



An American Manufacturing Company
ISO 9001:2015

PROCESS ENGINEERING

GUIDE FOR TEXTILES IN WIRE AND CABLE

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SECTION ONE: YARN AND THREAD PROCESSING CONTROL | BENEFITS OF USING A CREEL

A creel is simply a frame on which the feeding thread or yarn bobbin is fitted. Often, the creel is fitted with a yarn tensioning device which controls tension variation. Proper placement and stabilization of thread and yarn at the beginning of the product manufacturing process is critical. You will most likely be surprised at the process improvements that can be made by simply using a well-designed creel or by refining your current creel design.

How does a creel help control yarn tension?

Creels allow for standardization of the yarn's path and enable more accurate directional and tension control.

Additionally, some high-tech creels provide automatic control, centralized tension variation, and yarn breakage monitoring systems. Creel design can have a tremendous impact on process efficiency because with the use of a creel, yarn tension control is more consistent and the result is less down-time, less scrap generated and

fewer product defects, allowing for a more uniform finished good design.

Whether your industry focuses on wire and cable (integration of ripcords and strength members), industrial bags (closures), fabrics and tarps, or hose reinforcement, there are four benefits you may see from implementing the use of a yarn creel for industrial applications:

1 Customized to the Size and Width You Need

An important element in determining the best creel to fit your needs is identifying the type of base that best fits your production processes. Creel size is determined by floor space and capacity, which may limit options based on the manufacturing facility floorplan you are working within. You also have the option to use vertical space more efficiently by stacking creel positions and routing the yarn through the use of ceramic guides and rollers.



2 Load Multiple Packages and Pigtail Together for Continuous Run

Specialty creels also allow for multiple yarn spools to be loaded for continuous run without stoppages during a production cycle. The transfer tail end of the running package is joined to the beginning of the reserve package, leaving no leftover material remaining on the bobbins after transfer. This type of creel will eliminate waste material and rewinding, and is typically used for high-volume, long runs or where it is critical that there are no line stoppages to replace yarn packages.



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3

Defect Reduction

The prevention of and quick detection of defects are important factors in the manufacturing process. Yarn breakages or physical defects in yarns can result in machine down-time and possible product rejection. Implementing a creel system will put a level of highly effective monitoring into place, enabling the use of end break detection and fault detection before the yarn ever makes it into your product.

4

Tension Control and Uniform Yarn Path

There are several different types of mechanical and electronic tensioners available that monitor and control the tension of yarns used in your production process. Choosing the best tension device depends heavily on knowing what is best for your yarn. Yarn type, processing speeds, number of ends running, travel distance, desired tension range and other factors must be considered in order to make the best choice for your application. With a stationary creel, you know your yarn is always going to run in a uniform yarn path from the package location to the creel eyelets and into your process.



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SECTION TWO: CREEL DESIGN

TIPS - PACKAGE HOLDERS |

CHOOSING THE RIGHT PACKAGE HOLDER

The yarn creel or thread stand is like the foundation of a building. Most of your focus on process improvement probably starts after the yarn enters the process. You might be surprised at the gains you could make by taking a hard look at your creel design.

Creel Pins and Adapters

Proper placement and stabilization of the yarn or thread at the beginning of the process is the key to a solid foundation. While most creel frames are designed to take the overall load, the type of package holder is often overlooked. Here are some typical types and the advantages and disadvantages of each:





SIMPLE PIN

Most common type. Usually a 1/2"-3/4" steel pin

Advantages

Cheap

Good for multiple package sizes

Low cost to maintain

Disadvantages

Tubes can be less stable depending on the processing application

Can allow tubes/cones to be pulled off during processing



ADJUSTABLE PACKAGE ADAPTER

Used to align and stabilize a range of package sizes

Advantages

Better alignment of yarn to guides

Raw material tubes/cones less likely to pull off

Can be used for multiple tube/cone sizes

Disadvantages

More expensive

May require periodic maintenance



FIXED PACKAGE CREEL ADAPTER

Used to obtain a centered alignment of yarn package to thread guide, enabling yarn to pull off evenly

