The Andur Report

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In this Issue

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Anderson Development Company

New Products — LFTDI & MDI

Even amidst the pandemic, R&D at ADC has been very busy still developing new products along with servicing customers.

Two LFTDI products are highlighted to the right. Andur LQ 7 APLF is an LFTDI polyester prepolymer that when cured with Curene 442 yields a 70A elastomer. The LQ 7 APLF is a part of the LQ series of prepolymers that are viscous liquids at room temperature, which means less heating and energy to get a flowable material. Also, the LQ 7 APLF can be cured with Versalink® 740M to generate a tough, resilient 65A elastomer that is FDA approvable for dry food applications per 21 CFR 177.1680.

The other product is Andur 5000 APLF, an LFTDI PPG prepolymer, that when cured with Curene 442 (MBOCA), Curene 107 (DMTDA), or Curene 89 (DETDA), yields a 50A elastomer. The 5000 APLF can also be processed close to room temperature and cured at room temperature.

	LQ 7 APLF	
	MBOCA	Versalink 740M
Hardness	70A	65A
Tensile, psi	3800	3350
Split Tear, pli	95	90
Compression set, %	25	35
Rebound, %	50	52

	5000 APLF
Viscosity, cP	2200@50C
%NCO	1.0-1.3
Hardness	50A
Potlife (DETDA)	6-9 min.
Potlife (MBOCA)	~30 min.

In MDIs, we have three products to highlight (below). The first two are PTMEG-based prepolymers, Andur M 95 AP and Andur M 52 DP. The third is a polyester, Andur LQX-M 8-5 AP. The two PTMEGs produce a 95A and 52D when cured with Curene 45 (1,4 BDO). Like the LQ 7 APLF, the LQX-M 8-5 AP is a liquid polyester at room temperature. It yields an 85A with Curene 45. This material has a very quick green strength build and can be demolded in 30 minutes without the use of catalyst.

	M 95 AP	M 52 DP
Potlife, min	5	3-4
Hardness	95A	52D
Tensile, psi	5800	5500
Elongation, %	600	460
Split Tear, pli	180	300

	LQX-M 8-5 AP
Potlife/Demold, min	11 / 30
Hardness	85A
Tensile, psi	5500
Compression set, %	21
Rebound, %	38

Versalink® is a trademark of Evonik Industries

Straight Prepolymer Approach vs. a D.A.D. System

When it comes to using a D.A.D. (dial-a-durometer) system vs using a straight prepolymer approach, there are several things to consider. First, what is the total hardness range being covered by the D.A.D? If it is fairly wide, then using a D.A.D might be beneficial, especially if an MM&D machine is being used to mix material. It also allows for the processor to carry just two prepolymers meaning higher throughput and less aging/heat history on the items in inventory as well as the ability to dial in any hardness needed. If the hardness range is narrow, it is likely that a D.A.D. doesn't present an advantage because the cost benefit starts to decrease if only 1 or 2 additional prepolymers are needed to cover the gamut of products run by the processor. ADC has previously written a technical paper on the subject and it was shown that D.A.D. systems, in general, have comparable physical properties to a straight prepolymer approach (table below). Tear strength and resilience tend to be properties that are not quite as good, especially as you get close to 50/50 with the D.A.D. blend.

Andur 80-5 AP/Andur 1-75 DP D.A.D.

D.A.D. Approach / Straight Prepolymer Approach

	90A		92A		95A		60D	
Tensile, psi	6000	6000	6300	7140	6500	7000	6900	7300
Elongation, %	360	425	370	410	370	375	290	265
Die C Tear, pli	330	360	370	440	410	475	590	665
Split Tear, pli	80	80	90	110	95	145	140	165
Rebound, %	51	48	48	46	49	46	53	55
Compression Set, %	19	30	20	27	22	30	35	32

30A Brochure - Coming Soon

Available on our mobile app and website already are our 40A, 50A, and 60A systems brochures, which highlight several options for achieving those hardness levels along with physical properties, attributes, and disadvantages to each. Currently, we are working on a 30A version which will have a variety of materials including a room temperature curable system containing no plasticizer, an MDI system that is FDA approvable, a polybutadiene system (very hydrophobic), and several other candidates. When it comes to low durometer materials, the key is to have a material that is not only as tough as possible at that low hardness, but also one that has consistent hardness, good integrity/dimensional stability (not thermoplastic), and easy processability.

