Investment Information

NetworkRail

What's happening?

Best practice *Canal Tunnels* Diamond Wire Cutting

Overview:

Diamond wire cutting (DWC, see Figure 1) is a specialist procedure which only a limited number of contractors are able to provide. Used to abrasively cut metal, stone and concrete structures, it is an energy intensive process which requires water to cool down the 'drive unit' that powers the saw mechanism. As a result, only clean water can be used. The water is also required to cool the wire, dampen down dust and remove slurry from the cut zones.

BBRail were the first contractor to use the process of diamond wire cutting in this environment, and employed Kilnbridge as the DWC sub-contractor.

Best Practice:

The Canal Tunnels Junction site was located in close proximity to London St Pancras Low Level Station. The client was concerned about the amount of dust that the concrete cuts would produce as this could have lead to public health risks and aesthetic issues for the station.

The concrete track bed was cut out in sections using the DWC process as it was more efficient, quicker to execute and less energy intensive (both in power and labour) than traditional breakout methods.

Environmental considerations

The disposal of slurry directly into rivers, lakes or sewage systems without suitable pre-treatment presents environmental problems. This is created by high alkaline content from the concrete, as well as structural damage to pipes (caused by corrosive effects and sediment deposits). Hence, certain procedures were adhered to as follows:

- Collect the drilling or sawing slurry (e.g. using a wet type industrial vacuum cleaner).
- Allow the slurry to settle and dispose of the solid material at a construction waste disposal site (the addition of a flocculent may accelerate the separation process).
- The remaining water (alkaline, pH value > 7) must be neutralized by the addition of an acidic neutralizing agent or diluted with a large volume of water before it is allowed to flow into the sewerage system.

As the diamond wire cut through the concrete, water was discharged into the 6ft trenches (which had dams in place to prevent overflowing). The initial settlement process began here.

The water was then pumped into a large sedimentation tank where the fines were separated from the water using a sieve. This resulted in two waste streams; the slurry that became solidified, which was disposed of through BBRail's waste broker, Reconomy; and the settled water.

The settled water was then pumped into a second tank filled with ballast – this provided further filtration/settlement. The water was then pumped into the station drainage system where it was diluted with large volumes of water. The project team was responsible for ensuring that the drain capacity was not exceeded by the additional water volumes – approximately 10m^3 per weekend.

Large fans were also fitted along the length of the tunnel to draw excess dust away from the worksite and out of the tunnels.

Figure 1 - Diamond Wire Cutting Rig

Date: February 2011
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Positives

The process saved BBRail from breaking out large sections of concrete track bed, which meant:

- Less heavy machinery and plant was required – reduced fuel costs and CO2 emissions
- less labour required to cut out rather than 'break out' concrete
- less concrete waste produced
- significantly reduces level of dust
- accurate level finish with minimal track settlement. By placing shims in the gaps and providing temporary lateral supports, there was no movement in the top slab
  - this meant that trains were able to run in between possessions without any TSR requirements
- no disruption to other Thameslink contractors using RRV's during possessions – this was key as the site was a busy thoroughfare
- less noise and vibration than a conventional saw benefiting the Section 61 application
- electrically operated (no fumes)
- works completed earlier than originally planned
  - 153 hours of possession time utilised, compared with 624 hours estimated using "conventional" methods

Negatives

- energy intensive (415kV supply required)
- water intensive (need to ensure sufficient supply demands)
- dust can be a problem if not adequately managed

Lessons Learned

To improve the environmental performance, water could have been re-used, however, as space was limited on site adequate settlement / water purification could not be undertaken to bring the water up to the standard required for the cooling process.

The large sections of concrete blocks were also extremely heavy and BBRail had trouble in finding a waste contractor to remove them from site. This meant BBRail had to cut the slabs into smaller sections using the same DWC process, in order to allow the concrete to be taken away for onward recycling.

Recommendations

Network Rail commended the process and stated that this would become their preferred method for concrete cutting. The BBRail project team have also supported this.

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