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# *High Density Linear Polyethylene (HDLPE) versus High Density Cross-Link Polyethylene (HDXLPE)*

We commonly get asked "what is the best material – HDLPE or XLPE"? This is difficult to answer because there is no one type of resin that is best suited for every application and general guidelines of material selection are not advisable. It is always best to provide the tank manufacturer with specific application details (chemical, concentration, specific gravity, temperature, dimensions, mechanical loading) so a proper tank design recommendation can be made by the factory or the distributor. The chemical type, concentration and temperature must be considered in order to select the most appropriate resin. While polyethylene resins, as a class, are excellent materials for storing a wide range of chemicals because of their toughness and weatherability, there is no "super" resin that will work in every application. However, in most cases, there is testing information and performance history available to help determine which resin (HDLPE or HDXLPE) is best suited for the application. Snyder Industries has funded independent testing conducted in conjunction with the University of Nebraska and resin producers to help determine the best polyethylene resins available for a wide variety of chemical applications. The recommendations from this study can be found on our **Chemical Resistance Recommendation Chart.**

Snyder has the ability and technology to supply tanks made with either resin (HDLPE or HDXLPE). Therefore, we are able to make unbiased recommendations for tank designs. As for differences in HDLPE and HDXLPE, the chart below will give you another comparison of the HDLPE and HDXLPE resins that have been developed by Exxon:

| Product Attributes | HDLPE | HDXLPE |
|---|---|---|
| General Chemical Resistance | Excellent | Excellent |
| Impact Resistance | Excellent | Excellent |
| Weatherability | Excellent | Excellent |
| Initial Material Costs | Excellent | Good |
| Stress Crack Resistance ** | Excellent ** | Excellent ** |
| Maximum Service Temperature | 130 F | 140 F |
| Density (ASTM D1505) | 0.940-0.948 g/cc | 0.938-0.946 g/cc |
| Contains UV inhibitor | Yes | Yes |
| NSF/FDA Acceptability | Yes | No |
| Can be welded (hot gas) | Yes | No |
| Recyclability | Yes | No |

** Stress Crack Resistance is excellent when proper resin is chosen for the chemical application. See Snyder's **Chemical Resistance Recommendation Chart** for proper resin selection.

## MATERIAL SELECTION

Since there is no one type of resin that is best suited for every application, Sii offers tanks manufactured using both high density crosslinked polyethylene (HDXLPE) and high density linear polyethylene (HDLPE) resin. While HDXLPE tanks are preferred in some applications such as storing certain polymers and surfactants, field experience and laboratory testing demonstrate that in many applications, the HDLPE tanks are equivalent or superior to HDXLPE tanks.

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**MECHANICAL PROPERTIES**
Prior to the advancements in HDLPE resin technology, HDXLPE resins had superior mechanical properties. Today, however, the HDLPE resins used by Sii have greater tensile strength and greater elongation than current HDXLPE resins.

**ENVIRONMENTAL STRESS CRACK RESISTANCE (ESCR)**
In theory, HDXLPE should be better than HDLPE for environmental stress crack resistance. However, several years ago HDXLPE resin suppliers were forced to modify their processes because of environmental and economical factors. Today, HDXLPE resins are no longer superior to HDLPE resins.

The test (ASTM D 1693) that companies often refer to when discussing environmental stress crack resistance (ESCR) is misleading. The test shows the environmental stress crack resistance of a material when exposed to one specific chemical, igepal, which is an anionic surfactant. Because of the limitations of this test, it does not represent the stress crack resistance of the material exposed to other chemicals such as sulfuric acid and sodium hypochlorite. In fact, there are many chemicals where HDXLPE performance is inferior compared to specific types of HDLPE resins.

**TOUGHNESS**
The toughness (impact resistance) of a tank is affected much more by the cure of the material than by the properties of the type of polyethylene resin used. Consequently, test data which compares the impact "toughness" (impact strength) of HDXLPE compared to HDLPE is not necessarily representative of the performance of the resin type. Rather the performance of these samples represents variations in the cure of the different materials.

**CHEMICAL RESISTANCE**
The most important factor in determining tank performance is chemical resistance. While there are definitely applications where HDXLPE out performs HDLPE, such as when storing certain surfactants and polymers, independent testing at the University of Nebraska and field experience indicate that selected grades of HDLPE are less vulnerable to attack by certain chemicals (i.e. sulfuric, sodium hypochlorite, etc.) than HDXLPE.

**IN SUMMARY**
In every case, the chemical type, concentration and temperature must be considered in order to select the most appropriate resin. While polyethylene resins, as a class, are excellent materials for storing a wide range of chemicals because of their toughness and weatherability, there is no "super" resin that will work in every application. Regardless of the properties that an unexposed resin may have, the long term affects of the chemical on the processed resin is the determining factor.

At Snyder, we feel very confident that our studies and case histories can help us to determine the best resin for the application. Snyder has always taken pride in our ability to get the full development of the physical properties of the processed resins which translate into superior chemical resistance and longer tank life.
Since Snyder has the ability and technology to supply either resin (HDLPE or HDXLPE), 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. Please consult Snyder, or an authorized distributor, to determine which resin is best suited for your application.