



EvCo Research, Inc.
creating solutions ... *shaping the future*

CONVERTING RECLAIMED SCRAP PET TO USEFUL PROCESS CHEMICALS

SCOTT O. SEYDEL

EvCo Research specializes in using reclaimed polyethylene terephthalate (PET or RPET) as raw materials in the manufacture of industrial process chemicals for the paper, textile, and wood products industries. EvCo has recently patented and commercialized a series of internal wet-strength and anti-wicking binders, used in paper and paperboard manufacturing, which are applied by simple addition to the pulp fiber dispersion (furnish) that feeds the paper machine (from the head box).

These products have proven to substitute for fluorocarbon chemicals that have provided these properties, but which are being removed from industrial markets owing to health and safety issues. They also substitute other synthetic or natural substituted resins in many applications.

In addition to their value in providing improved anti-wicking and strength properties to paper and paperboard on a cost competitive basis, they also offer the following advantages:

- ❖ They impart total recyclability to the treated paper or paperboard (whereas conventionally treated paper and paperboard is more often nonrecyclable)
- ❖ They are made using scrap, reclaimed MSW PET (or RPET) as the principal raw material
- ❖ They are nontoxic, create no byproducts, and are fully FDA complied
- ❖ They are added without additional equipment or manufacturing process changes
- ❖ They are readily compostable, having been cross-reacted with vegetable oil derivatives

When used in combination with conventional wet strength chemicals including ADA, AKD, and Kymene, they reverse the nonrecyclable nature of paper and paperboard traditionally imparted by these additives, and even in small pulp stock additions, they impart easy recyclability.

These products are presently being used in commercially produced papers by Brown packaging, Bay State, and Boise Cascade, and in linerboard, medium and corrugated board by Independent Corrugators, Norampac, and Smurfit-Stone Container. Trials are underway with several other major paper companies but we are restricted by developmental partnership agreements that presently limit the disclosure of this work.

There will be no greater use or application for reclaimed bottle or fiber grade PET (RPET) during the coming year. The applications to which these products are being applied constitute markets for millions of pounds of the EvCo materials.

These products are already being used in butcher and sandwich wraps, fast food bags and other paper bags, pizza cartons, cake boxes, donut trays, fast food sleeves and trays and the like, perishable food boxes - - - corrugated or paperboard, live plant shipping packages



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There are few if any uses for the *reclaimed* beverage bottle and food containers that utilize patented, high technology chemistry to manufacture highly profitable industrial raw materials.

There are no known uses that profit from the stresses, temperatures, and mechanical shears that the original forming of these containers inflicts on these plastics.

EvCo Research specializes in using *reclaimed polyethylene terephthalate* (RPET) as the principal raw material in the manufacture of industrial process chemicals for the paper, textile, and wood products industries.

The molecular weight diversity of these RPET feedstocks benefits the end products' properties and facilitates its successful application.

Over the past decade, EvCo has invented and manufactured a series of barrier coatings used as water and oil repellents on cellulosic and synthetic fibers and similar substrates.

The use and commercial success of these products has been reported at earlier GPEC Meetings.

CONVERTING RPET TO USEFUL PROCESS CHEMICALS 2.

Many of the world's paper and paperboard companies have partnered with EvCo in the development of application systems and commercial products utilizing these technologies. Among them, several have requested methods to include them in pre-forming processes known as the "*wet end*" or the "*paper furnish*."

When applied at this stage in paper formation, polymer resins have long been known to contribute to both water resistance as well as to the strength of the paper or paperboard in either a wet or dry state.

In uses such as perishables packaging -- or *wet food* packaging -- these properties are often indispensable.

However, the traditional polymer resins also block easy recyclability of spent paper, cartons, and corrugated boxes because of the very properties that they bring to the pulp fibers and formed sheet or package.

The challenge, therefore, has been to develop *wet end* binders that resist moisture absorbency or wicking during the paper and paperboard's use in packaging, yet are easily compatible with recycling systems using conventional "repulping" systems.

