ACUDYNE™ DHR Durable Hold Resin

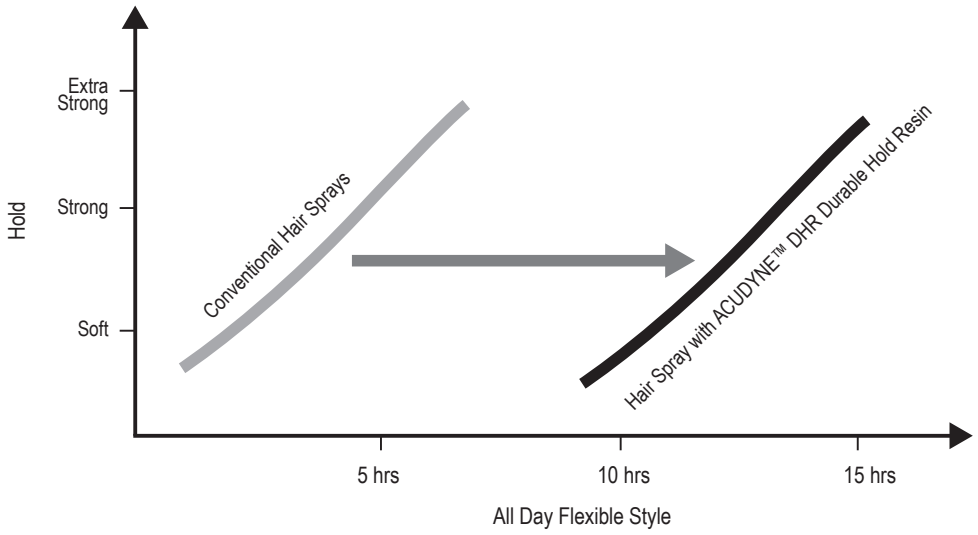
All day flexible style and shine for 55% VOC sprays

Description

In Hair Styling products, there is a constant trade-off between Strong Hold and All Day Flexible Style. The tradeoff is amplified in 55% VOC hair sprays. To deliver the targeted level of strong hold, compromises are often made in natural movement (flexible) and hair feel.

Introducing ACUDYNE™ DHR Durable Hold Resin

Developed specifically for high performance 55% VOC aerosol sprays and pumps, ACUDYNE DHR helps formulators deliver “Strong Hold” and “All Day Flexible Style” because of its unique “Dual Phase” (soft and hard) polymer design.



Consumer & Stylist Preference

Salon testing of hair sprays containin ACUDYNE DHR showed perceivable improvements over commercial benchmarks:

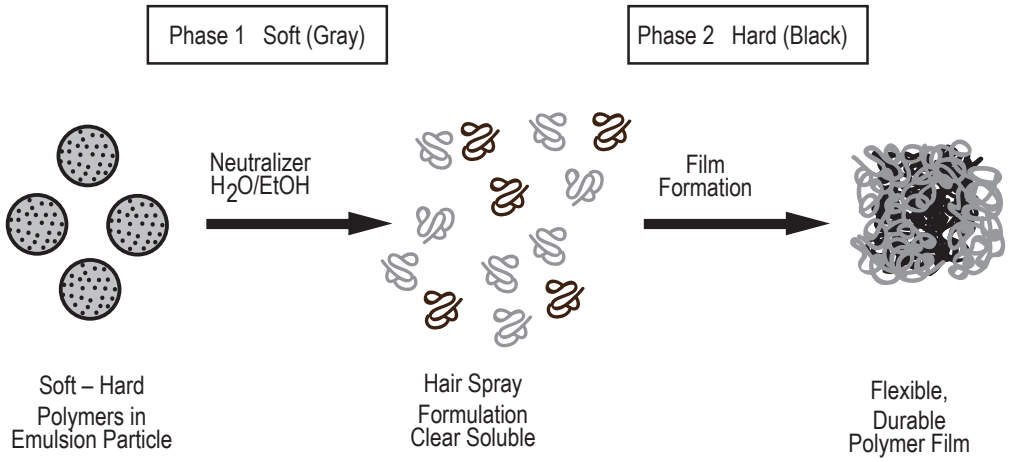
- All Day Flexible Style
- Shine
- Low Tack (Not sticky)
- Natural Feel (No build up)

