Rotationally Molded Polyethylene Tanks Offer These Advantages:

Difference in resin. The advantages our HDLPE resin has over **other rotomolded linear resins** in tank applications? **Over XLPE?**

1. Over Linear, Medium and Low Density Polyethylene:

-superior impact and stress-crack resistance
-Improved weatherability
-Broader chemical resistance
-Lower notch sensitivity

2. Crosslink versus Linear:
"The most important advantage that crosslinkable polyethylene (XLPE) tanks have over linear polyethylene (LLDPE) tanks is that XLPE has a much higher molecular weight than LLDPE. In general, as the molecular weight of polyethylene increases, the environmental stress cracking resistance (ESCR), part impact strength, elongation, weathering, toughness, and tensile at elevated temperatures are improved."

This in fact is a true statement; however Snyder is using a **TRUE HDLPE** and not a LLDPE. In fact, during the molding cycle the density of resins changes and testing has shown us that we end up with a higher density with our HDLPE than with the CL200 XLPE.

We feel very confident that our studies and case histories can help us to determine the best resin for the application. Sii has always taken pride in our ability to get the full development of the physical properties of the resins which translate into chemical resistance and tank life. The following chart will give you another comparison of XLPE and HDLPE that has been developed by Exxon:

	ADVANTAGES	
Product Attributes	**HDLPE**	**XLPE**
ARM RT Impact Strength	√	
ARM-40 Impact Strength	√	
Stiffness (Flexural Modulus)	√	√
Creep Resistance		√
Tensile Break Stress	√	
Tensile Break Elongation	√	
Heat Distortion Temp.		√
Stress Crack Resistance		√

Color	√	

Crosslinked vs. linear Advantages:

The most important advantage that crosslinkable polyethylene (XLPE) tanks have over linear polyethylene (LLDPE) tanks is that XLPE has a much higher molecular weight than LLDPE. IN GENERAL, as the molecular weight of polyethylene increases, the environmental stress cracking resistance (ESCR), part impact strength, elongation, weathering, toughness, and tensile at elevated temperatures are improved.

Wall thickness is not the only factor relevant to determining the strength of the tank. **Proper material cure is more important than wall thickness in determining tank strength.** Material cure is highly dependent upon the time of exposure to heat conducting through the tooling and the plastic material. Excessive exposure to high temperature will degrade the plastic material and cause a weak part. The ideal cure cycle is to reach the proper curing temperature as fast as possible, maintain that temperature for the correct period of time, and to cool the part and tooling at the proper rate of part temperature decrease. The superior Sii manufacturing process and oven capacity makes it possible to reach the proper cure temperature quickly and avoid the material degradation caused by slow oven temperature rise. Therefore, it is improper manufacturing technique to compensate for poor material cure with excessively thick tank walls.

Importance of Tank Design Standards.

1. Why are the ASTM specifications so important? Simple language describing hoop stress in relation to specific gravity.

Why is the UL rating irrelevant?

The ASTM D 1998-97 standard utilizes the same hoop stress formula that has been used by Sii design engineers for the past twenty years. Due to the superior Sii process control methods that have been developed, a stratified wall thickness is produced in large bulk tanks. Sii calculates the hoop stress and required tank wall thickness in one foot vertical intervals or less, and designs the part tooling to achieve these required thickness' in each of the calculated intervals. In the end, the only point that really matters is that Snyder Industries engineered and provided a tank best suited for the specific application and will stand behind our products.

UL Approvals - Do Snyder tanks meet any UL approvals? Snyder has not formally petitioned UL for any approvals, however **Snyder tanks DO meet the same UL Class 3B standards** that one of our XLPE tank competitor's tanks meet. This standard simply states that materials with a flash point higher than 200 F can be safely stored. The equivalent NFPA standard for above ground storage tanks is NFPA 30.

2. Relationship of wall thickness and tare weight to overall performance. When the stratified wall is better than a heavier tank?

In short, Sii puts the strength where it is needed. Some of Sii's competitors use a uniform tank wall thickness and claim this is required by the ASTM standard. Anyone who claims this should read section 6.1 carefully. The stratified wall optimizes the placement of the material where it is more needed. Sii has well established tank wall thickness requirements that are published for each tank and are consistent with the ASTM hoop stress formula and Sii warranty. Sii will continue to provide wall thickness information on request.

The wall thickness of a tank is not the only factor relevant to determining the strength of a tank; in fact it can be a very small factor. Proper material cure is more important than wall thickness in determining tank strength. The cure of the material is a determining factor for the long-term hydrostatic strength, flexural modulus, and the ESCR (Environmental Stress Crack Resistance) rating of the material. Long-term hydrostatic strength test values could vary from as high as 1600 psi for a properly cured material to as low as 160 psi for a poorly cured material according to tests conducted by an independent testing lab for Exxon Chemical. With these values, it

would take a poorly cured tank with a 2.5 inch wall thickness to have the same hydrostatic strength as a properly cured tank with a 0.25 inch wall thickness. This clearly demonstrates why tank weight and/or wall thickness may not be a very good indication of tank physical strength. Therefore, it is very important to have a manufacturing process that can produce a properly cured product with a high degree of reliability without degrading the material.

Material cure is highly dependent upon the time of exposure to heat conducting through the tooling and the plastic material. Excessive exposure to high temperature will degrade the plastic material and cause a weak part. The ideal cure is to reach the proper curing temperature as fast as possible, maintain that temperature for the correct period of time, and to cool the part and the tooling at the proper rate of part temperature decrease that does not induce stresses into the tank wall. The superior Sii manufacturing process and oven capacity makes it possible to reach the proper cure temperature quickly and avoid the material degradation caused by slow oven temperature rise. Therefore, it is improper manufacturing technique to compensate for poor material cure with excessively thick tank walls.

With the continuing improvements of true high density linear PE Snyder has taken tank design to a new level. We have participated in a test program with the University of Nebraska to determine the best resin choice for the application. The test program is based upon current resins and state of the art molding technology along with specific chemicals, concentrations and temperature of application.

Since Snyder has the ability and technology to supply either resin, we are able to make unbiased recommendations for tank design.

The crosslinked polyethylene and the high density linear offered by Snyder are both virgin number one grade resins. Snyder does not utilize any regrind or blend resins in the molding of industrial tank systems. Both resins have UV inhibitors incorporated into the raw resin. Along with the economics of a high density linear PE tank, a linear tank is weldable/repairable in the event of damage and in theory the tank could be recycled in the future once its use has been exhausted.

Recycling: crosslinks are thermosets which means they cannot be re-melted. Thus, many applications which required molding, though they can be granulated into road fillers, are excluded. Linears can be re-melted and thus the ease of recycling and possible end-uses are greatly enhanced.

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