RECENT DEVELOPMENTS AND SOLUTIONS OF HIGH-SPEED RING SPINNING PROCESS

Mahmud Hossain, Anwar Abdkader and Chokri Cherif

Institute of Textile Machinery and High Performance Material Technology (ITM), Technische Universität Dresden, Dresden, Germany

Corresponding author e-mail: mahmud.hossain@tu-dresden.de

Abstract: Ring spinning is one of the most versatile and leading techniques to spin natural and synthetic fibers with highest yarn quality as compared to other spinning systems. In spite of its flexibility to spin yarn from different materials, it is still far behind other spinning systems in terms of high production rates. This low production is associated with many technological limitations in the existing twisting system (Ring-Traveler-System). The prime cause is friction between ring and traveler and the high yarn tension that hinders to uplift the spindle speed.

Many attempts have been reported, to reduce or, eliminate the friction between ring and traveler as well as to reduce the yarn tension. The recent advancement and their solutions for the high-speed ring spinning process can be categorized as follows:

- Developments of low-friction ring/traveler system to reduce the friction such as different forms, materials and coatings of ring/traveler system
- Elimination of existing ring/traveler system with the friction-free twisting element such as electromagnetically controlled ring, air bearing, superconducting magnetic bearing (SMB) etc.
- Reduction of yarn tension such as cap-,loop-, nova spinning, multiple balloon technology etc.
- Reduction of yarn breakages by adding false twisting device based on air-nozzle or, Nu-torque technology

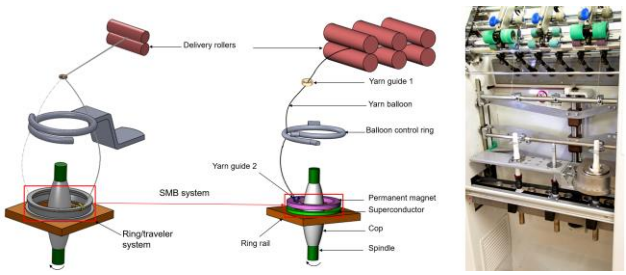

Figure 1 High speed ring spinning based on friction free superconducting magnetic bearing (SMB) system

To eliminate the frictional problem in the current ring/traveler system, the implementation of the ring levitated by air-pressure or magnetic force based on levitation principle is one of the most promising inventions to replace the ring/traveler system to increase the productivity. However, it is complicated to control the rotating ring at higher speeds. Most of the ideas with the rotating rings have not been implemented in the real spinning process. On the other hand, the implementation of SMB system offers a friction free twisting, where no sensor or complex control system is during its rotation to impart twist in the ring spinning process. The functionality of the integrated SMB system is to be investigated up to an angular spindle speed of 50.000 rpm [1, 2]. Further researches will be carried out particularly on the non-stationary yarn dynamics in interaction with the SMB system during the high-speed ring spinning process.
Thus, the results of the presented work reveal the enormous potential of the innovative twisting mechanism, so that the productivity of ring spinning can be doubled for the first time in a hundred years.

KEYWORDS: Ring spinning, twisting system, productivity, superconducting magnetic bearing, yarn tension, twist propagation

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REFERENCES

[1] DE 11 2012 000 596 A5. evico GmbH Dresden; Leibniz-Institut für Festkörper-und Werkstoffforschung Dresden e.V.; Technische Universität Dresden. (16.01.2014). Cherif, C.; Abdkader, A.; Schultz, L., *et al.*

[2] Hossain, M.; Sparing, M.; Espenhahn T.; Abdkader, A.; Cherif, C.; Hühne, R.; Nielsch, K.: In situ measurement of dynamic yarn path in a turbo ring spinning process based on superconducting magnetic bearing twisting system. *Text. Res. J.* 90 (2020) 951-968