

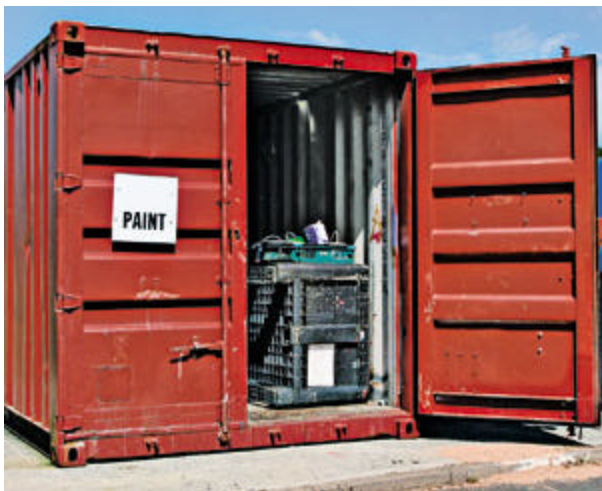
## Chemical and Engineering News Greening The Paint Market

October 16, 2006

### Industry looks for new ways to reduce the environmental impact of paints and coatings

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**For years**, producers of paint and paint raw materials have struggled to stay ahead of ever-more-stringent environmental regulations. Now, with the development of paint recycling schemes and environmentally friendly raw materials, they are trying to turn a reformulating headache into a marketing asset.



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CONTAINED Paint awaits recycling at a collection site.

Raw material suppliers help industrial paint makers offer their clients low-volatile-organic-compound (VOC) options, including radiation-curable coatings and heat-fusible powder coatings. And they have long supplied consumer paint makers with replacements for hazardous air pollutants and with products with little or no VOCs, the precursors of atmospheric smog.

Formulators of do-it-yourself architectural paints use such ingredients to come up with traditional brushable coatings, such as [Sherwin-Williams](#)' Harmony interior latex line, that boast odor-free and VOC-free contents.

Independent agencies now certify the environmental friendliness of architectural coatings. In the U.S., the nongovernmental organization (NGO) [Green Seal](#) helps to set environmental standards and certifies products that meet those standards. Green Seal has had a standard in place for architectural paints since 1993 that sets VOC limits for flat

interior and exterior coatings at 50 and 100 g/L, respectively. The group's standards are sometimes more restrictive than local regulations.

The standards also limit aromatic compounds to no more than 1% of product weight and limit certain chemical compounds including phthalate esters, methylene chloride, and 1,1,1-trichloroethane. Among the paints qualified to carry the Green Seal are [Benjamin Moore's EcoSpec](#) interior line and [Pittsburgh Paints' Pure Performance](#) line.

Just this summer, Green Seal and another NGO, [Product Stewardship Institute](#), helped to negotiate a standard for recycled paint among paint makers, paint recyclers, painting contractors, and federal, state, and local governments.

"Leftover paint is the largest volume material received at hazardous material recovery centers around the U.S.," says Scott Cassel, executive director of the Product Stewardship Institute. He says local governments end up with an estimated \$500 million tab to manage the roughly 65 million gal of paint left over each year.

No recycled paint yet has gone through the certification process. When it does, the paint will meet virgin paint performance standards from the [Master Painter Institute](#), a Canada-based performance certification group. In addition, the paint will have to meet all federal and state VOC limits. To achieve certification, recyclers will have to submit to product evaluations, on-site audits, and annual monitoring.

The certified recycled paint will meet performance and environmental standards as well as have other obvious environmental attributes, Cassel says. Such paint obviates the need to manufacture new petrochemical-derived ingredients or mine new mineral additives such as titanium dioxide and kaolin. The use of recycled paint would also save energy and reduce waste headed for landfills.

In developing the standards for recycled paint, Green Seal was concerned that ingredients prohibited in certified virgin paints could find their way into the certified recycled paints, says Ben Addlestone, an environmental scientist with Green Seal. To preclude that possibility, recyclers can only use paint in original cans with labels intact.

**One firm** that made grant money available to help the \$200,000 paint recycling certification project is [Dunn-Edwards Corp.](#) The California paint maker is better known for its vocal disagreement with regulatory authorities in the state over the contribution that paint-derived VOCs make to smog compared with VOCs from automobiles. Since 2000, Dunn-Edwards has distributed recycled paints processed by Amazon Environmental, also based in California, under the Recover brand.

"Consumers generally think of recycled paint as garbage," says Robert Wendoll, Dunn-Edwards' director of environmental affairs. "And smearing garbage over their walls is not appealing to most people." The new standards, he says, will assure consumers, architects, and specifiers that the certified recycled paints are viable materials. The recycled paints Dunn-Edwards distributes are now undergoing certification through Green Seal, Wendoll adds.

