



v.1.0 beta

Grading Criteria - Introduction

The Plastics Scorecard grades plastics on their environmental and human health performance across their life cycle: from feedstock production to manufacturing to use and end of life. The criteria between grades are calibrated to progressively increase the sustainability of a plastic. The grading criteria in the Plastics Scorecard (v. 1.0 beta) build from existing work to define more sustainable plastics, especially the criteria used in the Plastics Environmental Preference Spectrum¹ and the principles for more sustainable biobased plastics as set out in the Sustainable Bioplastic Guidelines.²

The criteria for grading plastics are defined for four stages of a plastic material's life cycle: feedstock production, manufacturing, use and end of life (with the last two stages included together). Within each life cycle stage, criteria are set for assigning grades to the plastic. The environmental and human health attributes that the Scorecard addresses in each life cycle stage are shaped by the Scorecard's guiding principles of sustainable resources, green chemistry and closed loop systems.

The Scorecard grades plastics on eleven attributes across the material's life cycle. Four in feedstock production:

1. Pesticide Use in Agriculture [*applies only to biobased plastics*]
2. Genetically Modified Organisms (GMOs) in Agriculture [*applies only to biobased plastics*]
3. Sustainable Agriculture Practices [*applies only to biobased plastics*]
4. Post-Consumer Recycled Content [*applies only to fossil fuel-based plastics*]

Five in manufacturing:

1. Primary and Intermediate Chemicals
2. Monomers
3. Catalysts
4. Additives
5. Nanomaterials

Two in the use and end of life stages:

1. Chemical Releases (during use and end of life management)
2. Compostability and Biodegradability in the Marine Environment [*applies only to biobased plastics*]

Some attributes only apply to either biobased or fossil fuel-based plastics [*as noted in the brackets above*].

In version 1.0 beta, the lowest grade for any attribute determines the overall grade for a plastic (see Table 1 below). For example, if a plastic receives Grade F for monomer, then the overall grade for the plastic material is a Grade F. It may be that a new grading system will be developed in the finalization of the Scorecard, allowing better grades in other attributes to offset a poor grade on one or two attributes. That said, the Scorecard intentionally weights certain attributes higher than other attributes. Pesticide use, GMO use, sustainable agriculture practices, monomers, additives and chemical releases are the six attributes for which Grade F is possible. For the other five attributes, the lowest grade begins at Grade C+/C-. These grade levels are set using a combination of factors, including:



v.1.0 beta

Grading Criteria - Introduction

- Likelihood to lead to wider public exposure and examples of government banning the chemical use -- that is, pesticide use, GMOs, monomers and additives.
- Availability and opportunity to improve the environmental and human health performance of an attribute. For example, catalysts are difficult to change in the short term. Thus the lowest grade possible for catalysts is Grade C-.

Since chemicals are at the heart of plastic materials, the principles of green chemistry (see the Guiding Principles section) are at the core of how the Scorecard grades each life cycle stage. The Plastics Scorecard gives preference to chemicals used in agriculture, manufacturing and contained in the final product that are inherently safer. Reflecting concerns for the global production and use of toxic chemicals as well as government actions to restrict these chemicals, plastic products that use chemicals of high concern in manufacturing, use or disposal receive low grades. For the plastics not reliant upon chemicals of high concern in additives and monomers, it is possible to receive higher grades in the Scorecard.

Table 1. Determining the Overall Grade for a Plastic

Overall Grade	Description by Attribute
A+	A plastic receives no grade lower than A+ for any attribute across all life cycle stages.
A-	A plastic receives no grade lower than A- for any attribute across all life cycle stages.
B+	A plastic receives no grade lower than B+ for any attribute across all life cycle stages.
B-	A plastic receives no grade lower than B- for any attribute across all life cycle stages.
C+	A plastic receives no grade lower than C+ for any attribute across all life cycle stages.
C-	A plastic receives no grade lower than C- for any attribute across all life cycle stages.
D	A plastic receives no grade lower than D for any attribute across all life cycle stages.
F	A plastic receives a grade of F for any attribute across all life cycle stages.

The Scorecard is a challenging system to fare well in. Any plastic product that can attain Grade B- is close to the highest level attainable by plastics today. For fossil fuel-based plastics, the challenges to attaining Grades B- and B+ are the need to use monomers and additives of only moderate to low concern and the need to use post-consumer recycled (PCR) content. A polypropylene plastic product, for example, could attain the Grade A- with sufficiently high PCR content and no additives of high concern. A fossil fuel-based plastic cannot achieve a Grade A+ because fossil fuels are non-renewable, and therefore not sustainable, feedstocks. The highest grade a fossil fuel-based plastic can achieve is Grade A-.



v.1.0 beta

Grading Criteria - Introduction

Grade A+, deep green, is a challenging level for any plastic product on the market today to attain. That said, it is possible for some plastics to attain Grade A+, although it will depend on a number of factors, including agricultural practices, additives and monomers used. For example, it is plausible for biobased polylactic acid (PLA) that is grown according to sustainable agriculture principles and is not made from a food crop to achieve Grade A+.

It is important to note that the Plastics Scorecard is designed to assess individual plastic materials and compare that assessment to other plastics; it is not designed to compare plastics to other materials such as aluminum, wood or glass. The goal is to foster the development and use of plastic materials that are more sustainable across every stage of their life cycle. Another attribute that the Scorecard does not explicitly address is the carbon footprint of plastics. This is for a couple of reasons. First, the movement to more sustainable practices in feedstock production, manufacturing and end of life management will reduce the carbon footprint of plastics - this is especially true of using greater percentages of post consumer recycled (PCR) content. Second, tools that specify how to address the environmental and human health issues of plastic materials are quite limited, especially relative to the carbon footprinting tools. And for that reason, any organization that wants to address the carbon footprint of plastic materials should use those tools.

ENDNOTES

¹ Mark Rossi and Tom Lent, 2006, "Creating Safe and Healthy Places: Selecting Materials that Support Healing," *Designing the 21st Century Hospital: Environmental Leadership for Healthier Patients and Facilities* (<http://www.healthdesign.org/research/reports/GreenPapers.php> -- accessed 7/23/08).

² Tom Lent, Mark Rossi, Jim Kleinschmit, Brenda Platt and Cathy Crumbley, 2007, *Sustainable Bioplastic Guidelines* (<http://www.sustainablebiomaterials.org/docs/SBCGuidelines%20070625-2.pdf> - accessed 7/23/08).