

Comparison of High Solvating Plasticizers in 1K Polyurethane Formulations

Purpose

Determination of how well Valtris Benzyl Phthalates and Non-phthalates work in 1K Polyurethane formulations.

Samples Evaluated

- Santicizer® 160
- Santicizer® 261A
- Santicizer® 278
- Santicizer® Platinum P-1400
- Santicizer® Platinum P-1700
- Santicizer® Platinum G-2000
- Benzoate
- Alkyl Sulfonic Ester

Formulation

Description	Amount (phr)
Polyurethane Prepolymer	30
Plasticizer	30
CaCO ₃	35
TiO ₂	3
DiButyl Tin DiLaurate	0.1

Testing

- Viscosity – Valtris Test
- Tack Time – Valtris Test
- Cure Through – Valtris Test
- Shore Hardness – ASTM D2240
- Exudation - Valtris Test

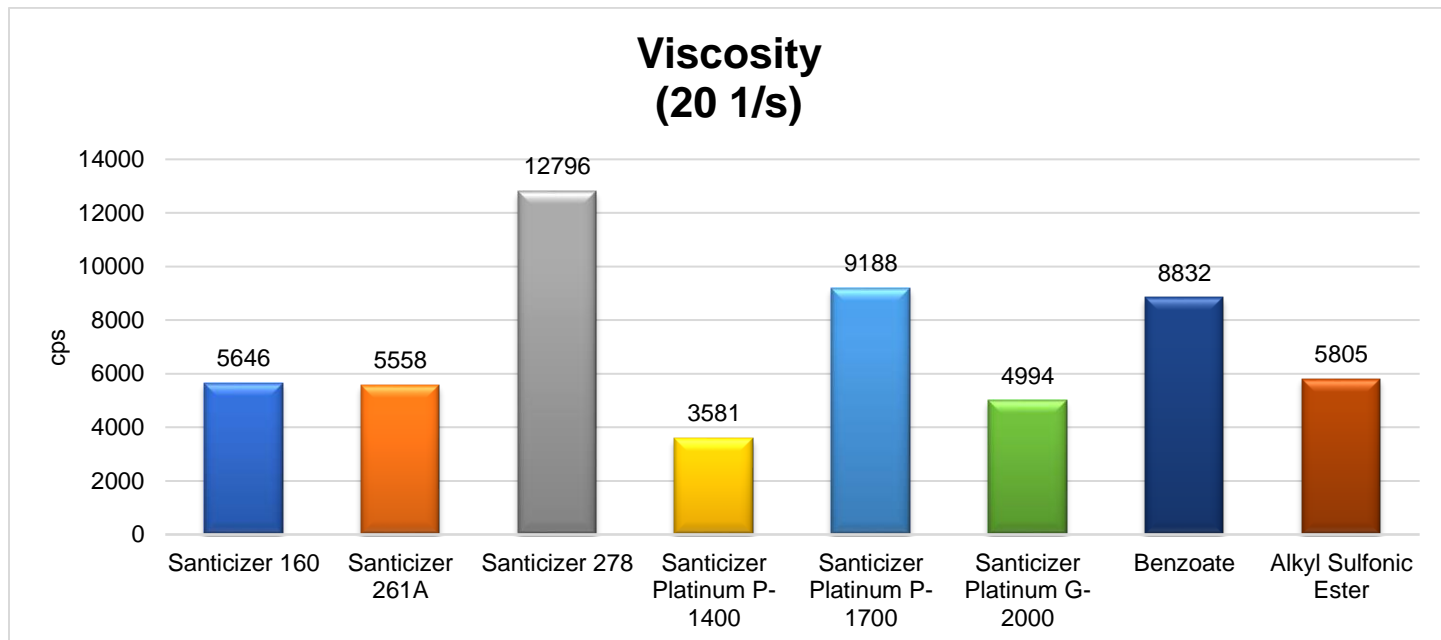


Executive Summary

All Valtris Benzyl Phthalates (Santicizer® 160, 261A, 278) and Non-Phthalates (Santicizer® Platinum P-1400, P-1700 and Santicizer® Platinum G-2000) work well in 1K Polyurethane applications. The structural differences in the molecules make them suitable for a range of different properties.

