Amongst the various new spinning technologies only rotor spinning has so far been able to establish itself as a viable system particularly in the coarse count range. The system is more versatile enough to handle many types of fibres, both natural and man-made. In view of the increasing interest by spinners in rotor spinning, it was thought worthwhile to explore the possibilities of spinning quality yarns from acrylic and its blends, especially with viscose rayon on this system.

The first phase of the work deals with the assessment of the influence of blend ratio and twist factor on the characteristics of acrylic-viscose rotor spun yarns. Since the fibres to be used have to be optimised for length and other characteristics, preliminary trials were carried out with viscose rayon fibres of different lengths. It was observed that from various considerations the optimum fibre length is 38 mm. According to the experimental combinations of a rotatable central composite design, acrylic and viscose yarns and their blends were spun from 2 denier, 38 mm length fibres on an Ingolstadt Rotor Spinner RU 11/RU 80 (4602). It is found that yarns spun from a viscose-majority blend of acrylic-viscose are stronger than acrylic-majority yarns at all the twist levels. However, yarns with higher proportions of acrylic fibres are more regular. It is interesting to observe that the twist loss, in general, increases with increase in twist factor and is higher for yarns with higher viscose content.
Rapid straining of ring yarn is known to result in a higher breaking load. This may or may not hold good for rotor yarns owing to their different structures. Therefore, it was desired to study the influence of extension rate and test length on the tenacity and breaking extension of acrylic-viscose rotor yarns. The yarns were tested for single strand strength and breaking extension on an Instron, using extension rates of 50, 100, 200, 500 and 1000 mm/min at two test lengths, 100 and 500 mm. It is seen that maximum yarn tenacity occurs at an extension rate of 200 mm/min for the 100 mm test length. It drops gradually as the extension rate is increased to 1000 mm/min, but the 500 mm test length shows a steady increase upto 500 mm/min and registers very little increase at 1000 mm/min extension. One of the reason for this phenomenon seems to be that most of the earlier researchers considered the relationship between the yarn tenacity and the strain rate as a logarithmic one and hence the strain rates were chosen in such a way that the ratio between the successive strain rates was 1:10. The strain rates commonly used were 1, 10, 100 and 1000 mm/min, thus completely missing the intermediate ones between 100 and 1000 mm/min. Yarn strength shows a slight reduction as the test length increases from 100 mm to 500 mm with extension rates in the range of 50 to 500 mm/min. The breaking extension increases, with increasing extension rate, particularly with the shorter test lengths.
Another important aspect which gives an assessment of the yarn performance is its resistance to repeated extension. The study shows that repeated extension of acrylic-viscose yarns causes a decrease both in breaking strength and breaking extension. The decrease in both of them increases with an increase in amplitude of extension or number of cycles and is lower in low twist yarns.

It is accepted that the twist-liveliness, leading to snarling and spirality, occurs predominantly due to the relatively high-twist generally used for rotor spun yarns. The snarling tendency of these yarns can be reduced by lower spinning twist and relaxation treatment. However, these factors, when not suitably controlled, can be responsible for many problems in processing and usage. Though numerous studies have been carried out on the influence of relaxation treatment on the characteristics of continuous filament and ring spun yarns, there is little work reported on rotor yarns. It is seen that steam-relaxation treatment has a significant effect on the breaking strength, breaking extension, diameter, bulk and residual shrinkage of acrylic-viscose rotor spun yarns. The changes, however, depends upon the blend proportions and the twist factor. One of the most plausible outlet of yarns from acrylic and its blend is the knitted garments. The second phase of the work is therefore concerned with the investigation of the contribution of yarn twist, tightness factor and relaxation treatment to the physical characteristics of weft knitted
fabrics. It was found that tightness factor affects courses per centimetre, wales per centimetre and stitch density considerably. The values of fabric thickness, weight per unit area and number of pills were observed to be dependent on yarn twist and tightness of construction for both dry- and fully-relaxed knits.