

FIBERS FOR THE WORLD

People, Products and Technologies for the Rope, Cordage, and Netting Industry



Spectra® Performance – Improved Safety & Increased Productivity

Spectra® fibers contribute significantly to the rope, cordage, and netting industry, improving workplace safety and increasing productivity. Saving dollars. Increasing Safety. The inherent advantages of Spectra® fibers - such as high strength-to-weight ratios, durability, and overall versatility - have led to their adoption in a wide range of applications.



Trust

Every day, soldiers and police officers put their lives on the line while protected by Spectra® fiber in their bullet-resistant vests, vehicles and helmets. Honeywell's Spectra fiber is one of the strongest manmade fibers and delivers on quality where it counts.



Productivity

Spectra's properties also allow for improved productivity in many ways. Lighter equipment, increased capacities and reduced manpower result from Spectra's high strength to weight ratio. Spectra's abrasion and bending performance leads to longer life and less downtime.



Performance

Pound for pound, Spectra fiber is 15 times stronger than steel, lends its lightweight strength to industrial workplaces. Spectra is light enough to float in water while remaining hydrophobic.



Safety

Spectra's light weight reduces lifting strains and back injuries. Its low density and low elongation minimize snapback risk to users. It is soft to the touch yet remarkably durable without requiring lubricants that increase slipping and environmental concerns.

The Benefits of Spectra Fiber

- 15 times stronger than steel by weight – lighter weight/heavier loads
- Light enough to float (.97 g/cc specific gravity) – no capacity loss in water
- Hydrophobic – no water weight gain
- Chemical resistance - does not corrode and eliminates need for lubrication
- Excellent abrasion resistance – longer life
- Excellent flex and bending fatigue performance – longer life
- Very good UV resistance – eliminates the need for UV protective coatings
- Excellent cut resistance – improves durability – longer life
- Low coefficient of friction – reduces energy loss and heat buildup



Fiber Portfolio

Selecting the right rope or net for a job depends on multiple concerns of construction, composition and function. Honeywell offers a wide range of Spectra® performance levels and deniers to meet the needs of many applications. Our knowledgeable and experienced applications team helps customers optimize manufacturing processes and develop creative and cost-effective solutions.

Typical Fiber Properties						
	Spectra® HMPE	Polypropylene	Polyester	Nylon	Aramid	Steel
Density (g/cc)	0.97	0.91	1.38	1.14	1.44	7.86
Tenacity (g/den)	38	6.5	8.6	9.4	26	3.7
Modulus (g/den)	1340	43	74	90	750	230
Elongation (%)	3.3	18	14	20	3.4	1.9
COF	0.08	0.15-0.22	0.12-0.15	0.10-0.12	0.10-0.12	n/a
Abrasion Resistance	Excellent	Good	Very Good	Very Good	Fair	Excellent
UV Resistance	Good	Poor	Very Good	Very Good	Fair	Excellent
Temperature Resistance	Poor	Fair	Good	Good	Excellent	Excellent
Creep	Fair	Poor	Good	Fair	Excellent	Excellent
Chemical Resistance	Excellent	Excellent	Good	Good	Fair	Excellent
Axial Com Fatigue	Very Good	Fair	Very Good	Good	Fair	

Fiber Capabilities at a Glance					
	Denier Range	Tenacity (gpd)	Elongation (%)	Modulus (gpd)	DPF
S900	650-5600	25-30	3.5-4.5	775-920	10-11.7
S980	1600	35	3.6	1100	6.7
S1000	75-2600	34 – 40+	2.9-3.5	1130-1700+ gpd	1.7-5.9
HC1000	1600	38.5	3.3	1300	4.4

