Internal Bubble Cooling

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Question No. 1
The internal bubble cooling (IBC) process is well known as a productivity improvement in blown tubular film. However, the optical properties of low density polyethylene (LDPE) film produced via this process are not as good as film produced via more conventional external bubble cooling methods (haze and gloss). What are the fundamental principles which result in poorer optics for LDPE produced via the IBC process? What fundamental resin characteristics would result in improved optics (haze and gloss) of blown LDPE film produced via the IBC process?

Answer to Question 1
In a conventional blown film process an external air ring controls the cooling process and this controls the height of the frost line where the transition from melt to solid occurs. Increasing the height of the frost line usually enables the extrudate surface to iron out surface irregularities.

Any imperfection on melt surface, once frozen, enhances haze and lowers optical properties, e.g., gloss.

— A.K. Rose, Sr.

With internal bubble cooling, chances of freezing surface irregularities are higher as the bubble is set faster to enable higher production rate.

Adjusting melt temperature, temperature of the air in internal cooling stack and the external air ring, along with controlling the frost line height will help improve the optical properties of the final product. Sacrifice in product output to adjust the above variables is not too great and can be justified due to added product qualities.

From observation, a low density polyethylene with a wide molecular weight distribution (MWD), and long branching or a copolymer seems to give good optics at a favorable output.

See also:

- Blown film air cooling
- Blown film - cooling air parameters
- Blown film versus the cast film process
- Centrifugal fans
- Effect of temperature

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