MONAHAN FILAMENT FIBER PROPERTIES

MFI produces fibers in a wide variety of materials, in several different shapes, in many different sizes, and in almost any color. We have prepared this section on Fiber Properties to distinguish between them. The following tables compares some of the properties in a general way, followed by definitions and by information in detail.

PRODUCT	Specific Gravity	Melting Point (°F)	Tensile Modulus (k-psi)	Typical Elongation (%)	Tensile Strength (k-psi)	Flicking Action (springiness)	% Bend Recovery .008" Fiber	Typical Ovality .008-.040"
Durastran® R	1.05	350	500	54	16	Excellent	65	1.04-1.20
Durastran® SR	1.08	250	550	47	13	Excellent	70	1.03-1.15
Durastran® FTA	1.00	250	520	51	24	Excellent	75	1.03-1.18
Durastran® FTD	1.00	320-350	500	62	20	Excellent	74	1.04-1.20
Durastran® FTR	0.93	320	810	20	58	Good	71	1.05-1.50
Durastran® FTY	0.93	320	765	25	59	Good	71	1.05-1.50
Prostran®	0.90	320	740	17	53	Good	75	1.02-1.40
Polyethylene	0.92	230	60	100	9	Poor	NA	1.02-1.20
PVC	1.35	200	515	60	25	Excellent	60	1.01-1.10
PPS[3]	1.35	545	560	40	59	Poor	67	1.02
Wytex® 6	1.14	410	480	36	53	Excellent	97	1.02-1.15
Wytex® 6.6	1.14	495	520	36	48	Excellent	97	1.01-1.10
Wytex® 6.12	1.06	410	480	36	42	Excellent	93	1.01-1.10
Wytex® 6.12S	1.06	410	500	52	55	Excellent	95	1.01
Plyer®	1.30	430	445	36	31	Excellent	92	1.01-1.10
Plyer® SK	1.26	430	550	52	55	Excellent	94	1.01

MONAHAN FILAMENT FIBER PROPERTIES (cont.)

PRODUCT	Relative Abrasion Resistance	Set Resistance	Relative Fatigue Flex Resistance	Water Absorption % Max	Retention of Stiffness in Water	Sun Light & UV Light Resistance [1]	Hi-Temp Oxidation Resistance [2]	General Solvent Resistance
Durastran® R	Poor	Excellent	Poor	<0.03	Excellent	Fair	NA	Poor
Durastran® SR	Poor	Excellent	Poor	0.5	Excellent	Fair	NA	Fair
Durastran® FTA	Poor	Good	Poor	0.4	Excellent	Poor	NA	Fair
Durastran® FTD	Poor	Good	Poor	<0.03	Excellent	Poor	NA	Poor
Durastran® FTR	Fair	Fair	Poor	<0.1	Excellent	Poor	Poor	Excellent
Durastran® FTY	Fair	Fair	Poor	<0.1	Excellent	Poor	Poor	Excellent
Prostran®	Fair	Fair	Best	<0.1	Excellent	Poor	Poor	Excellent
Polyethylene	Fair	Fair	Good	<0.1	Excellent	Poor	NA	Excellent
PVC	Poor	Excellent	Fair	<0.1	Excellent	Good	NA	Fair
PPS [3]	Fair	Good	Good	0.01	Excellent	Good	Superior	Superior
Wytex® 6	Excellent	Good	Excellent	9	Poor	Fair	Fair	Excellent
Wytex® 6.6	Excellent	Good	Excellent	9	Poor	Fair	Fair	Excellent
Wytex® 6.12	Excellent	Good	Excellent	3	Good	Fair	Fair	Excellent
Wytex® 6.12S	Excellent	Good	Excellent	3	Good	Fair	Fair	Excellent
Plyer®	Good	Good	Good	0.5	Excellent	Fair	Best	Excellent
Plyer® SK	Good	Good	Good	0.5	Excellent	Fair	Best	Excellent

1. Sunlight and UV resistance may be greatly improved by the addition of black pigment or UV inhibitors.
2. High temperature oxidation resistance may be greatly improved by oxidation inhibitors.
3. PPS can be used continuously for long time periods at temperatures up to 200-220°C (392-428°F), in contrast Plyer® and Plyer® SK are limited to about 150°C. PPS has good set resistance at very high temperatures where other materials, which have excellent set resistance at room temperature, fail to have any recovery whatsoever. PPS does not burn (it is a non-halogenated V-0 material requiring no flame retardant). It has superior solvent resistance. PPS is especially good in high temperature steam, fuels and oils. It has good resistance to most acids. Special grades may be used for medical handling and food contact applications. These special grades are in compliance with ISO 10993, USP Class IV, and are included in the Drug and Device Master Files at the FDA. This grade also complies with Food Contact Notification (FCN-No. 40) for repeat use applications

DEFINITIONS

Specific Gravity is the weight of the material compared to an equal volume of water. The specific gravity of water is 1.00. Materials with specific gravities less than water float in water; those with specific gravities more than water sink. This property is useful in identifying the material. It is also useful in comparing the volume of filaments per pound. The lower the specific gravity, the higher the yield.

Melting Point is also useful in identifying the material. These values are typical values and actual melting points may vary by 20°F from these values. It should be kept in mind that each of these materials often soften and melt over a range of temperatures, and that the useful temperature limit of a filament is quite a bit lower than the melting point.

Tensile Modulus is a measure of the stiffness of the filament. The higher the modulus the stiffer the filament. Other names for tensile modulus are elastic modulus and Young's modulus.

