CHAPTER 4

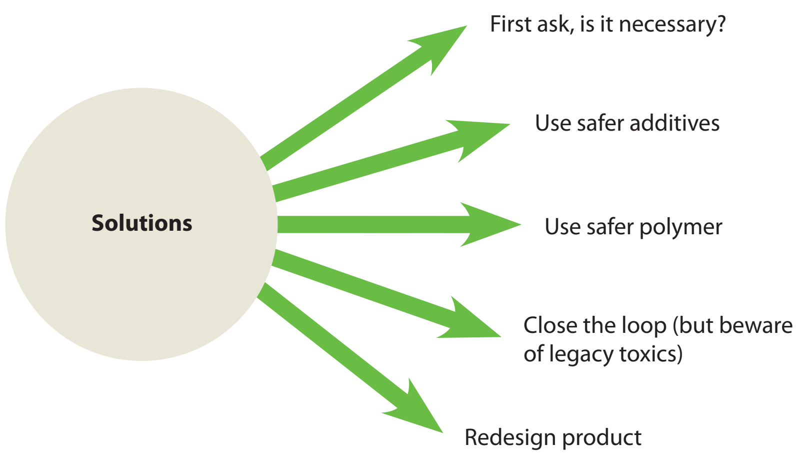
Strategies for Reducing the Chemical Footprint of Plastics

The Plastics Scorecard is a means for improving the human health and environmental performance of plastics. It is not designed to compare across material types, say from aluminum to plastics, or to assess impacts across the entire life cycle of a plastic product. Rather it provides the means for knowing the chemical footprint of plastics and how they compare to each other on this attribute. The Plastics Scorecard provides value to both those that want to demonstrate the lowered chemical footprint of polymer manufacturing or final product, as well as for those designers, specifiers, and purchasers that want to select products with a lesser chemical footprint. Figure 9 depicts the core solutions to making plastics safer in terms of human health and environmental impacts. Reducing the chemical footprint of plastics is a challenging endeavor to which these solutions provide a path forward.

Is it necessary? A critical approach to chemicals in products in general and plastics in particular, especially plastic additives, is to ask the question: Is it necessary? For example, is a flame retardant in nap mats even necessary?[13] The flame retardant may be in nap mats due to historical reasons or a failure to even know that the foam contains flame retardants in the first place.

13 For example, see California Priority Products listing under Safer Consumer Product Regulations—*https://dtsc.ca.gov/SCP/PriorityProducts.cfm.*

FIGURE 9 **Solutions to Reducing Chemical Footprint of Plastics**



Thus manufacturers may be able to eliminate the flame retardant with no consequence to the product or meeting regulatory requirements. For many plastic additives, a good starting point is to ask, is it necessary for the performance of the product.

Using PCR content in the manufacture of a product holds the potential of significantly reducing the chemical footprint of a plastic product by bypassing the impacts of polymer manufacturing.

Find safer additives. For those manufacturers or purchasers that don't answer, "this additive or product is unnecessary," there remain a variety of routes for reducing a product's chemical footprint. First, and often the relatively easiest route, is to substitute CoHC additives with safer alternatives. The most dramatic example of additive substitution is happening in the PVC industry. PVC consumes many CoHC additives, including phthalates such as DEHP, lead and cadmium stabilizers, and BPA as an antioxidant. In an effort to "green" their image, PVC manufacturers are aggressively reducing their use of CoHC additives:

- In Europe, the PVC industry will comply with REACH requirements that require reducing most uses of the phthalates DEHP, butyl benzyl phthalate (BBP), and dibutyl benzyl phthalate (DBP) by 2015 and will voluntarily eliminate the use of lead stabilizers by 2015 (Roberts, 2014a).
- Similarly the South African Vinyl Association announced in April 2014 it will: eliminate lead stabilizers by 2015; all cadmium stabilizers should have been eliminated by 2013 (although apparently have not); hexavalent chromium pigments, similarly should have been eliminated by 2013 (but have not yet been); BPA by 2015; and partial reductions of DEHP by 2015 (Roberts, 2014b).

The electronics enclosures comparison in Chapter 3 is an example of substituting a CoHC additive—decaBDE flame retardant—with a safer flame retardant, thereby reducing the chemical footprint of the product.

Use safer polymers. Another solution is to select a polymer that is further along the path to safer chemicals in manufacturing. The IV bag comparison in Chapter 3 is an example of both eliminating the need for a CoHC additive—DEHP plasticizer—and improving the progress to safer chemicals in polymer manufacturing by the substitution of polyolefin-based polymers for PVC.

Close the loop and use post-consumer recycled (PCR) content. Using PCR content in the manufacture of a product holds the potential of significantly reducing the chemical footprint of a plastic product by bypassing the impacts of polymer manufacturing (for example, see Wolf, 2011). In general using PCR content is a preferred route for reducing the chemical footprint of a polymer and a plastic product. Yet using PCR content seldom eliminates the need for virgin plastic because: 1) frequently companies do not use 100% PCR content for performance reasons, and thus require continued production and use of some virgin polymer content; and 2) even if 100% PCR content is used, some virgin content is required to flow into the economy given the wastage, leakage, and degradation of recycled content over time.[14]

14 In other words, a completely 100% PCR economy is not viable if all manufacturers use PCR content. But given that is not the case, virgin plastic continues to flow into the economy enabling some manufacturers to use 100% PCR.

Finally PCR content is challenged by the legacy of the past use of CoHCs in plastics manufacturing. For example, the recycling and reuse of polyurethane foam means that companies continue to keep the flame retardant, pentabromodiphenyl ether (pentaBDE) in the economy, thereby continuing to expose more people and the environment to this persistent, bioaccumulative, toxic chemical. The drive to greater PCR content should be a significant driver to reduce the chemical footprint of plastics.

Redesign the product. Product redesign holds the potential of both enhancing the value of the product while reducing its chemical footprint. For example, companies can redesign electronic products such that plastic parts do not come into contact or into proximity with parts that heat up, thereby obviating the need for flame retardants. The redesign of chairs to use wire mesh instead of foam both reduces the weight of utilized material and avoids the use of foam that frequently requires flame retardancy.

Ultimately the success of reducing the chemical footprint of plastics will require greater transparency around the chemicals in products. Chemical footprinting holds the potential of creating a metric for measuring progress away from CoHCs as well as towards safer alternatives. A challenge to managing CoHCs in products and supply chains has been, as the business adage goes, "you can't manage what you can't measure." To date companies have lacked clear metrics for measuring progress to safer chemicals. The Plastics Scorecard, by creating a framework for chemical footprinting, creates a metric by which companies can manage chemicals and measure progress.

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