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RESEARCH

RESOURCE

How Clean Is Clean Enough?

Consumer and recycler insights on how food residue affects paper packaging recyclability

6 Key Takeaways



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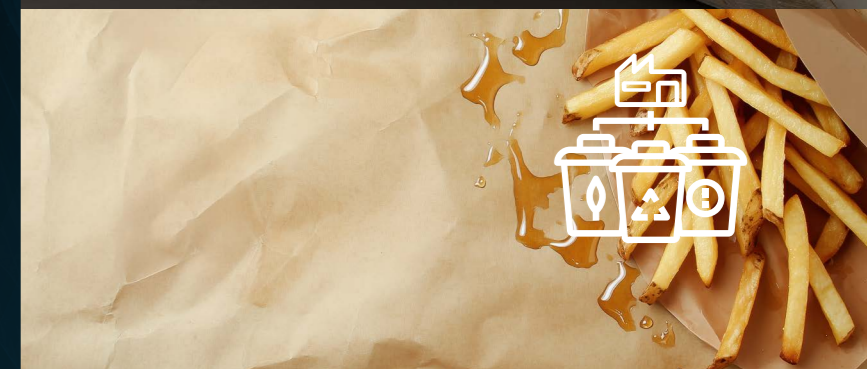
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American Forest and Paper Association



Takeaway One

Education and On-Pack Messaging are Key to Reducing the Amount of Food Residue that Enters the Recycling System

Participants who watched an educational video and received packaging with a How2Recycle label were twice as likely to properly recycle items that required cleaning, removing at least 50% of the original food residue on packaging.



| | Group N (no H2R label) | Group Y (H2R label only) | Group E (Education + H2R Label) |
|--|---------------------------|-----------------------------|------------------------------------|
| % of participants who successfully recycled items that required cleaning AND cleaned off at least 50% of the original food residue | 27% | 32% | 62% |
| % of participants who attempted to recycle items that required cleaning but did not clean the items | 9% | 9% | 8% |



Consumers need clear, bold, conspicuous, consistent labeling.



Takeaway Two

Consumers Find Printed Recycling Icons On-Pack Most Helpful for Determining Recyclability

Participants in the consumer behavior research took action to clean many of the included package formats to a point where minimal food residue remained, with the application of a How2Recycle

label and the addition of a small amount of education on the label each increasing the likelihood of food residue being removed prior to recycling. At the same time, study participants were confused about

the recyclability of some package formats or found them too inconvenient to clean in preparation for recycling.

| Shown from Very Helpful highest to lowest | Very Helpful | Somewhat Helpful | Not Helpful |
|--|--------------|------------------|-------------|
| Printed recycling icons on packaging | 76% | 19% | 5% |
| Visual posters/lists near recycling receptacles | 61% | 34% | 5% |
| Words about recycling on the packaging | 54% | 35% | 10% |
| What the package looks like (color, material, design) | 45% | 41% | 14% |
| Information from my local recycling center or waste management authority via email, flyer, website, etc. | 31% | 29% | 40% |
| Online research (Google, ChatGPT, sustainability blogs) other than social media. | 26% | 31% | 43% |
| Friends, family, or colleagues | 23% | 46% | 31% |
| Resin ID codes | 23% | 26% | 51% |
| Educational campaigns or public awareness initiatives | 22% | 52% | 26% |
| Guidance, signs, or websites from retailers/grocery stores or brands | 22% | 44% | 34% |
| Advertisements/ ads about recycling | 15% | 41% | 44% |
| Municipal waste or recycling companies | 14% | 41% | 45% |
| Neighbors/ local acquaintances | 14% | 27% | 59% |
| Social media | 7% | 31% | 62% |
| Government websites or environmental agencies such as EPA | 5% | 28% | 68% |
| Packaging manufacturer websites | 2% | 14% | 84% |



Takeaway Three

Food Residue Isn't a Major Barrier for Most Paper-based Packaging, But Certain Formats Still Create Friction

During the research, consumers often cleaned before recycling packaging until minimal food residue remained, particularly when on-pack messaging and education were provided. At the same time, study participants were confused about the recyclability of

some packaging formats, and others found certain formats (below) too inconvenient to clean before recycling, even though they would recycle those same formats if they were already clean.



