

TECHNICAL BULLETIN



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WEFT KNITTING STYLE CHANGE- OVER AND MACHINE SETUP PROCEDURE

EVALUATION OF NEW FABRIC CONSTRUCTION

The first step in changing styles on a knitting machine is the complete evaluation of the new style that is to be produced and the condition of the machine on which the style will be manufactured. The types of stitch, the stitch length, the gauge, the diameter (number of needles in the machine), the weight of the fabric, and the fabric width must all be considered. There may be other machine parameters that are also of importance that relate to specific needs of the individual knitter. This paper will only relate to circular weft knitting.

Fabric Construction Considerations for New Styles

Before any changes to the knitting machine are executed, the knitter and designer must answer some basic questions that will make the procedure more efficient. These questions include:

- a. What fabric type will be produced?
- b. Will the fabric be single knit or double knit?
- c. What types of stitches will be used in the construction?
- d. What type of pattern area and machine capabilities will be needed?
- e. Can the style be produced on a track machine, a step machine, a pattern wheel machine, or will you need a full electronic machine?
- f. What are the weight, width, hand, and appearance requirements of the new style?
- g. What are the types of yarn or yarns that are required to produce this construction?
- h. Will the yarns be hard (not stretch) yarns, stretch yarns, or both?
- i. Will novelty yarns be used?

MACHINE CONSIDERATIONS

After an evaluation of the new style and the fabric requirements is completed, the machine selection process is next. What is the best machine at your disposal that meets all of the construction and production requirements? What is the best selection of equipment to meet the weight, width, hand, performance properties, and production requirements of the new fabric construction? Other considerations of importance concerning the machine to be used include:

- a. What is the best option in machine gauge and machine diameter to engineer the fabric to perform?
- b. What is the mechanical condition of the machine?
- c. How many machines will it take to produce the poundage or yardage needed?
- d. What will be the speed factor and the number of feeds?
- e. Are there enough machines in-house to fill the order or will off-site (company owned or commission) machines be used?
- f. Will the new style require a change in preventative maintenance?

MACHINE EVALUATION

Once the machine selection process is completed, the next step is the evaluation of the machine's present mechanical condition and current fabric setup. The machine condition relates to

cleanliness in general, the knitting elements, fabric tension, take-up mechanisms, and auxiliary devices. The machine should be clean, free from lint, wax buildup, and oil run offs. This is more of a housekeeping issue than a mechanical issue. However, any mechanical problem that relates to cleanliness should be repaired immediately upon disclosure and not at the next style change.

Knitting elements include needles, sinkers, cams, the cylinder, and the dial. If any of these elements are to be replaced or serviced, it should be done before the new style change. Also, all machine accessories (needle detectors, stop motions, flutter blowers, fabric scanners, tape feeders, etc.) need to be checked for proper settings and operation.

The next step is to check the current setup of the machine with regards to yarn count, type, stitch length, and course length. On all yarn feeders, the yarn should be wrapped properly and have approximately the same number of wraps.

If the yarn currently being used is similar to the same size as the yarn required by the new style, the existing yarn should be used to make the new style change since it is a known quality. It is important to then check the current yarn run-in or course length to accurately determine what changes need to be made for the new style. When changing to a much smaller or larger yarn, the stitch length must also be changed before removing the old yarn so that the machine will accept the new yarn without resulting in hole formation or pressing-off the old fabric.

MACHINE PREPARATION

Before setting up the new style, it is necessary to clean, adjust, and thoroughly check both the machine and the creel. For example, all oil reserves should be full. The machine lubrication system should be working correctly and checked to ensure that the proper amount of lubrication is being applied. Lubrication would apply to oil and grease. Both the yarn feeding and fabric take-up systems should be examined to ensure proper functioning.