Advantages

Perfect alignment for a set tube/cone type

Best stability

Low maintenance cost

Disadvantages

Can only be used for one size tube/cone

Requires removal in order to process other tube/cone sizes



ROLL OFF ADAPTER

Secure fit inside package. Rotates around creel pin for even roll-off package

Advantages

Great for yarns with high TPI/TPM
to prevent kinking/knotting

Saves space because there is no yarn balloon

Disadvantages

Cannot be used for high speed processing

Expensive

Requires maintenance
for reliable performance

If you run a large number of ends, the cost of adapters adds up quickly. With thousands of creel pins at Service Thread, we previously used simple pins everywhere. When we made the decision to shore up our foundation by investing in the right yarn adapters and package holders for each process, we saw immediate reduction of scrap, and increased efficiencies.

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SECTION THREE: CREEL DESIGN TIPS - CONTROLLING YARN TENSION | CHOOSING THE RIGHT TENSION CONTROL DEVICE

Want to reduce yarn and thread waste and minimize backwinds and reprocessing? Choosing the correct tension device is all about knowing what's best for your yarn. Processing speeds, number of ends running, travel distance, desired tension range and other factors must be considered to make the best choice for your application.



POST OR DISC TENSIONER

A simple post housing, two plate discs with a weight or spring to add tension to the yarn running between the discs.



Advantages

Cost efficient

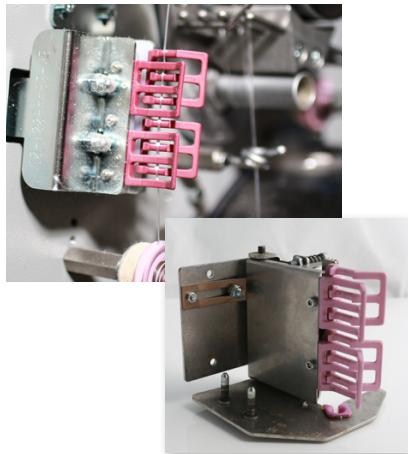
Disadvantages

Pinch point can "milk" twist back causing increased liveliness and potential for loop knotting and breaks in higher twist and unconditioned yarns

Discs may need to be replaced as they wear

If not periodically cleaned, build-up of lint/finish can cause tension variation

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GATE STYLE

A left and right plate where one is stationary and the other is hinged much like a fence gate. Pressure is applied to the yarn by either a spring or weight pulling the hinged side into the stationary side.

Advantages

Delivers tension over a greater surface area

Can be designed to reduce tension as spool or package increases in size

Disadvantages

Higher cost than Disc tensioners

Requires more operator training and maintenance for reliable performance



ALLIGATOR / LADDER BACK

Ceramic guides are configured in a stacked sequence like the rungs of a ladder. Similar to the gate style, one side is stationary while the other side pivots on an adjustable spring-loaded pin. The guides are passed in between each other creating tension on the yarn that can be dialed in and locked down for consistent tension.

Advantages

Distributes tension control over multiple contact points, reducing push back of twist

Available in different sizes and tension ranges

Simple design can be mounted in any orientation

Desired tension can easily be dialed in

Disadvantages

Requires threader or leno hook for loading by operator

More expensive than disc tensioner



CAPSULE, BULLET OR BALL

Yarn passes by this spring or weight loaded device which is contained in a housing. The device is nested in a ceramic guide. Passing between the guide and device applies pressure and tension to the yarn.

Advantages

Quick changes possible to accommodate various sizes

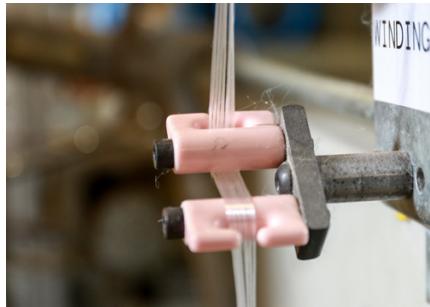
Consistent tension

Disadvantages

Should be vertically oriented

Requires more space than other options

Must be taken apart to clean



DIAL OR TURRET DEVICE

Two posts can be turned in a 360-degree motion to cause drag on the yarn as it passes through an S configuration.