EvCo has recently patented and has begun to commercialize a series of internal wet-strength and anti-wicking binders, used in paper and paperboard manufacturing.

These *anti-wicking binders* are applied by simple addition to the pulp fiber dispersion or *furnish* that feeds the paper machine (from the paper machine head box).

They have proven to substitute for a wide variety of traditional *wet strength* polymer resins, including the polyamide-epichlorohydrin crosslinking polymers and fluorocarbon chemicals that have traditionally provided these properties.

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The arrival of EvCo's products seems timely as some of the traditional *wet strength* products are being removed from industrial markets owing to health and safety issues, and others present significant manufacturing and toxic waste handling and disposal problems.

The EvCo products have very high levels of compatibility with the majority of traditional *wet strength* polymers, and thus can be gradually substituted.

In the process of making this partial substitution, the *recyclability* properties that are characteristic of the EvCo products is carried to the mixture without loss of the favorable wet strength binding properties of the traditional products.

The EvCo *anti-wicking binders* are also finding use in substituting other synthetic or natural substituted resins in many similar applications.

Again, they can also be *eased in* by gradual substitution when used in combination with conventional wet strength chemicals including ASA (alkenylsuccinic anhydride), and AKD (alkylketene dimers).

As when used to partially replace the epichlorohydrin and fluorocarbon resins, the EvCo anti-wicking binders, used as additives, tend to enhance the recyclability of *wet strength* treated paper and paperboard - - even in small pulp stock additions.

EvCo also makes versions of these products that can be added during the papermaking process using a size press.

This unit uses a metered quetch roll or squeeze roll assembly to apply the product to the semi-formed paper sheet after it progresses through water removal screens and felts, and begins travel through a drying cylinder section.

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Still other additions are being tested with the use of a particle spray assembly located over the paper machine screens and occasionally referred to as a hydra-sizer.

In addition to their value in providing improved anti-wicking and strength properties to paper and paperboard on a cost competitive basis, they also offer the following advantages:

- ❖ They are made using scrap, reclaimed MSW PET (or RPET) as the principal raw material
- ❖ They are nontoxic, create no byproducts, and are fully FDA complied for wet food contact
- ❖ They are added without additional equipment or manufacturing process changes
- ❖ They are readily compostable having been cross-reacted with vegetable oil derivatives.

The EvCo anti-wicking binders are presently being used in commercially produced papers by Brown packaging, Bay State, and Boise Cascade, and in linerboard, medium and corrugated board by Independent Corrugators, Norampac, and Smurfit-Stone Container.

Trials are underway with several other major paper companies but we are restricted by developmental partnership agreements that presently limit the disclosure of this work.

There will be no greater use or application for reclaimed bottle or fiber grade PET (RPET) during the coming year.

The applications to which these products are being applied constitute markets for millions of pounds of the EvCo materials.

CONVERTING RPET TO USEFUL PROCESS CHEMICALS 5.

These products are currently being used and tested in applications such as butcher and sandwich wraps, fast food bags and other paper bags, pizza cartons, cake boxes, donut trays, fast food sleeves and trays and the like, perishable food boxes, and corrugated or paperboard, live plant shipping packages.

In addition to the earlier mentioned EvCote surface coatings and the EvCo anti-wicking binders I've just described, EvCo has also invented a line of vegetable oil based hydrogenated tri-glyceride compounds that substitute paraffin waxes in "hot melt applications" where barrier coatings are applied using kiss-roll coaters, curtain coaters and cascade coaters.

Work is being completed on cross-reactions of the EvCote barrier chemistry with the EvCopel hydrogenates to emulate the properties of wax/polyethylene compounds.

These products are in principal use as carton coatings on frozen food boxes, milk cartons, and various oily wraps.

At EvCo, we envision a day when RPET based coatings and binders will solve the tremendous problem faced in the loss of over four billion pounds of non-recyclable food packaging. In the process, we will use billions of scrap bottles and food containers that are currently being land filled.