental characteristics fall under the umbrella of performance parameters and incorporating these attributes into the assessment has been brought up regularly during the stakeholder webinars.

While these are important selection parameters and can help identify environmentally sustainable products, they will not be taken into account for the performance assessment of alternatives for the same reasons that other attributes such as aesthetics have not been incorporated.

References:

Food Packaging Institute (2019a). Food Packaging by the Numbers [In the United States].

Available at:

<https://www.fpi.org/fpi/files/fpilibrarydata/documentfilename/000000000322/2019%20Consumer%20Survey%20Infographic-US.pdf>.

Food Packaging Institute (2019b). Consumer Perceptions on Foodservice Packaging Report: 2019 Executive Summary. Available at:

<https://www.fpi.org/fpi/files/fpilibrarydata/documentfilename/000000000320/2019%20Consumer%20Survey%20Executive%20Summary%20FINAL.pdf/>.

Specialty Packing Inc. (2020). Featured Case Study: A Flour Based Tortilla Package. Available at:

http://specialtypackaginginc.com/case_study/a-flour-based-tortilla-package/

Trier X, Taxvig C, Rosenmai AK, Pederson GA. 2017. PFAS in paper and board for food contact – options for risk management of poly- and perfluorinated substances. Copenhagen K, Denmark: Nordic Council of Ministers. TemaNord, 573(2017). Available online at:

[http://orbit.dtu.dk/files/149769110/Rapport PFAS in paper and board for food contact Options for risk management of poly and perfluorina.pdf](http://orbit.dtu.dk/files/149769110/Rapport_PFAS_in_paper_and_board_for_food_contact_Options_for_risk_management_of_poly_and_perfluorina.pdf)