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Initiators Basics

FACTORS EFFECTING RESIN AND GEL COAT CURE.

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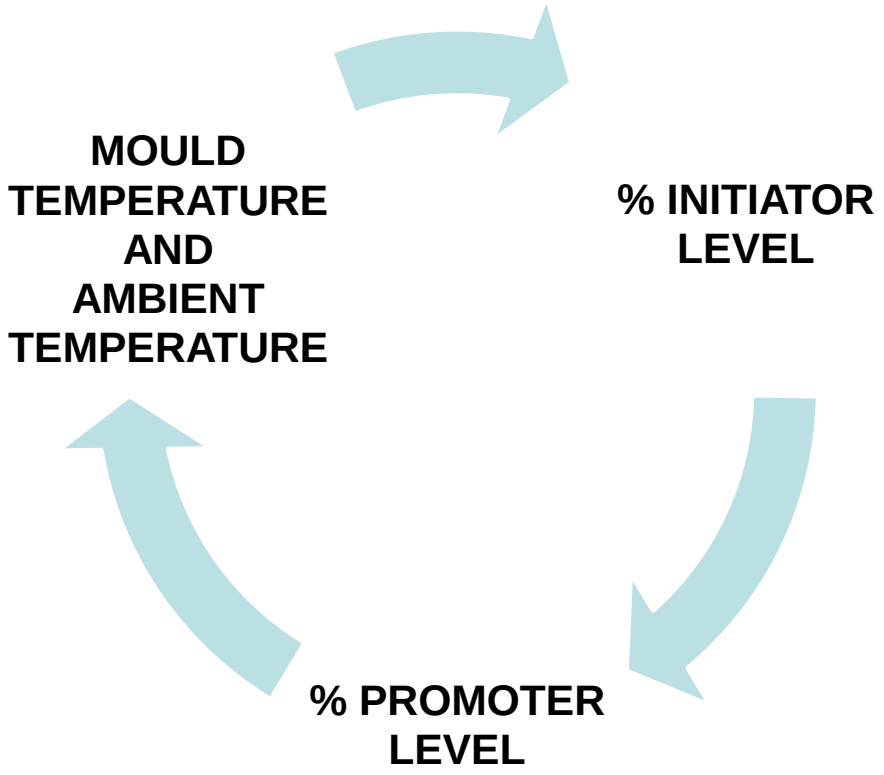

Factors Affecting the Cure of Gel Coats and Resin Systems.

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1) **Temperature levels** – operating temperatures should be between **60°F and 85°F.**

2) **Incorrect Initiator or promoter levels** – usually applicators reduce the catalyst (Initiator) levels too low to counter high temperatures and too much when it is too cold .

3) **Incorrect Initiator selection** – most catalysts (Initiators) found in the market are too high in **hydrogen peroxide** content .