These results highlight a clear gap: Consumers are willing to recycle clean paper packaging, but they're not always willing to clean it first.

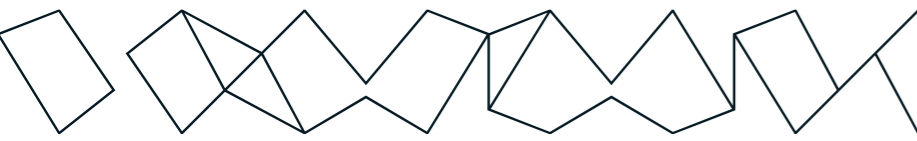
AVERAGE PARTICIPANT VIEWS FOR EXAMPLE PACKAGE CATEGORIES AND FORMATS

| Product | Component | Feel confused or unsure if the package is recyclable or not | Think the package is recyclable but considered too inconvenient to clean | Willing to recycle the package if it is already clean |
|----------------------------|-----------|---|--|---|
| Frozen Meal - Mac & Cheese | Bowl | 31% | 27% | 64% |
| | Carton | 2% | 1% | 68% |
| Ice Cream - Strawberry | Tub | 13% | 14% | 63% |
| | Lid | 18% | 11% | 51% |
| Paper Plate | | 22% | 27% | 61% |
| Coffee Cup - Single Wall | Cup | 17% | 11% | 55% |
| | Lid | 18% | 4% | 48% |
| Yogurt | Cup | 10% | 12% | 61% |
| Quick Mac & Cheese | Cup | 13% | 14% | 59% |



Takeaway Four

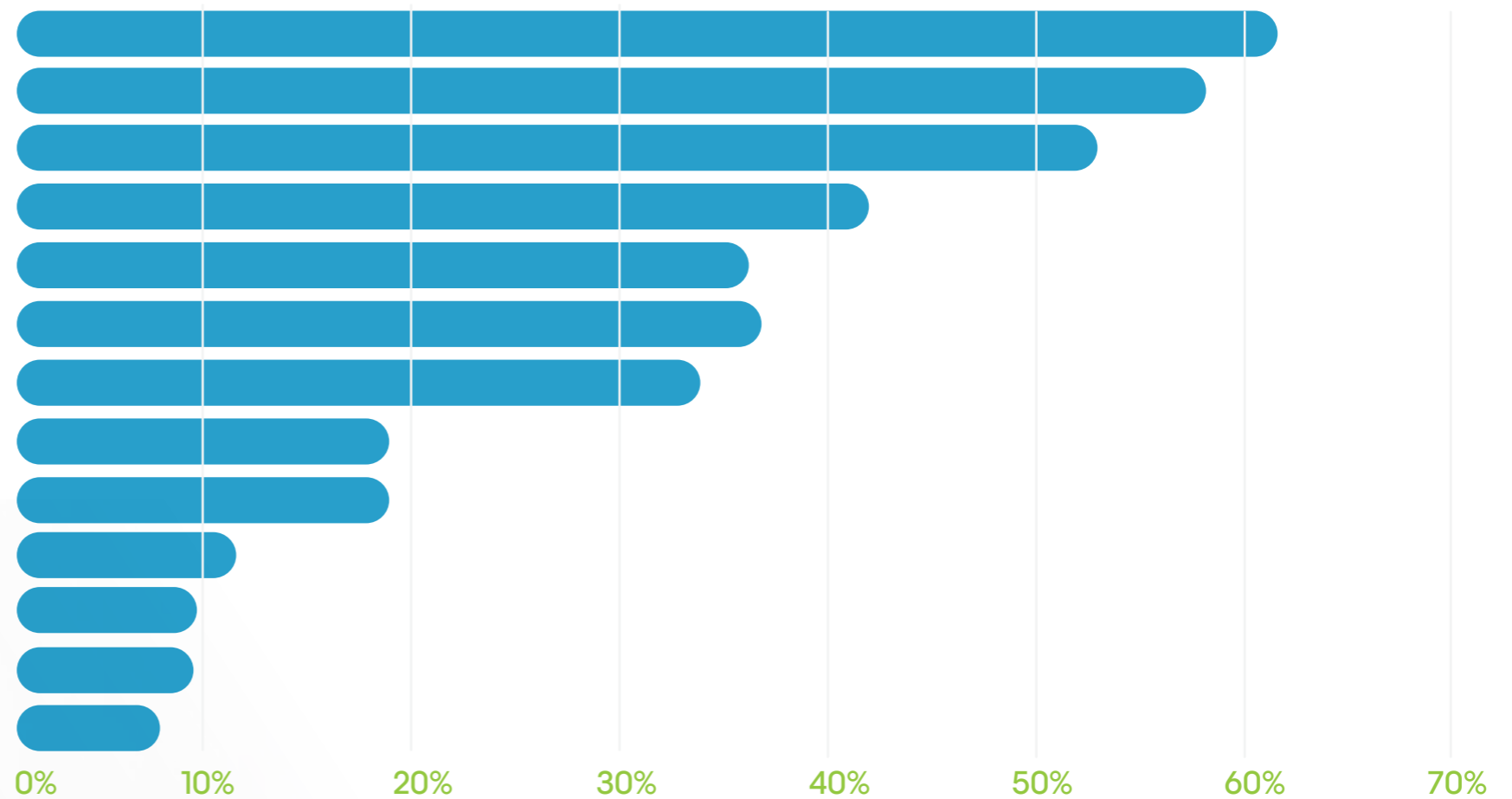
Most Consumers Already Know to Clean Food Residue from Packaging Before Recycling