Elongation refers to how much the filament will stretch before it breaks. A significant decrease in these values indicates that the filament is deteriorating usually due to UV, high temperature oxidation, or chemical attack.

Tensile Strength refers to how hard you can pull on the filament before it breaks. A significant reduction in tensile strength indicates deterioration of the material.

Bend Recovery is a filament's ability to return to its original position after being bent. Lack of bend recovery is a common mode of brush failure.

Abrasion Resistance is a filament's ability to resist being worn away. Abrasion is another mode of brush failure.

Ovality: No filament is perfectly round. Ovality is a measure of its out of roundness. It is calculated by measuring the largest and smallest diameters at a point along a filament and dividing the largest (called the d2) by the smaller (called the d1). Ovality generally increases with filament diameter. Certain colors and additives may affect ovality.

Set Resistance refers to a filament's ability to straighten completely after being moderately flexed for a long period. This differs from Bend Recovery which is a more severe bending for shorter periods.

Water Absorption and **Retention of Stiffness in Water** refer to the tendency of certain plastics to pick up and be plasticized by water. Some materials do not absorb water.

Sunlight, UV Light will result in the degradation of some polymers.

High Temperatures will cause some materials to degrade well below their melting points.

General Chemical Resistance refers to the ability of filaments to retain their important physical properties when exposed to certain chemicals. Ask about our Technical Bulletin on Chemical and Solvent Resistance.

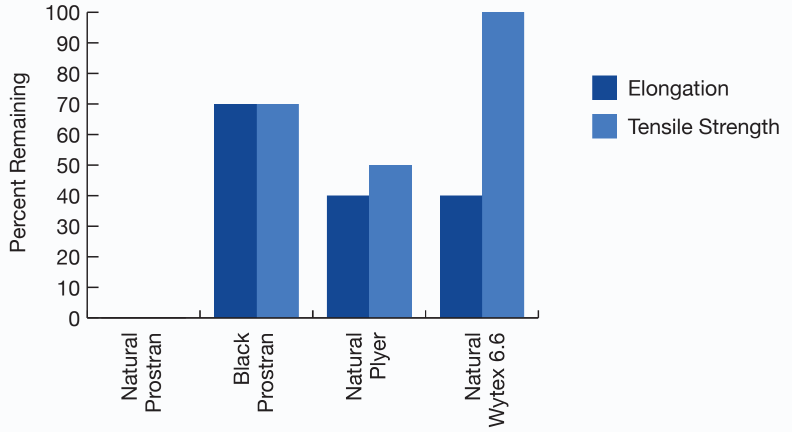
Note:
Tensile Modulus, Bend Recovery, Abrasion Resistance, Flex Fatigue Resistance, Retention of Stiffness in Water, Sunlight and UV Light Resistance, and *High Temperature Resistance* are covered in more detail in the following pages.

RESISTANCE OF FIBERS TO ULTRAVIOLET LIGHT OR SUNLIGHT

Many polymers will become brittle from oxidation by prolonged exposure to ultraviolet light. For example, if unprotected small diameter polypropylene is left exposed to the sun it can lose half its elongation (flexibility) in less than four weeks. The resistance of polymer fibers to UV light may be increased by the addition of carbon black. Carbon black works by absorbing the UV radiation before it can cause damage to the chemical bonds in the plastic. It offers the advantages of a high level of protection and small cost. Other pigments have much less protective effect and may increase degradation of the fibers by UV light.

After this year long test, the unprotected Prostran® would crumble to dust when rubbed with the fingers. The black Prostran® retained most of its properties and the tensile strength of the Wytex® was not significantly effected.

EFFECT OF ONE YEAR SOLAR EXPOSURE



About the Test

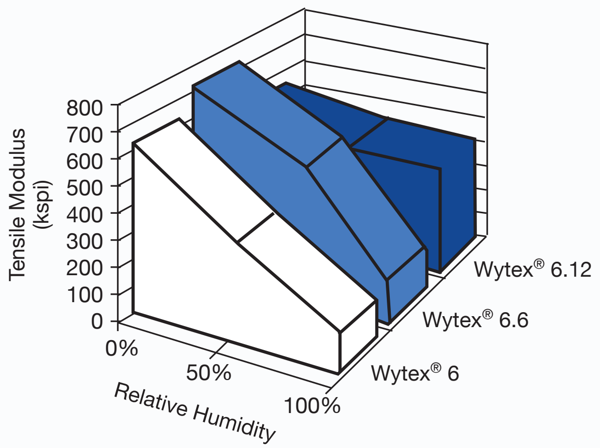
There are several ways to test materials for UV resistance. Some involve the use of carbon arcs, xenon arcs, or fluorescent sunlamps. These tests offer intense exposure, rapid degradation and controlled conditions, but only approximate natural conditions. The test above was done outdoors using sunlight. The fibers were exposed on our factory roof on frames oriented due south at 45° elevation. The usual criteria for failure is a 50% loss in elongation.

The information contained herein is based on actual laboratory tests done by us and is believed to be accurate but no warranties are expressed or implied regarding its accuracy or as to the performance of these products. Samples are available for testing in specific applications.

EFFECTS OF WATER ON PLASTIC FIBERS

Because of their chemical nature, most synthetic filaments do not absorb water to any appreciable extent, and as a result, their physical properties are not affected by water. Wytex® is an exception. The chemical bonds that give Wytex® its strength and high melting point also cause it to absorb up to 10% water. Water acts as a plasticizer in Wytex®, allowing the molecules to move more easily. This toughens the Wytex®, but it also reduces its stiffness. Wytex® 6.12 absorbs less water than Wytex® 6 or 6.6 and therefore its stiffness is less affected by water. Plyer® and Prostran® absorb almost no water and therefore do not lose stiffness when wet.

