OASIS® FLOATING COVER

BY COOLEY

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Cooley Engineered Membranes

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Cooley/Engineered Membranes
WHERE SUSTAINABLE CHEMISTRY MAKES THE DIFFERENCE

Background on Floating Covers

Floating covers are a vital component of a potable water reservoir design and are expected to provide long-lasting protection to the water body; they also help maintain the quality of the water and prevent water loss due to evaporation. The costs incurred with a cover (materials and installation) are typically high, and a robust design with superior outdoor performance is absolutely essential. Durability and certification for contact with potable water (NSF 61) are the two key performance characteristics required for this application. Projects intended to cover entire water reservoirs are usually very large areas — typically covering between 500K to 1MM square feet.

The American Water Works Association recommends that all new reservoirs used for storage of potable water be designed with a cover, and existing reservoirs should be covered or provided with a post-chlorination facility.

Building Oasis

With a 90-year history of proven performance, Cooley is a pioneer in developing new chemistries in the coated fabrics industry. Back in the 1980s, the single-ply roofing industry was plagued with performance issues (i.e., cracking, crazing, loss of polymer, and severe shrinking) with products such as standard PVC and CSPE (Hypalon) in certain climates; and, seeing the need for a robust membrane for this application, Cooley developed a novel chemistry using Dupont's™ Elvaloy® technology called C3®. Elvaloy ensures a pliable, durable, and UV-resistant sheet with superior chemical resistance — even in the most extreme environments. The product was first introduced in 1989 and, to date, the membrane has lasted the test of time with no failures — a period of over 25 years and counting.

In a 2011 study conducted by Roof Consultant/Architect Doyle E. Jones, AIA, RRC, during the repairs of Sevier County High School in Knoxville, TN, he stated, "The C3 portion of the roof had zero leaks and had no leakage repair patches; the membranes were over 19 years of age. I was pleased to see and observe membrane that appeared to be the same as new in all areas from thickness, flexibility, etc." About testing the cover in the future, he added, "I have an intuitive sense that the 20-year membrane is virtually in spec with freshly manufactured membrane." Furthermore, in ASTM G 53 (UV and water) testing, a 60-mil sample of Cooley's single-ply roofing membrane (created with similar chemistry to the Oasis Floating Cover) exceeded 39,000 hours of exposure—more than seven times the ASTM minimum — and still remained flexible and showed no signs of cracking or other damage. In addition, testing of the aged samples from the roof showed the total thickness over scrim had dropped only 0.002mm; breaking strength averaged 306 lbs. versus the ASTM minimum requirement of 200 lbs. and the seam strength was at 90% versus a minimum requirement of 75%.

Using real-life knowledge of this high-performing chemistry, Cooley embarked on finding a technologically superior solution to creating a long-lasting floating cover. Largely due to their high flexibility and extreme low-temperature properties, large proportions of high-performance grades of Elvaloy were used. When Elvaloy and PVC molecules are melted, they bind naturally — resulting in a chemical-resistant, highly flexible compound; this is because Elvaloy is a polymeric plasticizer that is 100% compatible with the PVC resin over the life of the product.

The biggest challenge in building performance is the effect of weathering as well as controlling the response of the polymeric membrane to climate and the environment. The most challenging of the weather components are a combination of solar radiation, temperature, moisture, biological attack, chemical attack, and time.

Solar Radiation

UV radiation between the wavelengths of 315 - 400nm is the most damaging and important part of sunlight as it is the highest energy component. The higher amount of energy from the UV component of sunlight will cause the maximum absorption of energy in the polymeric floating cover. The degradation process begins when the amount of energy absorbed by the floating cover exceeds the bond energy of the polymeric molecules. Oxygen present in the atmosphere will increase the rate of reaction and accelerate this degradation. Typically, the energy breaks a hydrogen molecule from a polymer chain creating a free radical which reacts with oxygen and another hydrogen atom from another polymer chain to form a hydroperoxide. The hydroperoxide can split into two new free radicals which continue to propagate the reaction to other polymeric molecules. The result is crazing, cracking, and failure of the floating cover.

Cooley's novel chemistry addresses this phenomenon. All environmental factors such as thermal history and life expectancy were taken into account during the development. First, a proven-pigment chemistry was selected to induce high opacity and delay the entry of solar radiation, preventing its penetration into the membrane. The pigments used in Oasis reflect more than 70% of light (and absorb most of the rest), keeping most of the total absorbed energy away from the polymer chains. TiO_2 was used in the product, and it has zero transmission of UV light < 400nm. A primary antioxidant was selected, and the package was designed to react with the initial free radicals and break the degradation cycle at the onset. A non-reacting HALS (hindered amine light stabilizer) package was selected, which complemented the antioxidant chemistry, and was designed to react with free radicals formed due to the breaking of polymer bonds

(as explained above). The HALS molecule rejuvenates itself after reacting to free radicals and releases them away from the polymer backbone. HALS, thus, act as long-term stabilizers providing thermal and UV protection to the polymer.

Temperature

Polymers will degrade when exposed to high temperatures, processing shear and solar radiation. Absorbed energy drives both the onset and rate of a photochemical reaction, which is accelerated at elevated temperatures. A general rule of thumb assumes that reaction rates double with each 10-degree Celsius rise in temperature of the material. The Cooley pigment chemistry fights temperature rise by reflecting a majority of the light back off its surface. The temperature rise is minimized due to the decreased amount of light that is absorbed.

