VALTRIS SPECIALTY CHEMICALS

FORMULATING TIPS SHEET

Overcoming the Formulation Difficulties related to the use of Non-Phthalate General Purpose Plasticizers: DINCH

Purpose

Diisononyl Cyclohexanoate is a Non-Phthalate, general purpose plasticizer. It can be compared to products such as DOTP and DEHCH in today's market place. Santicizer® Platinum P-1400 is a fast fusing, non-phthalate plasticizer that is used in conjunction with a general-purpose plasticizer, we have evaluated the material in a blend of DINCH and Santicizer® Platinum P-1400.

Samples Evaluated

1. DINCH
2. Blend – 70% DINCH, 30% Santicizer® Platinum P-1400 (Note – 65 phr was kept constant)

Formulation

Description	Amount (phr)
Resin – K Value 70	100
Plasticizer	65
Heat Stabilizer	2
Total	**167**

Testing

1. Viscosity – Valtris Test
2. Fusion Time and Temperature – Valtris Test
3. Water Sensitivity – ASTM D1239
4. Carbon Volatility – ASTM D1203
5. Shore A – ASTM D2240
6. Surface Energy – AccuDyne Test
7. Tensile and Elongation – ASTM D638
8. Loop Compatibility – ASTM D3291
9. Mathis Heat Stability – ASTM D2115-17

Executive Summary

Blend of 70% DINCH and 30% Santicizer® Platinum P-1400 shows better fusion time, temperature, water sensitivity, and volatility compared to the 100% DINCH sample tested.

VALTRIS SPECIALTY CHEMICALS
7500 E. Pleasant Valley Rd.
Independence, Ohio 44131 Phone
(216) 875-7200
Fax (216) 875-7201
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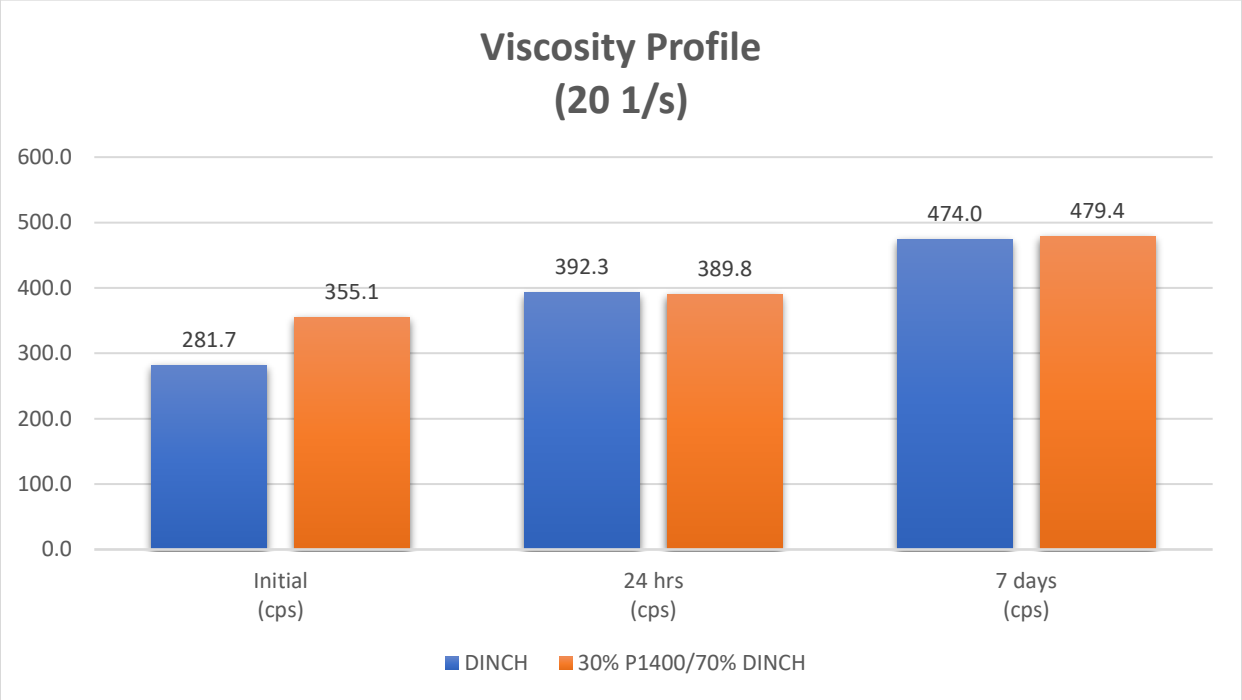
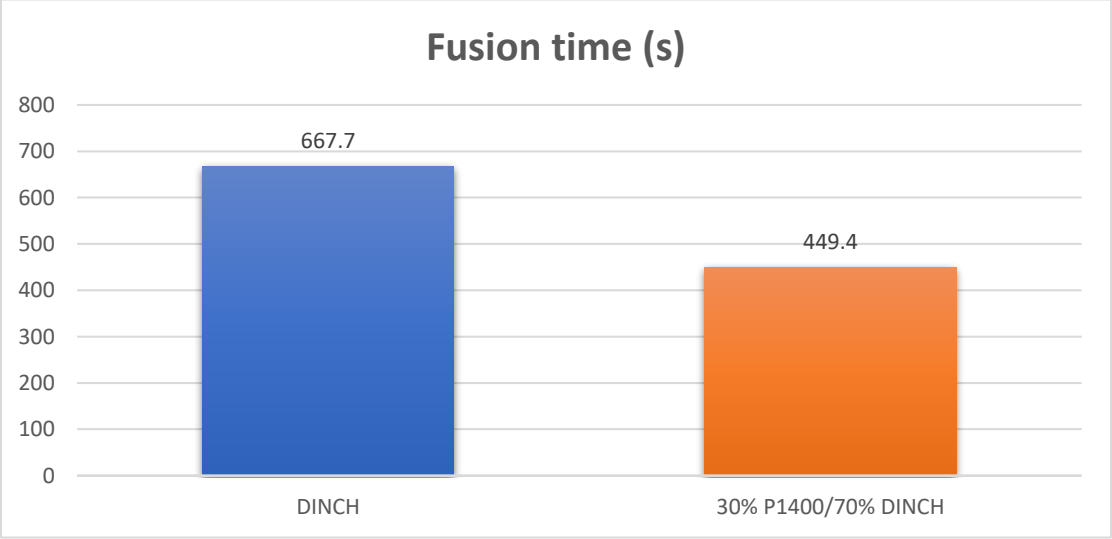
Plastisol Testing