CHANGING THE STYLE

Yarn Creeling/Inspection

Whether the yarn is changed before or after the style is changed, it is important to handle the yarn packages in such a manner to ensure that proper yarn quality and package integrity has been maintained. More information on yarns for knitting can be found in Cotton Incorporated's Technical Bulletin TRI 2006 – Yarn Requirements For Knitting. The packages of yarn should be handled in such a manner that will not disturb the layers of yarn on the package. The yarn package transfer tail should not be unwound and allowed to hang loose under the package unless the machine is to be double creeled. If double creeled, a reserve package is tied to the actively knitting package. The leading end of the reserve package is tied to the trailing end of the active package. It is important to consider the characteristics of the “tail” of the packages. It is important to consider both the length of the tail and whether the tail is put inside the package, wrapped around the base of the package, or wrapped around the yarn post in the creel. The length of the transfer tail on the package should be between six and eight inches. If the yarn is tied to the reserve package, a “*weaver's knot*” (Figure 1) is preferred, because of its strength and

small size. However, the “*overhand*” knot (Figure 2) is the most commonly used because of the speed and ease that it can be made. Whichever knot is used, remember to keep it as small as possible and clip the remaining tail to no longer than a one-tenth of an inch. Furthermore, the tail must not be exposed during knitting. If the tail is allowed to hang loose below the package, it can untwist and a weak area in the yarn will result. Lint will also accumulate on the tail if it hangs down below the yarn creel post and package. In any case, yarn breakage, holes, or machine downtime can result.

The yarn cones, upon which the yarn is wound, and the post, upon which the packages sit for support, are important, because they can often determine how well the yarn unwinds and transfers in knitting. Irrespective of whether a paper or plastic cone is used, both the tip and base of the cone can become damaged thereby preventing unwinding and package transfer as even the slightest of nicks can cause yarn breakage or a machine stop. If a yarn position with a center post or spindle that goes all the way through the cone is used, care must be taken to ensure that the yarn cannot catch on the post.

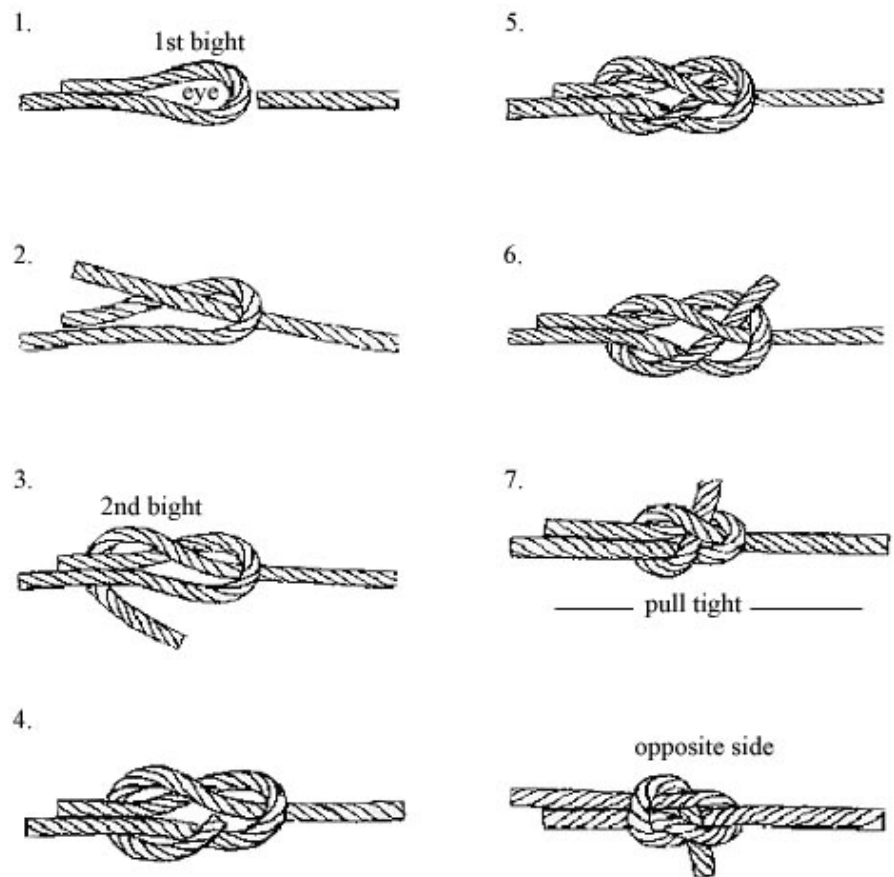


Figure 1 - Weaver's Knot



Figure 2 – Overhand Knot

Machine Settings Adjustment

After the desired yarn is creeled, the next step is to start putting the new style in place. Two methods are commonly used. One method starts at feed number one by removing the yarn from being fed from the positive feed system resulting in negative feeding. The needle selection should be changed to the new pattern and then the stitch length should be set. Each feed on the machine should be adjusted in the same manner. It is best to start at feed one and move in a sequential order around the machine until all have been adjusted and set the same way. After this has been accomplished, slowly turn the machine to check that the proper adjustments have been made. For single knit constructions, any adjustments of the sinker cams or sinker timing should be performed at this time. For double knit constructions, any adjustments of the dial height, gating, or needle timing should be done at this time.