EFFECT OF HUMIDITY ON STIFFNESS



TENSILE MODULUS AT VARIOUS HUMIDITIES (k-psi)

RELATIVE HUMIDITY	0%	50%	100%
Wytex® 6	630	375	140
WYTEX® 6.6	730	512	160
WYTEX® 6.12	540	450	400

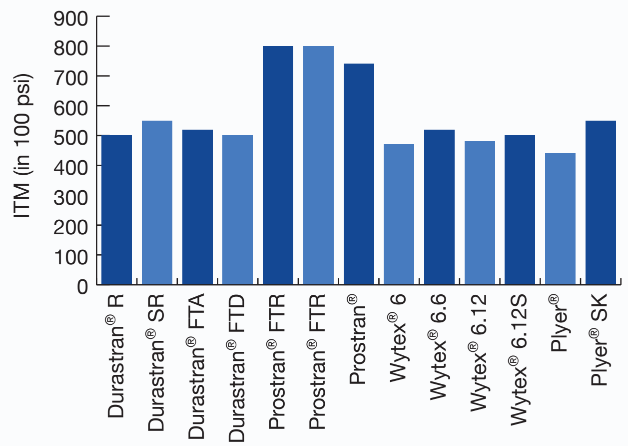
About the Test

Wytex fibers were conditioned in a desiccators (0% humidity), a climate controlled room (50% humidity), and a glass container with free water (100% humidity) for two weeks at 70°F. They were then tested on our Instron® tensile testing machine.

TENSILE MODULUS

Tensile modulus is one of the factors that affect the stiffness of a fiber. It is the ratio of force used to stretch a fiber (stress) to the amount of stretch (strain) and is a property of the material. The higher the modulus the stiffer the fiber. A fiber with a tensile modulus of 600 kpsi will be twice as stiff as a fiber of the same size and shape with a tensile modulus of 300 kpsi. Different methods of measuring tensile modulus give different numbers. Processing, additives, heat, sunlight, chemicals, humidity, and a host of other factors all affect tensile modulus. The tensile modulus of nylon fibers such as Wytex® 6 or 6.6 can change by a factor of 4 between 0% and 100% relative humidity. The stiffness of a fiber also depends upon its size and shape.

INITIAL TENSILE MODULUS



INITIAL TENSILE MODULUS
(average values in k-psi)

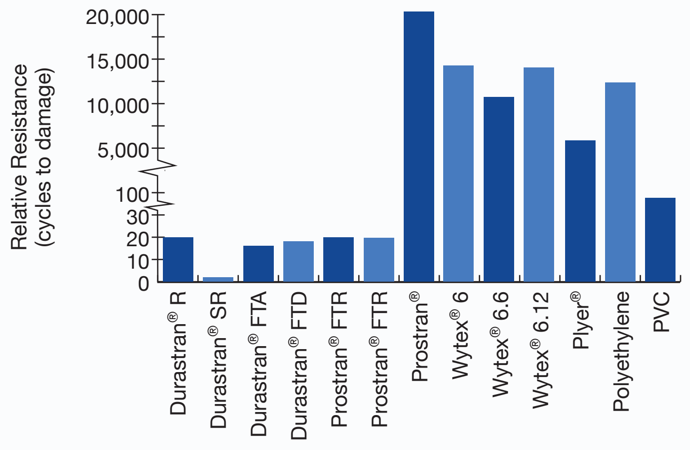
Durastran® R	500	Wytex® 6	470
Durastran® SR	550	Wytex® 6.6	520
Durastran® FTA	520	Wytex® 6.12	480
Durastran® FTD	500	Wytex® 6.12S	500
Prostran® FTR	800	Plyer®	440
Prostran® FTY	800	Plyer® SK	550
Prostran® 6.12	740		

About the Test

The fibers are conditioned in a climate controlled room at 50% relative humidity and 72°F and tested under the same conditions. Using an Instron® tensile testing machine, we measure the stress and strain of the fiber and calculate the tensile modulus for the first few percent of strain. This is where the "initial" in initial tensile modulus comes from. Tensile modulus is also known as elastic modulus or Young's modulus.

FLEX FATIGUE

Most materials will break down when severely bent repeatedly. Flex fatigue failure is not very common in brushes but can occur when the wrong fiber is used or the brush is abused. Embrittlement by high temperature oxidation or sunlight is sometimes confused with flex fatigue failure. Durastran® R (polystyrene) and Durastran® SR (SAN) have poor flex fatigue resistance, and Prostran® has excellent resistance. (See *High Temperature Exposure* and *Sunlight Resistance*)



FLEX FATIGUE RESISTANCE

FLEX FATIGUE RESISTANCE
(Cycles to Damage)