OVER CATALYZATION

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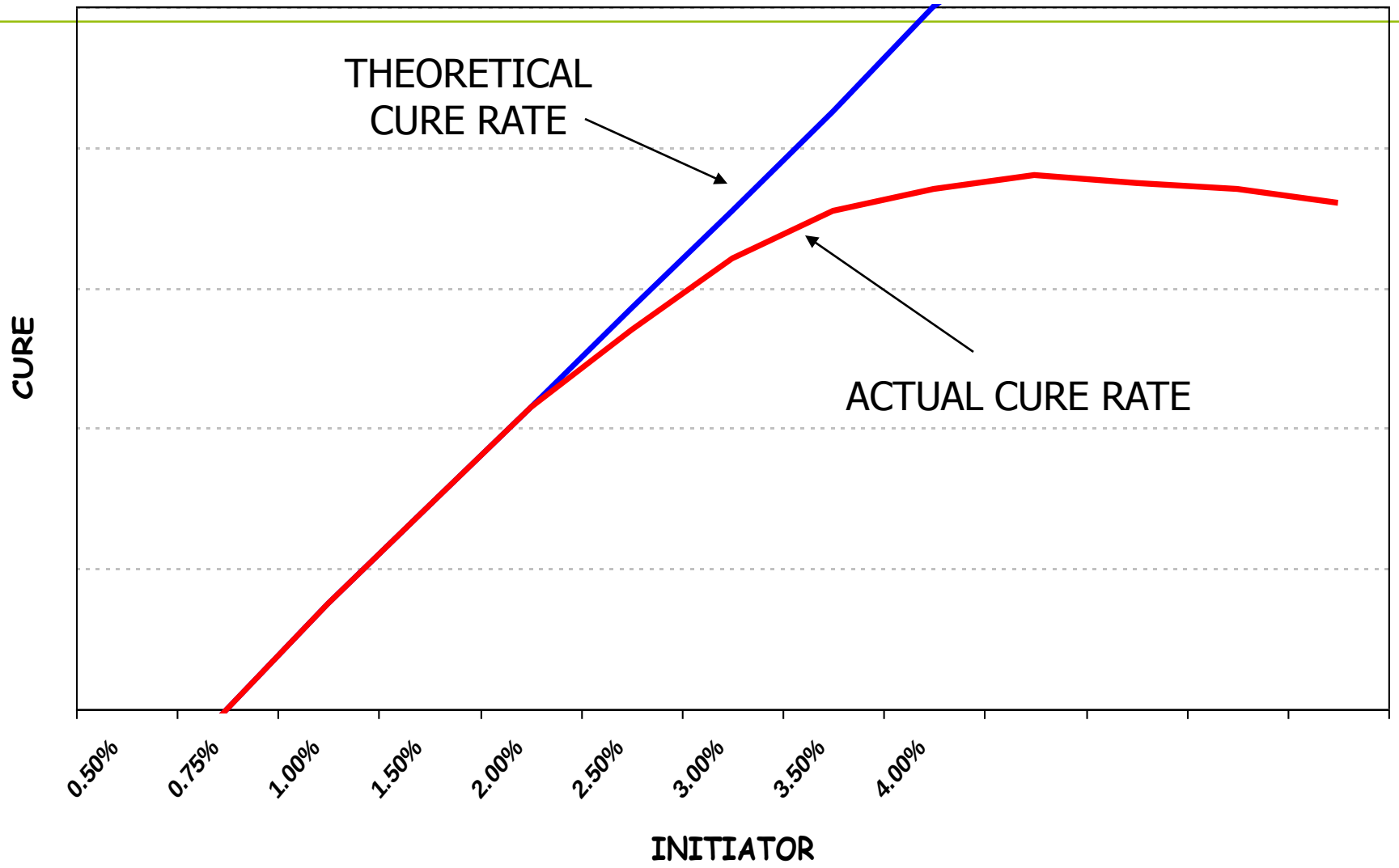

