

An Analysis of the Air-jet Yarn-texturing Process - Reply

We thank the writers of the letter to the Editor commenting on the seven-part paper by Acar et al. entitled "An Analysis of the Air-jet Yarn-texturing Process". The writers of this letter start by saying "There are certain serious inconsistencies between theory and practice in the otherwise excellent papers". This must, of course, be left to the judgement of the readers, but we shall show that it ought to be very clear to anyone who has a good understanding of the airjet texturing mechanism that there are no such inconsistencies. We feel that the misunderstood point that the writers of the letter detailed is very minor when one considers the vast amount of work in this field that we have published in learned society journals and conference proceedings [1-261].

To be able to understand the differences between the stabilizing-zone tensions and the instability-test results, and to appreciate the significance of the stabilizing zone as a part of the texturing process, one must understand the nature of these two very different stages and what actually happens to the yarn during each of them.

The stabilizing-zone tension is applied continuously during the texturing process, immediately after the textured yarn emerges from the nozzle. An extension normally between 3 and 5% is applied; this results in a tension of the order of 10 gf (98 mN) for an overfeed of about 20% for a typical supply yarn in the region of 200 dtex with about 2 dtex/fil fineness. By contrast, the instability tests are applied to textured yarns that have, of course, already gone through this stabilizing process. The tension applied in these instability tests is 0.5 gf/dtex (49 mN/tex) or 0.33 gf/den (29 mN/tex), depending on the test used, which results in a tension of about 100 gf (981 mN) for a typical textured yarn of, say, 200 dtex. This is therefore an order of magnitude greater than the tension applied during the stabilizing process.

What the stabilizing zone achieves, as part of the complete texturing process, is simply the removal, by pulling out, of wild and looser loops under the applied, relatively low tension, which thereby gives the yarn a better appearance and a more stable structure. It is not likely to pull out any firm loops or to alter or affect in any way the desired structure of the final textured yarn. It is obvious that the better-entangled yarns, which are obtainable when the continuous-filament yarn is wet-textured or textured at higher pressures, will show higher tensions in the stabilizing zone for a given extension. Our experimental results [8] prove this point.

In contrast to what happens to the yarn within the stabilising zone of the process itself, the instability test causes some structural changes to occur in the textured yarn during the test because the yarn is subjected to a much greater tension, i.e., about ten times that to which it had been subjected in the stabilizing zone as mentioned above. At such relatively high tensions, some of the fixed loops will be pulled out, which thus indicates a relatively higher yarn instability. For poorly textured yarns with fewer loops and entanglements, and therefore frequently straight-filament sections, the instability tests will indicate lower instability due to the resistance to the applied tension of the constituent filaments possessing no loops. This behaviour is very similar to that indicate very low instability, despite the lack of any loops whatsoever. Consequently, the greater the number of loops, the greater is the likelihood of pulling them out during the instability tests, thereby resulting in higher instability values. Consequently, it is perfectly possible to obtain both increased stabilizing-zone tensions and increased values of instability-test results for yarns with a greater degree of entanglement and loop formation, which occurs when they are either wet-textured or textured at higher pressures.

In the light of the foregoing discussion, we conclude that Sengupta et al.'s two claims that "If the extensibility results are correct, the stabilization-zone tensions should also be lower for the yarns with higher extensibility" and "The process that leads to a higher stabilization tension (for the same level of stabilization stretch) cannot produce yarn with higher instability" are both without any sound basis and are therefore of no constructive value.

To conclude, we should like to refer the reader to the comments we published [51 regarding the inadequacy of instability-test results alone for judging the quality and suitability of air-jet-textured yarns for intended end-uses. In that paper, it is suggested that, for a sound assessment of air-jet-textured yarns, the physical properties and structure of the textured yarn should also be analysed in addition to making instability tests.

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REFERENCES

- [1] G.R. Wray and M. Acar in "Proceedings of International Textiles Symposium, Izmir, Turkey, Nov., 1981", Ege University Press, Izmir, Turkey, 1984, p.295.
- [2] M. Acar, A.J. Alexander, R.K. Turton, and G.R. Wray in "Texturing Today" (Shirley Institute Publication S46), Shirley Institute, Manchester, 1982, p.207.
- [3] M. Acar, A.J. Alexander, R.K. Turton, and G.R. Wray. Int. Text. Bull., Yarn Forming, 1983, No.3, 49.
- [4] G.R. Wray and M. Acar in Air-jet Texturing Conference, Clemson University, S.C., U.S.A., Sept., 1985.
- [5] A. Demir, M. Acar; and G.R. Wray. Text. Res. J., 1986, 36, 191.
- [6] M. Acar and G.R. Wray. J. Text. Inst., 1986, 77, 19.
- [7] M. Acar, R.K. Turton, and G.R. Wray., J. Text. Inst., 1986, 77, 28.
- [8] M. Acar, R.K. Turton, and G.R. Wray., J. Text. Inst., 1986, 77, 235.
- [9] M. Acar, R.K. Turton, and G.R. Wray., J. Text. Inst., 1986, 77, 247.
- [10] M. Acar, R.K. Turton, and G.R. Wray., J. Text. Inst., 1986, 77, 359.
- [11] M. Acar, R.K. Turton, and G.R. Wray., J. Text. Inst., 1986, 77, 371.
- [12] M. Acar and G.R. Wray. J. Text. Inst., 1986, 77, 377.
- [13] Acar and G.R. Wray. Tekstil & Teknik, 1986, 2, No. 18 (July), 8; No. 19 (Aug.), 10; No. 20 (Sept.), 4.
- [14] G.R. Wray, M. Acar, R.K. Turton, and T.G. King in "Proceedings of SERC ACME Directorate Grantees Conference, University of Salford, Sept., 1986".
- [15] M. Acar, T.G. King, and G.R. Wray. Text. Asia, 1986, 17, No. 11, 62.
- [16] M. Acar in "Proceedings of 4th International Symposium on Textile Technology, Izmir, Turkey, 15-17 Oct., 1986", Aegean University Press, 1986, p.221.
- [17] A. Demir, M. Acar, and G.R. Wray in "Proceedings of 4th International Symposium on Textile Technology, Izmir, Turkey, 15-17 Oct., 1986", Aegean University Press, 1986, p.131.
- [18] M. Acar, R.K. Turton, and G.R. Wray. J. Eng. Industr., 1987, 109, 197.
- [19] A. Demir, M. Acar, and G.R. Wray. Text. Res. J., to be published.

- [20] A. Demir, M. Acar, and G.R. Wray in "Proceedings of 4th International Conference on Polypropylene Fibres and Textiles, Nottingham, Sept., 1987", the Plastics and Rubber Institute, London, 1987.
- [21] M. Acar in "Textile Panorama in 21st Century" (International Textile Conference, New Delhi, India, Nov., 1987).
- [22] A. Demir, M. Acar, and R.K. Turton. *Melliand Textilber.*, 1988, 69, 233.
- [23] M. Acar and A. Demir in "Air-jet Texturing: Present and Future" (International Conference, Loughborough, Oct., 1987), Loughborough University of Technology, Loughborough, 1987, 4/1.
- [24] M. Acar. *Chemiefasern/Textilindustrie*, 1988, 38/90, 322.
- [25] A. Demir and M. Acar in "Air-jet Texturing: Present and Future" (International Conference, Loughborough, Oct., 1987), Loughborough University of Technology, Loughborough, 1987, 5/1.
- [26] M. Acar and G.R. Wray in "Air-jet Texturing: Present and Future" (International Conference, Loughborough, Oct., 1987), Loughborough University of Technology, Loughborough, 9/1. *J. Text.*