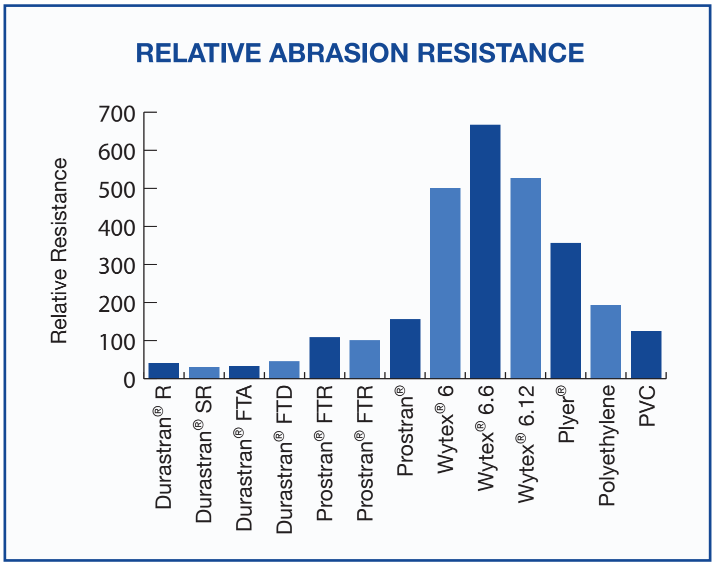
Durastran® R	20	Wytex® 6	14,000
Durastran® SR	2	Wytex® 6.6	10,800
Durastran® FTA	16	Wytex® 6.12	14,0000
Durastran® FTD	18	Plyer®	6,000
Prostran® FTR	20	Polyethylene	12,400
Prostran® FTY	20	PVC	100
Prostran®	20,000+		

About the Test

The test was run by repeatedly flexing .040" fibers back and forth over a steel bar with .25" clearance, resulting in severe stress on the fibers. The Durastran® fibers were quickly broken, except the FTD, which split longitudinally. The Wytex® and Plyer® fibers showed small cracks at the stated number of cycles. The Prostran® FTR and FTY were quickly damaged but did not break even after 15,000 cycles. The Prostran® showed deformation with resulting loss of stiffness at the site of flexing, but no signs of breaking.

RELATIVE ABRASION RESISTANCE

Abrasion resistance is the ability of a fiber to resist wearing away when it is rubbed on a surface. There are two types of abrasion: Simple abrasion where small particles of fiber are cut off by sharp particles on the surface being brushed; and Melt abrasion where friction melts the bristle tips in high speed brushing. Factors affecting abrasion include: material type, temperature, force on the brush, abrasiveness of the surface being brushed, brush speed, brush fill, etc. In the chart and table below, the higher numbers indicate the higher relative resistance. A fiber rated 200 will last twice as long as a fiber rated 100.



RELATIVE ABRASION RESISTANCE

Durastran® R	42	Wytex® 6	500
Durastran® SR	31	Wytex® 6.6	667
Durastran® FTA	33	Wytex® 6.12	526
Durastran® FTD	45	Plyer®	357
Prostran® FTR	108	Polyethylene	194
Prostran® FTY	100	PVC	126
Prostran®	156		

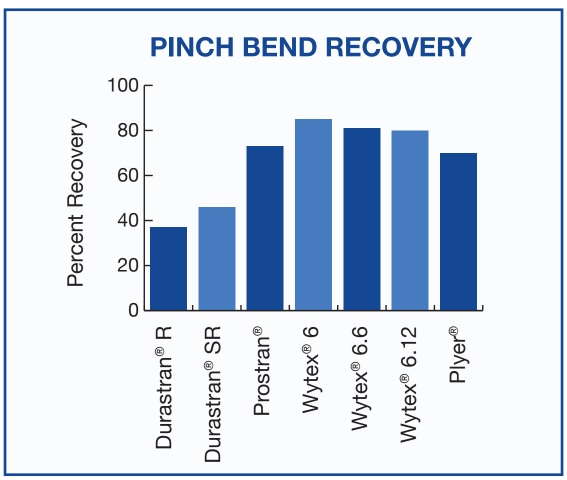
About the Test

We took short sections of fiber and held them against a rotating drum of 80 grit for two minutes and measured the change in length. The diameters of the fibers were all equalized and the inverse of the loss of length calculated and displayed above.

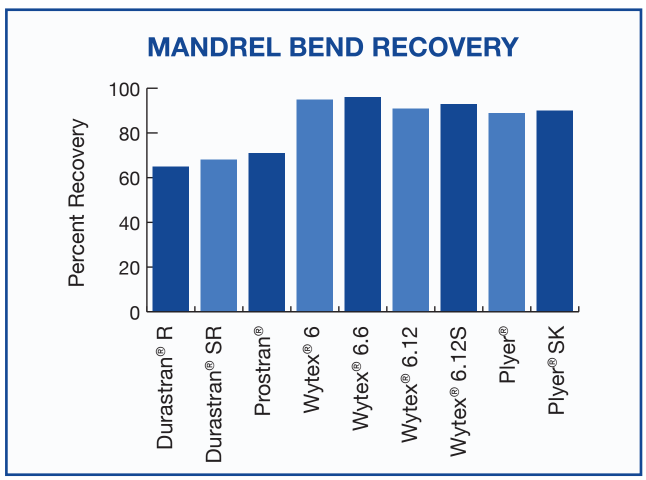
BEND RECOVERY

Most brushes wear out from abrasion or bend recovery failure. Bend recovery failure results in the bristles becoming so bent or matted so they do not function effectively. In a properly designed brush, this typically takes a long time. Factors that influence bend recovery are severity of the bending, fiber material, how the fiber is made, length of time the fiber is bent, length of time the fiber is allowed to recover, temperature, diameter, and shape. We use three different tests to investigate some of these factors: a pinch bend recovery test that results in a very sharp bend for a few seconds, a mandrel* bend recovery test that results in a less sharp bend for a few minutes, and a set resistance test that results in a slight bend for up to several days. "Set" is the permanent bend that results from a slight bend over a long period of time.

The chart on the left shows the results of sharp bending. Wytex®, Plyer® and Prostran® all show good recovery, but this amount of bending will deform any bristle and should be avoided in brush use.