UNDER/OVER CATALYZATION

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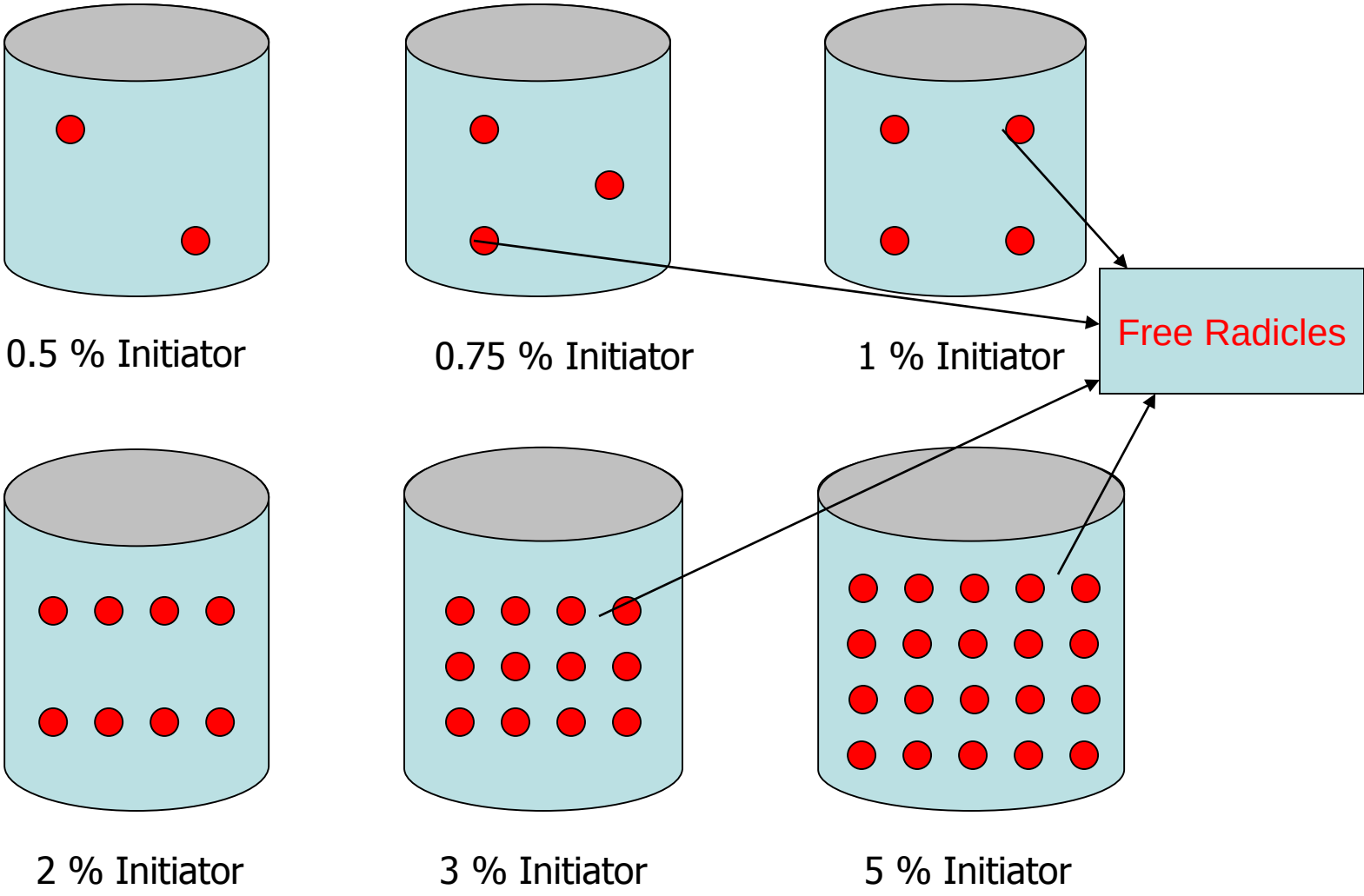

FREE RADICLE TERMINATION

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- Free radicals are charged particles, formed by the chemical reaction between the Promoter (which is the true catalyst) and the Initiator.
- When they collide with each other they terminate themselves and do not take any further part in the cross linking reaction.
- Terminated free radicals can become active again if they become in contact with another free radical.
- Therefore we have a shutting down and restarting process happening, particularly when there is a high concentration of Promoter or Initiator.

UNDER/OVER CATALYZATION

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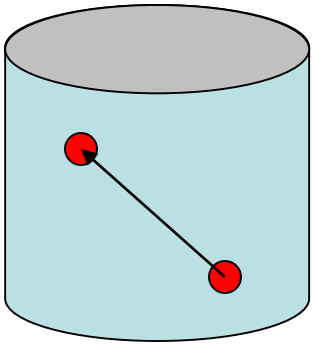
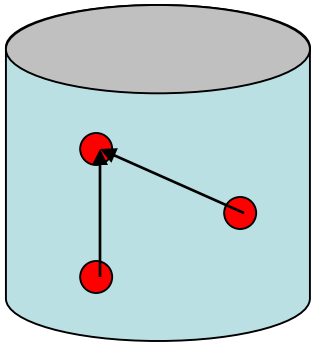
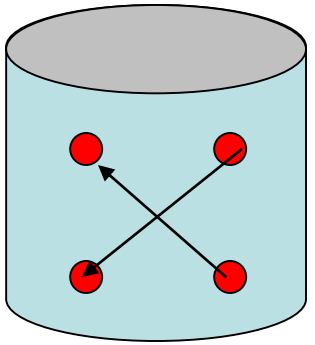