Straight Prepolymer Approach vs. Adding Plasticizer

Another method processors use to lessen the number of prepolymers on hand is to use plasticizer. This can be an effective method to accomplish that goal, but there are some things to keep in mind. First, as with a D.A.D. system, what is the hardness range that is needed to achieve? If it is narrow, plasticizer might be a good option as little will be needed to get to the intended hardness target. If it is wide, then the amount of plasticizer being added to the system can be very large.

The primary effects of plasticizer are decreasing hardness, physical properties, and mix viscosity. Of course, lowering the viscosity is a positive. The physical properties go down in relation to the amount of plasticizer used, mostly in a linear fashion, but this is not a hard and fast rule. Below is data for a TDI-ester as an example of how the properties can change. In general, the tensile/tear strength is lower and elongation increases with 10% plasticizer added (left and middle columns). Compression set increases with plasticizer, especially at higher loadings.

	Andur 8-3 APLF	Andur 8-3 APLF	Andur 8 APLF
% Plasticizer	0	10	0
Hardness	83A	81A	80A
Tensile, psi	7200	5400	7500
Elongation, %	610	680	650
Die C Tear	415	355	445
Split Tear	200	145	200

A straight prepolymer approach will almost always have better properties compared to adding plasticizer as seen in column three with the 80A TDI-ester versus the plasticized 83A in the middle column.

Usually plasticizer users are loading more than 10% and dropping the durometer more than a few points, but this example illustrates the kinds of changes and trends that can be expected, This is why all the aspects of price, processing ease, and performance must be evaluated before using plasticizer to replace using multiple prepolymers.

R&D Hodgepodge

Pandemic Products!

Just before the start of the pandemic and during, several new products were released that are highlighted below (in case you missed them!):

- Andur LV series (LFTDI-PTMEG with lower viscosity)
  - Andur LV 60 DPLF
  - Andur LV 65 DPLF
  - Andur LV 70 DPLF
  - Andur LV 75 DPLF
- Andur LQ series (Polyesters that are liquid at room temperature)
  - Andur LQ 7 APLF
  - Andur LQ 8 APLF
  - Andur LQ 8-5 APLF
  - Andur LQ 9 APLF
  - Andur LQ 9-5 APLF
  - Andur LQ-M 9-5 AP
- Andur CL-M 9-5 AP (MDI-Polycaprolactone)
- Andur HC BA-M 9-5 AP (MDI-Polyester, HC=hand castable; BA = approved for wet food contact applications per 21 CFR 177.2600)

TDS & SDS are available from our mobile app, website, or by request.

TDS Update—Curene 107 physical properties

In a continuing effort to keep customers well informed with value added data on our products, our TDS will be revised with new/updated data for Curene 107 (DMTDA) on most of our TDI-based Andur prepolymers.

New Lab Equipment

In the past year, our R&D lab was able to get a few new pieces of equipment. One of those was a DeMattia flex tester which can give insight into flex fatigue of different materials. Recently, we have also acquired a centrifugal mixer to be able to pour large parts for customer prototypes or trials in our applications lab. Another recent item is a 90° peel fixture for our mechanical load frame so we can look at properties like adhesion to various substrates.

60A Polycaprolactone Study

Recently we completed a study with our Andur CL 6-0 APLF (LFTDI-polycaprolactone) and Andur 6 APLM (conventional TDI-polycaprolactone) evaluating physical properties of these two products with Curene 442 (MBOCA) at various stoichiometries ranging from 0.92 to 1.02 to look at the changes in tear strength, compression set, etc. The data is available by request.

Coming Technical Paper

In the near future we will present new data at the PMA and CPI conferences on PO3G technology which are diols similar to PTMEG made from bio-based sources. A paper was presented back in 2011 on this technology and this is expansion of that work using recently available raw materials.

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Mission Statement

Anderson Development will be a global supplier of innovative specialty chemical products, striving for continual improvement in all of our operations. It is our goal to be personal, efficient, and responsive to our customers and employees. We will provide a team-oriented atmosphere while allowing for individual diversity among our employees.

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