Benefit	Enabling mechanism
Hair Style Durability	2 polymer interpenetrating phases provide a tougher film giving long-lasting hold.
Not Sticky on Hair Good Humidity Resistance	Hydroxylated polymer backbone composition does not form hydrated phases readily.
Easy Shampoo Removability	Polymer easily swells during shampooing, and is removed from hair.
Compatibility - In all water, 55% VOC, and high VOC pump and aerosol sprays - With DME and Dymel 152a in aerosols With DME/hydrocarbon where DME is the dominant propellant - In alcohol free or alcohol containing gels	Polymer structure and composition
Tunable Stiffness on Hair	Low viscosity in 55% VOC formulations enables dry sprays at higher solids.
Non-corrosive to aerosol tin plate cans	No corrosion causing salts in the polymer

Chemical Properties

ACUDYNE™ DHR Durable Hold Resin is a mixture of two acrylic polymers consisting of a "hard" phase and a "soft" phase. The polymers are random and linear, consisting of polymerized methacrylic acid, hydroxyethylmethacrylate, and various acrylate esters. It is manufactured as an emulsion in water. Upon neutralization, it dissolves into water or water/alcohol to form clear solutions.

ACUDYNE™ DHR Durable Hold Resin Chemistry



Physical Properties

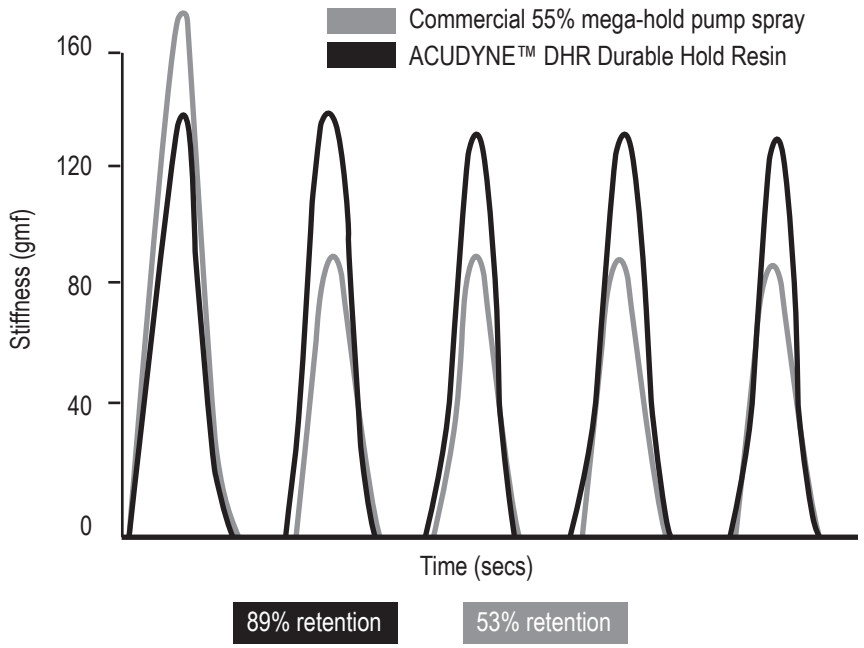
The following are typical properties of ACUDYNE™ DHR Durable Hold Resin **they are not to be considered product specifications.**

Trade name : ..... ACUDYNE™ DHR Durable Hold Resin
Name: ..... Acrylates/Hydroxyesters Acrylates Copolymer
Appearance: ..... Emulsion in water (neutralizes to a clear soluttion)
Solids: ..... 44 - 46%
pH: ..... 3.3 to 4.3
Acidity: ..... 1.8 to 2.1 mmoles/gram active
Molecular weight: ..... About 60,000
Preservative: ..... 0.75% benzoic acid

Hair Application Data

5 Cycle Compression Durability Test on Curled Tresses Using Dia-Stron

Durability: The dual phase film helps improve the durability of the hair style as shown in the Dia-Stron experiment, where the curled tresses were compressed 5 times. With ACUDYNE™ DHR Durable Hold Resin, formulating a strong hold resin is possible, and the curled tresses bounce back after being compressed. With the commercial hair spray, the crust is broken after the first compression.