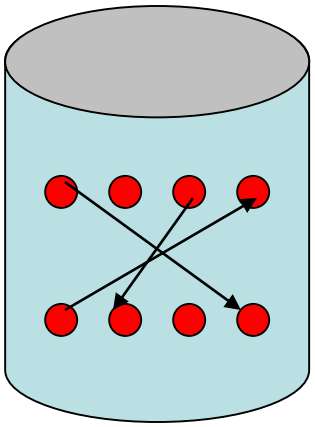
0.5 % Initiator



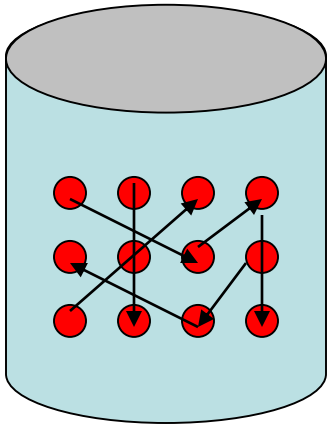
0.75 % Initiator



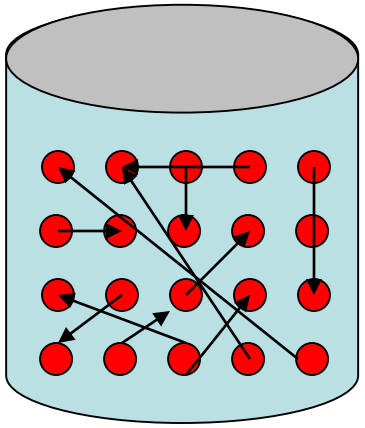
1 % Initiator



2 % Initiator



3 % Initiator



5 % Initiator

Gel Coat Faults

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UNDER CATALYSATION

- Alligatoring/Wrinkling.
- Print Through (Fiber Pattern).
- Sagging or Running (when gel coat is applied too thick).
- Dull Parts/Softness (Poor Mixing).
- Premature Yellowing.
- Premature Chalking.
- Fading of Color.
- Water Spotting.
- Checking (Mud Cracking).

OVER CATALYSATION

- Pinholes/Craters
- Delamination (combination of high Initiator levels and too high gel coat film build).
- Pre-release (especially in combination with high temperatures).
- Porosity.
- Spot Blisters (droplets of Initiator from overspray- external mix equip.).
- Chalking.
- Dull Parts.
- Print Through.

Resin Laminating Faults

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UNDER CATALYSATION

- Shrinking/Warping (After part has been pulled).
- Print Through (After part has been pulled).
- Resin Tearing.
- Soft Spots.
- Low Mechanical Strengths.

OVER CATALYSATION

- Color Variation (High Initiator level combined with poor mixing).
- De-lamination.
- Shrinkage.
- High Exotherm.
- Hot Spots.
- Resin Cracking.
- Air Bubbles.
- Poor Wet Out.
- Low Mechanical Strengths.

CONCLUSION

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REMEMBER

A FAST GEL TIME DOES NOT MEAN A GOOD OR FULL CURE

15 DEGREE RULE

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FOR EVERY 15 DEGREE (F) CHANGE IN MOLD TEMPERATURE,

THE GEL TIME WILL

- DOUBLE WHEN THE MOLD OR AMBIENT TEMPERATURE DROPS.
- HALVE WHEN THE MOLD TEMPERAURE INCREASES.

ELIMINATING THE PROBLEMS

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- Always work with the correct Initiator levels.

  1.5 to 2.25% for Gel Coats.

  1 to 2.5% for Resins.

- **Work in the Middle of these parameters**.

- If you cannot work in the above then use a variant of the Gel Coat and Resin that will work.
- Look at using an alternative Initiator that works in your temperature requirements.

MEKP ACTIVE INGREDIENTS

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1. **Hydrogen Peroxide** – This affects the Gel Time only.

2. **MEKP Monomer** – This completes the Gel Time and starts the cure, so it has a major affect on the green stage cure.

3. **MEKP Dimer** – This completes the cure
   (Absolutely essential for optimal cure of iso-phthalic and VE based resins).

4. The total of the three above reactive components, can not exceed 9.0% AO (active oxygen). This equates to approximately 37% of the total volume contained in a 4 kilogram bottle.