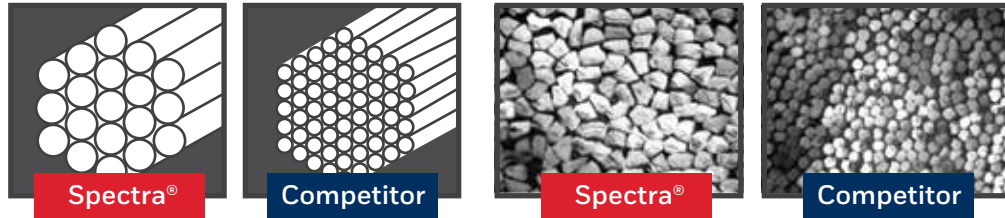
Range of Available Deniers															
	75	100	130	180	215	375	435	650	1200	1300	1600	2400	2600	4800	5600
S900								✓	✓			✓		✓	✓
S980											✓				
S1000	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓		✓		
HC1000											✓				

Unrivaled Strength and Versatility



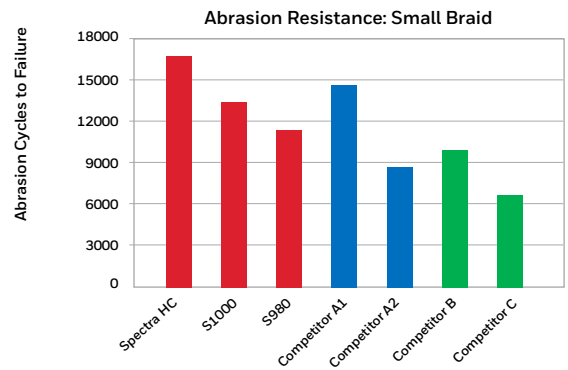
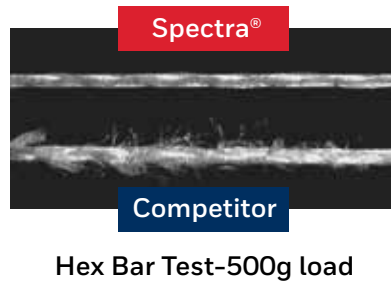
Abrasion-Resistance

Because of Honeywell's unique processing, Spectra fiber has larger filaments, which provides higher resistance to abrasion, bending fatigue, and breakage after repeated use.



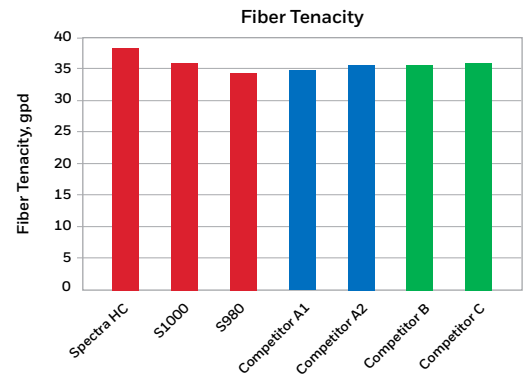
Abrasion

Spectra fiber leads in abrasion performance compared to other HMPE competitors.



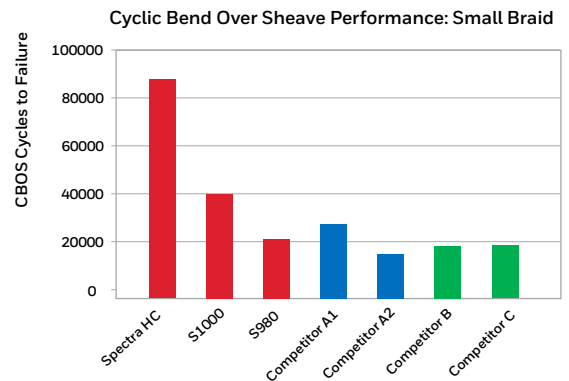
Tenacity

High tenacity performance makes Spectra fiber® ideal for demanding applications.



Cyclic Bend Over Sheave (CBOS) Performance

Spectra fiber demonstrates superior CBOS performance than the closest competitor, lasting 10,000 more cycles before breaking





Spectra[®] Fiber at Work

Industrial Marine

For decades, Spectra[®]-made ropes have been used as a replacement to steel wire in heavy-duty lines for the marine industry. Spectra fiber is much lighter than steel wire for a given strength, which makes the work environment safer by alleviating strain on dock and mooring workers, reducing cuts, pinched fingers, back injuries and joint damage.