PINCH BEND RECOVERY



MANDREL BEND RECOVERY

The chart on the right shows the Mandrel Bend Recovery for Monahan Filaments fibers. Wytex® and Plyer® have bend recoveries greater than 92% and are suitable for severe applications They should be used where their higher performance justifies their higher cost. Prostran® has adequate bend recovery for many applications and is widely used in household, janitorial and industrial brushes.

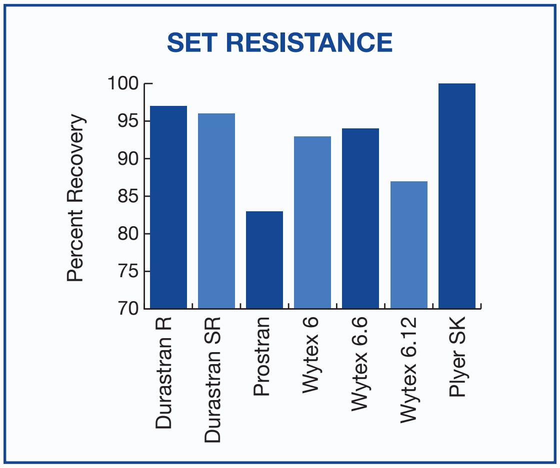
About the Tests

Many techniques for measuring bend recovery have been developed. We have chosen three as they give a good overall understanding of bend recovery properties of a fiber. Pinch bend recovery is ensured by bending a fiber in half and pulling it through a hole three times its diameter, then letting it recover for five minutes. The Du Pont[1] or mandrel method is relatively easy to do and gives very consistent results. The basic test involves winding ten turns of the fiber on a 3/32" diameter rod. After the fiber has been on the rod for four minutes it is cut off and allowed to relax in a dish of water for one hour. The bend recovery is calculated based on the number of turns wrapped on the mandrel and the number of turns in the fiber at the end of the recovery period.

[1] E. I. Du Pont de Nemours, *Bend Recovery of TYNEX® and HEROX® Nylon Filaments, Technical Data Bulletin No. 5*, Plastics Department, Wilmington, DE, 1979

BEND RECOVERY (cont.)

The following chart shows the resistance to taking a set. In tough scrubbing applications, however, the fiber will quickly bend permanently because of the much higher amounts of bending stress that occurs. Set problems in other products can be minimized with proper brush design and reasonable care in storage and packaging.



About the Test

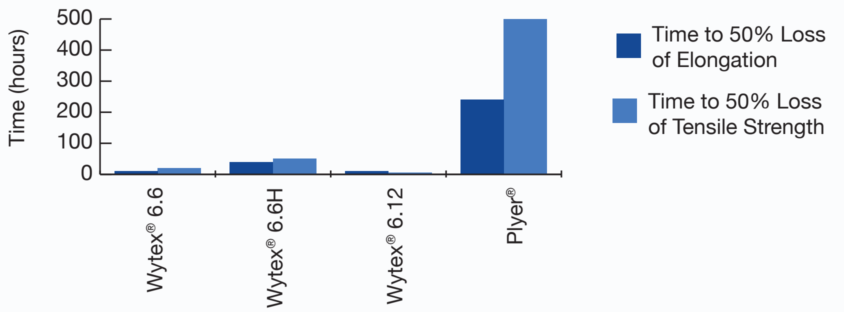
Set resistance is measured by winding the fiber around a 1" round bar for a certain period of time, then cutting them off, and letting them recover. If you would like to have some fiber measured or further information on bend recovery under special conditions please call the Monahan Filaments R&D Dept. at 802-388-4956.

RESISTANCE OF FIBERS TO OXIDATION AT HIGH TEMPERATURE

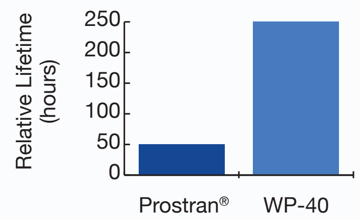
Many polymers will oxidize rapidly and become brittle at temperatures well below their melting or softening points. For example, nylon 6.6 melts at 495°F but will lose half its flexibility in less than two hours at 325°F, and even temperatures as low as 185°F will shorten its life. Plyer® is highly resistant to high temperature oxidation. Plyer® will last 100 times longer than nylon 6.6 at 325°F. The life of a fiber may be substantially increased by the addition of an anti-oxidant.

The chart at left shows the natural resistance of Plyer® to high temperature oxidation and the ability of an antioxidant to lengthen the life of Wytex® 6.6H. Wytex® 6.6H is preferred in certain applications where the heat exposure is intermittent or in very aggressive applications. This test was conducted under very severe conditions. Fiber life at lower temperatures will be much longer.

EFFECT OF 350°F TEMPERATURE ON ELONGATION AND TENSILE STRENGTH OF WYTEX® AND PLYER®



EFFECT OF HIGH TEMPERATURE ON PROSTRAN® AND WP-40



The chart on the right shows the effect of anti-oxidant in polypropylene. WP-40, a polypropylene fiber containing anti-oxidant, was developed for hot wet scrubbing applications, like steel mills, where a combination of high temperatures, water and strong detergents will degrade other materials. The chart shows that WP-40 stood up more than five times longer than regular Prostran® in this very severe test. Actual brush life will be much longer under normal usage.

