PINE CHEMICALS Forum

ASI talks pine chemicals with two industry players

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Q How did your company get involved in the pine chemicals industry?

Eckhardt: I spent over 25 years in the pine chemical industry with Union Camp Chemicals/Arizona Chemical and Hercules, mostly in the adhesives market. I had responsibility for the business development growth and management of the rosin tackifier and adhesive polyamide businesses at Union Camp. When we were merged into Arizona Chemical, I became global business director of adhesive resins, which presented the opportunity and the need to restructure and re-build the rosin, terpene resin, and tackifier dispersion businesses.

I've since established Teckrez Inc. as a specialty marketer of a range of pine chemical resins with a focus on the adhesives market. There aren't many rosin or terpene tackifier producers left in the U.S. Crude Tall Oil (CTO), a Kraft paper-making byproduct, has been the major source of rosin for adhesive use in the U.S. and Europe, but there are limitations in supply. Dramatically increased energy value has diverted some CTO to fuel use (burning). With continued growth in rosin ester use in adhesives, combined with domestic supply limitations, there is a need for additional supply of a broad range of pine chemical-based tackifiers backed by expertise on producers, products, applications and market/customer needs.

Wherry: It started in 1972 when the company founder, Walter (Bud) Cleaver Sr., was sent to China as an employee of Hercules to obtain gum rosin for Hercules' rosin operations. Cleaver was very successful at that and created a wonderful relationship with certain brokers and traders. About five years later, he retired from Hercules and decided to use his contacts in China to try importing rosin and selling it to smaller companies in North America. Using the contacts that he had, Cleaver and his wife started the business, and that parlayed into a substantially large business that has branched out since then into the area of terpene resins, which also come from pine trees. The business has gone farther than China now, too; we're now active with Mexico, Brazil, Portugal and Canada. But the basic intent is still the same: we bring in pine tree raw materials — or naval stores, as they used to be called — and warehouse them here and then distribute them to North America.

Q What are some of the advantages to formulating with pine chemicals?

Eckhardt: Rosin esters make up by far the largest volume of pine chemicals going into adhesives, so I'll focus on that product category. Compared to hydrocarbon resins, rosin esters exhibit compatibility with a wider range of adhesive polymers and provide better adhesive performance in a wider range of applications and substrates. The resulting multi-purpose benefits of such adhesives allow for simplification of formulations, fewer raw materials and better inventory control. The polarity of rosin esters is responsible for compatibility and adhesive performance advantages. For example, in hot-melt packaging applications, your adhesive will provide better "grab" on difficult-to-adhere substrates. We also see advantages in pressure-sensitive adhesives where rosin-based tackifiers provide better overall tack and adhesion.

Wherry: The biggest advantage to formulating with pine chemicals, or rosin derivatives, is that they're compatible with a very broad range of polymers. They're compatible with SBR, natural rubber, acrylics and a number of other things, whereas with hydrocarbons you've got to design and tailor the resin specifically for the compatibility that you want with a specific polymer. With rosin you get that because it's a very soluble and compatible compound. So, you get esters or derivatives that are in the 3000 molecular-weight range, which is fairly low when compared to the polymers they're being put together with, like natural rubber, etc., which can get up to a couple hundred thousand in molecular weight. When you add rosin esters to these things, what you get is stickiness, the ability for the adhesive to "wet" a certain substrate, and good flowability.

Q What are the major end uses for pine-chemical-containing adhesives and sealants?

Eckhardt: A major area would be hot-melt adhesives, particularly those based on EVA (ethylene vinyl acetate) polymers for packaging, bookbinding and other assembly applications. Other important markets include pressure-sensitive adhesives for labels and tapes, and construction adhesives for flooring, paneling, and carpeting-type applications.

Wherry: Pressure sensitives, chewing-gum base, construction adhesives and labels are some of the major end uses for pine-chemical-containing adhesives and sealants. Also, hot-melts based on rosin tackifiers are used for food packaging because rosin derivatives have a very broad sanction in FDA regulations.

Q In what end-use application is the most growth expected?

Eckhardt: The market segment with the best growth prospects is generally considered to be pressure-sensitive adhesives. There are several factors at work here. First, there's an increased overall demand for labels and tapes using pressure-sensitive adhesives based in part on the increase in package shipments brought on by Internet commerce. Also, improved inventory control methods, of which RFID is a prominent example, are resulting in increased demand for labels used to identify and track individual products.

