Troubleshooting Extrusion Problems in Coextrusion Film Applications

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Common issues

- Haze lines
- Melt stability
- Gels
- Interfacial instability
- Poor gauge

Contributing Factors
Haze Lines

- Processing temperatures
- Temperature gradient
- Screw and barrel conditions
- Die design

Considerations:Melt stability

- Resin selections
- Extruder sizing
- Product layflat and blowup ratios

Gels

- Which layer(s) exhibit gels?
- Resin contamination
- Screw and die design

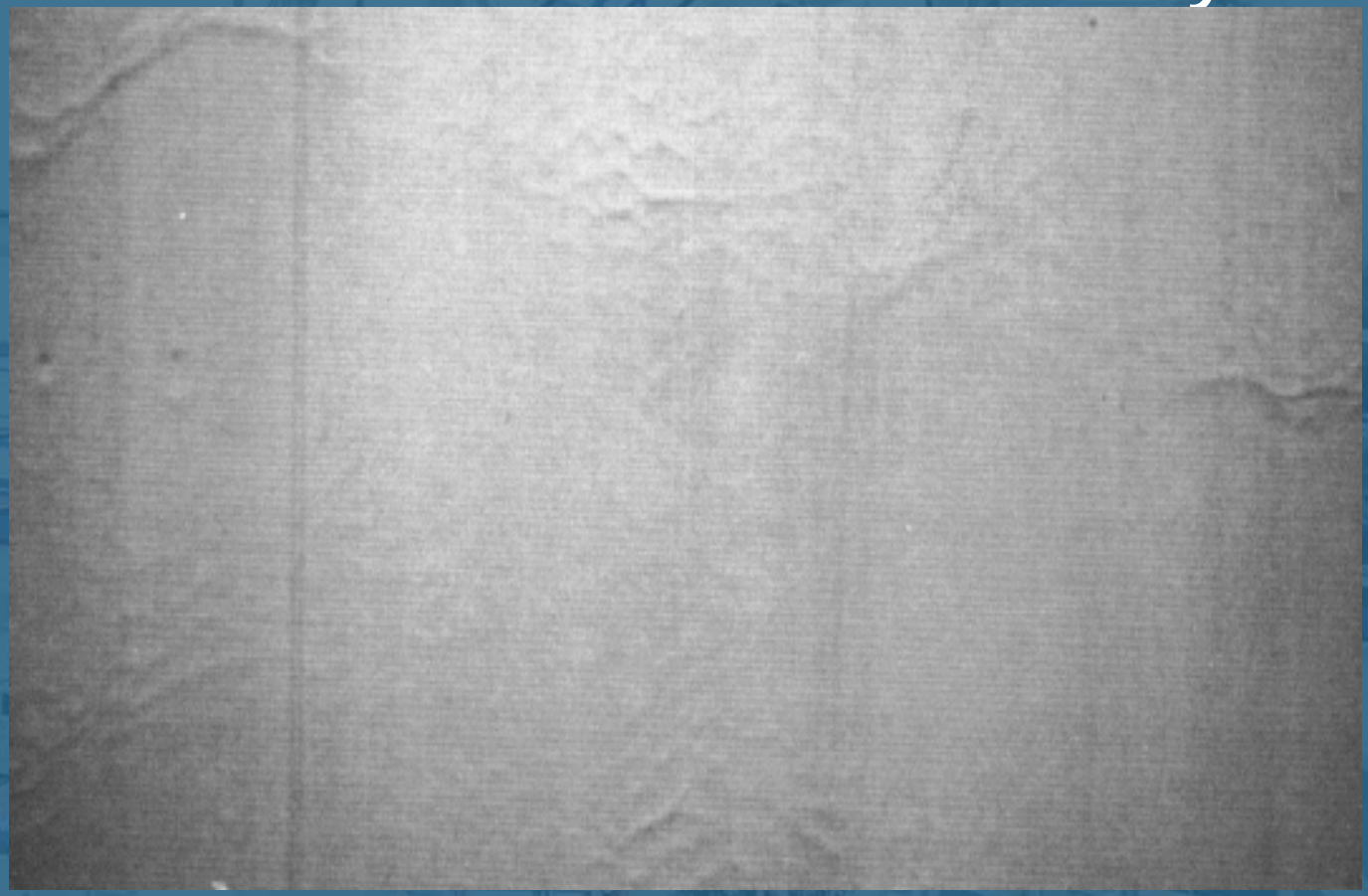
Gels - Unmelts

- Resin sources
- Processing temperatures
- Resin blend compatibility
- Screw design

