D. R. Miller
R. A. Ruehrwein (proposals)
F. S. Clark (NASA)
R. L. Green (NASA)

NASA (Research Contract)

Synthesized phenylmercaptodisiloxanes for NASA contract; built a $2.4 \times 10^6$ DN bearing rig for NASA contract. This is an outstanding mechanical job, putting us in a class with Pratt & Whitney and SKF for high speed bearing test capability.

## E/VCl LATEX BINDERS

### PAPER APPLICATIONS

M. V. Merchant
M. J. Holm
Y. L. Wang
J. E. Adamove
W. G. Wagner

Pigment Binder

Demonstrated pigment binder properties on commercial equipment at Continental Can, Federal Paperboard and Eastex.

In conjunction with Eastex trial, participated in web offset print run showing E/VCl as workable pigment binder in such coatings.

Saturation: Web & Beater

Developed workable saturation formulas for wallcovering at Imperial Papers. Formulas should develop business for both E/VCl (1.2M lbs.) and Scripset 101 (45M lbs.).

Completed study for paper nonwoven at C. H. Dexter which showed E/VCl system can match acrylics for water resistance and be superior for tensile and flame retardancy.

Completed beater-add study for Chicopee Mfg. Co. Demonstrated E/VCl value for strength, hand and wet end retention. This motivated them to pilot plant runs.

Lab demonstrations show soap stripped E/VCl latexes are excellent prospects for new products. Such binders have superior water resistance.

Functional Coatings

Recommended clear coating formulations commercially used at Resistane, York Wallpaper and Thomas Strahan Co.

Completed functional coating study for Continental Can Co. E/VCl should qualify for cup stock and paper plate coating, replacing organic solvent systems.

Established the value of E/VCl as precoat for PVDC for a high level water vapor barrier properties.

Completed FDA work needed to obtain approval under FR section 121:2526 (component of paper or paperboard in contact with aqueous and fatty foods).

Aided Riegel Paper Products in developing new flexible packaging using E/VCl as a barrier saturant.

Determined how high Tg 30°C. product may be used for barrier coating.

Characterized the heat seal and blocking properties of all E/VCl products alone and in combination with PVDC.

Wrote technical bulletin to cover market areas for Functional Coatings.

TEXTILE APPLICATIONS

M. J. Holm
Y. L. Wang
F. W. Fallwell
J. E. Adamove
E. A. Byes
W. J. Renaudette
W. G. Wagner

Nonwoven & Finishing

Did work to provide means of improving heat and light stability of E/VCl for non-durable applications.

Established for duPont the diammonium phosphate compatibility of E/VCl.

Ran commercial trial at Globe. Results gave impetus to synthesis program, showing that hot tensile strength can be obtained by self-crosslinked E/VCl.

Developed laboratory techniques to show that self-crosslinked E/VCl candidates have potential for dry cleaning and laundering requirements.

Showed that self-crosslinked E/VCl does not undergo hydrolytic degradation upon laundering.

Made technical calls at Norton Co. and Ballanger Co. to move their use of E/VCl in abrasive and buffing wheels.

CARPETING

K. A. Pollart
J. D. Gabbard
C. J. Harris

Developed lab equipment and technique which provide meaningful results in studying carpet backing formulas. (Completed pilot trial at Monsanto-Decatur.) This aided training of product group and research application team in carpet manufacture.

Devised test to measure carpet stiffness at various temperatures. Used this to generate data on role of plasticizers and on comparison of E/VCl to SBR and blends of same for use in technical bulletins.

Provided TGA and stiffness data as needed to keep Walter Carpet on E/VCl and to increase their usage rate.

Demonstrated how backside blowing problem at Walter Carpets can be eliminated.

Assisted in the successful runs at Coronet Industries. This led to use of E/VCl as precoat to foam.

Used Coronet trials to further train product group.

Determined the relative responses, efficiencies and high shear rheologies of eleven different thickeners.

Studied accelerated aging of E/VCl vs. SBR. Technical bulletin written from data obtained.

For Textile Rubber showed that E/VCl is not adequate as frothed laminating adhesive. Yet these systems were shown to be promising for Ozite's Polygrass.

Completed 50 TSR's as requested by Marketing.

ADHESIVES

Wrote sales bulletin outlining properties of E/VCl for use in adhesives.

Characterized the peel strengths to polypropylene of E/VCl products for use in technical bulletins.