Furthermore, rosins are growing faster than other tackifier technologies in PSAs for two reasons: 1) Waterborne PSAs are growing somewhat faster than overall PSAs due to environmental and performance factors. Rosin tackifers dominate due to performance and compatibility advantages with the major polymers used (acrylics and SB). 2) In hot-melt PSAs, where SBCs (styrene block copolymers) are the base polymers, increased use of SBCs favoring rosins (SBS) is taking place due to shortages of isoprene containing SBCs (SIS).

Wherry: Pressure-sensitives have become a really significant market. People usually think of tapes and labels as a scotch tape type of thing, but now pressure-sensitives are being used for transdermal patches that dispense drugs through the skin, bar coding on just about every part you can think of, tags for luggage, and plastic sheets that go over the hoods of cars to prevent in-transit damage, among other things.

Q Adhesive demand is expected to grow rapidly in developing countries as living standards and disposable incomes increase. It has been said in the past that adhesives demand in industrialized countries closely follows Gross Domestic Product (GDP). Is this still true?

Eckhardt: That is true, although adhesives grow somewhat faster (perhaps one to two percent higher) than GDP. Innovation in adhesive formulations and polymer and resin technologies results in new applications for adhesives. Going back to an earlier example, pressure-sensitive adhesives are growing faster than GDP due to increased Internet commerce shipments, inventory tracking, etc. Also, waterborne PSAs are growing somewhat faster than pressure sensitives overall due to both performance and environmental factors. Pine chemicals — particularly rosins — are preferred because the major waterborne polymers, acrylics and styrene butadiene (SB), are tackified most effectively by rosin-based tackifiers.

Wherry: I think this is definitely still true. If you think about the things adhesives are used for — labels, tapes, construction — all you have to do is look at China and see all the construction going on over there. Eventually, China will get into the construction of what they call 'product assembly,' where you start putting your own things together with adhesives more and more rather than importing them.

Q How is the tight supply of styrene-isoprene-styrene (SIS) polymer affecting the pine chemicals market? Will new opportunities for pine chemicals emerge from this? If so, which ones?

Eckhardt: It's affecting demand for pine chemicals positively based on two major dynamics. The tight SIS (polyisoprene midblock) supply, caused by limitations in isoprene supply, is causing replacement by SBS (polybutadiene midblock) polymers and newly developed SIBS (polyisoprene-polybutadiene mid-block) polymers. Butadiene supply is quite adequate to support this trend. While C5 hydrocarbons are preferred as tackifiers for SIS polymers, rosin esters are much more effective with polybutadienes. So, the increase in polybutadiene-based polymers is spurring increased demand for rosin-based resins.

The second dynamic, limited piperylene supply, is causing availability issues with C5 hydrocarbon resin tackifiers. This further favors use of rosin-containing adhesive formulations.

Wherry: It has to have an effect because SIS is one of the primary raw materials for pressure-sensitives, which I've already mentioned as one of the fastest-growing markets, and it's also a critical raw material in a number of other uses, primarily diapers, or disposable-article adhesives. So I would imagine the tightness of the SIS supply is bound to have an effect, but the hydrocarbon producers — notably Exxon and Eastman — have been able to develop petroleum-based tackifiers that will function with SIS, and, in fact, do a pretty good job. The problem with most of those, though, is that SIS requires a whole lot more tackifier than it does polymer. You might have a system where you're using twice as much resin as you do polymer, so if something happens with the supply of that polymer, it has a much bigger impact on the resin because there's a lot more resin used to get the properties you need. And I don't think there's any relief when you go looking for other tackifiers for SIS when you get to the hydrocarbon side because they've got the same supply problems.

It's hard to say if the SIS situation will mean new opportunities for pine chemicals because, as I said, rosin derivatives are very widely compatible. In an SIS, you've got a styrene endblock, which is a rigid-type plastic endblock that gives the adhesive strength. But then in the middle you've got an isoprene midblock, which is very sticky and tacky. The problem with rosin esters is that they go to both of those domains; they'll affect the properties of the midblock and the endblock. On the other hand, you can pick a hydrocarbon and design it so that it only affects one of those blocks. So I would say that I can't see the SIS shortage creating any mass opportunities for pine chemical products because SIS polymers and pine chemicals are just too compatible.