Advantages

No changing of springs or weights

Simple construction

Disadvantages

Limited fine tension control



HYSTERESIS TENSIONER

Yarn runs across or is wrapped around a wheel. Resistance/tension is created by magnetic forces controlling how fast the wheel can turn

Advantages

No yarn clamping/pinch points

Great for handling delicate materials

Allows for fine level of tension control

Disadvantages

More expensive than other types of tensioners

May require additional space

Electronic variants require wiring



ELECTRONIC TENSION FEEDERS

For the ultimate in tension control, electronic feeders combine a yarn feeder with an electronic tension monitor. The tension monitor sends feedback to the feeder motor which in turn makes adjustments in real time to maintain whatever tension level you set.

Advantages

No yarn clamping/pinch points

Great for handling delicate materials

Maintains constant tension under virtually any condition

Disadvantages

Most expensive type of tensioner

Larger than most other tensioners

Requires power source



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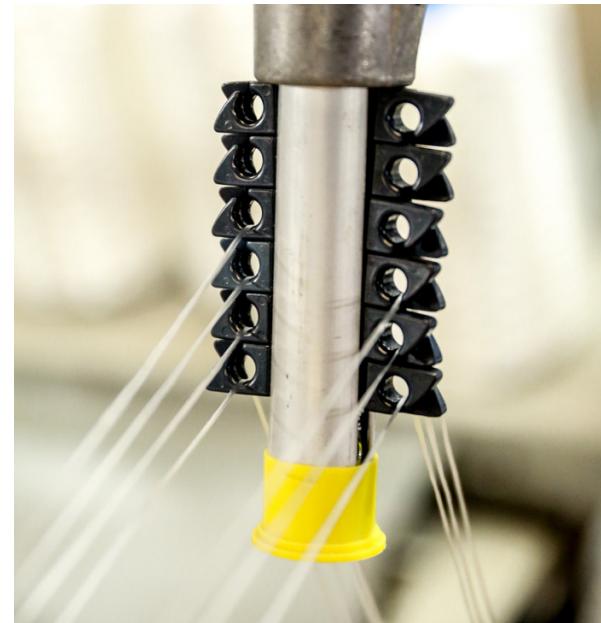
SECTION FOUR: CREEL DESIGN TIPS - HOW GUIDES IMPROVE PROCESS EFFICIENCY | CHOOSING THE RIGHT THREAD & YARN GUIDE

Choosing the right yarn or thread guide for the product and process is one of the key factors that can influence the quality and efficiency of any production operation using industrial textiles. When your operators report problems, always look at the yarn guides and thread path first.

What Yarn & Thread Guides Do

Guides are generally used for directing or positioning ends of yarn, thread or wire for processing on production equipment, and may also add tension to the yarn for processing.

Guide shape, size, material & surface finish types include eyelets, pigtails, rods, discs and others. Sizes can vary from very fine, typically used for small gauge threads, to large sizes designed to minimize tension or accommodate multiple ends of heavy denier yarns. Materials used for guides include steel and aluminum alloys, ceramic and porcelain.



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Benefits of Ceramic Guides

Ceramic is always a good choice because it offers the best wear, heat and chemical and corrosion resistance for most applications. We use ceramic at Service Thread for most applications since we get long wear and minimize yarn damage at high processing speeds.