Study participants were asked: Imagine you have decided to recycle a used food package that has left over food pieces, some food residue, and food stains on it.

You then see this label printed on the package – what actions would you realistically do prior to recycling?

- I rinse food residue off*
- I dump off any remaining chunks or pieces of food*
- I wipe or scrape off food residue*
- I put my rinsed package into recycling still wet*
- I recycle portions with stains, as long as it does not...*
- I examine to make sure it's clean*
- If it still has food residue on it, I do not recycle it*
- I set out the package to dry or I dry it with a cloth...*
- If it has any stains, I do not recycle it*
- I would not recycle the package*
- I put my package that I didn't rinse into the recycling*
- I do not rinse food residue off*
- Any stained portions I do not recycle, but I recycle...*

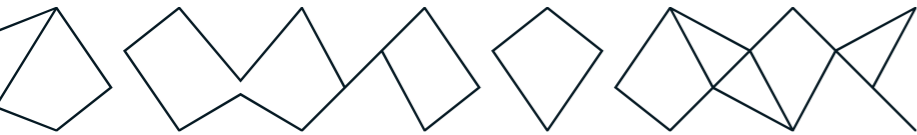


Good news: 80% of study participants knew, without education or explicit instructions, to clean food residue off of packaging before placing it into the recycling bin.

Better news: With explicit, on-pack instructions included, nearly all study participants took some form of action to remove food residue before recycling.



Takeaway Five



Most Recycling Facilities View Food Residue as a Minor Issue, But None are Open to Receiving More of It