About the Tests

The Wytex and the Plyer were put in an oven at 325°F. The Prostran and WP 40 were boiled in water for seven days and then placed in an oven at 300°F. The fibers were sampled periodically and their tensile strength and elongation to breaking measured on our Instron® tensile tester. We chose a 50% loss in tensile strength or elongation as our criteria for failure.

The information contained herein is based on actual laboratory tests done by us or tests done by others and is believed to be accurate but no warranties are expressed or implied regarding its accuracy or as to the performance of these products. Samples are available for testing in specific applications.

SOLVENT & CHEMICAL RESISTANCE

INTRODUCTION

Solvent and chemical resistance refers to the ability of a fiber to retain its important physical properties. Attack may range from slight swelling and loss of stiffness to complete dissolution of the fiber. The resistance of fibers to chemicals depends not only on the type of fiber and the chemical, but concentration, temperature, time, fiber diameter, stress, etc. We have written general comments on solvent and chemical resistance, followed by a more specific table.

GENERAL COMMENTS

Wytex®

Wytex® nylon has excellent resistance to most substances. It is however attacked by oxidizing agents, organic acids, mineral acids, and aromatic alcohols. It has excellent resistance to hydrocarbons (such as gasoline, kerosene, and diesel fuel), oils, cleaning solutions, and alkalis. It will absorb small amounts of water, low molecular weight alcohols (e.g., methyl, ethyl, or isopropyl alcohols) and chlorinated solvents, and be plasticized by them. This will result in a temporary loss of stiffness and tensile strength and an increase in elongation. Wytex® 6.12 shows greater resistance to dilute acids and other water soluble substances than Wytex® 6 or Wytex® 6.6.

Plyer®

Plyer® has excellent resistance to most substances. It is resistant to acids, oxidizers such as hydrogen peroxide, and most solvents. Plyer® has excellent resistance to hydrocarbon fuels, oils, and lubricants. It is, however, attacked by strong alkalis such as concentrated solutions of sodium hydroxide (lye or caustic soda), calcium hydroxide (lime, mortar), ammonia, trisodium phosphate, or sodium carbonate (washing soda, soda ash).

Prostran®

Prostran® offers excellent resistance to most water soluble chemicals, including fairly strong acids, or alkalis and simple hydrocarbons. It may be attacked by oxidizing agents such as hydrogen peroxide, chlorinated solvents such as 1, 1,1-trichloroethane, and aromatic solvents such as xylene, especially at higher temperatures.

Durastran® R

Durastran® R resists fairly strong acids, alkalis, and most water soluble chemicals including oxidizers like hydrogen peroxide. It is readily attacked by solvents such as gasoline, lighter fluid, acetone, paint thinner, etc.

Durastran® SR

Durastran® SR (SR stands for solvent resistant) will resist many of the chemicals that attack Durastran® R. Durastran® SR is not affected by gasoline, kerosene, paint thinner, or other hydrocarbons. It is, however, attacked by aromatic hydrocarbons, ketones, esters, and chlorinated hydrocarbons.

Note

This report is based on our experience and research, and published data. Some published data has been contradictory, but we believe this report to be true and accurate. Because of the effects of concentration, time, and temperature on solvent and chemical resistance, we suggest that actual trials be conducted in critical applications. If you have questions or would like more specific information please call our R & D Dept.

SOLVENT & CHEMICAL RESISTANCE RATINGS

RATINGS

S—Satisfactory— The product should give good service life when used with this chemical.

M—Marginal— Depending on temperature, concentration, exposure, expected life, etc., the product may or may not give adequate performance. Specific testing for this application is recommended, or contact us for further details.

U—Unsatisfactory— The product will deteriorate in hours to weeks when used with this chemical.

NOTES

- (aka)—also known as
- Blanks indicate a lack of information on this specific product. Specific testing for this application is recommended.
- Percents give concentration in water.
- Solids are dissolved in water to form a saturated solution unless otherwise indicated.

If you can't find what you are looking for on this chart, call us. We may have the information you need.

The information in this table is based on our tests and information supplied by others. We believe it to be true and accurate, but no warranties are expressed or implied regarding its accuracy or the performance of any Monahan Filaments products. Actual testing is recommended for critical applications.

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Acetaldhyde	U	U	M	M	M	M	
Acetic Acid 5%	S	S	S	S	M	S	Will etch Wytex®
Acetic Acid 10%	M	S	S	S	M	S	
Acetic Acid 100%	U	U	S	S	U	U	Will dissolve Wytex®
Acetone	U	U	S	U	S	M	
Acetophenone	U	U	S	U	S	S	Solvent for SR
Allyl Alcohol	M	U	S	S	S	S	
Aluminum Chloride	S	S	S	S	M	S	
Aluminum Sulfate	S	S	S	S	S	S	
Ammonia Solution	S	S	S	S	S	S	(aka) Ammonium Hydroxide
Amyl Acetate n-	U	U	S	U	S	S	Solvent for R
Amyl Alcohol	U	M	S	S	S	S	
Amyl Chloride	U	U	M	U			
Amyl Phthalate	U	U		M			

