

Wax Pattern Defect Troubleshooting

R&R recommends utilizing the following potential causes and corrective actions for troubleshooting wax pattern related defects in your foundry.

Air Entrapment (Bubbles)

| Potential Cause | Corrective Action |
|---|--|
| Air bubbles in wax purge operation | Perform wax conditioning sequence per wax supplier |
| Acceleration/ramp-up too short (electronic control) | Increase time to reach full flow rate |
| Excessive mold release | Clean mold and decrease mold release use |
| Improper mold venting due to excessive clamp force | Reduce clamp force |
| Injection system fill rate too rapid | Increase time to fill injection system chamber |
| Injection system seals worn, allows air to be pulled with wax | Inspect injection unit for wax leakage, may require rebuilding |
| Low wax level in reservoir, air pulled into system | Check wax level in reservoir or wax delivery system |
| Mold temperature | Increase or decrease temperature |
| Mold vents blocked due to equipment | Flip mold over (top to bottom), changing vent arrangement if possible |
| Nozzle temperature | Make adjustments to nozzle temperature |
| Sprue location or size causing turbulence | Evaluate mold design to reduce turbulence |
| Turbulence/mold loading into press | Check mold sprue is in line to injection nozzle not to cause flow turbulence |
| Vents filled with wax/mold release | Clean vent holes |
| Wax flow too high | Decrease wax flow or longer injection ramp-up time |
| Wax hot | Decrease wax reservoir temperature |

Flash

| Potential Cause | Corrective Action |
|--|---|
| Acceleration/ramp-up too short (electronic control) | Increase time to reach full flow rate |
| Dirty mold | Clean wax fragments or compressed wax from mold |
| Flow rate incorrect | Decrease flow rate |
| High injection pressure | Decrease injection pressure |
| Hot wax temperature | Lower wax temperature |
| Low clamp force | Increase clamping force |
| Mold alignment, unequal clamp force or worn guide pins | Check closing of mold, watch for shifting or reposition for equal clamping force |
| Mold wear | Check fit up of parting lines and inspect for edge rounding or guide pins/bushings wear |

TECHNICAL TIP



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Wax Pattern Defect Troubleshooting

Flow Lines, Ripples & Knit Lines

| Potential Cause | Corrective Action |
|---|---|
| Acceleration/ramp-up excessive (electronic control) | Shorten time to reach full flow rate |
| Cold mold | Increase mold or platen temperature |
| Cold wax | Increase wax temperature |
| Cold wax in nozzle | Increase nozzle temperature |
| Excessive mold release | Decrease amount of mold release, excess becomes trapped where knit line forms |
| Flow rate incorrect | Increase or decrease flow rate |
| Hot wax (creating turbulence) | Decrease wax reservoir temperature, change flow rate |
| Improper mold venting | Add or enlarge vents, clean vents |
| Injection pressure low | Increase injection pressure |
| Sprue location or size | Evaluate mold design |

Non-Fill

| Potential Cause | Corrective Action |
|---|---|
| Acceleration/ramp-up excessive (electronic control) | Shorten time to reach full flow rate |
| Cold mold | Increase mold or platen temperature |
| Cold nozzle, wax slugs | Increase nozzle temperature/remove slug |
| Cold wax | Increase wax reservoir temperature |
| Excessive mold release | Clean mold and decrease mold release use |
| Flow rate incorrect | Increase or decrease flow rate |
| Improper mold venting | Add or enlarge vents, clean vents or core pins |
| Low injection pressure | Increase injection pressure |
| Low wax level in reservoir | Check wax level in reservoir or wax delivery system |
| Shot size incorrect | Increase shot size or check equipment capacity |
| Small injection sprue, wax freezes during injection | Enlarge sprue, insulate mold contact with nozzle |
| Trapped air in mold | Slow flow rate/flip mold over (top to bottom) changing fill arrangement |



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Wax Pattern Defect Troubleshooting

Pattern Oversize

| Potential Cause | Corrective Action |
|-------------------------------------|---------------------------------------|
| Clamp force low | Adjust clamp force to prevent opening |
| Cold wax | Increase wax temperature |
| Dirty mold | Clean mold |
| Excessive hold time/injection time | Reduce time |
| High injection pressure | Lower injection pressure |
| Incorrect shrink factor/mold design | Inspect mold dimensions/design |
| Mold wear/damage | Inspect mold |
| Nozzle temperature (small parts) | Adjust nozzle temperature |
| Platen/mold temperature | Adjust platen temperature |

Pattern Undersize

| Potential Cause | Corrective Action |
|---------------------------------------|---|
| Incorrect shrink factor/mold design | Inspect mold dimensions/design |
| Insufficient hold time/injection time | Increase time |
| Low injection pressure | Increase injection pressure |
| Missing chills | Check proper chills were placed in mold |
| Nozzle temperature (small parts) | Adjust nozzle temperature |
| Platen/mold temperature | Adjust platen/mold temperature |
| Small sprue runner | Enlarge sprue |
| Wax hot | Decrease wax temperature |

Pitted, Graining, Orange Peel Finish

| Potential Cause | Corrective Action |
|----------------------------|--|
| Cold mold | Increase mold, platen temperature |
| Cold wax | Increase wax temperature |
| Excessive mold release | Clean mold and decrease amount of mold release |
| Flow rate incorrect | Increase or decrease flow rate |
| Injection pressure low | Increase injection pressure |
| Issues with mold | Inspect surface finish of mold |
| Wax separation with filler | Perform wax conditioning sequence per wax supplier |



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Shrinkage, Cavitation, Sink

| Potential Cause | Corrective Action |
|--|--|
| Cold mold | Increase mold or platen temperature |
| Flow rate incorrect | Increase wax flow rate |
| Hold time too short | Increase hold/clamp time |
| Injection temperature low | Increase injection system temperature |
| Insufficient injection time | Increase injection time |
| Low injection pressure | Increase injection pressure |
| Small injection sprue, wax freezes before pattern solidifies | Enlarge sprue, insulate mold contact with nozzle |
| Sprue location or size | Evaluate mold design |
| Type of wax used | Consult wax supplier |
| Wax temperature too high | Decrease wax reservoir temperature |

Splash/Splatter

| Potential Cause | Corrective Action |
|---|---------------------------------------|
| Acceleration/ramp-up too short (electronic control) | Increase time to reach full flow rate |

Wax Pattern Cracking

| Potential Cause | Corrective Action |
|------------------------------------|---|
| Burr in mold or back lock | Inspect mold |
| Cold mold | Increase mold or platen temperature |
| Excessive hold time/injection time | Reduce time |
| High injection pressure | Lower injection pressure |
| Improper mold eject timing | Check timing of eject pins as mold opens |
| Improper mold opening | Check or add guide pins, check opening sequence and core pull operation |
| Improper removal of pattern | Check for mold damage, use mold release spray, add ejector pins or compressed air to assist removal |
| Pressure in tool | Determine if vacuum exists, inspect or add vents |
| Type of wax used | Consult wax supplier |



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