



**Project Info**

**SEP 8** 08 / 09 / 16

**CC** CCH5™ Bulk Rolls

**#** 4000m<sup>2</sup>

**V** Vertical layers

**G** Milford Haven, UK

**H** Jones Brothers (Henllan) Ltd.

**i** CCH used to provide secondary containment to earthen bunds at oil storage facility.



Completed CCH lined Tank 114, Milford Haven

In September 2016, CC Hydro™ (CCH) GCCB\* was used to provide secondary containment to a 5000m<sup>2</sup> berm face at an oil storage facility in west Wales operated by SemLogistics Ltd.

SemLogistics Milford Haven is one of the largest petroleum products storage facilities in the UK, accounting for nearly 25 percent of the UK's independent multiproduct storage. Located on the Milford Haven waterway on the west coast of Wales, the facility serves ships transporting in and out of international locations. The facility plays a key part in the region's economy, employing more than 60 people from the local area. The premises were built in the 1960s and are located adjacent to a Site of Special Scientific Interest (SSSI).

There are 52 tanks of various sizes within the site that are used to store different petrochemical products: gasoline, gasoline blendstocks, naphtha, jet fuel, gas oil and diesel, as well as crude oil. Each tank sits within a bunded area formed with granular fill during the original construction of the site. As part of ongoing improvements, SEM embarked on a programme to install secondary containment around two of the site's most critical storage tanks.

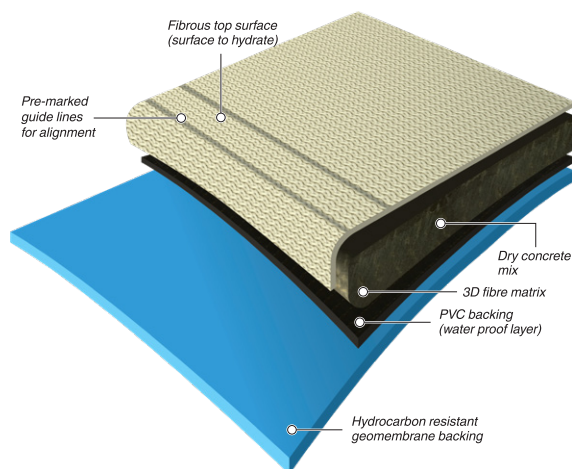
SemLogistics engaged Mott MacDonald to design a robust solution which takes into account safety during construction, use and maintenance and ease and speed of installation. Following the successful application of an earlier tank (206) in 2014, and after completing cost comparison analysis considering several design scenarios, CCH was specified as part of major investment into providing secondary containment for tank 114. CCH, as well as satisfying the required regulatory and environmental requirements, offered an opportunity to significantly reduce the construction time, operational disruption and cost of secondary containment works within the site.

\*Geosynthetic Cementitious Composite Barrier

## CC Hydro™

CC Hydro™ is a revolutionary new containment product from Concrete Canvas Ltd. It combines the company's concrete impregnated fabric technology with a high impermeability, chemically resistant geomembrane backing. The geomembrane provides a high-performance liner with a testable joint for quality assured containment applications. The liner incorporates a hi-visibility welding strip allowing joints to be thermally bonded with a twin-track or triple-track air channel for on-site testing.

The flexible concrete impregnated fabric, hardens on hydration, to provide long term protection to the geomembrane from puncture, abrasion, weathering and UV degradation. This hard armour concrete surface effectively removes the need for concrete, soil or aggregate top cover, normally required with conventional liner systems. Although the company only began commercial volume production of CCH and CC products in 2009, we now supply 7 out of the top 10 oil and gas operators worldwide.



## CC Hydro™ Key Benefits & Properties

CCH is effectively an all-in-one solution, combining the impermeability of a containment liner with the hard armour protection and durability of concrete, reducing install times and simplifying logistics. CCH does not require a protective top cover. This removed the need for additional excavation, the treatment of contaminated arisings and the import of costly fill material. It was possible to maintain the original volume capacity of the bund asset, as the CCH5 was laid directly onto existing profiles providing significant overall time and cost savings.

