# TORSIONAL RIGIDITY AND HYSTERESIS OF SINGLE SPUN YARNS

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## ABSTRACT

Very little work has been reported, describing the contributions of fibre diameter distribution, yarn twist, fibre ellipticity and fibre length distribution to the torsional rigidity of single spun yarn. And there is a little research pertaining to contribution of the yarn twist and constituent fibre characteristics to yarn torsional hysteresis.

In the work to be described in this paper, authors show how the torsional rigidity of a single spun yarn can be calculated from knowledge of its fibre diameter distribution, yarn twist, fibre ellipticity, mean fibre length. And this paper shows how the yarn twist and constituent fibre characteristics on the yarn affect the torsional hysteresis and discusses the contributions of inter-fibre friction and viscoelasticity of fibres in terms of energy loss and coercive couple.

The conclusions are as follows

The estimated torsional rigidity of single yarns can be calculated from the mean fibre diameter together with four correction factors and minimum torsional rigidity. Among these factors, the correction ones due to fibre diameter distribution and twist are most dominent. And the extent of contribution of inferfibre friction to the torsional riqidity, $C_5$ was clearly analyzed by comparing the values between estimated and experimental torsional riqidity.

However, the torsional behaviors of the fibres in the yarn are seen to be more affected by interfibre friction compared to that of bending behavior.
This phenomena were well explained by experimental results measured by torque tester, i.e. by energy loss on the torsional hysteresis curve and coercive torsional couple.