Pamela McAuley, vice president of development for [Hotz Environmental Services](#), a family-owned concern in Hamilton, Ontario, has collected and processed industrial and household waste for 17 years. "We realized we had a lot of reusable paint and so we started to recycle the paint in small batches," she said. The firm participated in the dialogue leading up to the Green Seal certification standards.

Hotz, which collects overruns as well as incorrectly labeled paint from paint manufacturers, exports about 500,000 gal of recycled latex and solvent-based paint annually to countries such as Malaysia, Mexico, Chile, and China. Manufacturers, who pay a small fee to Hotz, are "sensitive" about the sale of recycled paints domestically, McAuley says.

Minimizing use of resources is also behind [Rohm and Haas](#)'s introduction of a new acrylic resin product line under the Avanse name. According to Luis Fernandez, business unit director for architectural and functional polymers, Avanse works at the interface of the pigment and resin binder, forming a tighter lock between pigment particles than in other resins.

The result is a more opaque film that provides one-coat coverage for architectural and industrial applications. Formulators can also reduce costs by using less pigment than they normally would, Fernandez says.

Rohm and Haas is also trying to reduce the use of petrochemical raw materials. Using \$3.75 million in grant money received in 2004 from the Department of Energy, Rohm and Haas is working with agricultural processor [Archer Daniels Midland](#) to develop polymer technology that can remove as much as 30% of petrochemical raw materials now being used to manufacture paints and coatings.

Archer Daniels is contributing low-VOC biomass-derived coalescing agents to the ongoing project. The University of Minnesota is performing analytical chemistry and polymer characterization testing.

Other firms are trying to introduce new biomass-derived raw materials into coatings on a larger scale. [DuPont](#) plans to bring biomass-based polymers to the automotive refinish market by 2008. Together with its partner, British sugar producer [Tate & Lyle](#), DuPont is constructing a plant in Tennessee to make 1,3-propanediol, a raw material for the polymers, from corn sugar.

DuPont first undertook the Tennessee project to supply 1,3-propanediol for the manufacture of its Sorona fibers for clothing and carpets. John McCool, vice president and general manager of DuPont Automotive Refinish Systems, says 1,3-propanediol from the Tennessee plant will also be used to develop a new generation of sealers, primers, and clear coats. The new finishes are being derived from renewable resources and will have low-VOC emissions and deliver what McCool calls "superior performance at a competitive price."

[International Specialty Products](#) (ISP) is looking to nature for inspiration. Ray Fahmy, marketing manager, says the firm recently introduced a new in-can preservative based on glycine, a naturally occurring amino acid. The glycine used in ISP's Nuosept 44, an aqueous solution of sodium hydroxymethylglycinate, however, is synthetically derived. **The chemistry** for Nuosept 44 was originally developed about eight years ago as a baby wipe preservative, Fahmy says. ISP has since introduced glycine-based preservatives in the personal care, household cleaners, and detergents markets.



USDA

**GREENER PASTURES** Vernonia galamensis is the source of a valuable diluent for alkyd paints.

Although the greatest effort seems to be behind the development of more benign waterborne paint systems, work continues on greener solvent-based paint systems. Sometimes these developments can take many years. Seventeen years ago, C&EN reported on industry interest in oil derived from the seed of Vernonia galamensis, a plant native to Africa.

Back then, Robert E. Perdue Jr., a taxonomic botanist who had recently retired from the Department of Agriculture's Agricultural Research Service, explained that oil derived from the seed is chemically similar to epoxidized soybean and linseed oil. Although the two modified seed oils are widely used in paints and coatings, they are highly viscous, semisolid at 50 °F and nonpourable below 32 °F.

By contrast, vernonia oil has a low viscosity and is pourable below 32 °F. At the time, Perdue said the oil showed great potential as a reactive diluent in very low VOC alkyd paint systems. He even started his own company, Ver-Tech International, in Bethesda, Md., to commercialize the oil. "We were on the verge of success and then we ran out of money," Perdue says today. He adds that "we have a new plan of action and expect to move ahead."

Perdue has some competition now. In August, a London-based firm, [Vernique BioTech](#), announced it had signed a deal to commercialize vernonia oil with the government of Ethiopia. A Vernique partner, Paul McClory, says his privately financed firm hasn't partnered with any paint companies yet. Given the Ethiopian deal, however, "there is no reason why vernonia could not start entering the paint industry next year-obviously on a trial basis-but it should expand exponentially from there," he tells C&EN.

The attempt to introduce vernonia oil into commerce is perhaps an extreme example of how long it can take to get a new product on the market. But with the increasing emphasis today on marketing environmentally friendly and renewable ingredients, perhaps the time is finally coming when vernonia oil and other green products will gain greater market acceptance.