The lighter weight ropes also speed rigging efforts, reducing setup, mooring and placement times – all improving efficiency.

In addition, Spectra allows industrial marine companies to forgo the purchase and cleanup of expensive biodegradable grease traditionally needed to lubricate steel-wire lines.



Improved Safety and Operational Spend: ARCO

When ARCO Marine Incorporated (AMI) sought to optimize their mooring line system and replace steel-wire docking lines, the company adopted Spectra-made mooring lines from Whitehill Manufacturing Corporation.

AMI reported that Whitehill lines with Spectra fiber not only provided the essentials of strength and durability, but they also added the benefits of increased safety for its people. In a study conducted by AMI, back injuries attributed to handling these mooring lines were largely reduced. The study documented a welcomed additional benefit: the same factors that contributed to safety also reduced docking time by up to 60 percent, bringing a productivity improvement that lead to enormous savings.

Spectra fiber also alleviated ARCO's environmental concerns caused by the need to lubricate the steel-wire lines. Spectra fiber lines require no lubrication, yet marine lines made of Spectra[®] fibers have a significant work life that equals – and even surpasses – that of steel-wire rope.



Offshore Oil and Gas

Honeywell Spectra fiber provides additional benefits to the demanding offshore oil and gas deep water installation applications. As offshore drilling depths grow, and more and more equipment are being positioned on the ocean floor, contractors are looking for safer, more reliable and efficient ways of lowering equipment to greater depths. Spectra's high strength, while still being lighter than water, makes it a perfect fit for working in deep water. Operators are able to utilize more of the capacity of their lifting equipment to place the load instead of lifting a heavy column of steel wire rope. Rigging and placement times are reduced, as are the number of operators required and much of the heavy equipment typically required to facilitate the rigging effort.

In addition, Spectra's UV, chemical, and abrasion resistance provide longer life without the maintenance requirements of steel wire rope, such as messy periodic lubrication.

Reducing Operating Costs and Maintenance: Petrobras/AKER Solutions

Aker Solutions, supporting Petrobras, the largest oil and gas company in Latin America, sought a deep water installation system for offshore oil and gas platforms. The rope in the system had to be able to withstand the abusive cyclical bending action induced into ropes caused by pitching seas up to 2200m in depth.

Spectra fiber was incorporated by Cortland, a leading engineered rope maker, into its BOB® 12x12 Fiber Rope, which was installed on Rolls-Royce's Fiber Rope Deployment System (FRDS) chosen by Aker for their placement needs.

After five years of use and several hundred operations, AKER found far higher levels of efficiency and reliability than with other systems in its fleet. AKER was able to reduce installation times by 50% and maintain 98% availability with the system. Savings added up to about ten days of schedule and \$5M per well.

The success of the system has led Aker to purchase another system for use on the Aker Wayfarer vessel supporting deep water efforts off of the coast of Brazil.

Lifting Slings

The unique characteristics of Spectra fiber make it a natural choice in applications that require lifting extraordinarily heavy objects. Slings manufactured with Spectra fiber are much lighter than their steel counterparts reducing the need for crane and fork truck time when positioning cables. Without compromising on strength, Spectra fiber-based ropes lower working loads and increase the lift capacity. Spectra's excellent flex fatigue and abrasion characteristics leads to longer sling life. A lighter weight Spectra-made sling minimizes snapback risk to users due to its low density and low elongation.

Heavy Lift with More Payload: Oakland Bay Bridge

High-strength Spectra fiber served as a key component of industrial slings that lifted a new span of the reconstructed San Francisco-Oakland Bay Bridge.

The fiber was used as reinforcement material in the Holloway Houston HHIPER LIFT™ slings used to raise multiple sections for the construction of the new earthquake-resistant self-anchored suspension span of the bridge.



Spectra fiber's unique properties allowed the slings to lift up to 4 million pounds of the bridge's steel skeleton at a time. Because slings built with Spectra fiber are more than 80 percent lighter than traditional steel slings with the same load rating, slings made with Spectra waste less energy holding their own weight, which allows cranes to lift more payload.