Durability

Bouncing Head Mannequin Test, 6 Hours

ACUDYNE™ DHR Durable Hold Resin helps improve the durability of the hair style when stressed continuously to help deliver all-day flexible style.

Initial time 0

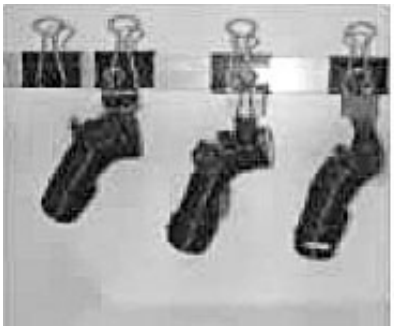
Time 6 hrs

Left side of each mannequin head:
Commercial 80% VOC pump spray

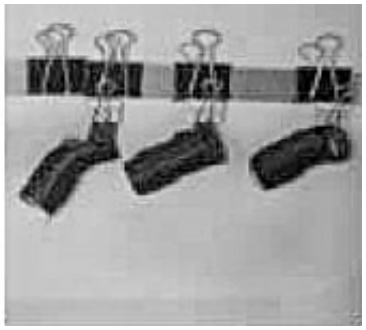
Right side of each mannequin head:
Strong Hold 55% VOC pump spray containing ACUDYNE™ DHR Durable Hold Resin.

Bouncing Hair Tresses for 10 Hours @ 70 rpms

Durability: Curled tresses treated with hair spray containing 55% VOC ACUDYNE™ DHR Durable Hold Resin retain their definition versus commercial mega-hold 80% VOC pump spray.



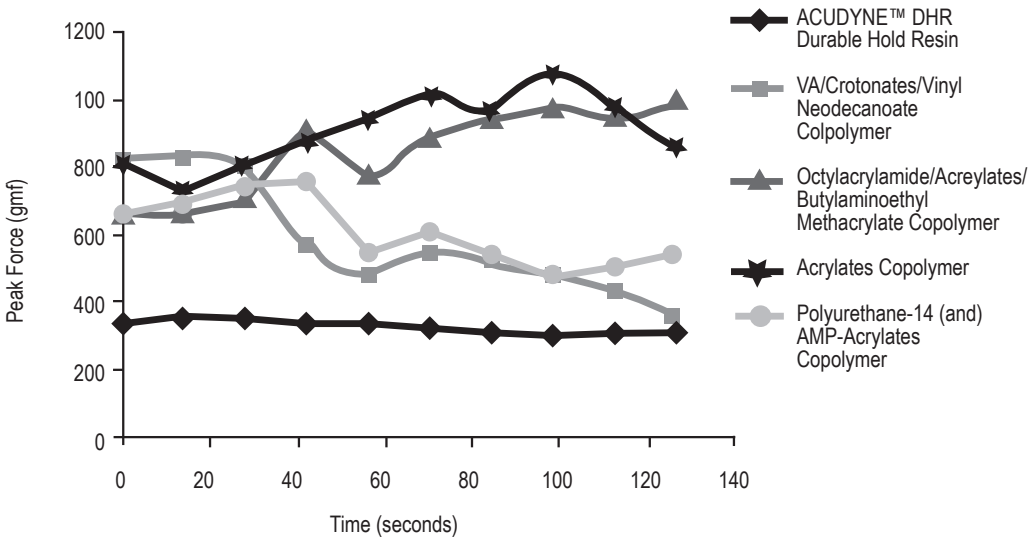
Left picture:
Commercial Mega-Hold
80% VOC pump spray



Right picture:
55% VOC pump spray containing
5% solids ACUDYNE™ DHR Durable
Hold Resin.

