YARN QUALITY BENCHMARKS FOR COTTON MURATA VORTEX YARNS

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Abstract

American textile companies have shown a great deal of interest in the Murata Vortex Spinner (MVS) since its introduction at the 1997 OTEMAS show. Several U.S. companies either have full production plants with MVS, have a sample MVS machine, or are contemplating the purchase of MVS machines. This work provides a first look at yarn quality indexes for MVS yarns. Most of the yarn test results used in the development of tentative yarn quality indexes were shared by Murata, and a few yarns were tested at the Institute of Textile Technology (ITT); in all, test results from 24 lots of 100% cotton MVS yarns were used in this work. Both carded and combed yarns were included, with the count range of 12/1 to 50/1. The manner in which MVS yarn compares to ring and open-end yarns is similar to the manner in which MJS yarn compares to ring and open-end yarns.

Results and Discussion

The ITT Monthly Yarn Quality Control and Calibration Program (MQC) indexing system has been used by ITT member companies for many years. The indexes for this work were developed using regression statistics, similar to the way the normal MQC indexes were developed. For the ITT MQC indexing system, an index of 100 represents the average property or variability of all mills in the particular database, an index of 125 represents a property or variability superior to 84% of all measured values, and an index of 150 represents a quality parameter superior to 98% of all measured values. The MVS yarn data for this work were categorized as either "weaving yarn" or "knitting yarn," which is different from our normal MQC program. Otherwise, an inquirer can simply select the yarn count, carded or combed, and knitting or weaving, and receive quality benchmarks. Users should recognize that the normal MQC database is based upon hundreds or even thousands of yarn test results, and that the MVS indexes are tentative. Nevertheless, the new MVS quality benchmarks cannot be obtained anywhere else, and represent a first approach to quantifying benchmarks.

Listed below are sample indexes for MVS yarns as compared to those for ring and open-end yarns. Table I shows 125 indexes for 14/1, 100% carded cotton MVS, ring, and open-end yarns; Table II provides 125 indexes for 18/1, 100% carded cotton MVS, ring, and open-end yarns; Table III includes 125 indexes for 35/1, 100% carded cotton MVS, ring, and open-end yarns; and Table IV shows 125 indexes for 50/1, 100% combed cotton MVS and ring yarns. Data provided in these tables show that MVS yarn compares favorably to ring yarn in terms of evenness and defects, but is weaker than ring yarn. However, MVS yarns "close the gap" as the yarn count becomes finer. The strengths of MVS yarn and open-end yarn are similar for coarser counts, but the MVS yarn is stronger than open-end yarn at finer counts. Defects and evenness levels are similar for the MVS and open-end yarns, although the %CV (1-yd) and %CV (3-yd) of open-end yarn are lower than those of MVS yarn. Research has shown that better mid-term evenness usually results in improved knitted fabric appearance. However, ITT and Murata research has also shown that the mid-term evenness of MJS yarn can be significantly improved with machine set-up changes such as increasing main draft.

Finally, Table V provides 125 indexes for 26/1, 50/50 P/C MJS, ring, and open-end yarns. These data were presented as a means for showing that the way MVS yarn compares to ring and open-end yarns is similar to the way in which MJS yarn compares to ring and open-end yarns. That is, MJS yarn is weaker than ring yarn but stronger than open-end yarn; MJS yarn is more even than ring yarn, and is similar to open-end yarn in this regard; and the mid-term evenness of open-end yarn is superior to that of either MJS or ring yarns. Of course, MVS and MJS machines both employ a three-zone roller drafting system.

Murata has demonstrated in sales literature that the tenacity of MVS yarn increases as yarn count increases. Data from this study show this to be true; the relationship between yarn count and yarn tenacity for carded MVS, ring, and open-end yarns is shown in Figure 1. As shown, MVS yarn tenacity increases to almost meet ring yarn tenacity at finer counts, while open-end yarn shows decreasing tenacity with finer counts. Figure 2 shows a similar relationship for combed MVS and ring yarns. One possible explanation is that for finer yarn counts a higher percentage of fibers in a given cross-section are able to be twisted into the core of the yarn, resulting in a structure similar to that of a ring yarn. Increasing the number of twisted fibers anchored in the core of the yarn results in improved fiber load sharing when a force is applied to the yarn.

Summary

Many American textile companies are interested in the new Murata Vortex Spinner (MVS) technology, and this work provides a first look at quality benchmarks for 100% cotton yarns. The manner in which MVS yarn compares to ring and open-end yarns is similar to the manner in which MJS yarn compares to ring and open-end yarns.

