

Project Info

Petroineos Pipe Track Remediation,
Petroineos Grangemouth Refinery



10 / 10 / 2016



CC8™ Bulk Rolls



3900sqm



Longitudinal layers



Falkirk, UK



Luddon Construction
on behalf of Petroineos



CC used as weed
suppression under
complex series of pipe
tracks at Grangemouth
Refinery

petroineos
REFINING AND TRADING



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Completed CC lined pipe track.

Project Context

In October 2016, Concrete Canvas® (CC) GCCM* was extensively used to provide weed suppression under a series of complex pipe tracks at Grangemouth Refinery, operated by Petroineos in Falkirk, UK.

Grangemouth Refinery, operated by Petroineos, is Scotland's only crude oil refinery, producing the bulk of fuels used in Scotland and has a refining capacity in excess of 10 million tonnes per year. Situated close to the Firth of Forth, Grangemouth traces its origins back to 1924 and was previously owned by BP before being sold to Ineos Group in 2005. Since its change of ownership, Ineos have invested heavily in infrastructure at the 90 year old site including jetties, tank farms and pipe tracks. The North Sea Forties Pipeline system terminates at the refinery and excess crude oil is exported via pipeline to a tanker loading terminal on the Forth. Crude oil also comes into the refinery via a 58 mile pipeline from Finnart Ocean terminal which can handle up to 324,000 ton deadweight tankers.

Safety is paramount at Grangemouth, and as part of the Refinery Integrity Improvement Project, a section of pipe track at Overton Road was identified as in need of remediation, to remedy the pooling of water and to prevent the growth of vegetation. There had been previous weed suppression work carried out in earlier phases of the pipe track remediation but in this instance, the engineering consultancy IKM proposed CC as part of a new drainage and weed suppression system.

* Geosynthetic Cementitious Composite Mats



Installation



Site prior to clearance and showing vegetation growth.



Dispensing of bulk roll CC8 via spreader beam.



Attachment of low profile pulling jig.



Feeding of CC8 under low profile.



Adjusting position to create 100mm overlaps prior to screwing joint.



CC8 terminations to existing concrete infrastructure.

Overton Road Pipetrack Remediation Phase 3



The existing Overton Road pipe track drainage system was not capable of delivering the required dispersion for the water table the area covered. Any leaked hydrocarbons would have been able to soak into the ground, potentially causing environmental damage. The pooling water and vegetation could have potentially created an integrity risk in terms of corrosion to the pipework.

Petroineos site standards pipe track conditions, layout and design stipulate that;

- All pipe track drains shall be clear and able to operate to their design capacity.
- The surface of any standing water in pipe tracks should be no closer than 100mm to the lowest point of pipework, fittings and insulation.
- Floors should be of suitable condition and construction to enable safe access/egress for inspection, maintenance and operational purposes.
- There should be no substantial vegetation in pipe tracks. Any vegetation in the pipe track shall be no closer than 100mm below the lowest point of pipework and insulation.
- Adequate drainage should be supplied for all pipe tracks to ensure that there is no possibility of flooding.

The purpose of the standard is to ensure that pipe tracks are run in a consistent manner and configured such that maintenance and inspection activities can be carried out successfully and economically.

Site Conditions

Access under the pipe tracks was significantly restricted with limited clearance between the underside of the pipework and the track floor. The track floor itself was uneven, puddled and of a low CBR value. The pipe track section included a significant number of irregularly placed upstands of varying size and location.

Alternative Solutions Considered

Given the site standards and the requirements, 3 possible solutions were proposed by IKM; poured concrete, stone chips or Concrete Canvas®.

Poured concrete would have required additional digging within the pipe track floor to achieve a suitable thickness of concrete. Without reinforcement, this would have been prone to cracking and perishment. A poured concrete floor would also not have been able to accommodate the underlying water table and may have led to flooding elsewhere on site. Other considerations that led to the discounting of a poured concrete floor as a viable option were the limited access to excavate, the required costly removal of soil from site and the difficulty in achieving a good surface finish in the low profile.

Stone chips are the traditional method for dressing pipe track floors due to the relatively lower cost of installation compared to conventional poured concrete floors. However, it has been demonstrated that over time, dirt will build up within the stone chips which would allow root vegetation to grow (as observed in previous phase of the Overton Rd. pipe track remediation project). Stone chips also do not prevent the burrowing of animal and wildlife into what can be sensitive infrastructure. Stone chips also hide pooling of water and hydrocarbons.

The decision to employ Concrete Canvas® as the means of remediating the pipe track floor was based on a number of factors including:

- Required less groundwork preparation, grading and removal than the stone chip or concrete pour option
- Significantly quicker to install compared to poured concrete
- CC offers tested weed suppression and root penetration resistance according to DD CEN/TS 14416:2005
- CC has an abrasion resistance approximately 7.5x greater than a 17MPa OPC cement (ASTM C-1353)
- CC has a Euroclass B fire resistance rating BS EN 13501-1:2007+A1:2009
- CC can be easily cut to shape using basic hand tools to accommodate irregular upstands and infrastructure
- Installing CC in longitudinal layers with simple mechanically fixed overlaps would accommodate a rising and falling water table
- The fibrous top surface of CC would provide clear and visible leak detection
- CC8 would allow for pedestrian foot traffic for essential maintenance works.
- CC has excellent chemical resistance against hydrocarbons, sulphates and acids (BS EN 14414)
- CC would prevent burrowing animal damage and discourage habitation protecting sensitive infrastructure within the pipe track.



Example of vegetation growth through dilapidated stonechip/geotextile option.

Overton Road Pipetrack Remediation Phase 3



Installation

Prior to deploying the Concrete Canvas®, the pipe track area was first graded, made as even as was practical and any vegetation growth removed. Given the low profile and restricted clearance levels between the pipes and the track floor, the CC was deployed where possible using a modified light weight spreader beam to pull the material in lengths under the pipework.

The CC layers were laid perpendicular to the pipe track to accommodate the majority of pipe upstands and to minimise the length and subsequent weight of each individual layer. Subsequent layers were overlapped by 100mm and screwed together using SS 35mm screws at 200mm centres through the overlap. The material was actively hydrated using the onsite water mains.

CC layers were periodically fixed to the substrate using a combination of either steel or plastic ground pegs depending on the ground condition at specific points.

Summary

Installed in challenging conditions, with inclement weather, restricted access and a significant number of upstands to accommodate, CC was successfully installed by Luddon Construction Ltd. over a 6 week period. Following the success of the initial 2150sqm trial area completed in August 2015 which showed no signs of vegetation growth, a subsequent 1750sqm area was commissioned for lining with Concrete Canvas and is scheduled to be completed by end of 2016.

“After a year of installation, nothing has grown within the Concrete Canvas lined areas, whereas vegetation continues to grow within the stop chipped sections of the pipetrack. Concrete Canvas has proven to be the better and more cost effective vegetation suppressor and we look forward to specifying the material wherever possible for this type of control.”

Stewart Woolley
Mechanical Asset Care Engineer
Petroineos

“Installation of any weed suppression system can be both challenging and technically difficult within pipetracks due to the layout, access restrictions and infrastructure. However, the simple installation process of Concrete Canvas made overcoming these challenges easier.”

Ryan Montgomery
Contracts Manager
Luddon Construction Ltd