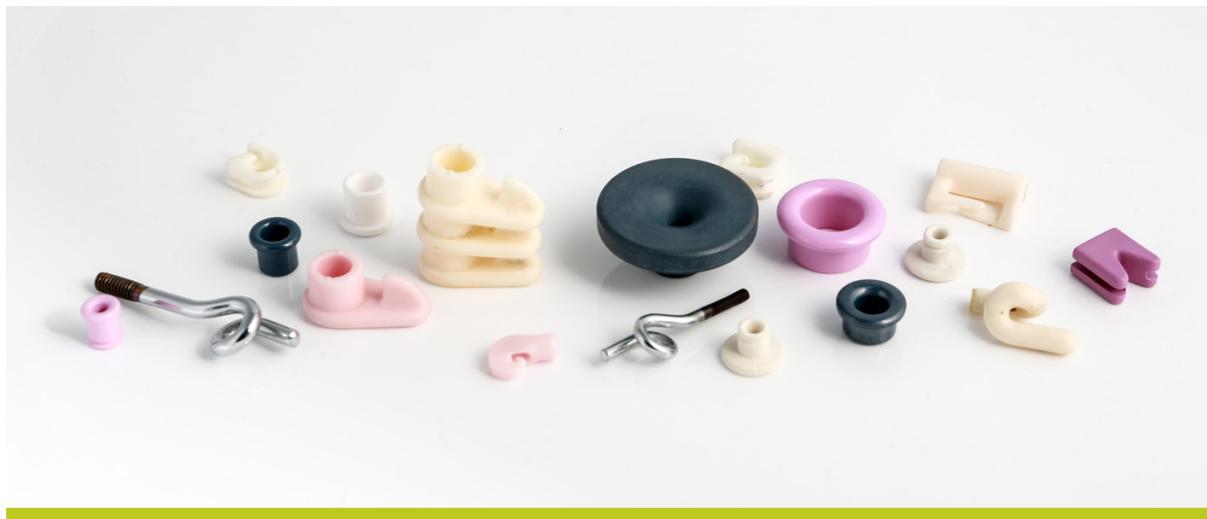
Identifying Material or Type of Ceramic Guide by Color:

- **AP (Alumina Pink):** This is a higher quality alumina oxide, 95 to 99.7% pure. Long lasting, the 99.7% pure ceramic material is commonly available in various surface finishes, making it easier to find a ceramic to fit your applications.
- **AR (Alumina Red):** This is a deep red material, made from 85% pure alumina oxide. With low density and low hardness, it is a general purpose ceramic.
- **AW (Alumina White):** This material is white in color. This can be alumina or 95% pure zirconia, and is suitable for general applications.
- **T (Titania):** This material is tan in color and has been used for many years. 90% pure material, this is a soft ceramic which yarn can wear over time. This is for applications where damage to yarn must be minimal.
- **TBR (Titania Brown):** This is titania material, similar to 90% pure titania which is brown in color, similar to 90% pure titania.
- **TC (Titania Conductive):** This material is dark grey in color and has been widely used for some time. It is the same 90% pure titania, but it is fired with an additive to make it neutralize electric charge. For applications where static is a problem, the nature of this material can be helpful.

