Primer Intelligence

MICA CORPORATION

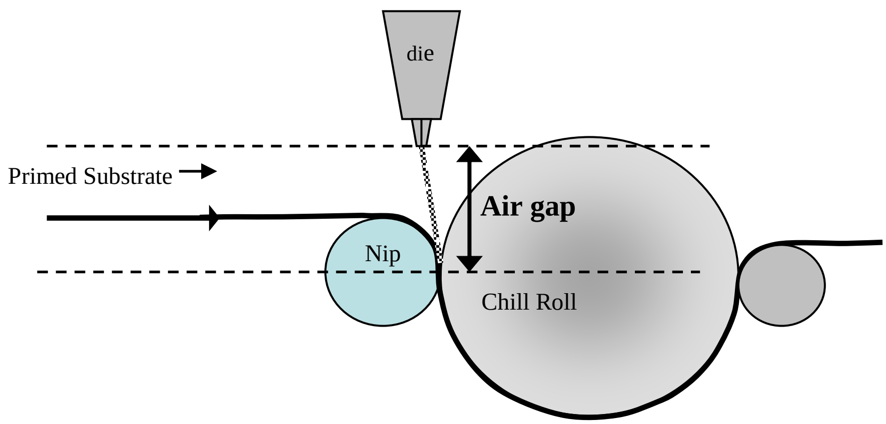
9 MOUNTAIN VIEW DRIVE, SHELTON, CT 06484 USA ■ +1 (203) 922-8888 ■ INFO@MICA-CORP.COM ■ WWW.MICA-CORP.COM

Time in the Air Gap

Adequate oxidation of an extrusion coating resin in the air gap is critical for adhesion to the primer.

A primer imparts functional groups, or polarity, to a substrate. A polar substrate will bond well to a polar extrudate. Unfortunately, polyethylene is a nonpolar hydrocarbon resin. The way to produce a functionalized polyethylene surface is to extrude it at high temperatures, approximately 320°C (610°F). Under these conditions, atmospheric oxygen attacks the hot resin and forms oxidation products (carbonyl, carboxylic acid, aldehyde, ester, peroxide, etc.) while passing through the region between the extruder die lip and the combining nip, the "air gap".

At a given temperature, the degree of oxidation can be influenced by varying the amount of time the resin spends in the air gap. By holding line speed constant and increasing the size of the air gap, the residence time of the melt increases and the adhesion to the primer improves. Too much residence time, however, may lead to excessive melt cooling and reduced adhesion.



Field experience has shown us that for LDPE, the best time in the air gap (TIAG) is in the range of 60 to 120 milliseconds (msec), and 100 msec is a good starting point for experimenting. TIAG may be calculated as follows:

Metric: **TIAG** (msec) = $\dfrac{\textbf{gap}\ (\text{mm}) \times 60}{\textbf{line speed}\ (\text{meters per minute})}$

English: **TIAG** (msec) = $\dfrac{\textbf{gap}\ (\text{inches}) \times 5000}{\textbf{line speed}\ (\text{feet per minute})}$

Some resins, such as EVA, degrade at high melt temperatures and are extruded at relatively low temperatures. In these cases, *ozone assistance* may be necessary to affect adequate oxidation.