CCH has excellent impermeability and has been independently tested to BS-EN-1377 to have a hydraulic conductivity better than  $1 \times 10^{-12}$  m/s. This gives a factor of safety over and beyond alternative solutions with standard impermeabilities of  $1 \times 10^{-9}$  m/s.

In addition to meeting the impermeability required, CCH provided effective weed suppression eliminating the ongoing maintenance cost of soil covered systems. Incredibly durable, CCH has a hard armour surface, protecting the geomembrane liner from puncture, abrasion, weathering, burrowing animals and UV degradation. This all contributed to the reduced life-cycle costs of the material compared to the GCL option.

From a health and safety aspect, the use of CCH significantly reduced the amount of time that people were required to work on the embankments (height) in comparison with the use GCL and the associated systems. In other installations, CC Hydro™ also reduces the end-of-life costs associated with treatment of any contaminated top cover.



CCH is installed in a similar fashion to conventional plastic and geomembrane products, using off the shelf tools and accepted standard design details. The general process for installation is as follows;

**Preparation of the substrate:** Prior to the installation, the berm faces were graded to the required profile and height for the volume of media being contained in the event of a catastrophic tank failure. Angular rocks, roots, grass and vegetation were then removed from the base material. In some instances, a compensatory geotextile can be laid first, but here, the surface was made smooth using a fine dust top layer to the soil berm.

**Deployment of the CC Hydro™:** Supplied in bulk rolls of up to 150m<sup>2</sup>, CCH is deployed via spreader beam and plant equipment, before being cut to length using basic hand tools.

**Thermal welding and pressure testing of the joint:** Welded in accordance to Thermal Welding Institute (TWI) guidelines, CCH incorporates a high-visibility welding strip, allowing the joint to be thermally bonded with a twin-track or triple-track air channel for fast and simple on-site pressure testing.

**Hydration:**

Following the welding and testing of the joints, CC Hydro™ was hydrated via the local on site water mains. CC Hydro™ cannot be over hydrated so there was no requirement to measure exactly the water:CC ratio.



Preparation of the substrate



Deployment of the CCH



Thermal welding and testing of the joints



Hydration

A total of 4000m<sup>2</sup> of CCH5™ were installed in under 5 months despite very adverse weather conditions. For a facility like SemLogistics getting the tank back in service on time was of paramount importance in order to meet their client's expectations. Not only were the secondary containment requirements of the bund area met, the project was undertaken using a locally sourced product, enabling the capital expenditure to remain largely within the area.

Concrete Canvas Ltd. worked closely with Mott MacDonald in the initial extensive research and preparation phase, developing the standard details for pipe penetrations, corner and valley sections, upstands, interfaces with concrete infrastructure, mating to incumbent liners and ramp construction details. Concrete Canvas Ltd. now have a full portfolio of standard details covering all aspects of secondary containment berm and bund lining.

Similarly, Concrete Canvas Ltd. worked closely with the contractor, Jones Brothers, taking on board feedback during the early sections of work and lessons learnt from the lining of the previous tank. Significant product improvements were made over the course of the project including the introduction of a reinforcement scrim into the material to enable more efficient welding on site. Another key product improvement was the development of a propriety Triple Tracked Weld, which not only provides the twin track weld required for pressure testing of joint, but incorporates a third weld that secures the overlying CC Hydro™ layer to the layer beneath. This provides additional protection to the CC Hydro™ membrane from environmental exposure and results in a neater finish.

Following the success of the lining of tank 114, the system is being proposed for future containment schemes across the site and was awarded an ICE (Institute of Civil Engineers) Innovation Award in July 2017.



*Northern elevation of the CCH lined tank 206 berm with perimeter drain*



*Step access detail*



*Access ramp detail*



*Pipe penetration detail in western elevation of Tank 114*



*Image from drone footage of Tank 114 during installation and prior to painting of tank*