Surface Finishes of Guides

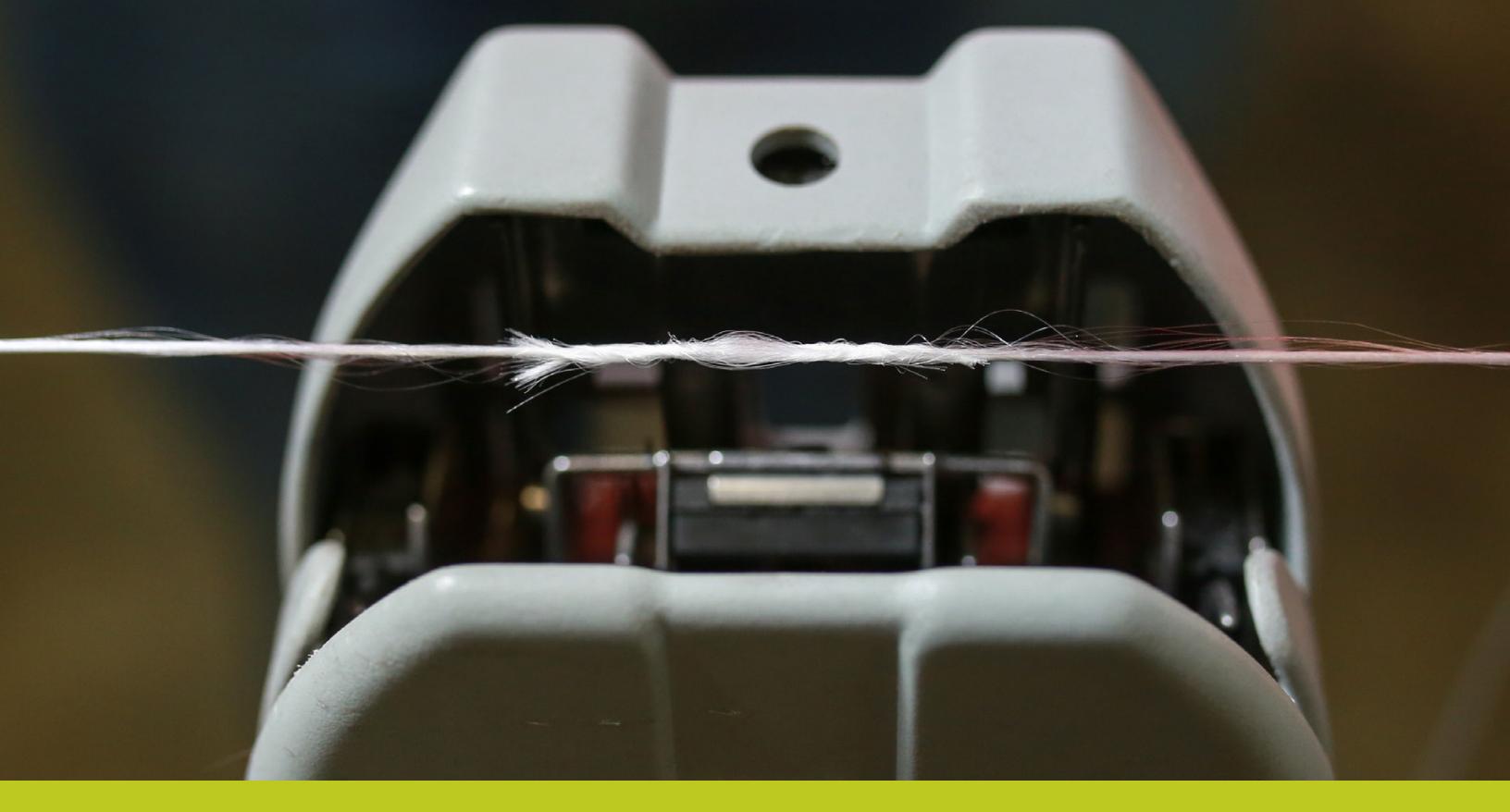
Guides also have different surface finishes. For example, a metal guide can be chromed, ceramic coated or have a black oxide finish. Different finishes result in increased or decreased drag on the yarn. A satin or MF (Matte Finish) has an orange peel texture and will have less drag than a bright chrome

finish because the yarn is running over small peaks and valleys compared to a flat surface that has a larger surface area. A DP (Diamond Polish) surface finish is heavily polished and finished to a smooth texture, ideal for use with textured yarns in the twisting and heating zones.



Are You Using the Right Guide?

Choosing the correct guide for your application is critical to ensure quality production and process control. Machine manufacturers for thread and yarn processing machines may not always choose the best guide for your application. This is because most machines are designed with general processing in mind, and cheaper guides are often considered wear items that can be sold as high margin replacement parts.



SECTION FIVE: YARN JOINING METHODS | ADVANTAGES & DISADVANTAGES OF YARN JOINING METHODS

The practice of joining industrial yarn ends (resulting from breaks, defects, or end of the supply), is a critical component to the product manufacturing process, particularly in industries such as wire and cable (integration of ripcords and strength members), hose reinforcement, belting and more. When using industrial yarn in the production process, it is essential that the joining method endures the process without interruption and does not have a negative effect on the quality of the end product.

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Air (Pneumatic) Splice

In air splicing (commonly used in industrial hose manufacturing), yarn ends are inserted into a splicing chamber (small air chamber) and then overlapped. A strong current of compressed air is introduced which entangles and intermingles the fibers, joining the two ends together. Multiple air chambers are incorporated for specialty yarns, like aramids, where more than one point of the yarn gets spliced and intermingled. While redundant, this process ensures the yarn maintains sufficient strength.