Chemical and Biological Attack

The Elvaloy backbone exhibits high chemical resistance — thus, it will effectively withstand water chemicals and the atmospheric effects of acid rain, pollutants, pollen, mold, and mildew. Appropriate additives compatible with drinking water were selected to fight mold and mildew growth on the surface of the membrane. A study conducted by SGH Consulting Engineers found that the Elvaloy/PVC compound, as used in Cooley's roofing membrane, was the most chemical resistant of all single-ply roofing membranes.

Chemicals tested: HVAC oil, canola oil (restaurants), dry heat (arid climates), water (humid climate), 1N Acid (acid rain), pH11 base (cleaning solution).
No change in: Mass, puncture resistance, dimensional stability*

**Study presented to ASTM, 2008.*

About Cooley Group

Cooley Group is a worldwide leader in the design, development, and manufacture of innovative, sustainable, high-performance engineered membranes used in various environmental protection; water, fuel, and chemical containment; commercial roofing; military; and outdoor advertising initiatives. Cooley's award-winning portfolio of highly diversified solutions is distributed worldwide, and the company collaborates with leading global brands to develop proprietary, first-of-its-kind solutions.

Committed to sustainability and process-efficiency improvement, Cooley Group completed certification as an ISO 9001:2008-compliant organization in 2012 — a standard that provides a systematic framework for managing a company's manufacturing processes. The company proceeded to earn ISO 14001:2004 Environmental Standard Certification the following year, which is the most widely accepted international standard for environmental management systems (EMS).

A One-Stop Shop. Cooley is the leading provider of a complete range of commercial and potable water-grade geomembranes—including Coolpro® reinforced polypropylene, Coolthane® polyurethane coated fabrics, and Coolshield® for high-temperature and extreme containment applications—to provide cost-competitive solutions for a wide, highly diverse range of applications.

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WATER PROTECTION

OASIS® FLOATING COVER

20-year and 30-year Warranties

Oasis for Floating Cover Applications

Added Benefits

Extremely high resistance to UV radiation, ozone, and weathering

Easy to fabricate, install, and repair without curing out

Certified to NSF Standard 61 for potable water usage

RF, hot air, and wedge weldable (extrusion rod available)

Available Colors

20-year | Tan/Black

30-year | Tan/Light Blue (Reflective)

Available Thicknesses

20-year | 45 mil

30-year | 60 mil

Oasis® Floating Cover is a durable, high-performance membrane specially designed for use on water reservoirs and certified (NSF Standard 61) for potable water usage. Engineered with Cooley's proprietary TPA polymer, the cover is highly resistant to oxidation, ozone, ultraviolet light, and weathering effects; and because the membrane does not cure, it allows for easy welding of strong, reliable seams during the entire lifetime of the cover. The Oasis Floating Cover's optimized product design is reliable and cost-effective, and Cooley's history of proven performance ensures consistent quality, responsive customer service, and world-class technical support.

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WATER PROTECTION

20- and 30-year Warranties

TECHNICAL SPECIFICATIONS

20-year Warranty

Base Fabric	Standard	Metric
Base Fabric Weight	3.4 oz / yd²	115 g / m²
Fiber/Style	Polyester / Knit	

Coated Fabric	Standard	Metric
Total Weight	37 oz / yd²	1,254 g / m²
Thickness (nominal)	45 mils	1.14 mm
Coating Type	TPA	
Sealing Properties	Dielectric / Thermal	

Material Properties	ASTM Test Methods	Standard	Metric
Tensile Strength, Grab	D751A	250 lbs	1,112 N
Tear Strength, Tongue (8" x 8")	D751B	55 lbs	245 N
Puncture, Flat Tip	D4833	100 lbs	445 N
Ply Adhesion	D751	12 lbs / in	2 N / mm
Dimensional Stability	D1204	1 %	
Seam Shear Strength	D751A	200 lbs	890 N
Seam Peel Strength	D413	20 lbs	90 N

30-year Warranty

Coated Fabric	Standard	Metric
Overall Thickness (+/- 10%)	60 mils	1.5 mm
Polymer Type	TPA	
Sealing Properties	Dielectric / Thermal	

Material Properties	ASTM Test Methods	Standard	Metric
Tensile Strength, Grab (Warp / Fill)	D751A	400 / 380 lbs	1,779 / 1,690 N
Tensile Strength, 1" Strip (Warp / Fill)	D751B	265 / 225 lbs	1,179 / 1,000 N
Tear Strength, Tongue (Warp / Fill)	D751B	140 / 130 lbs	623 / 578 N
Puncture, Screwdriver	D751	70 lbs	311 N
Puncture, Ball	D751	415 lbs	1,846 N
Hydrostatic Resistance	D751	750 psi	5.2 MPa
Dimensional Stability (212°F / 1h)	D1204	+/- 2.5%	
Low Temperature Bend	D2136	-25°F	-32°C
Weathering Resistance	D2565	> 19,000 hrs [1]	
Seam Shear Strength	D7749	210 lbs	934 N
Seam Peel Adhesion	D751	20 lbs / in	35 N / cm

[1] *Accelerated laboratory weathering and natural outdoor weathering are ongoing.*

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NSF Certified to NSF/ANSI 61

TÜV SÜD ISO 14001 ISO 9001

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