The next step is to take the first feed, engage the positive feeder, if applicable, and adjust the course length by using an inch meter or run-in gauge and make adjustments by changing the quality wheel. After adjusting to the desired course length, adjust the yarn tension to the desired level by adjusting the stitch cam while reading a tension meter. After the first feed has been adjusted to the proper course length and yarn tension, the positive feed system can be engaged on the remaining feeders one at a time, while adjusting to the proper stitch length and yarn tension by using just the tension meter.

The other method most commonly used also starts with disengaging the positive feed system if applicable, and then changing all feeds to the proper needle selection and adjusting the stitch length all at one time instead of one at a time. The procedure for setting the yarn tension course length in the first method can be used in this method.

Adjusting Spreader Takedown

Once the machine has been metered for the proper course length and yarn tension, several revolutions should be run at a slow speed to check and adjust the fabric takedown to ensure proper fabric tension. Incorrect fabric tension can cause fabric defects as well as damage to the needles and cams. While adjusting the takedown to the proper setting, the fabric spreader system

should be adjusted to allow for fabric winding without wrinkles and folds (Figure 3). The takedown roller spacers should be adjusted to prevent the fabric from being pinched and creased on the edges (Figure 4). Takedown roller pressure must also be checked. The roller pressure on both sides should be uniform so that the fabric cannot slip and/or form linear creases (Figure 5).