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Table I. 125 Indexes for 14/1, 100% Carded Cotton Yarn

Parameter	MVS*	Ring	OE
Single-End Strength, g	521	654	522
Single-End Strength %Vo	7.0	7.7	6.8
Single-End Elongation, %	6.3	7.0	7.3
Single-End Tenacity, g/tex	12.4	15.5	12.4
Uster %CV	13.1	15.2	13.6
Uster %CV (1- yd)	4.1	4.7	3.6
Uster %CV (3-yd)	2.8	3.4	2.7
Uster %CV (10-yd)	1.7	2.3	1.8
Thins (-50%)	0	8	5
Thicks (+50%)	53	281	47
Neps (+200%)	45	77	--

* MVS yarn is specified as a weaving yarn.

Table II. 125 Indexes for 18/1, 100% Carded Cotton Yarn

Parameter	MVS*	Ring	OE
Single-End Strength, g	403	512	404
Single-End Strength %Vo	7.4	8.1	7.3
Single-End Elongation, %	6.2	7.2	7.0
Single-End Tenacity, g/tex	12.3	15.6	12.3
Uster %CV	13.9	16.3	14.2
Uster %CV (1- yd)	4.4	4.7	3.5
Uster %CV (3-yd)	2.9	3.5	2.7
Uster %CV (10-yd)	1.8	2.3	1.8
Thins (-50%)	0	20	9
Thicks (+50%)	88	421	59
Neps (+200%)	93	136	--

* MVS yarn is specified as a knitting yarn.

Table III. 125 Indexes for 35/1, 100% Carded Cotton Yarn

Parameter	MVS*	Ring	OE
Single-End Strength, g	259	272	203
Single-End Strength %Vo	8.9	10.0	9.1
Single-End Elongation, %	5.9	6.5	6.6
Single-End Tenacity, g/tex	15.4	16.1	12.0
Uster %CV	16.9	20.9	16.5
Uster %CV (1- yd)	5.3	4.6	3.2
Uster %CV (3-yd)	3.5	3.7	2.8
Uster %CV (10-yd)	2.1	2.7	2.0
Thins (-50%)	100	188	43
Thicks (+50%)	234	1218	110
Neps (+200%)	296	625	--

* MVS yarn is specified as a weaving yarn.

Table IV. 125 Indexes for 50/1, 100% Combed Cotton Yarn

Parameter	MVS*	Ring
Single-End Strength, g	232	250
Single-End Strength %Vo	10.3	8.8
Single-End Elongation, %	5.6	6.0
Single-End Tenacity, g/tex	19.6	21.2
Uster %CV	15.9	15.4
Uster %CV (1- yd)	5.1	4.6
Uster %CV (3-yd)	3.2	3.6
Uster %CV (10-yd)	1.8	2.7
Thins (-50%)	96	14
Thicks (+50%)	104	128
Neps (+200%)	132	131

* MVS yarn is specified as a weaving yarn.

Table V. 125 Indexes for 26/1, 50/50 P/c Yarn (1.2 Dpf Polyester)

Parameter	MJS	Ring	OE
Single-End Strength, g	372	504	350
Single-End Strength %Vo	9.1	9.1	8.2
Single-End Elongation, %	9.2	10.4	8.8
Single-End Tenacity, g/tex	16.4	22.2	15.4
Uster %CV	15.4	17.0	15.1
Uster %CV (1- yd)	4.9	5.1	3.4
Uster %CV (3-yd)	3.1	3.8	2.7
Uster %CV (10-yd)	1.8	2.5	1.9
Thins (-50%)	21	23	14
Thicks (+50%)	157	529	107
Neps (+200%)	205	322	--

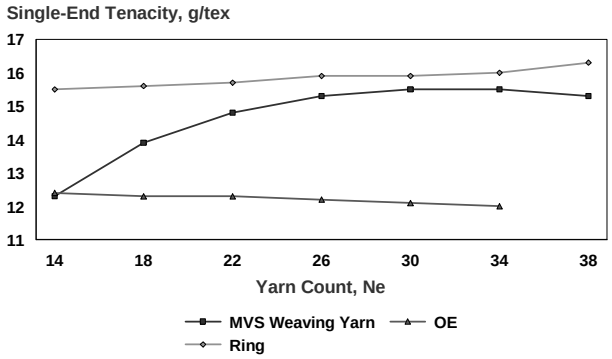

Figure 1. Relationship between yarn count and single-end tenacity, 100% carded cotton yarns.

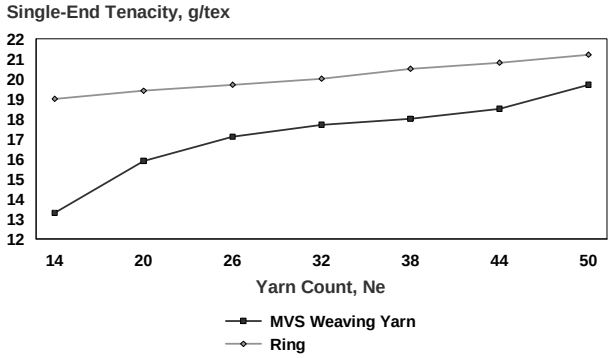

Figure 2. Relationship between yarn count and single-end tenacity, 100% combed cotton yarns.