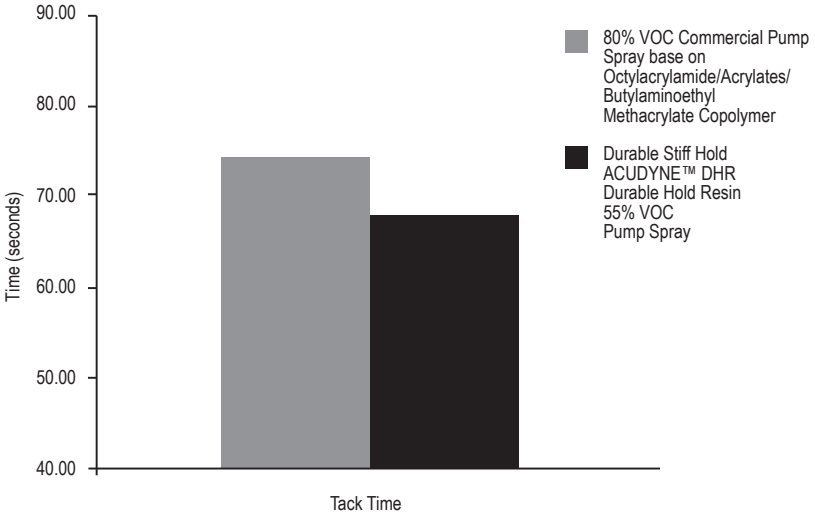
Dia-Stron Tack Test on Hair Tresses

Least sticky on hair in 55% VOC spray: Hair spray containing ACUDYNE™ DHR Durable Hold Resin is the least sticky on hair, from the time it is sprayed until it dries.



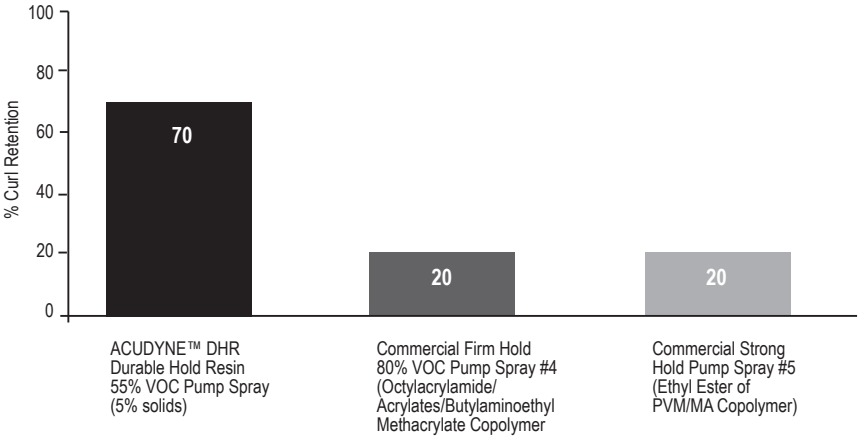
Shorter Tack Time in 55% VOC Versus 80% VOC Commercial Sprays

ACUDYNE™ DHR in a 55% VOC pump spray gives a shorter duration of tack than 80% VOC commercial pump hair spray.

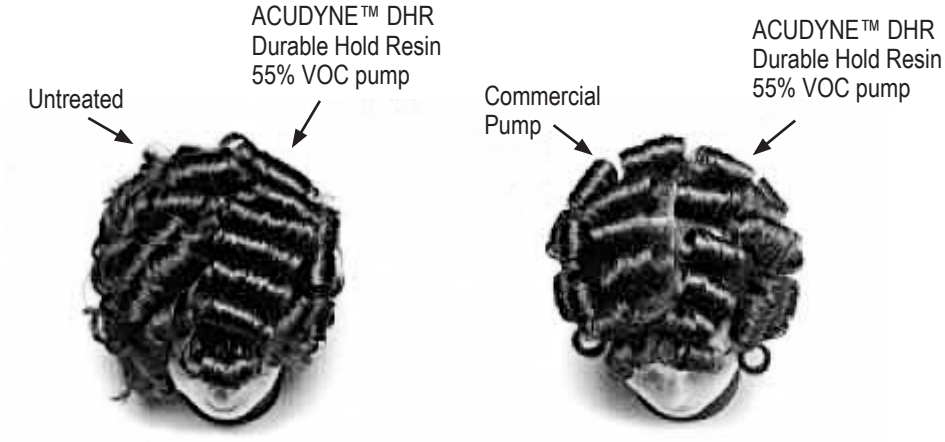


High Humidity Curl Retention for Pump Spray at 90% RH, 25°C for 4 hrs

Humidity resistance: excellent humidity resisitance.



Shine benefit: Hair sprays containing ACUDYNE™ DHR Durable Hold Resin provide a noticeable shine benefit on hair, without shine additives.



