LyondellBasell Technical Tip

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Rough or Dull Surface

A rough surface is just that: small bumps or raised areas that appear and feel grainy. While the material may pass all tests, the rough surface detracts from its appearance and indicates a processing problem exists.

When the problem of rough surface arises, check the following:

1. Was there a material change? If possible, pull a sample or check certified reports to determine if the melt index of the resin was changed significantly. A change in melt index may be the result of improperly blended material or new material.

2. Check for a malfunctioning temperature controller, thermocouple or heater. Lower than normal processing temperatures can cause rough surface problems.

3. Is the problem detected on product from more than one extruder? Check for high moisture content, a common cause of roughness, although found more often in products containing carbon black than in foam/skin insulations. Packaged material should be brought in from cold storage at least 24 hours prior to processing to avoid condensation.

4. Have any process changes or repairs to the equipment occurred?

5. When was the last time the machine was cleaned? Screw pulled? Breaker plate and screen pack checked?

6. When the problem of a dull surface arises, it is normally associated with cold compound or insufficient back pressure. If the second, increase the screen pack.

Possible causes of Rough Surfaces and recommended solutions:

A. High Moisture Content In Resin

1. If there is a bulk handling system, is the problem apparent on more than one line?

2. Make sure your hand is dry and insert it into the material. Remove your hand and see if a large number of pellets stick to your hand. If so, there may be a moisture problem (this is a crude method, but a starting point).

If the material is damp, run it through a hopper dryer.

B. Incorrect melt temperature

1. Adjust the melt temperature to between 425° and 475°F for LDPE and between 450° and 500°F for HDPE.

2. Check with the resin manufacturer for the recommended temperature profile.

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Rough or Dull Surface *(continued)*

C. Melt Fracture (Normally Associated With Thin Coatings At High Speeds), Creating A Coarse, Web-Like Appearance

1. Try increasing the melt temperature.
2. The drawdown ratio may be too high or the die size may be incorrect.
3. It may be necessary to try a more streamlined die with a short land die exit.

D. Crosshead And/Or Die Tip Temperature Too Low (Look For Dull Surface)

1. Surface may improve with the addition of a die tip heater (or a flame to the die tip).

E. Non-Homogeneous Melt from Extruder

1. Check the screen pack and if necessary, try a finer screen pack, but monitor head pressure.
2. Check screw design and residence time in the extruder. A higher L/D ratio may be needed.

F. Over-Blown Foam Shows Through The Skin

1. Check the cell structure and correct if necessary.

G. Water Droplets On The Plastic (Can Be Associated With Bubbles In The Water Bath)

1. Check the circulating pump for cavitation. Water should enter bath below operating level.
2. Lower water temperature or increase water velocity.

H. Gum Space Too Narrow. Although an Unlikely Cause, Gum Space Needs to be Checked.

1. Increase gum space in small increments.

I. Wet Wire Going Into the Die

1. Change wipes. Please note that dirty wipes can result in contamination of the wire and generate other problems.

J. Too High Conductor Preheat

1. Check insulation stretch. If this factor is adequate, lower preheat.

K. Inadequate Cooling (Plastic Still Hot when Exiting the Cooling Trough)

1. Slow the line speed, lower the melt temperature and/or lengthen the cooling trough.

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Rough or Dull Surface *(continued)*

L. Nicks or Scratches on the Die. Die Imperfections Normally Cause a Rough Surface only on a Portion of the Insulation Circumference.

M. Obvious Mechanical Damage to the Insulation

1. Stop all wire vibrations.
2. Align the water trough to the wire path.
3. Increase the amount of water in the trough.
4. Check sheaves for alignment to the wire path.
5. Check take-up for proper operation.

N. Too Many Color Chips Added

1. Lower the number of color chips added, as excessive amounts can affect surface appearance as well as physical properties.

O. Rough surfaces in a coextruded product may be due to interfacial instability caused by dissimilar viscosities of the two (or more) materials.

Note: A rare problem that can result in rough surface on skin or solid material occurs when the extruder is running at a very low speed, but the temperature profile is different from that recommended by the resin manufacturer. Because the extruder is running so slowly, the material's residence time is long enough to result in its degradation and an increase in its molecular weight, resulting in a rough surface on the end product. If the extruder speed cannot be increased, lower the temperature profile to the point where the roughness disappears. When using this technique, watch out for excessive head pressures and check physical properties.

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