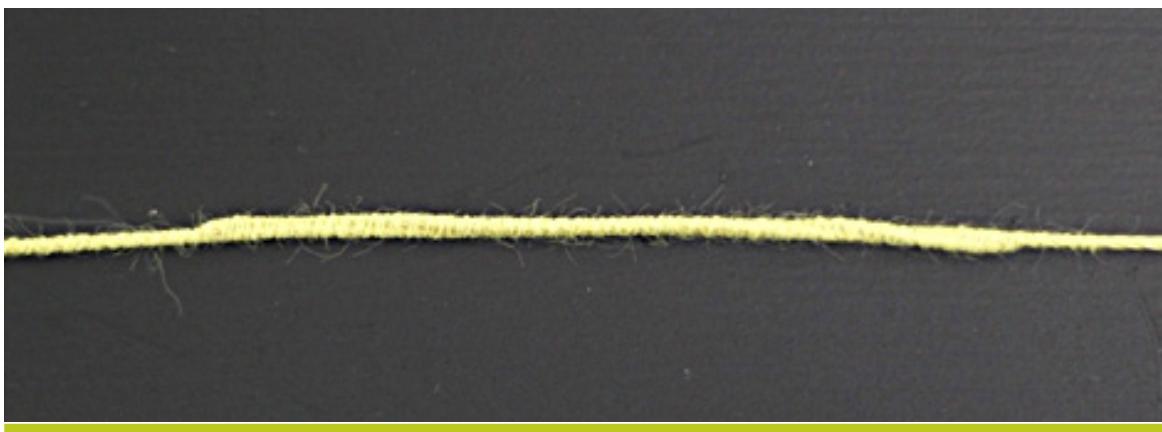
The time and air pressure needed in air splicing are determined by fiber type and characteristics of the yarn. Air spliced yarn produces a joint that in most cases will meet all requirements of the parent yarn, both in regard to strength and appearance. This type of splicing can also be applied to a large range of yarn types without a lot of equipment adjusting which results in greater winding efficiencies.



| Advantages | Disadvantages |
|--|---|
| No tails remaining | Different sized air chambers needed for different materials |
| Splice typically maintains at least 80% of yarn strength | Requires specialized equipment |
| No secondary material introduced into process | Requires air compressor and air line |
| Smallest joint | |
| Minimizes waste | |

Illman / Wrap Splice

The Illman or wrap splicing method is typically used on spun sewing threads for bag closures and for wire and cable applications. In this process, two yarn ends are overlapped and a fine auxiliary yarn is tightly wrapped around them and bound to produce a joint of high strength. This method can produce a thick and rigid joint. However, the thickness of the splice is much less than that of a knot, and the spliced yarn causes significantly lower tension fluctuations than what typically occurs with knotted yarn.



| Advantages | Disadvantages |
|--|---|
| High strength | Splice can be stiff and if not made properly can pull apart |
| No tails | Requires specialized equipment |
| Can be used with almost any type of yarn | Approximately twice as thick as original yarn |
| Multiple types of auxilliary wrapping material are available to match material being spliced | |
| Minimizes waste | |

Knotting

Knotting, particularly a weaver's knot, is a commonly used yarn joining method because its strength is several times that of the yarn strength. If tied properly, it will give you the maximum amount of strength to enhance the overall product construction. A weaver's knot is most appropriate for short-staple yarns, is typically a smaller knot and used when materials are woven or knitted. Can be hand tied or from a mechanical knotter.



| Advantages | Disadvantages |
|---|--|
| Provides maximum level of strength | Resulting knot can be 2-3 times the thickness of the yarn |
| Good option for woven material or materials where yarn diameter is not critical | Knots usually have tails which can get caught when running through small eyelets |
| No equipment necessary | |

Contact us if you need help determining which splice method will work for your end use. Service Thread supplies multiple industries and has broad knowledge about yarn and fiber application best practices. Our expert yarn engineers can review your products and processes to recommend the fiber type and product construction will work best for your application.

When was the last time you evaluated your process and assessed the best guide or foundation for your yarn package? If you would like more control over yarn tension, yarn path and uninterrupted production runs, Service Thread can help customize and design the best industrial yarn guide and creels for your unique application.

CONTACT US



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