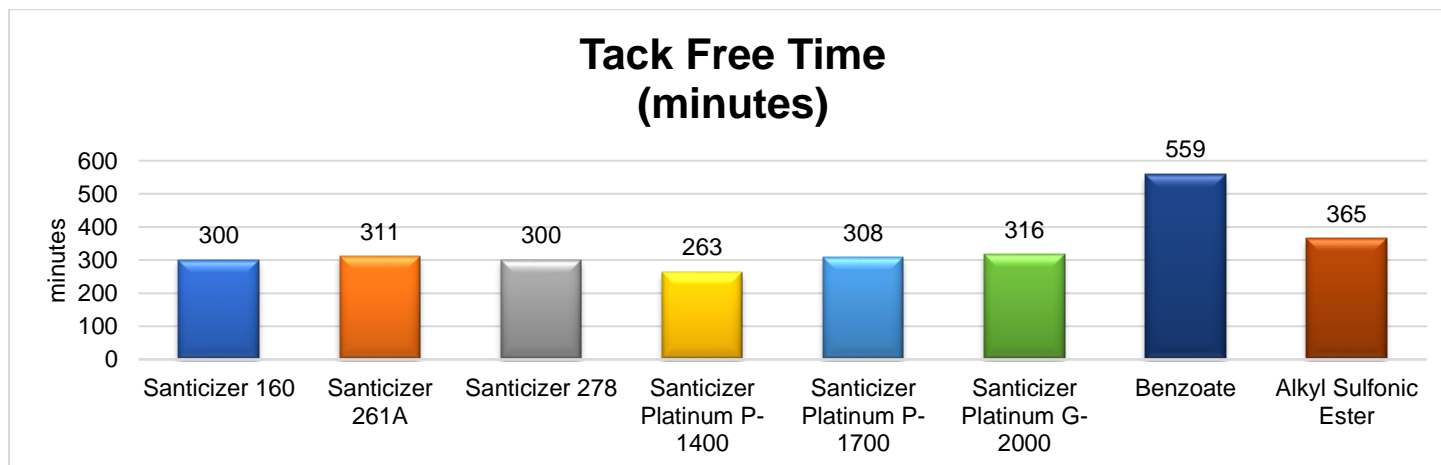
Testing

Viscosity was tested on a TA Discovery HR-2 Rheometer at 20 1/s at 25°C.



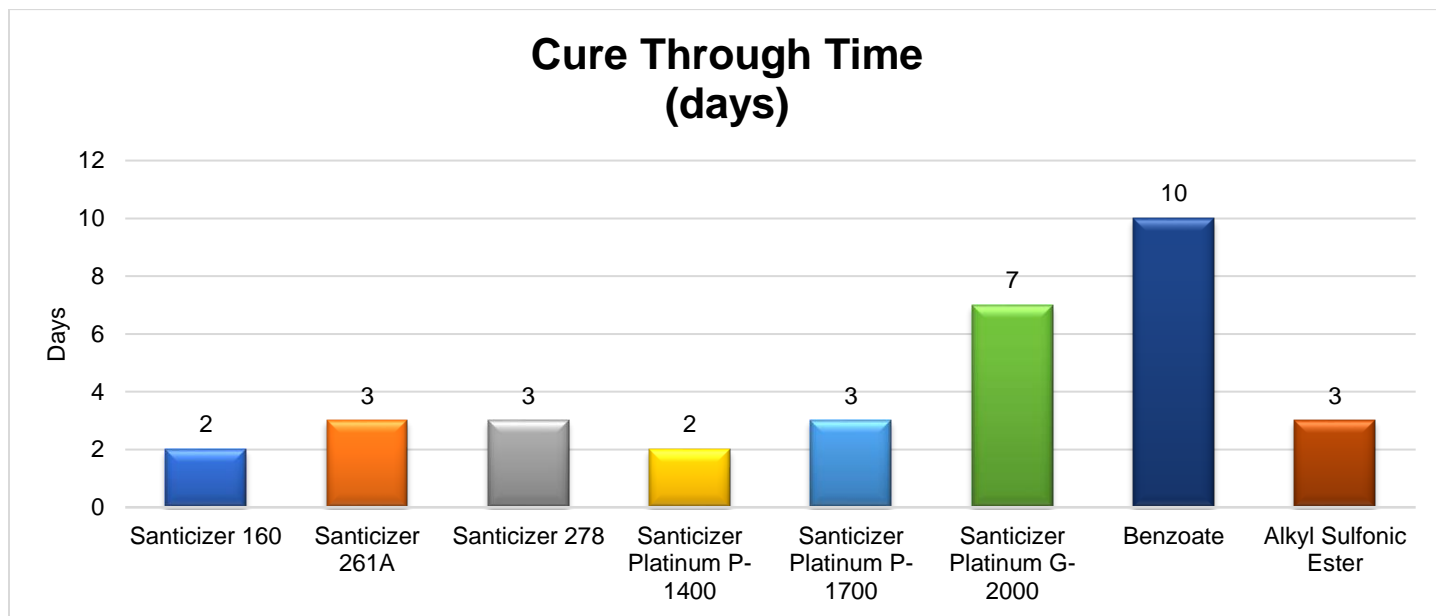
The Santicizer® Platinum P-1400 shows the lowest initial viscosity. The Santicizer® 160, 261A, Santicizer® Platinum G-2000 and Alkyl Sulfonic Ester have similar initial viscosities.

