

## SOFT THROUGH-AIR DRIED FACIAL TISSUE

### BACKGROUND OF THE DISCLOSURE

Tissue products, such as facial tissues, paper towels, bath tissues, napkins, and other similar products, are designed to include several important properties. For example, the products should have good sheet bulk, a soft feel, and should have sufficient strength and durability to withstand use. Further, to improve wiping utility, it may be desirable to provide the product with a degree of surface texture. Unfortunately, however, when steps are taken to increase one property of the product, other characteristics of the product are often adversely affected.

One means to balance important tissue product properties is to manufacture the products by processes that do not compress the nascent web during drying. Such processes often consist of non-compressive drying techniques in which the nascent web is molded to the contours of a patterned fabric that supports the web as it is dried. The wet molded web is typically dried by passing heated air through both the fabric and the wet web as it is transported over a cylindrical dryer. In this manner the web is imparted with a three-dimensional pattern and its bulk is maintained.

One widely used non-compressive drying process used to manufacture tissue products is through-air drying, which consists of transferring a wet-laid web to a coarse, highly permeable through-air drying fabric imparted with three-dimensional surface topography. The wet-laid web is molded to the through-air drying fabric and is supported by the fabric until it is at least almost completely dry. The resulting dried web is softer and bulkier than compressively dewatered tissue webs, such as wet-pressed webs, because fewer papermaking bonds are formed and because the web is less dense. Further, the through-air dried web often has a three-dimensional pattern imparted by the through-air drying fabric.

While through-air drying results in softer and bulkier webs compared to manufacturing processes that rely upon compression to dewater the web, the process has limitations. To generate bulk, tissue makers often employ coarse through-air drying fabrics having a high degree of surface topography. As the wet web is molded to the high topography fabrics and dried it retains the shape of the fabric resulting in a dried tissue web having a high degree of surface topography. While such topography contributes to bulk it may impart the web with a rough surface and decrease the perceived softness of the web. Unfortunately, simply reducing the coarseness and topography of the through-air drying fabric to produce a smoother, less bulky web is not sufficient to improve softness because, when the surface topography is reduced the web becomes denser and fiber-fiber bonding is increased, which has a negative effect on softness. Thus, providing a through-air dried tissue web having good bulk and surface texture, while maintaining softness has proven to be elusive.