CASE STUDY: Anglian Water - Raithby Water Treatment Works

SECTOR TYPE: Utilities - water treatment
LOCATION: Louth, Lincolnshire
CLIENT: Anglian Water
PRINCIPAL DESIGNER: @one Alliance
CONTRACTORS ENVIRONMENTAL CONSULTANT: @one Alliance
PRINCIPAL CONTRACTOR: MWH Treatment
CONTRACT VALUE: £7 million
CONTRACT DURATION: 2 years

The Project

The existing Water Treatment Works (WTW) at Raithby had reached the end of its life and required a major refurbishment, including a new 15ML/d iron and manganese removal system complete with disinfection and supply pumps for the production of potable water.

Anglian Water challenged the project team to construct a brand new works for the same embodied carbon and cost as a refurbishment of the existing treatment works, while delivering to current Anglian Water standards.

Key features of the new works include:

- Rapid gravity filters to be installed outside at high level to remove the need for an underground pump station. This offers substantial capital and carbon savings by removing a filter building and the reinforced concrete associated with building a new structure below ground.
- Structured wall HDPE contact tanks to reduce capital costs and embodied carbon. As the tanks are built off-site and in one piece, on-site construction activities are minimised and health and safety improved.
- Standard products to maximise off-site build.
- A modular approach to design to aid fabrication and construction by repetitive processes and techniques (for example, same cut lengths for four pipes ensure the fabricator can cut four pieces in one pass).

A primary focus on reducing embodied carbon encouraged design and management teams to radically rethink the way water treatment works are designed, built and operated. This generated creative ideas that not only saved carbon but also cut cost, reduced impact on customers, shortened construction time and lowered construction risk on-site.
The Benefits

- **Reduced carbon** – the new works are expected to deliver a 55% reduction in embodied carbon compared to the traditional solution. Operational carbon will also be reduced by 74 tonnes per annum.

- **Cost** – capital expenditure of the new works will be reduced by 22% compared to using a conventional method.

<table>
<thead>
<tr>
<th>Option</th>
<th>CAPEX (£m)</th>
<th>Emb Carbon (TCO2e)</th>
<th>Op Carbon (TCO2e/year)</th>
<th>WL Carbon (TCO2e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional Solution</td>
<td>7.53</td>
<td>2,097</td>
<td>13.76</td>
<td>2,647</td>
</tr>
<tr>
<td>Target</td>
<td>6 (20%)</td>
<td>1,048 (-50%)</td>
<td>0</td>
<td>1,048</td>
</tr>
<tr>
<td>Sustainable Solution</td>
<td>5.89 (22%)</td>
<td>954 (55%)</td>
<td>-60</td>
<td>-1,446</td>
</tr>
</tbody>
</table>

The Process

The key processes underpinning the project were:

- The selected treatment process for the scheme was a conventional iron and manganese removal plant consisting of aeration, oxidation, filtration and disinfection with a high lift pumping station. The challenge set to the project team was to build the plant to the same embodied carbon level as would be required to refurbish the existing treatment plant which was beyond its asset life.

- With a process for measuring, managing and reducing carbon embedded into asset design, engineers clearly understood the goals of halving embodied carbon and reducing operational carbon by 20% by 2015 from a 2010 baseline. A bespoke carbon modelling tool is used to measure carbon impacts of individual designs and a robust governance process is in place to challenge on carbon reduction.

- All major items of plant were assessed to determine the use of alternative materials and potential carbon savings, following which a preliminary layout was identified and valued. The final solution was achieved by reviewing the layout to a further level of detail while focusing on minimising the site footprint to reduce embodied carbon.

- A carbon tracker was used through the process to identify where savings were achieved for each major element of plant. By application of this challenge, the embodied carbon was reduced by 55% and operational carbon by 74 tonnes per annum against a conventional solution.

Key Learning Points

- Targeting embodied carbon as a major driver early in the project gives license to the project team to consider innovative solutions for a scheme.

- By focusing on the major carbon elements of the scheme, a realistic target for carbon reduction can be set and tracked.

End User Feedback

Early involvement within the design and decision making process from a number of internal stakeholders resulted in significant changes to traditional designs being accepted. For example, initial concerns from Anglian Water operational teams of locating water treatment processes outside of buildings were discussed at length.

The teams accepted the business requirement to drive down cost and embodied carbon, and the benefit of a new treatment works to replace an ageing asset at Raithby, without any impact on health and safety.

Learn more

http://www.anglianwater.co.uk/_assets/media/one_summer2012-pullout-lr.pdf

For more information on
The Green Construction Board
visit www.greenconstructionboard.org
or email green.board@bis.gsi.gov.uk