ACUDYNE™ DHR Durable Hold Resin Neutralization

We recommend that ACUDYNE™ DHR be neutralized at the following percentages:

Type of formulation	% Neutralization
55% VOC pumps	60%
55% VOC aerosols	60%
Alcohol free sprays and mousses	70%
80% VOC pumps and aerosols	60%

ACUDYNE DHR Neutralization Equations

$$X = \frac{A * B * C * D}{E * 1000}$$

X = grams of neutralizing agent required
A = millimoles acid/gram ACUDYNE DHR solids
See C of A provided with sample
B = grams of polymer (solids) in the formulation
C = molecular weight of the neutralizing agent
D = % neutralization desired
E = % solids of neutralization agent used

Example #1:

How many grams of AMP-95 (i.e. AMP-95: Molecular weight is 89 g/mole and 95% solids as supplied) are required to neutralize 5 grams of ACUDYNE DHR solids to 60% neutralization?

X grams AMP-95 required

$$= \frac{1.92 \text{ (mmoles)} \times 5 \text{ (grams)} \times 89 \text{ (grams/mole)} \times 60}{95 \times 1000}$$

= 0.54 grams AMP-95

% Neutralization Chart using AMP-95® (95% solids as supplied)

	50% Ntr	60% Ntr	70% Ntr	80% Ntr	90% Ntr	100% Ntr
1 gram polymer solids	0.09	0.11	0.13	0.14	0.16	0.18
3 grams polymer solids	0.26	0.32	0.38	0.43	0.49	0.54
4 grams polymer solids	0.36	0.43	0.50	0.58	0.29	0.72
5 grams polymer solids	0.44	0.54	0.63	0.72	0.81	0.90
6 grams polymer solids	0.54	0.65	0.76	0.86	0.97	1.08

Pump: Stiff Hold 55% VOC Spray - Formulation #077118-77C

Trade Name	% Wt.	CTFA / INCI Name	Supplier
Water	31.24	Water	
Ethanol (200 Proof)	55.00	Alcohol	Pharmaco
ACUDYNE™ DHR Durable Hold Resin (45.55%) Solids	13.11	Acrylates/Hydroxyesters Acrylates Copolymer	Dow
AMP-95 (*)	0.65	Aminomethyl Propanol	ANGUS

(*) This corresponds to 60% neutralization.

Processing Instructions:

1. Add the alcohol and water to the mixing kettle followed by aminomethyl propanol and fragrance. Stir until the mixture is uniform.

2. Add ACUDYNE™ DHR Durable Hold Resin to the mixing solution at a rate such that the emulsion disperses as it contacts the stirring solution. These solutions rapidly turn clear. Formulation viscosities are between 10 to 12 cps for 55% VOC hair sprays and 7 to 10 cps for 80% VOC hair sprays, depending on resin concentration.

Valve:

Pump Type:..... Seaquist Euromist Optima, 160 mcl Output
Insert: ..... .016 x .010 Shallow
Diptube: ..... 7”, 0.060’ I.D. cut to length

Formulation Characteristics:

Parameter	Range	Method
Viscosity	11.0 - 12.0 cps	Brookfield LV viscometer, Spindle #1, 60 rpms
pH	7.0 - 7.5	pH meter
Appearance	Clear	Visual

Note: Any variation in the formulated noted may cause performance to change.

Pump: Firm Hold 55% VOC Spray - Formulation #KVK4390A

Trade Name	% Wt.	CTFA / INCI Name	Supplier
Water	36.03	Water	
Ethanol (200 Proof)	55.00	Alcohol	Pharmaco
ACUDYNE™ DHR Durable Hold Resin (45.55%) Solids	6.59	Acrylates/Hydroxyesters Acrylates Copolymer	Dow
Resyn 28-2930	2.00	VA/Crotonates/Vinyl Neodecanoate Copolymer	Akzo Nobel
AMP-95 (*)	0.38	Aminomethyl Propanol	ANGUS

(*) This corresponds to 60% neutralization.

Processing Instructions:

1. Add the alcohol and water to the mixing kettle followed by aminomethyl propanol. Stir until the mixture is uniform.

2. Add fragrance.

3. Add Resyn 28-2930 and mix until dissolved. Add ACUDYNE™ DHR Durable Hold Resin to the mixing solution at a rate such that the emulsion disperses as it contacts the stirring solution.