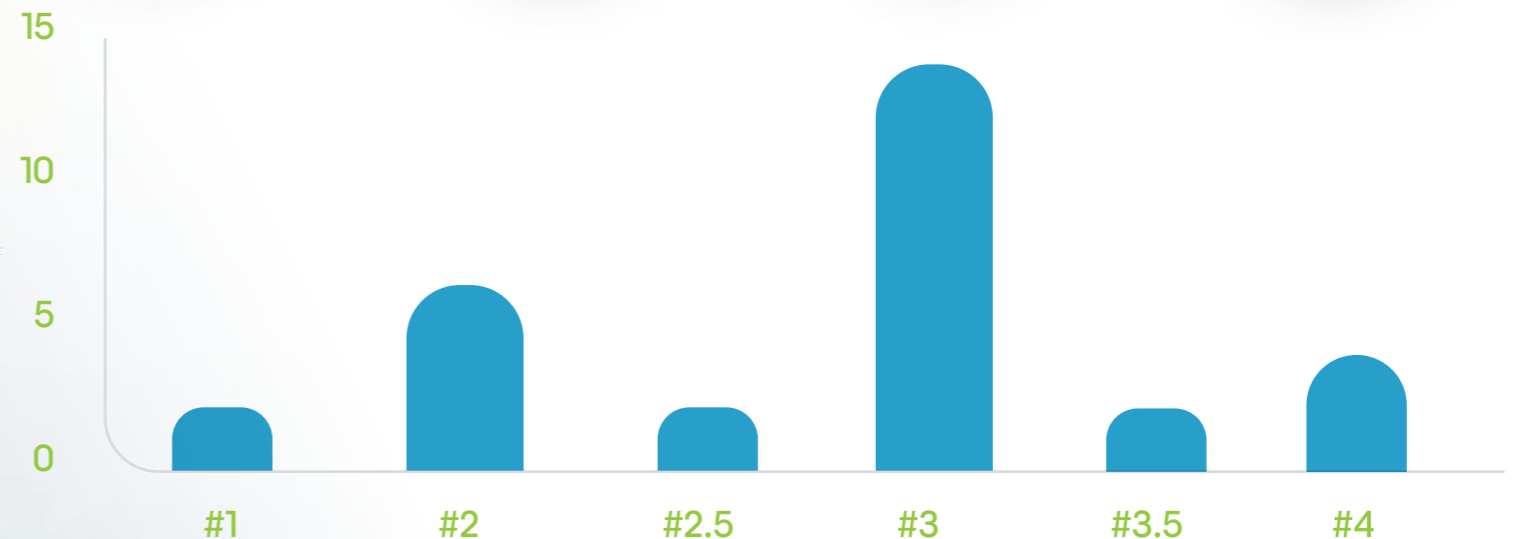
Our recycler interviews paint a nuanced picture. Paper recyclers widely view food residue as a minor issue through the recycling process and have systems in place for managing what they receive. Yet none are willing to accept more food residue than they already receive.

Since food residue can be difficult for paper recyclers to quantitatively define and measure, qualitative indicators and definitions are often used to illustrate when food residue starts to become an issue. For paper food packaging, physical remnants are often seen as problematic, while residue absorbed into the fiber is less concerning.

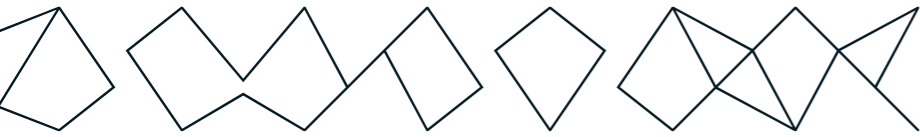
Relying on recyclers to accept more food residue isn't a viable path forward for advancing the recycling of food packaging. Instead, the industry should focus efforts on reducing the amount of residue entering the recycling stream in the first place.

EXAMPLES OF FOOD SOILED PACKAGES SHOWN TO INTERVIEWED PAPER RECYCLERS AND BROKERS WITH THE QUESTION:

At Which Level Does Food Residue Become Unacceptable in Your Operations?



Takeaway Six



While “Clean and Dry” provides a concise, on-pack instruction for preparing packaging for recycling, the paper packaging industry may be better served in identifying new language that clearly communicates how clean a paper package should be before recycling. This requires industry-wide alignment on what level of on-pack food residue is acceptable for recycling.



CLEMSON STUDY PARTICIPANTS ON INCLUDED PACKAGING AND LABELING:

Some instructed to rinse and dry while others didn't therefore, I wasn't sure if I should be drying all of them or just the ones with those specific instructions.

Results showed that study participants generally understand that packaging needs to be clean prior to placing it in a recycling bin.

