

# Caramel Troubleshooting Guide

PMCA 78th Annual Production Conference | April 7-9, 2025

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
Graining – sugar	<i>Formulation</i>	Have more syrup solids than sugar. Mono to disaccharide ratio should be 1.3:1 or greater; less than 5% lactose
	<i>Sugar not dissolved</i>	Minimum 16% moisture in premix Add sugar to premix earlier Increase time to dissolve/lower heat Vigorous (shear) mixing
	<i>Batch – steam kettle</i>	Premix below steam jacket/wash down after boil
	<i>Batch – fire cooker</i>	Premix below scrapers/wash down after full boil
	<i>Agitation after cooking</i>	Shut off agitator and discharge from kettle
	<i>Excessive cooling</i>	Do not cool below 55°F/12.7°C
	<i>Excessive handling after cooking</i>	Minimize handling below 170°F/76.6°C – especially pumps
	<i>Excessive slow cooling</i>	Cool below 115°F/46.1°C before packing

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
Graining – protein	<i>Low pH</i>	pH of water and residual cleaning should be greater than 5.4 Ensure dairy ingredients are not sour Add buffers such as sodium citrate, dipotassium, phosphate or baking soda Add any acids after cook
	<i>High premix moisture</i>	Adjust premix moisture to less than 30% or drip feed milk during cook of 228-230°F/108.8-110°C

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
Lacks flavor/ poor flavor	<i>Formulation</i>	Fat melting point too high – should be less than 100°F/37.7°C
	<i>Lack of milk fat</i>	Ideally half or more of fat is dairy
	<i>Lack of salt</i>	0.25–0.5 in formulation
	<i>Heat liable flavors</i>	Add flavors after cook- ideally below 180°F/82°C Oil soluble is more stable than water soluble

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
Lack of color	<i>Insufficient cooking time</i>	Minimum of 25 minutes cook time
	<i>Use of vacuum to remove moisture</i>	Increase caramelization hold time
	<i>Insufficient caramelization time</i>	Increase caramelization hold time
	<i>Lack of amino acids/reducing</i>	Increase milk solids (e.g. whey) or invert syrup sugars
	<i>Low pH</i>	Increase pH by adding baking soda

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Stickiness	<i>Sugar inversion - pH</i>	Increase pH to 6.0 or higher using buffers or baking soda; add acids at end of cook  Excessive cook time - should be less than 60 minutes
	<i>Low fat %</i>	Minimum of 8% fat
	<i>High moisture</i>	Increase cook temperature – will cause harder texture. Ensure that moisture is removed and not allowed to drain back into kettle
	<i>Excessive syrups or high DE</i>	Reduce % of syrups or their dextrose equivalent (DE) – replace with sugar
	<i>Low milk protein solids</i>	Minimum of 2.0% milk protein solids
	<i>Lack of emulsifiers</i>	Add glycerol monostearate (GMS) or mono and diglycerides
	<i>High humidity</i>	Good sealed moisture proof packaging and less than 50% relative humidity stor

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Caramel too soft/cold flow</b>	<i>High moisture</i>	Increase cook temperature
	<i>Excessive syrups or high DE</i>	Reduce % of syrups or their DE – replace with sugar
	<i>Low milk protein solids</i>	Minimum of 2.0% milk protein solids
	<i>Excessive milkfat/butter or low melting point fat/oil</i>	Replace % or portion with 90–100° melt-point fat

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Texture not smooth</b>	<i>Grained caramel</i>	See <b>Graining</b> sections above
	<i>Milk protein not rehydrated</i>	Combine equal amounts of cold water and milk powder and high shear. Hydrate 30 minutes. Strain before using.
	<i>Milk protein curdled</i>	See section on <b>high premix moisture</b>

<b>PROBLEM</b>	<b>POSSIBLE CAUSE</b>	<b>SOLUTION</b>
<b>Caramel sauce separation</b>	<i>Not sheared, mixed</i>	Homogenize or high shear mix at 200°F/93°C for 3+ minutes
<b>Caramel sauce becomes moldy</b>	<i>High water activity</i>	Reformulate to water activity below 0.68 Fill sauce in jars at 190°F/87.7°C, seal and invert Add 0.1% potassium sorbate with pH 6.5 or higher

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