Valve:

Pump Type:..... Seaquist Euromist Optima, 160 mcl Output
Insert: ..... .018 x .010 Deep
Diptube: ..... 7", 0.060' I.D. cut to length

Formulation Characteristics:

Parameter	Range	Method
Viscosity	9.0 - 10.0 cps	Brookfield LV viscometer, Ultra Low Adapter 12 rpms
pH	7.0 - 7.5	pH meter
Appearance	Clear	Visual

Note: Any variation in the formulated noted may cause performance to change.

Aerosol: Stiff Hold 55% VOC Spray - Formulation #KVK4298-F

Trade Name	% Wt.	CTFA/INCI Name	Supplier
Water	27.37	Water	
SD Alcohol 40B (200 Proof)	15.00	Alcohol	Pharmaco
ACUDYNE™ DHR Durable Hold Resin (45.55%)	15.37	Acrylates/Hydroxyesters Acrylates Copolymer	Dow
AMP-95 (*)	0.76	Aminomethyl Propanol	ANGUS
Dow Corning 345 fluid	1.00	Cyclomethicone	Dow Corning
Mirasil HMS	0.30	Hexamethyldisiloxane	Rhodia
Monacor BE	0.20	MEA Borate	Uniqema
Dymel A	40.00	Dimethyl Ether	DuPont

(*) This corresponds to 60% neutralization.

Processing Instructions:

1. Add the Dow Corning 345 fluid, Mirasil HMS, Monacor BE and fragrance to alcohol in a mixing kettle.

2. Add water and AMP-95 and stir until the mixture is uniform.

3. Add ACUDYNE™ DHR Durable Hold Resin to the mixing solution at a rate such that the emulsion disperses as it contacts the stirring solution.

4. Charge Dymel A under pressure.

Valve:

Pump Type:..... Seaquist VX-81
Stem: ..... 016 Length: 0.343”
Tubing ID:..... 0.122”
Vapor Tap: ..... 0.025”
Body: ..... 025 Standard VX
Gasket: ..... Butyl 0.045” THK. Code: 501
Actuator ..... VX 2802-05480-18

0% VOC Spray Gel: Stiff Hold

Trade Name	% Wt.	CTFA/INCI Name	Supplier
Water	q.s. to 100	Water	
ACULYN™ 28 (20.0%)	3.00	Acrylates/Beheneth-25 Methacrylate Copolymer	Dow
ACUDYNE™ DHR Durable Holdr Resin (45.55%)	4.39	Acrylates/Hydroxyesters Acrylates Copolymer	Dow
AMP-95 (*)	0.46	Aminomethyl Propanol	ANGUS
Tagat CH 40	0.50	PEG-40 Hydrogenated Castor Oil	Degussa
Glycerin	0.50	Glycerin	RITA
Preservative	q.s.		

(*) This corresponds to 60% neutralization.

Processing Instructions:

1. Blend ACULYN™ 28 with about half the water (46 mls).

2. In a separate container, with stirring add the remaining water, aminomethyl propanol, ACUDYNE DHR, Tagat CH 40, and Glycerin, stir until uniform. Gradually add in preservative. Add the mixture to the ACULYN 28 emulsion with stirring.

Valve:

Seaquist Euromist HV Spray Valve .014 x .010 Shallow

Characteristics:

Parameter	Range	Method
Viscosity	10,000 - 11.000 cps	Brookfield LV viscometer, Spindle #6, 20 rpm
pH	7.0 - 7.5	pH meter
Appearance	Clear	Visual

Note: Any variation in the formulated noted may cause performance to change.

Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Disposal Considerations

Dispose in accordance with all local, state (provincial) and federal regulations. Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user's responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

Customer Notice

Dow strongly encourages its customers to review both their manufacturing processes and their applications of Dow products from the standpoint of human health and environmental quality to ensure that Dow products are not used in ways for which they are not intended or tested. Dow personnel are available to answer your questions and to provide reasonable technical support. Dow product literature, including Safety Data Sheets (SDS), should be consulted prior to use of Dow products. Current Safety Data Sheets are available from Dow.

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