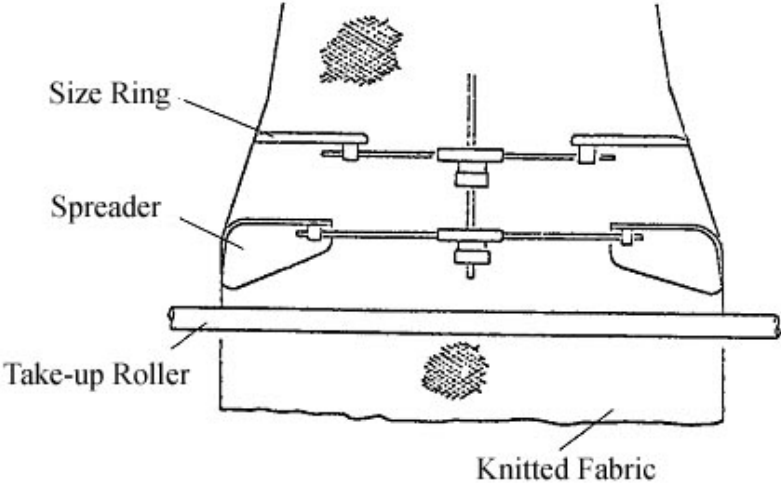


Figure 3

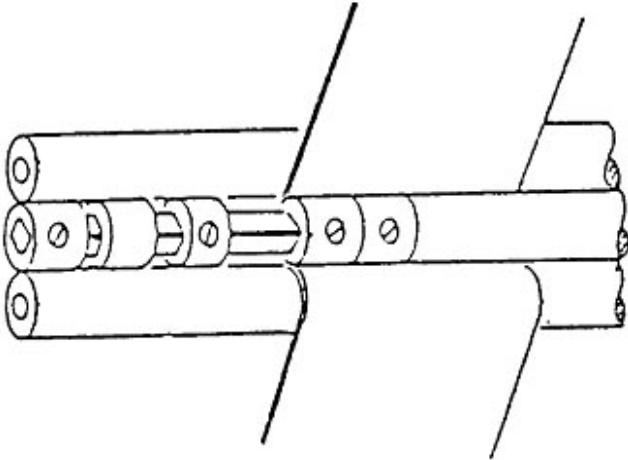


Figure 4

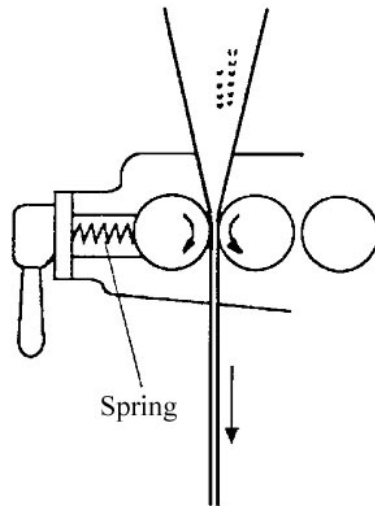


Figure 5

Yarn Path System Check

After the style has been changed and the machine has been run at slow speed, it is time to thoroughly re-check all machine systems. This includes checking all detectors, which includes cylinder needle, dial needle, and fabric build-up or defect detectors, to ensure that they are properly set for the new style. Make sure that yarn carriers are aligned and stop motions are working properly (Figure 6).

Double check to determine that the creel is working properly and that the yarn has been creeled with the right yarn in the proper position and manner. It is also a good practice to remove the old yarn completely from the creel to prevent it from being mixed with the new yarn in the creel (Figure 6).

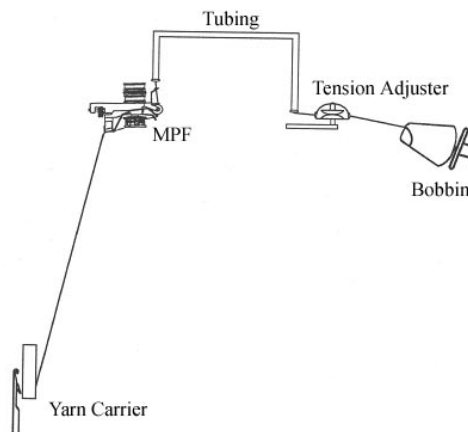


Figure 6

FABRIC STYLE CHECK

At this time, the fabric should be run at production speed to check the run-ability (how well the fabric knits) of the new style. A one-yard long sample should be cut for inspection.

The fabric should be checked for proper construction and appearance. Another one-yard sample should be allowed to relax while laying flat under no tension and checked for fabric weight and width. If the fabric weight, width, or pattern needs to be changed, then follow the prescribed procedure for setting the course length and yarn tension.

Another method for evaluating the new style is to launder the sample or even to dye a one or two yard piece. Many times by washing and tumble drying a sample piece, problems such as edge lines, miss selections of the stitch, miss creeling, fabric defects (i.e. barré, holes, etc.) and pattern defects will show up. Dyeing in many cases may allow for defects in both the yarn and fabric to be more easily seen.

STYLE RECORD KEEPING

Once the fabric and machine have been checked to confirm that everything has been set properly and that the fabric specifications have been met, the style should be recorded. A set-up sheet should be used that gives all the fabric information for historical reasons. Also, this information can be used for reproduction of the style at a later date. It is also recommended that a small fabric sample be cut and put into the fabric style folder.

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- Agricultural research leads to improved agronomic practices, pest control, and fiber variants with properties required by the most modern textile processes and consumer preferences. Ginning development provides efficient and effective machines for preservation of fiber characteristics. Cottonseed value is enhanced with biotechnology research to improve nutritional qualities and expand the animal food market.
- Research in fiber quality leads to improved fiber testing methodology and seasonal fiber analyses to bring better value both to growers and then mill customers.
- Computerized fiber management techniques result from in-depth fiber processing research.
- Product Development and Implementation operates programs leading to the commercialization of new finishes and improved energy and water-conserving dyeing and finishing systems. New cotton fabrics are engineered -- wovens, circular knits, warp knits, and nonwovens -- that meet today's standards for performance.
- Technology Implementation provides comprehensive and customized professional assistance to the cotton industry and its customers -- textile mills and manufacturers.
- A fiber-to-yarn pilot spinning center allows full exploration of alternative methods of producing yarn for various products from cotton with specific fiber profiles.
- The Company operates its own dyeing and finishing laboratory, knitting laboratory, and a laboratory for physical testing of yarn, fabric, and fiber properties including High Volume Instrument testing capable of measuring micronaire, staple length, strength, uniformity, color, and trash content.

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