Utility Stringing

Spectra® fiber helps make ropes used to string power lines easier to handle and more durable.

With outstanding abrasion resistance compared to steel wire and other HMPE products, Spectra fiber-based ropes are less likely to break, reducing both expensive replacement costs and injury to workers due to recoil and backlash.

Spectra-based lighter weight ropes allow for easier hand carry and lighter equipment increasing efficiency. Overall system weight reductions allow for more rope capacity and improved system maneuverability providing operational savings by increasing productivity, efficiency and reducing operational costs such as fuel and overweight permitting.

Safer and More Efficient Utility Stringing: Tennessee Valley Authority

Honeywell Spectra fiber is used by the largest public power company in the United States to help to save costs while making it easier and safer for workers to install power lines.

The Tennessee Valley Authority (TVA), which provides electricity to nine million people in seven southeastern states, uses ropes manufactured by Yale Cordage containing Spectra fiber to string power cables. The light weight of Spectra fiber allows the ropes to be more easily handled by workers in the field, making the stringing process safer.

Spectra fiber also makes the ropes more durable, which means there is less wear and tear on equipment and the ropes do not have to be replaced as often, resulting in cost savings for the utility.

Ropes that contain Spectra fiber are seven times lighter than steel wire ropes used previously by utility workers at TVA, allowing the ropes and the equipment that carries them to be easier to maneuver and position. The light weight of the ropes can also further reduce cost by eliminating the need for overweight permits on utility trucks or can give utilities flexibility to add additional rope length to current assets.

Spectra fiber also extended the durability and lifespan of the ropes. Previous ropes used by TVA lost up to 88 percent of their breaking strength over a two-year period compared to just two percent for the Spectra based ropes.



Honeywell Trust

Customer Commitment

Our commitment is to customers. Not only do we support our fiber customers and their customers with state-of-the-art product innovation and applications technology, but we are committed to working together to solve problems. This means listening to customers to find the best material solution. It means using the power of Honeywell to bring experience and knowledge to a project such as using our research labs and scientists in Colonial Heights, Virginia and other Honeywell locations throughout the world. It means working with all of Honeywell to support and grow our customers for years to come.

Performance Services

Worldwide Sales and Manufacturing Team

Our sales team is made up of knowledgeable, well-trained customer representatives. Our regionally located, customer-focused team also serves as the link between the customer and our applications technology and marketing teams that stand ready to identify solutions and partner in your success.

Honeywell Packaging and Composites

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Applications Technology

The applications technology team is dedicated to identifying and responding to customer needs. A full staff of engineers, technologists and researchers serve as partners with our customer and their customers. On site and in the lab, we help solve problems, whether that means finding the right fiber mix for an application, optimizing a manufacturing process, or inventing a new technology. We also conduct forensic analyses to help identify problems in usage and manufacturing. Honeywell laboratories are equipped for prototyping and testing rope constructions for a wide range of applications. We can also use our expertise to help train customers' sales staffs and distributors on the unique properties and value of products.

Customer-Linked Commercialization

This company-wide initiative is geared toward creating partnerships with customers in applications and product development. As a fiber producer, we combine our own research and development, applications technology, and marketing capabilities with those of a commercial partner to develop new products and applications worldwide.

Research and Development

As part of the larger Honeywell organization, we have the opportunity to leverage the expertise of its technologists and well-equipped facilities at the company's skills centers located around the globe.

Six Sigma Quality: A strategy to Achieve Performance Breakthroughs

Honeywell is committed to upholding worldwide standards of quality and consistency. As a quality assurance program, Six Sigma targets zero defect manufacturing. Honeywell adheres to Six Sigma principles. This set of standards defines a process that engages everyone in the company in striving for excellence in order to guarantee customer satisfaction.

These principles are applied across every activity in which the company engages, from product development to manufacturing and marketing. Six Sigma drives the world-class quality that makes Honeywell the rope and cordage industry's benchmark supplier of Spectra® fibers.

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