“Clean and Dry” Improves Understanding, But Doesn't Eliminate Confusion

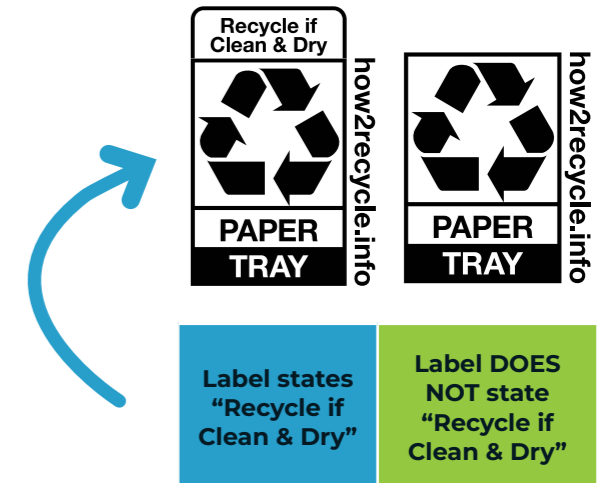
Clemson study participants were asked the following on their beliefs about dryness and cleanliness, and how the presence or lack of specific language on package impacted those views:

- Which statement best aligns with your belief about recycling a used food package that states “Recycle if Clean & Dry” like the label shown below?
- Which statement best aligns with your belief about recycling a used food package that does not explicitly state “Recycle if Clean & Dry” like the label shown below?

WHAT WOULD MAKE IT EASIER TO RECYCLE PACKAGING WITH RESIDUE:

Clear instruction on how clean the package needs to be before placing into the recycling bin. I want to know if residue or staining is allowed.

Without a label explicitly telling them what to do, more than 80% of participants still indicated that packaging should either be fully clean or only have a small amount of residual food on it prior to recycling.



| Belief About Package Dryness | | |
|---|------------|------------|
| The package should be fully dry before placing it in the recycling bin | 26% | 10% |
| The package should be mostly dry before placing it in the recycling bin | 30% | 22% |
| The package will dry in a recycling bin before being recycled | 29% | 27% |
| I don't think it affects recycling if the package is wet or dry | 13% | 41% |
| Belief About Package Cleanliness | | |
| The package should be fully clean with no food before placing it in the recycling bin | 65% | 50% |
| The package can have just a bit of food on it going into the recycling bin | 31% | 33% |
| I don't think it affects recycling if the package is clean or has food on it | 3% | 15% |





What Comes Next? Food Residue and Paper Packaging Recyclability

Increasing the amount of food packaging that is both accepted for recycling and correctly recycled by consumers will require collaboration among stakeholders across the paper packaging and recycling value chains. Our research points to the need for the paper packaging industry, in partnership with paper recyclers, to align on:

- *Acceptable levels of food residue on paper packaging that is recycled*
- *Consistent on-pack language that communicates acceptable levels of food residue to consumers*

THE SPC RECOMMENDS THE FOLLOWING NEXT STEPS:

- 1. Focus on the right formats first:** *determine the right language for labeling.*
- 2. Build an industry standard residue threshold:** *Agree on acceptable levels of food residue and associated on-pack language through a cross-industry working group.*
- 3. Support on- and off-pack education:** *Build education on cleaning food residue off paper packaging into the planned How2Recycle Forward campaign.*
- 4. Expand system-wide partnerships:** *Identify ways the SPC and its members can partner with MRF operators to support education.*



To get involved in the SPC's ongoing food residue work, SPC members can join our [Paper Packaging Recyclability Collaborative](#) today.



How Clean Is Clean Enough?

April 2026 | Version 1.0



Special thanks to the SPC member organizations and partners who provided funding to Clemson University for this research. Without their generous support, this project would not have been possible.

*Cheese Stick Packaging:
Consumer Behavior and Recycling
Effectiveness*

*From Intention to Action: The Impact of Labeling
and Education on Consumer Preparation of
Food-Contact Packaging for Recycling*

Full report to release in May!



GreenBlue is an environmental nonprofit dedicated to the sustainable use of materials in society. We bring together a diversity of stakeholders to encourage innovation and best practices to promote the creation of a more sustainable materials economy.

The Sustainable Packaging Coalition (SPC), a trademark project of GreenBlue, is a membership-based collaborative that believes in the power of industry to make packaging more sustainable. As the leading voice on sustainable packaging, our mission is to catalyze actionable improvements to packaging systems while lending an authoritative voice on packaging sustainability challenges.



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