Tack Time was tested to determine how quickly the material is tack free to touch in minutes. Material was applied in forms at ¼ in. thickness.



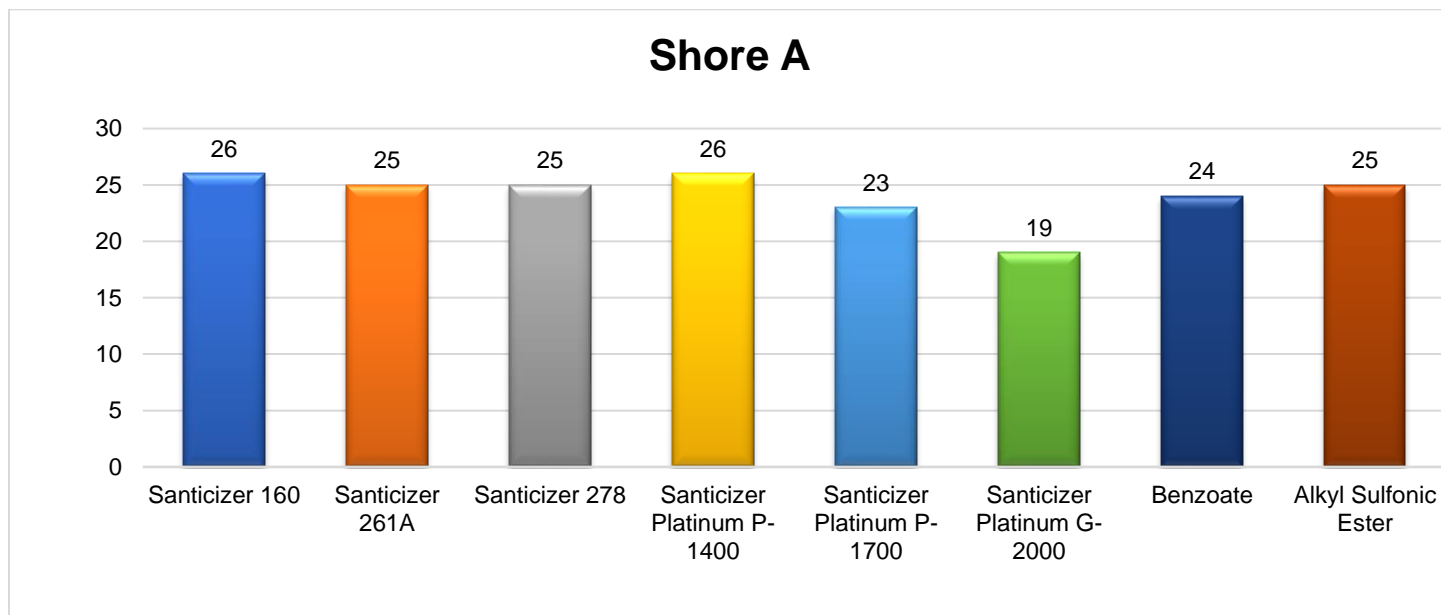
All Valtris Plasticizers as well as the alkyl sulfonic ester show similar tack free times. The Benzoate plasticizer has a delayed tack time response.

Cure Through - Material was applied in ¼ in. thickness. Samples were cut daily to determine how long it takes the product to cure all the way through. Data was determined in days.