Determined shelf life of E/VCl-amide polymers combined with reactive melamine resin. This to be used for product bulletin.

Studied plasticizer addition to E/VCl for use in product bulletin.

SPECIALTY COATINGS

M. J. Holm
Y. L. Wang
W. J. Renaudette
W. G. Wagner

Prepared films for new FDA petition for entry into can coating markets.

Prepared special metal coating for Scoville Aerosol Products. Coated units now under evaluation.

Completed trials at United Wallpaper to show that E/VCl can produce scrubbable wall covering.

Demonstrated at Columbus Coated Fabric that E/VCl is a workable binder as basecoat and printcoat for fabric wall covering. Lower price of parent company PVC kept us from business.

Determined compatibility of E/VCl for alcohol used in inks at Equitable Bag. Switched customer to use of hydrolyzed E/VCl.

Wrote technical bulletin on safe solvents for clean-up of E/VCl at Equitable Bag. Information has general interest.

## POLYMER CHARACTERIZATION

M. J. Holm
Y. L. Wang
W. F. Fallwell
J. E. Adamove
E. A. Byes
W. J. Renaudette
W. G. Wagner

Supported synthesis effort to develop new products by characterizing base polymer properties.

Developed new techniques for testing physical properties of bulk polymers. Used to characterize E/VCl and competitive products. Improved method of determining Tg.

Characterized the cure response of E/VCl and various competitive products.

Established the flammability character of E/VCl from films and filled system by LOI method and determined effects of plasticizers on flammability properties and screened FR additives.

Determined long term (1 year) aging properties of E/VCl films as measured by brightness change.

Completed studies on methods and economics for making new E/VCl products by soap stripping or deionizing.

Aided in training Marketing group in properties and applications of E/VCl through field trips, telephone calls and their visits to St. Louis.

## E/VCl POLYMERIZATION

M. E. Gibbs
H. M. Andersen
S. M. Balaban
W. J. Raiff
A. J. Bindbeutel

### High Strength E/VCl

Successfully demonstrated and produced a 30°C. Tg E/VCl, a high tensile, non-blocking product. Resolved tendency for higher grit and coagulum formation in 85% vinyl chloride content systems (30°C. Tg process).

Initiated interest in dry powder for special coating applications by preparation and trial of 30° Tg fine powder samples.

## Improved FR Rubbers for Textile Applications

Established feasibility of ethylene-vinyl acetate/ethylene-vinyl chloride graft systems to improve low temperature properties, achieving Tg's in the range of -20°C.

Explored techniques for running new polymer systems (necessary for vinyl acetate grafts and special crosslinking monomers) at acid pH's and made progress towards plant capability of operating autoclaves at pH 5 through cathodic protection technique.

Explored crosslinking systems for E/VCl which improved hot tensile strength solvent resistance and launderability of textile and paper composites.

## Continuous Process

Demonstrated initial feasibility of two stage continuous process (initiator tube plus backed mixed finishing vessel). Production rate for continuous E/VCl process is 2 to 3 times the batch rate, depending upon composition of polymer being made.

Demonstrated monomer recycle in continuous process venting only dissolved monomer in polymer, increasing monomer yield by 10% and decreasing waste monomer incineration requirements by 70%.

# PAPER CHEMICALS

## SCRIPSETS

D. R. Dill
F. T. Marshall
R. W. Sanders
W. F. Vogelpohl

Two developments, Liquid Scripsets and Dry Ammoniated Scripsets, have kept us in surface sizing leadership by correcting product deficiencies, becoming environmentally more compatible and forming the cornerstone to our entry into the European paper chemical specialties market.

## Liquid Scripsets

Developed Liquid Scripset 520 (RPC-1022) process via solvent-non-solvent route and demonstrated and established production at Montreal plant site.

Developed Liquid Scripset 500 process via S/NS and demonstrated at Montreal plant site. Provided products equivalent to competitive American Cyanamid product, Cypres 48.

Developed S/NS SMA technology further with wide range (specific viscosity 1% in DMF 0.4-12.0) of molecular weights. One high viscosity model demonstrated in pilot equipment.

Dry Ammoniated Scripset

Developed two routes for a dry ammoniated maleic anhydride copolymer resin. Demonstrated feasibility in pilot equipment for liquid ammonia process (RPC-1016, Scripset 808).

Developed application technology, trialing and full commercialization within one year period for this new dry ammoniated Scripset 808.