Plastisol Viscosity



Plastisol Fusion Time & Temperature



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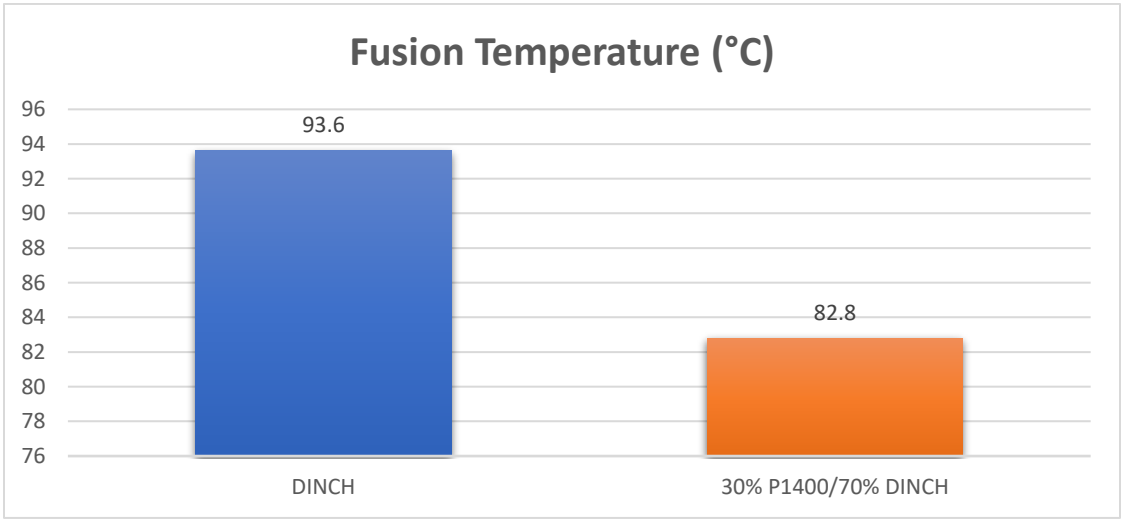
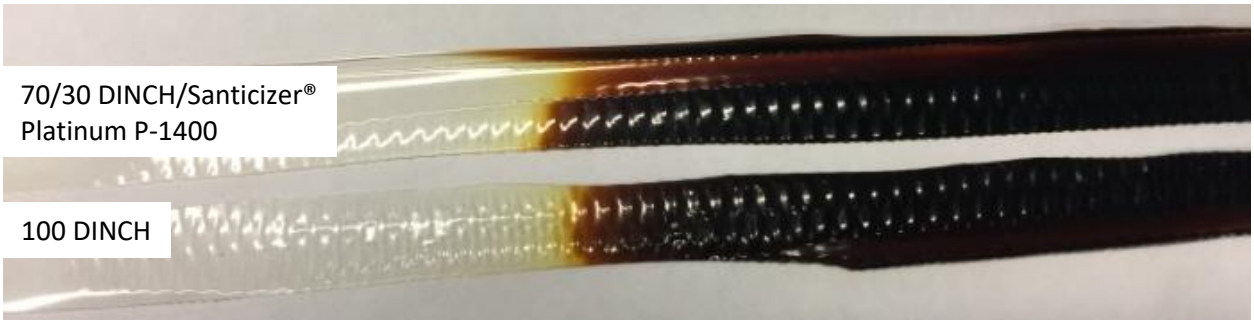