Gels - Degraded Gels

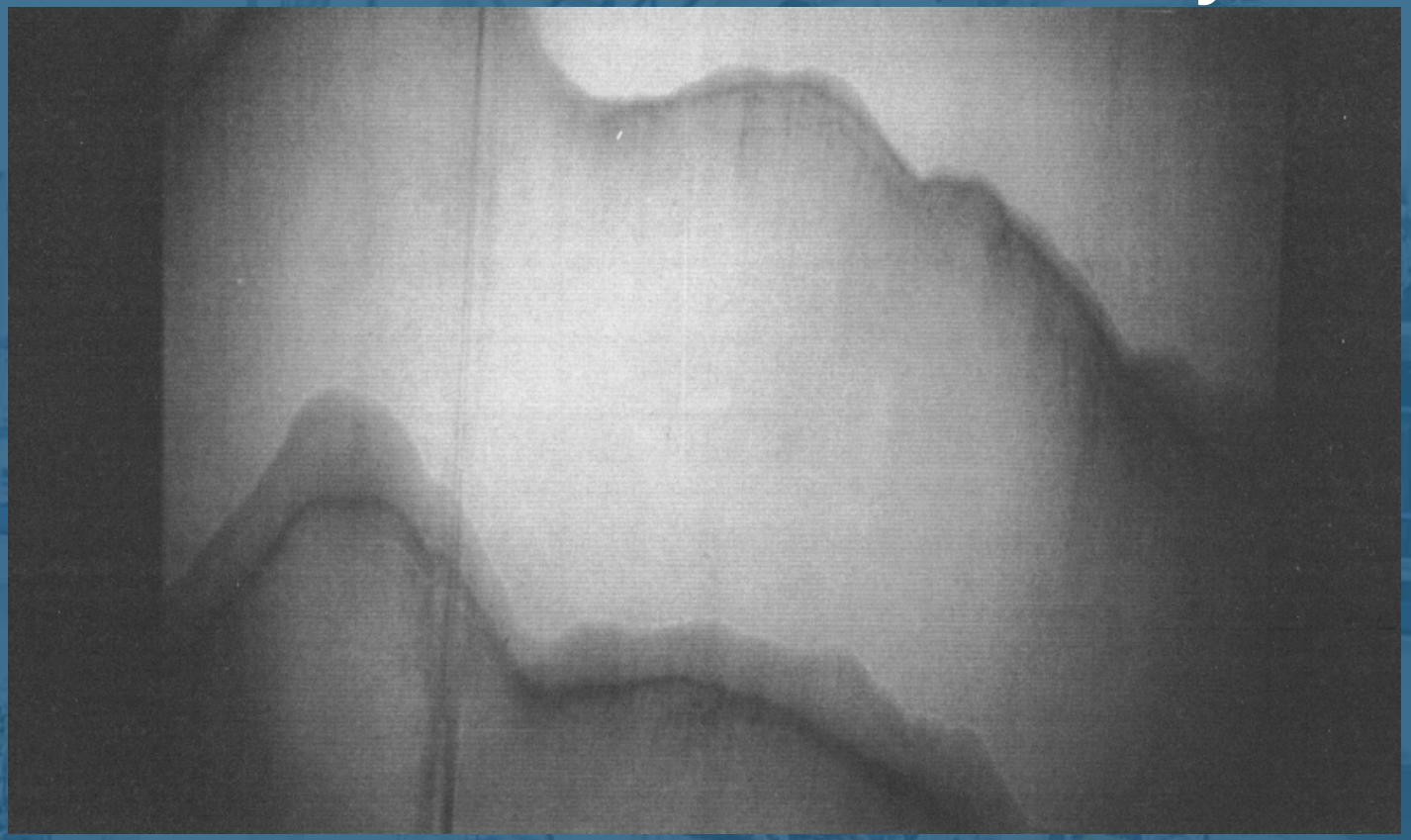
- Resin contamination
- Processing temperatures
- Screw and barrel conditions

Interfacial instability



Zig-zag – viscosity mismatch

Interfacial instability



Wave type – elongational viscosity differences between layers

Interface instability

- Identify the interface problem –possibly more than one location
- Change only one parameter in one layer at a time
- Look for layer percentage change and a temperature change

Poor Gauge

- Temperatures and outputs
- Screw and barrel conditions
- Die design
- Air ring and local ambient temperature

Case Study:
7 layer blown film line

- Stacked pancake die – inner layer at bottom of stack, outer layer at top of stack
- Trouble free operation for a few years
- Routine die cleaning
- Sudden appearance carbon buildup on die, poor gauge – all after die cleaning

Information Required

- Recipe change? New structures?
- What materials in each layer?
- Layer percentage, output
- Processing temperatures of each layer
  - setpoints and actuals if available
- Screw RPM of each layer
- Significant events –e.g. power outage, extruder failure

Assessment/Evaluation

- Calculate shear rates and shear stresses

  - material flow, potential degradation location

  - premature hardware failure, e.g. screw and barrel wear or heater band failure

Problem identified

- New recipe
- Output rate calculations
  - Output in one layer too low
  - Shear rates 4-6sec $^{-1}$
- Residence time for that layer too long
  - Carbon build up
  - Change in flow behaviour

Action:Results

Increase output of specific layer

- Better gauge uniformity
- Faster changeover times
- Reduced downtime – less cleaning time

Common issues in coextrusion

	Processing Temperatures	Screw and Barrel Conditions	Resin Selection	Die Design	Screw Design	Air Ring & IBC Conditions
Gels	X	X	X	X	X	
Unmelts	X		X		X	
Gauge	X	X		X		X
Interfacial Instability	X		X	X		
Haze Lines	X	X	X	X	X	
Melt Stability	X	X	X			X

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Thank You

PRESENTED BY

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