SEALANT FEATURE

Sealants:

A New Market for Hot Melts

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Hot melt sealants, a relatively new entry in the sealants market, show promise of becoming a 10-million-pound-a-year market within five years. These materials show growth potential in both the automotive and appliance markets, and they could also carve out a special niche for themselves in a number of other specialized applications in the construction industry.

The major advantage of hot melt sealants is that they are solventless, 100 per cent solids materials which can be used without postcuring. These features are particularly significant at this time, with the energy crisis affecting industrial production and with governmental concern for environmental safety of plant workers. In addition, hot melt sealants have no shrinkage and exhibit little or no creep; they are relatively easy to apply, and their cost is competitive with sealant materials now on the market.

Currently, hot melt sealants are starting to make inroads into plastisol markets in automotive applications, and this use should expand considerably in the next few years. Because of the need to eliminate postcure at elevated temperatures, plastisols are particularly vulnerable to replacement by hot melts in in-line auto production. The market for hot melt sealants now approaches one million pounds a year and is ready to follow in the footsteps of hot melt adhesives, which have established a strong foothold in industrial applications and currently command a market in excess of 100 million pounds a year.

New Developments

In the past, the sealants industry was dominated by oil-based products, and latex and solvent systems had a minor share of the market. Synthetics have been capturing a larger share of the sealants market in recent years, however, and now hot melt sealants could provide yet another alternative in the automotive, appliance, and construction markets.

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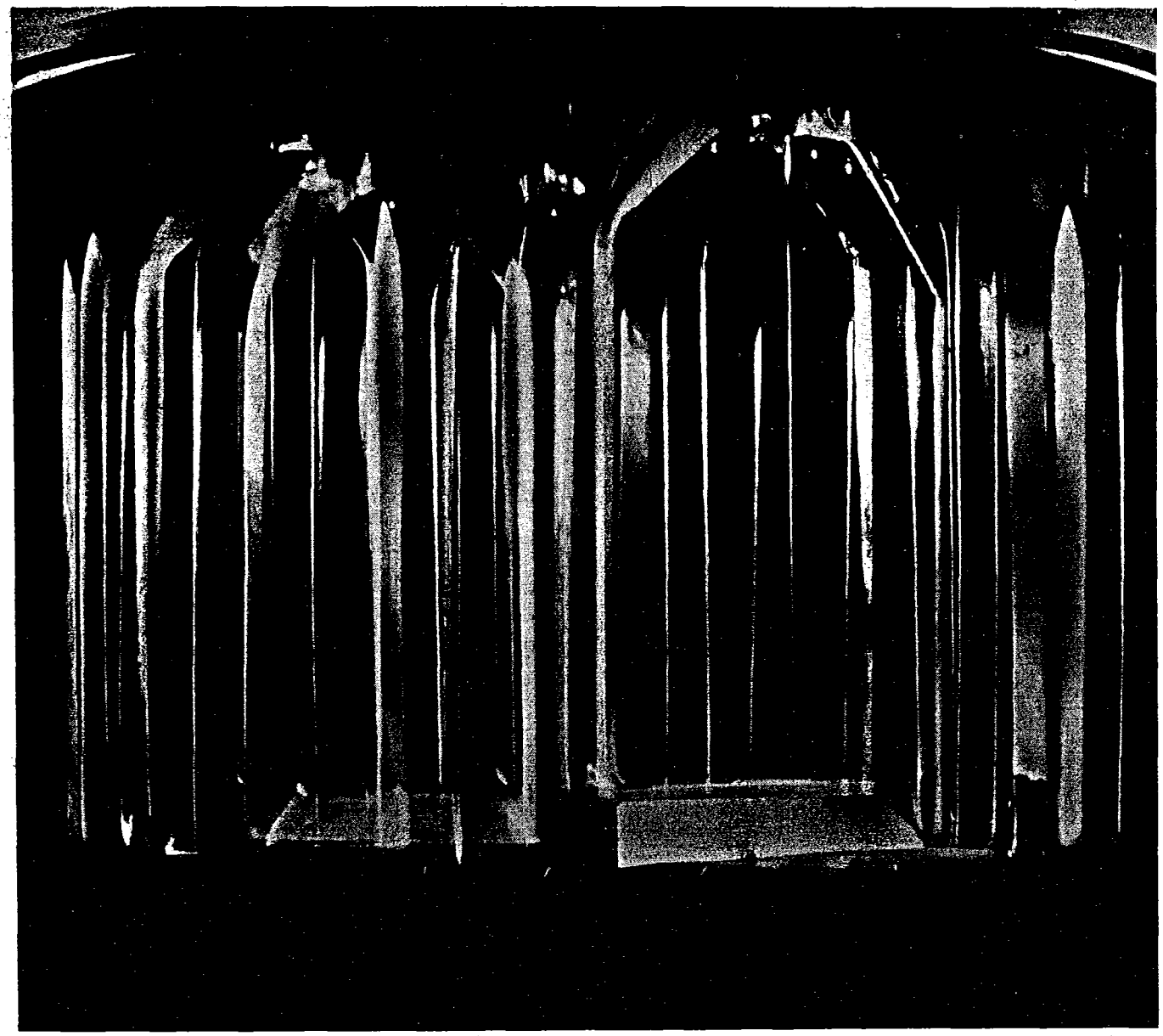