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Anti-Freeze	S	S	S	S	S	S	
Aqua Regia	M	U	S	U	U	U	
Aromatic Hydrocarbons	U	U	U	U	S	M	
Barium Carbonate	S	S	S	S	S	S	
Benzaldehyde	U	U	M	U	S		
Benzene	U	U	U	U	S	M	Solvent for R
Benzoic Acid	S	S	S	S	S	S	
Benzyl Acetate	U	U	M	U			
Borax	S	S	S	S	S	S	
Boric Acid	S	S	S	S	S	S	
Brake Fluid	U		S	M	S	S	
Bromine Liquid	U	U	M	M	U	U	
Butanol	U	M	S	M	S	S	
Butter	U	S	S	S	S	S	
Butyl Acetate iso-	U	U	S	U	S	M	Solvent for R and SR
Butyl Acetate n-	U	U	S	U	S	M	Solvent for R and SR
Butyl Alcohol iso-	S	M	S	S	S	S	
Butyl Alcohol n-	S	M	S	S	S	S	
Butyl Phthalate	U	U	S	M	S	S	
Calcium Chloride	S	S	S	S	U	S	
Calcium Hypochlorite 15%	M	S	S	S	U	S	
Camphor	M	S	U	M	S	S	
Carbon Tetrachloride	U	U	U	M	S	S	Solvent for R
Carbolic Acid 50%	M	U	S	M	U	U	aka Phenol; Solvent for Wytex®
Carbolic Acid 100%	U	U	S	U	U	U	aka Phenol; Solvent for Wytex®
Castor Oil	S	S	S	S	S	S	
Caustic Soda	S	S	S	M	M	M	aka Sodium Hydroxide
Cedarwood Oil	U	M		M			
Cellosolve	U		S	M	S	S	
Cellulose Acetate	U	U	S	U	S	S	

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Cetyl Alcohol	S	S	S	S	S	S	
Chlorobenzene	U	U	U	S	M		Solvent for R and SR
Chloroform	U	U	U	U	M	M	Solvent for R; temporarily softens Wytex®
Chlorine	U	M	U	S	U	U	
Chromic Acid	S	S	S	S	U	M	
Citric Acid 10%	S	S	S	S	M	S	
Citric Acid 20%	M	S	S	S	M	S	
Citrus Oil	U	M	S	M	S	S	
Cocoa Butter	M	S	S	S	S	S	
Cod Liver Oil	M	S	S	S	S	S	
Coconut Oil	M	S	S	S	S	S	
Copper Salts	M	S	M	S	M	M	
Corn Oil	M	S	S	S	S	S	
Cottonseed Oil	M	S	S	S	S	S	
Cyclohexane	U	U	M	M	S	S	
Cyclohexanol	S	M	S	M	S		
Cyclohexanone	U	U	M	U	S		Solvent for R and SR
Decalin	U	U	U	S	S	M	Solvent for R
Detergents	M	S	S	S	S	S	
Diacetone	M	U	S		M	U	
Dibutyl Sebacate	U	U	S				
Dichlorobenzene o-	U	U		U			Solvent for R
Dichlorobenzene p-	U	U		U	S		aka Moth Balls; Solvent for R
Diethylene Glycol	S	S	S	M	M	M	
Diethylketone	U	U	S	U	M	U	Solvent for R and SR
Dimethyl Formamide	U	U	S	U	M	S	Solvent for SR
Dimethyl Phthalate	U	U		M	S	S	
Epichlorohydrin	M	M	S		M		
Ether	U	U	S	U	S	S	
Ethyl Acetate	U	U	M	U	S	M	Solvent for R

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Ethyl Alcohol 95%	M	M	S	S	S	S	Temporarily softens Wytex®
Ethyl Benzene	U	U	U	U	S	S	Solvent for R
Ethyl Benzoate	U	U	S	U	S	S	
Ethyl Chloride (Gas & Liquid)	U	U	M	U	S	S	
Ethyl Ether	U	U	S	U	S	S	
Ethyl Lactate	U	U	S	U	M	S	
Ethylene Dichloride	U	U	M	U	S	M	Solvent for R
Ethlyene Glycol	S	S	S	S	S	S	
Ethylene Oxide	U	U	M	U	M	S	
Ferrous Chloride	S	S	S	S	U	S	
Formaldehyde	U	M	S	S	S	S	
Formic Acid	M	M	S	S	U	S	Solvent for Nylon
Furfuryl Alcohol	U	U	M	M	S	S	
Gasoline	U	S	M	M	S	S	
Glucose 30%	S	S	S	S	S	S	
Glycerin	S	S	S	S	M	S	
Heptyl Alcohol n-	S	S			M		
Hexane	U	S	M	M	S	S	
Hexyl Alcohol n-	S	S			M		
Hydrochloric Acid 10%	S	S	S	S	U	S	Dissolves Wytex® 6
Hydrochloric Acid 38%	M	S	S	S	U	M	Dissolves Wytex® 6 & 6.6; Softens 6.12
Hydrofluoric Acid	U	S	S	S	U	U	
Hydrogen Peroxide 3%	S	S	S	S	U	S	
Hydrogen Peroxide 30%	S	S	M	S	U	S	R and SR show excellent resistance
Hydroquinone	M	S	S		U	S	
Iodine Tincture	M	U	S	S	U		
Isopropyl Alcohol	M	S	S	S	S	M	
Kerosene	U	S	M	S	S	S	
Lactic Acid 10%	U	S	S	S	M	S	
Lanolin	S	S	S	S	S	S	

