Marine Pile Sleeving

HDPE Versus UHMW-PE

Technical Note

Corrosion of steel structures in marine environments is a common problem. However, in areas with higher humidity and salinity, it can be significantly more pronounced. That is why it is important to find effective solutions to increase the lifespan of marine piles.

Typically, steel piles will be coated with layers of epoxy paint, which protects the steel underneath from corroding, as long as the coating remains in place. Ageing, damage and abrasion of the coating will expose the steel underneath, allowing corrosion to start. In most marinas, this is a common issue. Damage to the protective coating can occur in a matter of days after installation, as the rollers and wear pads will remove the coating by abrasion over time.

A recent viable alternative is to sleeve an epoxy coated pile with HDPE (High-Density Polyethylene) or UHMW-PE (Ultra-High Molecular Weight Polyethylene) sleeves. Both options provide the best wear protection and corrosion resistance available and are largely maintenance free, making them an ideal choice for marine applications.

Longer Lifespan

Both HDPE and UHMW-PE pile sleeves are designed for long-lasting durability, while providing the highest impact strength and abrasion. The pile sleeves have significantly longer lifespans than traditional materials and treatment methods when used in marine environments.

On average, industry experts estimate that a galvanized or epoxy coated steel pile has 8-10 years before it will require frequent maintenance and a lifespan of 15-25 years. In comparison, HDPE and UHMW-PE sleeved piles typically have a lifespan of 50-100 years.

Benefits of Composites

The sleeves will never suffer corrosion, and will withstand the harshest UV environments, such as the Middle East.

Lower Maintenance Costs

Both types of pile sleeves require low or no maintenance and limit marine growth on the pile. Should the sleeve be damaged beyond repair, it can be replaced at a lower cost than replacement of a pile.

Cosmetic Appearance

They not only offer the benefit of longevity, but offer cosmetic benefits to marinas as well. The sleeves restore rusted marine piles to a clean, sleek and uniform look.

Environmentally Friendly

The pile sleeves contain no toxins that can leach into ecosystems or negatively impact water quality, unlike traditional methods such as heavy metal coatings.

Even though there are many similarities between HDPE and UHMW-PE pile sleeves, differences can also be observed, especially when looking at the polyethylene and sleeve properties, represented in the table below.

POLYETHYLENE PROPERTIES	ASTM	HDPE	UHMW-PE
PHYSICAL			
Density (g/cm^3)	D792	0.941-0.965	0.928-0.941
Water absorption (%)	D570	0	0
Molecular weight (g/mol)		200,000	6,000,000
MECHANICAL			
Tensile strength (psi)	D638	4,600	3,100
Flexural modulus (psi)	D790	200,000	125,000
Hardness, shore D	D785	D69	D62-D66
IZOD notched impact (ft-lb/in)	D256	3	No break
THERMAL			
Coefficient of linear thermal expansion	D696	6	11
Approx. melting temperature (°C)	D3418	125	138
Working temperature range (°C)		-40 to +80	-200 to +80
SLEEVE PROPERTIES			
Wall thickness (mm)		12-42	3
Void between sleeve & pile (mm)		Recommended max 10-25	0 (none)
Installation method		Driven into seabed; sleeve depth at least 0.5m below mudline	Heat-shrunk onto pile; sleeve to be extended to 0.5m below LAT
Installation equipment		Barge, crane, vibro hammer	Scaffolding, small equipment
Installation cost		Medium-High	Low
Sleeve cost		Low	Medium
Impact resistance		Medium	High
Abrasion resistance		Medium	High
Modifications required		Yes, to pile guides in most cases	Yes, to pile guides in most cases

NOTE:
The information presented above are typical values intended for reference and comparison purposes only. They should not be used as a basis for design specifications or quality control. Contact us for complete material property brochures and datasheets.