Developed replacement product for our major Scripset 530 customer eliminating objectionable ammonia makedown and supplied material for customer trialing (RPC-1027).

Scripset Sizing

Field demonstrated two significant application studies on surface sizing:

Related basesheet variables and machine speed to size press pick-up control.

Found that interaction of internal (Mersize) and surface sizes (Scripset) will provide the optimum in performance from the customer's sizing dollar.

P&P Div., improved polypress operation fewer blown cakes in late 1972; made "high" molecular weight polymer by mass process at 35°C.; may provide route to polypress operation for higher molecular weight products.

New Scripsets

In cooperation with the wet-end group we developed an optimum rosin size (RPC-609) for the size press to be used as a fourth generation candidate.

Based on the RPC-609 technology, two 3rd generation surface sizes (RPC-1023, 1025) based on blends of RPC-609 and SMA's were developed, evaluated on pilot machine and prepared for full machine trial.

New Mill Process for Coloring Paper

Developed a new mill process for colored paper by dyeing at the size press and sizing with Scripset.

Non-Polar Holdout

Developed back-up candidates for PCW-10 (>2.0$\overline{M}$ lbs./yr. current sales) and demonstrated performance on Weyerhaeuser pilot coater clearing way for full machine trial (RPC-117).

Utilized film forming properties of partially neutralized sodium salts of current SMA products to develop two new products currently being sampled to the non-polar holdout market.

Defoamers - New Product Line

Selected, trialled and sold Limit 33, a defoamer for Scripset. This is a new product line.

New Projects

Evaluated but presently declined the opportunity to market a fluorochemical candidate product from Allied Chemical Co.

Initiated efforts to work with H&P and CRD to develop technology utilizing propionic acid as a candidate for wood chip preservation.

Initiated a minimal effort on permanent fire retardants for paper in an effort to meet our customers' growing needs with existing greater Monsanto technology.

Marketing

Completed 90 technical service requests for specific customers. Assisted Marketing with certain customer presentations and field trials.

MERSIZES

A. J. Lauck
J. P. Petrovich
D. N. Van Eenam
C. H. Danett

Wet Strength

Developed, produced and trialed a new wet strength resin/NaOH activator system for the \$20$\overline{M}$ sanitary paper market. Expect initial sales first quarter 1973 for the RPC-1110-1114 series. Produced 20M lbs. at Baxley for trials.

Supported sales of Santo-Res 21 and 23. Fourth quarter sales rate = \$1.4$\overline{M}$/yr. Have problems with 20% loss in efficiency - possibly due to changes in storage or by-product "HMD batch amine residue" from Monsanto Decatur.

Retention Aid

Demonstrated Santo-Res 21 as a retention aid for Neuphor 100 at American Can, replacing Kymene. Advantages of Santo-Res are lower foaming, better efficiency than Kymene (Hercules' product).

A. J. Lauck
M. H. Berry
O. E. Mueller

Sizing - Mersize

Produced Mersize LCS at Seattle to capture West Coast business. Monitored and advised in plant quality of Mersize TFL, maintained uniform high efficiency, resolved poor emulsion characteristics. Supported Marketing customer service - 50 requests.

Developed optimum liquid rosin size (RPC-609) for surface size application and produced initial batch at Baxley.

Helped develop interaction internal/surface sizing concepts now being used to promote our Scripset line.

A. J. Lauck
J. T. Daust
E. D. Clemons (CED)
M. H. Berry

Dispersed Rosin Size

Have shown limited feasibility procedures for both a solvent and molten route to a dispersed rosin size. The lower manufacture and capital cost molten method will be developed to a Tentative Process and engineering design stage in early 1973.

PENTACHLOROPHENOL

D. R. Dill
S. H. Vogel (DKL)
D. R. Cova
J. E. White

Completed plant optimization of additive package which provides Monsanto with the best current commercial pentachlorophenol.

Developed processes for converting by-product scrubber solutions to a saleable 30% Santobrite solution.

Low dioxin Penta - Completed a tentative process for distillation route; will evaluate a "cleaner chlorination" and crystallization route. Dow registered a "clean" Penta in late 1972.

Monitored dioxins in our standard commercial production and in samples from all laboratory studies.

Selected and demonstrated a superior oil for coating Penta prills to minimize sublimation.

Demonstrated biodegradability of pure pentachlorophenol by outside contract at Purdue University in cooperation with other Penta producers. Found impure commercial Penta is more toxic to bugs.