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Lard	M	S	S	S	S	S	
Lauryl Alcohol	S	S	S		S	S	
Lemon Juice	M	S	S	S	M	S	
Lubricating Oil	M	S	S	S	S	S	
Lye	S	S	S	M	M	M	
Magnesium Carbonate	S	S	S	S	S	S	
Maleic Acid 10%	S	S	S	S	S	S	
Mercuric Chloride 5%	S	S	S	S	U		
Mesityl Oxide	U	U					Solvent for R
Methyl Acetate	U	U	M	U	S	M	Temporary loss of stiffness in Wytex®
Methyl Alcohol	M	U	S	S	S	S	Temporary loss of stiffness in Wytex®
Methyl Chloride	U	U	M		S		
Methyl Ethyl Ketone	U	U	M	U	S	M	Solvent for R and SR; Softens Wytex®
Methyl Isobutyl Ketone	U	U	M	U	S	U	Solvent for R and SR
Methyl Propyl Ketone	U	U	M	U	S	U	Solvent for R and SR
Methyl Salicylate	U	U					aka Oil of Wintergreen
Methylene Chloride	U	U	M	U	M	U	
Milk	S	S	S	S	S	S	
Mineral Oil	S	S	M	S	S	S	
Monochlorobenzene	U	U	U	U	S	M	Solvent for R and SR
Motor Oil	M	M	S	S	S	S	
Nitric Acid	U	M	M	M	U	M	Polyester is not affected by 50% nitric acid
Nonyl Alcohol	S	S	S		S	S	
Octyl Alcohol	S	S	S		S	S	
Oils - Essential	U	U	M	M	S	S	
Oils - Vegetable	M	S	S	S	S	S	
Oleic Acid 100%	M	S	S	S	S	S	
Orange Juice Fresh	M	S	S	S	S	S	
Orange Juice Concentrate	S	S	S	S	S	S	
Oxalic Acid 10%	S	S	S	S	M	S	

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Ozone	S	S	M	S	M	M	In absence of light
Paint Thinner	U	M	M	S	S	S	aka VM&P naptha
Palm Oil	M	S	S	S	S	S	
Palmitic Acid	M	S	S	S	S	S	
Peanut Oil	M	S	S	S	S	S	
Pectin	S	S	S	S	S	S	
Perchloroethylene	U	M	U	U	S	S	
Petroleum Distillate	U	M	M	S	S	S	
Petroleum Jelly	S	S	S	S	S	S	
Phenol 5%	M	U	S		U		Solvent for Wytex®
Phosphoric Acid 50%	S	S	S	S	U	S	
Potassium Hydroxide 30%	S	S	S	S	S	U	
Potassium Hydroxide 35%	M	S	S	S	S	U	
Potassium Hydroxide 50%		S	S	S	M	U	
Potassium Bromide	M	S	S	S	S	S	
Potassium Ferricyanide	S	S	S	S	S	S	
Potassium Iodide	S	S	S	S			
Potassium Permanganate	M	S	M	S	U	S	
Potassium Thiocyanate	S	S	S	S	U	S	Wytex® 6.12 has greater resistance than Wytex® 6 or 6.6
Propyl Alcohol iso-	M	M	S	S	M	M	
Propylene Dichloride	U	U					
Proplyene Glycol	S	S	S	M	S	S	
Resorcinol	S	S		M	U		Solvent for Wytex®
Salicylic Acid	S	S	S	S	S	M	
Silver Nitrate	S	S	S	S	S	S	
Sodium Acetate	S	S	S	S	S	S	
Sodium Benzoate	S	S	S	S	S	S	
Sodium Bicarbonate	S	S	S	S	S	S	
Sodium Bisulphate	M	S	S	S	S	S	
Sodium Borate	S	S	S	S	S	S	

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Sodium Bromide	S	S	S	S	S	S	
Sodium Carbonate	M	S	S	S	S	S	
Sodium Chloride	M	S	S	S	S	S	
Sodium Dichromate 10%	M	S	S	S	M	M	
Sodium Fluoride 5%	M	S	S	S			
Sodium Hydroxide 40%	S	S	S	S	M	U	
Sodium Hypochlorite 5%	S	S	M	S	U	M	aka bleach, Clorox®
Sodium Tetraborate	S	S	S	S	S	M	aka Borax®
Sodium Thiosulfate	S	S	S	S	S	S	aka Hypo
Stannic Chloride	S	S	S	S	M		
Stearic Acid (powder)	S	S	S	S	S	S	
Stoddard Solvent	U	S	M	S	S	S	
Sucrose 30%	S	S	S	S	S	S	
Sulphuric Acid 2%	S	S	S	S	M	S	
Sulphuric Acid 50%	S	S	S	S	U	U	
Sulphuric Acid 96%	U	U	S	M	U	U	
Tannic Acid 2%	U	S	S	S	S	S	
Tartaric Acid	S	S	S	S	S	S	
Tea (sol.)	S	S	S	S	S	S	
Tetrahydrofuran	U	U	S	U	S	S	Solvent for R and SR
Tetralin	U	U	M	S	S	S	
Thionyl Chloride	U	U		U			
Toluene	U	U	M	U	S	M	
Trichloroethylene (1,1,1-)	U	U	U	U	S	S	Softens nylon; Solvent for R and SR
Trisodium Phosphate	S	S	S	S	S	M	
Triethylene Glycol	S	S	S	M	S	S	
Triethylene Tetramine	M	S					
Turpentine	U	U	M	U	S	M	
Water	S	S	S	S	S	S	Softens and swells Wytex® 6 and 6.6
Water Carbonated	S	S	S	S	S	S	

SOLVENT & CHEMICAL RESISTANCE RATINGS

REAGENT	R	SR	PRO & PE	PVC	WYTEX®	PLYER®	NOTES
Xylene	U	U	M	U	S	M	Solvent for R
Zinc Chloride	S	S	S	S	U	S	Wytex® 6.12 has better resistance than Wytex® 6 or 6.6
Zinc Salts (sol.)	S	S	S	S	U	S	Leads to environmental stress cracking in Wytex®
Zinc Stearate	S	S	S	S	S	S	