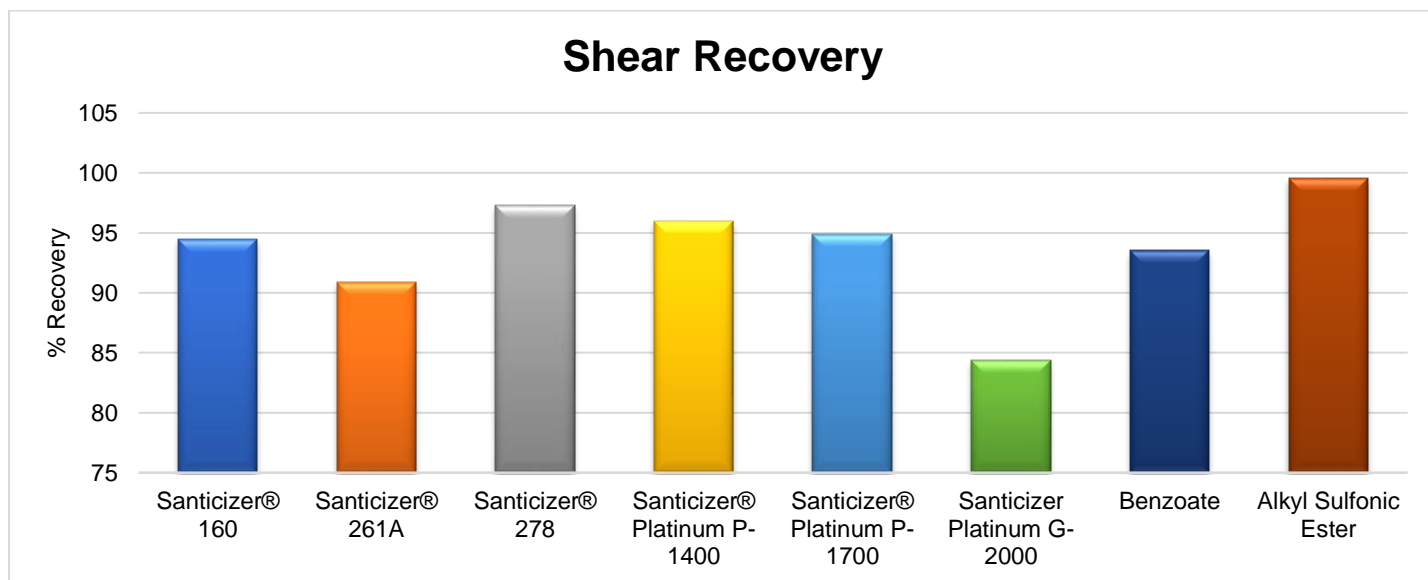
All samples have relatively the same cure through time except for the Santicizer® Platinum G-2000 and the benzoate samples as they showed extremely long cure through. As much as 10 days' time for the benzoate.

Shore Hardness - Material was applied in 1/8 in. thickness.



All samples show similar Shore Hardness values, except for the Santicizer® Platinum G-2000 that shows improved efficiency.

Shear Recovery is used as a way to determine how well a sealant rebounds after being dispensed from a tube or caulk gun. In this application, we also used a TA Discovery HR-2 Rheometer, we kept the temperature at 25°C, initial shear rate was 0.1 1/s for 3 minutes, 50 1/s for 30 seconds, followed by 0.1 1/s for another 3 minutes. We looked at the % Recovery of the sealant, or how well it rebounded to its initial viscosity reading at 0.1 1/s.



All samples except for the Santicizer® Platinum G-2000 show to have % recovery of >90%.

Exudation - No specific exudation test was run. Material was applied in 1/4 in. thickness. Samples were evaluated everyday with cigarette paper to determine if plasticizer migration (exudation) was occurring. Samples were reviewed every day for 10 days. Data below was at 10 days' time.

	Exudation
Santicizer 160	none
Santicizer 261A	none
Santicizer 278	none
Santicizer Platinum P-1400	none
Santicizer Platinum P-1700	none
Santicizer Platinum G-2000	slight exudation
Benzoate	slight exudation
Alkyl Sulfonic Ester	none

The Santicizer® Platinum G-2000 and the benzoate plasticizer showed slight exudation concerns, meaning that there was residue detected on the paper. All other samples evaluated had no concerns for exudation.



Conclusions

- All Valtris Benzyl Phthalates (Santicizer® 160, 261A, 278) and Non-Phthalates (Santicizer® Platinum P-1400 and P-1700) work well in 1K Polyurethane Sealant formulations. There were no detriments to the testing that was completed.
- They are comparable in viscosity, tack free time, cure through, shore hardness, and exudation. The Alkyl Sulfonic Ester also performs well in the above stated property testing.
- The Santicizer® Platinum G-2000 and benzoate plasticizers have limitations that may need to be investigated further. They show issues with cure through, tack free time (benzoate) and exudation or plasticizer migration.

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

