EORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[X] ORIGINAL [ ] REVISION NO. _____

roject No. A-4173 GTRC/GTRI DATE 5 / 28 / 85

roject Director: Dr. Jan W. Gooch School/Lab EMSL

ponsor: Gateway Plastics, Inc. 100-A Piedmont Court

Doraville, Georgia 30340

ype Agreement: Research agreement dated 5/13/85.

ward Period: From 5/13/85 To 6/3/85 (Performance) 6/3/85 (Reports)

ponsor Amount:	This Change	Total to Date
Estimated:	$ 4,000.00	$ 4,000.00
Funded:	$ 4,000.00	$ 4,000.00

ost Sharing Amount: $ _____ Cost Sharing No: _____

itle: Testing of Polymeric Films and Resins

DMINISTRATIVE DATA

OCA Contact R. Dennis Farmer X4820

) Sponsor Technical Contact:

Lois Williams
Gateway Plastics, Inc.
100-A Piedmont Court
Doraville, Georgia 30340
(404) 446-0440

2) Sponsor Admin/Contractual Matters:

efense Priority Rating: _____ Military Security Classification: _____

(or) Company/Industrial Proprietary: _____

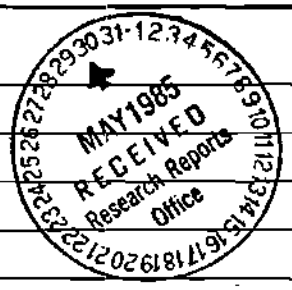
ESTRICTIONS

ee Attached _____ Supplemental Information Sheet for Additional Requirements.

ravel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

quipment: Title vests with None Proposed

OMMENTS:



SPONSOR'S I. D. NO. _____

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GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date August 1, 1985

Project No. A-4173 School/Lab EMSL

Includes Subproject No.(s)

Project Director(s) Dr. Jan W. Gooch GTRC / [redacted]

Sponsor Gateway Plastics, Inc. 100-A Piedmont Court Doraville, Georgia 30340

Title Testing of Polymeric Films and Resins

Effective Completion Date: 6/3/85 (Performance) 6/3/85 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [X] Final Invoice or Final Fiscal Report
- [ ] Closing Documents
- [ ] Final Report of Inventions
- [ ] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. Continued by Project No.

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FORM OCA 69.285

Standard Research Project Agreement A-4173
Georgia Tech Project No. A-4173

TESTING OF POLYMERIC FILMS AND RESINS

Dr. Jan W. Gooch
Georgia Tech Research Institute
Georgia Institute of Technology
Atlanta, Georgia 30332

June 3, 1985

Final Report

Prepared for

Gateway Plastics, Inc.
100-A Piedmont Ct.
Doraville, Georgia 30340

Introduction

Gateway Plastics, Inc. requested the Energy & Materials Sciences Laboratory at Georgia Tech Research Institute to test five polymeric films and four resins. Initially, five resins were requested, but changed to four by Gateway Plastics, Inc. since the fifth was not available. The results of these tests are needed to comparatively evaluate films and resins which were submitted by Gateway Plastics, Inc. The measured properties will enable Gateway Plastics, Inc. to optimize the selection and blending of resin materials for manufacturing film products.

Test Procedures

Gateway Plastics, Inc. submitted five film and four resin samples for physical testing. Gateway Plastics, Inc. requested that the tests employed for this evaluation be those listed in Table 1 which are American Society of Testing Materials (ASTM) standard tests for above films and resins with the exception of the impact tests. The impact testing instrument described in ASTM D1709-75 is not available on the Georgia Tech campus, however we did modify our present impact testing instrument to produce similar results. In all cases, the results are comparative which is the object of this effort.

Results and Discussion

The film materials are listed with corresponding code number in Table 2.. The results of tensile and % elongation test results are contained in Table 3. It was found that

these properties are different for machine direction (0°) and perpendicular direction (90°C) which means that the film is oriented during processing.

Tear strength and impact resistance results are listed in Table 4. The impact resistance test was modified to be performed with Georgia Tech equipment.

Melting points of films were measured with differential scanning calorimetry and these are reported in Table 5. The two distinct melting points for each sample indicates that the films are blends of different polymers or block co-polymers.

The melting points, melt flow index and density of the resins are listed in Table 6. The single melting point indicates a homopolymer type structure and the two melting points for "Repro" resin indicates a blend of different polymers or a block copolymer.

The tensile strengths and % elongations (0° and 90°), tear strengths and impact strengths of films are ranked in decreasing order in Table 7 by code number. The film identified as Dupont/Dow/Repro Resin appears to possess the greater properties.

The results of preliminary infrared analysis of resins in "neat" form are listed in Table 8. Additives were not detected from these analyses either because of their absence from the resins or concentration below the detectable limits of the instrument. Further analysis of additives would require extracting the additives from the resins and concentrating the additives to enhance the infrared spectra.

Table 1. Materials and Testing Methods

Material	Test Description	ASTM No.
Films	Test for Tensile Testing of Thin Plastic Sheeting	D882-83
	Elongation of Thin Plastic Sheeting	D882-83
	Modified Impact Resistance of Polyethylene Film by the Free Falling Dart Method*	D1709-75
	Propagation Tear Resistance of Plastic Film and Thin Sheeting by the Pendulum Method	D1922-67
Resins	Melting Points	D3418
	Flow Rates of Thermoplastics by Extrusion Plasometer	D1238
	Density of Plastics by the Density Gradient Technique	D1505-68

* Modified GIT instrument was substituted.

Table 2. Identification of Films

Film No.	Code No.
Dupont/Dow Repro Resin	1
Dupont/USI/Repro Resin	2
USI Dupont/No Repro	3
Dow/Dupont/No Repro	4
Dow 2100/Dupont/Repro 8%	5

Table 3. Tensile Strength and % Elongation of Films

Film No.	Tensile Strength, lbs/sq.in. (0°)	(90°)	% Elongation (0°)	(90°)
1	14,630	9,324	250	186
2	14,430	8,317	240	209
3	12,726	7,881	385	156
4	9,593	7,456	215	109
5	11,615	9,388	125	285

Table 4. Tear Strength and Impact Resistance of Films

Film No.	Tear Strength, Grams	Impact Resistance, Joules
1	214.4	0.76
2	140.0	0.57
3	155.5	0.65
4	282.2	0.56
5	208.8	0.57

Table 5. Melting Points of Films

Film No.	Melting Point, °C
1	91.4, 120.8
2	90.2, 119.4
3	92.2, 120.6
4	92.3, 121.4
5	93.0, 120.7

Table 6. Melting Points, Melt Flow Indices and Densities of Resins

Resin	Melting Point, °C	Melt Flow Index, G/10 min.	Density, G/cc.
Dupont EVA	88	0.53	0.9298
Repro	87,115	0.45	0.9283
Dupont Laneor	118	0.92	0.9265
USI Leneor	116	0.57	0.9207

Table 7. Ranking of Film Properties by Code No.

Rank	Tensile Strength (0°)	Tensile Strength (90°)	% Elongation (0°C)	% Elongation (90°)	Tear Strength	Impact Resistance
1.	1	5	3	5	4	1
2.	2	1	1	2	1	3
3.	3	2	2	1	5	2
4.	5	3	4	3	3	5
5.	4	4	5	4	2	4

Table 8. Results of Infrared Analysis of Resins

Resin	Spectrum Identification
Dupont EVA	Polyethylvinyl acetate
Repro	Polyethylvinyl acetate/ Polyethylene
Dupont Leneor	Polyethylene
USI Leneor	Polyethylene