1 + 2 + 3 < 9.0% AO

Last to react is the
MEKP Dimer

2nd to react is the
MEKP Monomer

1st to react is the
Hydrogen Peroxide

Why Understand H_2O_2

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THE EFFECTS OF HYDROGEN PEROXIDE (H_2O_2) IN MEKP FORMULAS

1. The more Hydrogen Peroxide (H_2O_2)the shorter the working time (gel time).
2. The more H_2O_2 the earlier the rise in viscosity.
3. The more H_2O_2 the more chance of porosity.
4. We need some H_2O_2 to ensure the reaction can start when the temperatures we operate in are low.

Rule on All UI-SPI Norox MEKPs

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- **Specific Density**

	NOROX®					
	MEKP-9	**MEKP-9H**	**MEKP-900**	**MEKP-925**	**MEKP-925H**	**MEKP-30**
Active Oxygen, %	8.9 – 9.0	8.9 – 9.0	8.9 – 9.0	8.9 – 9.0	8.9 – 9.0	5.4 – 5.5
Form	← Liquid →					
Color	← Water White →					
Specific Gravity @25/4°C	1.1	1.1	1.1	1.1	1.1	1.15
Viscosity, cps @25°C	15 – 16	15 - 16	15 - 16	15 - 16	15 - 16	18
Flash Point (SETA C.C.), min	← 170°F →					
Hydrogen Peroxide, %	0.8 – 1.0	0.4 – 0.6	1.8 – 2.0	1.2 – 1.4	0.1 – 0.4	0.5 – 0.6
Monomer / Dimer Ratio	High / Low	High / Low	High / Low	Med / High	Med / High	High / Low
Soluble in	← Oxygenated Organic Solvents →					
Insoluble in	← Water →					

More active ingredients per pump stroke – 0.1% adjustment.

Gel Coat application – better mixture in external spray guns.

One Resin - Many Options

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Vinyl Ester Laminating Resin

		100g Mass			20g Mass	BARCOL			
Sample Name	% Catalyst	Gel Time	Cure Time	Peak Temp.	Peak Temp.	1 hr. BARCOL	3 hrs. BARCOL	6 hrs. BARCOL	24 hrs. BARCOL
MEKP-9	1.50%	13.1	10.0	349°F	293°F	25-30(D)	55-60(5)	65-70(5)	10-15(4)
MEKP-925	1.50%	13.0	8.1	354°F	312°F	50-55(D)	60-65(5)	65-70(5)	15-20(4)
MEKP-30 *	1.50%	21.6	14.9	332°F	266°F	N/A	50-55(D)	55-60(5)	05-10(4)
MCP	1.50%	40.1	48.1	290°F	090°F	N/A	0-5(D)	50-55(D)	20-25(4)
MCP-21	1.50%	35.6	44.5	296°F	089°F	N/A	0-5(D)	45-50(D)	20-25(4)
MCP-75	1.50%	29.7	33.2	313°F	092°F	N/A	5-10(D)	55-60(D)	15-20(4)
771	1.50%	33.1	33.4	313°F	095°F	N/A	0-5(D)	50-55(D)	20-25(4)
CHP	1.50%	70.6	66.7	241°F	088°F	N/A	N/A	60-65(5)	25-30(4)

*** MEKP Actual Percentage of active ingredient = 0.9%**

MEKP/CHP Blends

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Benefits:

- Dimensional Stability
- Low Exotherm
- Thicker parts
  - Consolidation of steps
- Long gel times
- Better cure in 24 hrs.

Fastest to slowest

- **MEKP**
- **HDP-75**
- **MCP-75**
- **MCP-21**
- **MCP**

Other Specialty Blends

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- 750 & 757
  - Azox /CHP – great for close molding and thin skins
  - Dimensional stability
- CHM-50
  - Thick putty applications reduction of exotherms
  - Excellent cure on VE tooling Gelcoats
  - Zero foaming in VE resins
- Azox/MEKP
  - Snap cure with out effecting gel times
- MEC
  - Manufacturing consistency
  - Less sensitive to temperature swings and high humidity

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For more information contact :

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800-231-2702

Thank you!