

Program identifies safer chemicals for use as plasticizers

It took years of work, but an independent body formed by a cross section of business, industry, academics and public institutions started out with approximately a hundred plasticizers for wire and cable, specifically for the electronics sector, and a goal: to identify safer chemicals. The list was pared down to nine by methods that included a screening process, then assessed, with the result shown in the tables on the opposite page.



Becker

The project, which came about through a pilot program of the Green Chemistry & Commerce Council (GC3), is not meant to be an endorsement. Instead, it provides an assessment of the products, and not all of them are complete.

First, a bit of background. The GC3 work group, which including industry suppliers BASF, Dow Chemical, Teknor Apex and Hallstar, as well as OEMs/retail, university partners, Government and NGOs, hired an independent toxicology consultant firm. That company, ToxServices, used the Clean Production Action's (CPA) GreenScreen™ Method. Project group members reviewed the Draft GreenScreen™ assessments and provided additional data and comments. The study was completed in June 2013, but many companies in the electronics supply chain may not be aware of the results, the availability of the data, and the collaborative model that can be repeated for new plasticizers in wire and cable and other chemicals. More on that can be found at <http://greenchemistryandcommerce.org/projects/preservatives-project>.



Morose

Per the study results, the project yielded detailed chemical hazard assessments for wire and cable applications. Of the nine, four—DEHT, DOZ, Hexamoll® DINCH® and TEHTM—were “verified” (subjected to rigorous peer review) by a protocol developed by CPA. These assessments are deemed “final,” while the others are considered “drafts” due to incomplete information.

GreenScreen™ assessments of Dow's Ecolibrium™ and HallStar's Dioplex™ and Paraplex™ plasticizers have not been verified and the reports are redacted. Unlike the other plasticizers assessed in this project—which consist of a single chemical—these three products are formulations of multiple chemical ingredients. The manufacturers did not disclose the identities of the ingredients to the GC3 project

group. Instead, the manufacturers provided chemical ingredient information to ToxServices under a non-disclosure agreement (NDA) and ToxServices issued redacted assessment reports.

How did these results ever come about?

In a past update of the project, GC3 co-director Monica Becker said that the process was not perfect, but that it offered progress via cooperation that otherwise would not come from competitors. “Some brands are finding that this is an area ripe for collaboration rather than competition. Pooling knowledge, funds and data to evaluate safer alternatives can lower the cost to individual companies; create more robust results; help avoid regrettable substitutions; and ultimately increase the demand, availability and lower the cost of the most promising substitutes.”

It's not easy to determine which substitutes make most sense, Becker said. “The path to elimination can be riddled with challenges. Finding a truly safer substitute that can deliver as good or better performance can be time-consuming and expensive, made difficult by the lack of toxicity and performance data on purported alternatives and the need in many cases to compel suppliers to make the switch.”

Becker said that collaboration makes even more sense when the target chemical is in a commodity material or component that is common to products sold by multiple brands. “Take power cords for example. Many brands want power cords that are free of polyvinyl chloride, brominated flame retardants, and certain phthalate plasticizers. They source these cords from the same group of suppliers. If these brands are aligned on safer chemical alternatives, they stand a greater chance of getting what they want, cheaper and faster, from their supply chain.”

Greg Morose, Research Manager at the Toxics Use Reduction Institute (TURI), was the initial project manager for the project initiative from 2010 to late 2011, at which time that role was assumed by Becker. He said that the nine plasticizers were chosen based upon the results of a survey that was sent to companies participating in this collaborative initiative. The survey asked them to identify the plasticizers they were interested in for further study, the priority for the plasticizers identified, and the reasons for identifying them, including cost, performance and EHS considerations.

Beyond the immediate value, Morose said that the project follows strict scientific guidelines. “We wrote up our ‘playbook’ for the project in a Royal Society of Chemistry article so that others could replicate the collaborative model that we developed.”

Per Becker and Morose, the findings are meaningful. “We believe that the detailed assessments and the benchmark scores can be very informative for companies that are trying to distinguish between alternative plasticizers based on chemical hazard,” they said. The full report can be found at http://greenchemistryandcommerce.org/documents/PilotProjectFullReportOct2-final_000rev.pdf. ■

Table 1. Results of Verified GreenScreen assessments

Plasticizer Acronym	Chemical Name	CAS No.	GreenScreen Benchmark (see explanations below)	Notes	Link to GreenScreen Assessments
DEHT (Eastman 168)	Di(2-ethylhexyl) terephthalate	6422-86-2	3 _{DG}	Data gaps for neurotoxicity and respiratory sensitization	Verified GreenScreen
Hexamoll® DINCH® (BASF)	Diisononyl cyclohexanedi carboxylate	166412-78-8 (outside the U.S.), 474919-59-0 (inside the U.S.)	2*	Moderate endocrine activity	Verified GreenScreen
DOZ	Bis(2-ethylhexyl) azelate	103-24-2	U	Data gaps for cancer and endocrine activity	Verified GreenScreen
TEHTM	Tris(2-ethylhexyl) trimellitate	3319-31-1	U	Data gaps for cancer and endocrine activity	Verified GreenScreen

*BASF toxicologists disagree with the assessment of endocrine activity for Hexamoll® DINCH®. Their assessment is that Hexamoll® DINCH® is not endocrine active, that the endpoint for endocrine activity should be scored as “Low”, and that the GreenScreen Benchmark should be 3 or higher. BASF states that their assessment is supported by the published opinions of a number of government and scientific authoritative bodies, including European Food Safety Authority (EFSA).

Table 2. Results of Draft (i.e., unverified) GreenScreen assessments

Plasticizer Acronym	Chemical Name	CAS No.	GreenScreen Benchmark (see explanations below)	Notes	Link to GreenScreen Assessments
DPHP	Di(2-Propyl Heptyl) phthalate	53306-54-0	U*	Data gaps for cancer and endocrine activity	Draft GreenScreen
DINP	Diisononyl phthalate	68515-48-0	1*	High endocrine activity, developmental and reproductive toxicity	Draft GreenScreen
Dow Ecolibrium™	Modified vegetable oil derivatives (confidential formulation)	Confidential	<u>4 Formulations</u> BM 3 for 3 form.* BM 2 for 1 form.*	The BM for the formulation is for the monomer with the lowest GS BM score	Draft, Redacted GreenScreen
HallStar Dioplex™ and Paraplex™	Polymeric adipate (confidential formulation)	Confidential	<u>5 chemical ingredients</u> BM 3 for 4 ingred.* BM 2 for 1 ingred.*	The BM 2 chemical is a fatty alcohol monomer with moderate developmental toxicity	Draft, Redacted GreenScreen

* Based on Draft (i.e., unverified) GreenScreen assessment.