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Current investigations have concentrated on using ethylene-vinyl acetate copolymers in conjunction with butyl rubber and other resins and fillers in hot melt formulations. The advantage of EVA copolymers is that they are already in large-scale commercial use for hot melt adhesives, and butyl rubber is also readily available.

Most hot melt sealants now being used are based on EVA copolymers and butyl rubber. For example, Union Carbide's Bakelite Co-Mer EVA-501 resin, a low-molecular-weight copolymer containing 28 per cent vinyl acetate, has been found to give tough, flexible hot melt sealants, in conjunction with butyl rubber and after modification with phenolic resin and fillers. The low molecular weight and inherent adhesion characteristics of EVA allow formulators to add high levels of the EVA copolymer to formulations while retaining usable viscosities and flexibility over a wide range of temperatures.

Formulating and Applying

The advantage of hot melt sealant formulations is that they require, at most, only small amounts of plasticizer, and there is therefore a greater latitude in formulating. EVA copolymers are considered an integral component of most commercial hot melts because of their excellent adhesion properties; butyl rubber adds toughness and resiliency. Tackifiers such as phenolic resins can be added for improved adhesion, and plasticizers are used to give better wetting. Fillers are usually included to complete the formulation in order to lower cost and provide thixotropy. A typical formulation is shown in Table I.

Hot melt sealants do, however, require a new approach to compounding, mixing, and application. The hot melts must remain elastomeric and retain this property at temperatures ranging from −20° to 190°F. in all types of environments, while still being fluid enough at elevated temperatures so that they can be easily applied.

It has been found that hot melt sealants are most easily made in a high-shear mixing-type blender. Typically, such a blender as the AMK Kneader-Extruder, available from Chas. Ross & Sons, can be used. This equipment gives high shear which results in excellent polymer dispersion, it mixes rapidly at 250° to 300°F., and the blend can be easily removed via the extrusion screw at the bottom of the mixer. The mixer is able to extrude the blend in rod form, which is then cooled and can, in turn, be fed to an extruder gun.

One of the most effective applicators is the Hardman "P-Shooter" available from Hardman Inc., Belleville, N.J. This hand-held gun extruder is specially designed for on-site sealing where high-speed application is not needed. The gun provides variable extrusion rates for hot melt sealants and it has accurate solid state temperature controls.

Markets

Hot melt sealants are currently showing most promise in the automotive market as a replacement for plastisols. Potential areas of application are drip rail sealers, coach joint sealants, and trunk seals.

The advantage of using hot melts in these applications is that no postcure is needed. Currently, this is of increasing importance to the auto manufacturers, who are faced with limitations in energy availability to their assembly plants. Coatings that cure at lower temperatures have already been developed, but until plastisols which must be cured at around 300°F. are eliminated, these lower curing coatings are limited to off-line use.

There are other factors favoring hot melts. Vinyl resins have been undergoing critical scrutiny by the Occupational Safety and Health Administration and other governmental agencies. However, since ethylene-vinyl acetate copolymers and the other hot melt sealant components are considered to be relatively acceptable, and as there is no vapor loss or gassing on curing, hot melts have an edge from the viewpoint of worker safety.

Recent shortages of vinyl resins are also encouraging a switch to hot melts. Presently there are several companies involved in the manufacture of hot melt sealants, but interest is growing and more producers are evaluating materials with a view to entering this market.

Hot melt sealants are showing promise for applications in appliances, where they offer a good choice for replacing plastisols in air conditioner frames, refrigerators, and freezers, and in construction, where hot melts can be used in insulated glass.

Table I — Typical Starting Hot Melt Sealant Formulation

EVA-501* (ethylene copolymer)	40%
Bucar-5214† (butyl rubber)	30%
CK-1834* (phenolic resin)	20%
Santicizer 160‡ (plasticizer)	5%
Calcium carbonate (filler)	5%

*Union Carbide Corp.
†Cities Service Corp.
‡Monsanto



The Hardman P-Shooter extruder gun is being used to apply hot melt sealants around air ducts.

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