ALL IN ONE ARMOUR FOR SECONDARY CONTAINMENT

A revolutionary new secondary containment bund lining solution is a world first in tank storage

There have broadly been two approaches to creating secondary containment bunds within tank storage facilities, 'hard' and 'soft'. The 'hard' solution is the construction of a hard faced structure (typically concrete) which offers long term durability but is logistically complex and expensive to install. The 'soft' solution is the use of a geomembrane liner, which is relatively easy to install, but needs to be buried and therefore often requires importing expensive fill materials.

CC Hydro is a new material from Concrete Canvas, which offers a different approach. It can be unrolled and jointed as easily as a conventional geomembrane liner, but it has an integrated protective concrete layer on one side, thus eliminating the need for burial.

CC Hydro is the second generation of a new class of materials known as GCCM's (geosynthetic cementitious composite mats). Broadly speaking GCCM's are concrete impregnated fabrics which can be unrolled over any surface, sprayed with water and then 24 hours later set hard to form a hard wearing, durable, fibre reinforced concrete layer. Essentially it is concrete on a roll.

The first generation of GCCM's, known simply as Concrete Canvas, are a finely tuned composite consisting of a 3-dimensional polymeric matrix, filled with a high early strength, dry concrete mix. The result is a range of flexible fabric from 5 to 13mm thick, in roll lengths up to 200m.

MARKET

Standard Concrete Canvas (CC) is used in the construction sector for erosion control applications such as lining water channels, protecting slopes and providing weed suppression. More recently it has been adopted within the petrochemical sector to provide erosion control to secondary containment bunds and remediation of cracked concrete for applications such as relining extinguishing ponds.

The ability to be unrolled in the same manner as a geosynthetic product and then set hard to form a concrete surface with a design life of more than 50 years is a unique quality in the material. The standard product does however have its limitations, the CC joint provides limited impermeability and cannot be easily leak tested. That means its use, until now, has been limited primarily to erosion control rather than for containment applications.

THE FIRST ALL-IN-ONE ARMOURED CONTAINMENT LINER

CC Hydro is designed to address that limitation, combining standard CC with a high impermeability (1x10-12m/s), chemically resistant geomembrane liner laminated onto the rear surface. CC Hydro can provide the same level of impermeability in containment applications as a conventional geomembrane but has an integrated protective concrete surface as part of the package.

By contrast, conventional geomembranes typically require 0.3-0.5m of top cover (often expensive imported fill) to protect them from UV degradation, puncture and the effects of weathering. The logistical and time savings benefits of eliminating top cover are enormous, not to mention the safety benefits of reducing plant and personnel movements in a high risk environment such as a petrochemical plant.

A key feature of CC Hydro is that it incorporates a high visibility welding strip along one edge. This allows the product to be thermally


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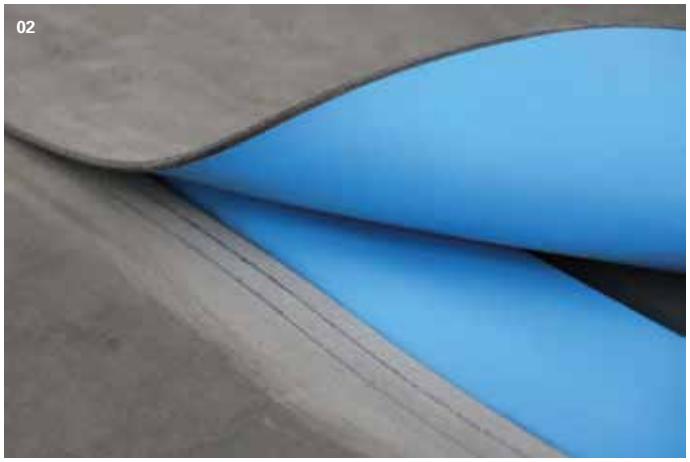

01 Secondary containment bund lining with CC Hydro

02 CC Hydro welding strip with high visibility blue geomembrane

03 A pallet of CC Hydro containing 150 sqm of material

04 Unrolling CC Hydro prior to welding and hydration

welded using the same techniques as conventional geomembranes. This also has the advantage of allowing installation with an existing thermal welding contractor with only minimal additional training. The twin track weld for jointing CC Hydro layers together works by welding two parallel seams along each joint to create an air channel; and this is then pressurised to ensure joint integrity and continuous impermeable across the containment surface.

In many ways the geomembrane backing is an innovation in itself, developed in close partnership with one of the world's leading geomembrane manufacturers. Its distinct colour – bright blue – allows any uncovered areas, around joints or interfaces with upstands to be easily identified on site and addressed during installation, to ensure the membrane has complete protection. Significant development time has been invested in the polymer chemistry, in order to create a material which has excellent resistance across a broad range of hydrocarbons – often a key challenge when polymers meet hydrocarbons.

It also incorporates a high tensile reinforcement scrim embedded in the membrane, this gives the material a high level of puncture and tear resistance as well as adding stiffness.

The system has already completed a raft of national and international tests standards including long term durability and fire certification tests. Concrete is inherently far more fire resistant than conventional geosynthetics, allowing CC to be assessed against building materials such as concrete and plaster board. Under the European Norm for building material CC achieved a Euroclass B classification, the second highest level achievable. In addition, CC Hydro has been tested to and passed the Canadian national standard for flammability of secondary containment liners with a zero burn time.

BENEFITS

In the past there have broadly been two approaches, a hard structure, such as poured or precast slabs of concrete, often onto a trapezoidal earth berm. Or a flexible geomembrane liner buried deep within the bund to protect it from the effects of weather, UV and puncture.

Both of these approaches require large amounts of plant, personnel and time. Pre-cast or poured concrete offers long term durability but is logistically complex, subject to weather conditions and costly. Geomembrane liners are generally seen as fast and easy to install but require large amounts of earth works and often expensive imported fill to provide top cover.

CC Hydro offers a new approach. It can be unrolled and jointed as easily as a conventional liner system but provides the long term protection and durability of a concrete structure. This has the added benefit when remediating existing infrastructure in that it can be laid directly onto an existing bund profile without any additional excavation works. Also, because CC Hydro is the only surface lying containment product, it is easy to inspect post-installation – even several years after the contractors have finished. All joints are fully visible and any damage can by identified and repaired and re-tested, with nothing hidden from view, providing the terminal operator with peace of mind that they comply with current regulations.

There is also a final benefit that comes when considering the total life cycle costs. A standard earth covered bund for example, will normally require a high degree of ongoing maintenance. In arid climates this may be in the form of annual re-profile to combat the effects of weathering and erosion. In northern European climates, root growing vegetation will necessitate an annual 'de-veg' (as a minimum) to limit potential fire hazards. Longer term, at end-of-life, any top cover may also contain hidden costs at the point of disposal. If the material is classified as 'contaminated fill' it will require processing, even if the facility can show that it hasn't had any documented leak events. This is a significant cost when consider the volume of fill material laid over membranes in a typical tank storage facility.

CONCLUSION

The geomembrane market has remained relatively static over the last decade, with modest product innovations over the years. By combining a containment liner and hard armour protection into a single product, Concrete Canvas has made a product which is as easy to install as a liner and as durable as concrete.

FOR MORE INFORMATION

This article was written by Will Crawford, director at Concrete Canvas.
Will.crawford@concretecanvas.com