ANNEALING OF GLASS

BY

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ABSTRACT

During production, glass articles are subjected to sudden heating or cooling. This produces temperature gradients in the material. Consequently, stresses are produced as a result of different parts of the glass expanding or contracting by different amounts. In order to remove or to reduce these stresses, annealing of the product is carried out. The temperature of glass is first increased to its annealing temperature and then reduced gradually by passing it through a series of temperature zones in an annealing lehr.

This thesis presents the results of a study carried out at the Ceylon Glass Company, Ratmalana to ascertain the significance of various parameters associated with annealing.

An attempt has been made to correlate the zone temperatures, thickness of the product, lehr speed and breaking pressure of bottles with the magnitude and character of residual stresses, in order to enhance the quality of products and reduce the number of breakages with a possible reduction in the total power consumption.

Composition analysis have been carried out for Amber and Flint glass to determine the correct annealing temperatures. Samples of bottles annealed at these temperatures with varying lehr parameters were tested for pressure and thermal shock resistance. Nature of failure for each sample was identified. The collected data was analyzed using frequency charts, Stanchi & Toninato studies and Adam - Williamson law. Using Stanchi Toninato studies bottle surface stress variation in regions just below the shoulder and just above the base with thickness was observed in order to reduce the number of breakages.

The Adam - Williamson equation was modified for the process of bottle manufacturing by finding the annealing constant using stress analysis.