Sample Description	Tensile Strength (psi)	Break Strain %	Shore A Average	Surface Energy (DYNE pen)
DINCH	2415	409	68.0	38
70% DINCH/ 30% Platinum P-1400	2674	396	68.0	38

	Volatility – Carbon Method		Water Sensitivity	Compatibility – Loop Testing		
Sample Description	% Loss 1 Day	% Loss 6 Days	% Absorption	4 hrs	1 day	7 days
DINCH	1.44	22.06	1.7	0	0	0
70% DINCH/ 30% Platinum P-1400	0.55	17.26	1.63	0	0	0



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Conclusions

- Viscosity stability for a plastisol is an important test to determine how the product would handle being stored over time. We looked at initial, 1 day, and 7 day viscosity changes on a TA Discovery HR-2 rheometer. Samples were run at 25°C at increasing shear rates. All data was recorded at 20 1/s. DINCH and 70/30 DINCH/Santicizer® Platinum P-1400 perform similar for viscosity stability.
- Adding 30% Santicizer® Platinum P-1400 decreases fusion time by 1/3 and temperature by 11°C compared to the 100% DINCH control.
- Tensile Strength and Elongation show similar results, by adding 30% Santicizer® Platinum P-1400 it does not hurt your elongation.
- Shore A hardness and Surface Energy remain the same when Santicizer® Platinum P-1400 is included by 30%. Please keep in mind that the amount of plasticizer has not changed. They are both at 65 phr.
- Water sensitivity (ASTM D-1239) results show that the 70/30 DINCH/Santicizer® Platinum P-1400 performs the better than the 100% DINCH control for water sensitivity or amount of water absorbed into the discs.
- Carbon Volatility (ASTM D1203) was tested at 1 and 6 days. % loss was recorded. The 70/30 DINCH/Santicizer® Platinum P-1400 samples shows to be less volatile than the 100% DINCH sample tested.
- Loop Compatibility (ASTM D-3291) - When a plasticized PVC sheet is stressed by folding into a loop, the sheet may relieve the stress by migration on the plasticizer from the loop, or what we can refer to as exudation. As you can see under compression or tension both samples showed no issues with exudation.
- Mathis Heat Stability was run at 200°C and at 8 mm/minute. Results suggest that DINCH and 70/30 DINCH/Santicizer® Platinum P-1400 perform the same for heat stability.

Valtris Overview

Valtris is a global leader in specialty chemical additives and precursors, offering innovative solutions and products to customers around the world. With strong technical expertise and best-in-class formulation capabilities, we develop products that provide essential performance properties to plastics, coatings, adhesives and sealants, pharmaceuticals, flavor and fragrance, and personal care products. For more than 75 years, we have served as a trusted partner for customers by providing exceptional service and high-quality products. www.valtris.com

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