

## Dutch River Swing Bridge - Goole

The project involved the design and construction of a new bridge for the A161 Dutch River Bridge crossing in Goole. The existing bridge was an old Victorian bridge that had been refurbished a number of times but was reaching the end of its life. This bridge also had a number of intrinsic problems in dealing with the modern vehicles that were using it, as well as pedestrians. The carriageway was extremely narrow by modern standards and weight restrictions were being considered to prolong the life of the bridge. It was also necessary to control traffic on the bridge using traffic lights which caused long delays during peak times on a major route.

- One of the largest swing bridges to be constructed in recent years
- Constructed over a difficult waterway whilst maintaining traffic flow
- Exemplar drive mechanism and bearing arrangement was greatly simplified to improve maintainability and reliability.
- Novel use of a composite material to form the main bridge bearings improving their performance and reliability
- Bridge traffic and pedestrian use has been greatly improved with dedicated walkways and cycleways
- Wider boat traffic is now able to navigate the river

The design solution accepted by ERYC consisted of a swing bridge with a moveable span measuring 45 metres long x 14 metres wide – one of the biggest to be built in the UK in recent years. Unlike the Victorian bridge it has replaced, which had a central pivot, the pivot on the new bridge is positioned one-third of the distance from the tail, which has increased the navigable passage when the bridge is open to shipping from 11.5 metres to 15.2 metres, despite the increased width of the bridge deck.

M G Bennett and Associates were responsible for the design of all the bridge bearings, as well as the drive mechanism and associated equipment for the swing action. In addition, we also specified the control system, as well as writing and commissioning the control software. In designing the bridge bearings, a number of novel features were introduced that had not been used on swing bridges in the past and in addition to this a new material was used to form the bearings that had not been used in this application before.

M G Bennett and Associates were responsible for the M&E design work associated with the Dutch River Swing Bridge. This involved developing designs for a number of main bearings on which the bridge sat whilst traffic passed over it, as well as the bearings and drive mechanism used to swing the bridge.

An initial design concept was provided by the client involving a number of complicated rolling element bearings, as well as having a relatively complex hydraulic control system. It was felt that this would be costly to implement, as well as to maintain and may not provide the reliability in the future that the client desired. This concept was developed and simplified to use a number of plain bearing concepts, using a composite material for the main bearing surfaces. This had a number of benefits that included more cost effective manufacture and improved reliability. It also meant that the bearing elements that would need replacing in the future were significantly lighter and easier to handle compared to their metallic equivalent.

The drive mechanism and hydraulic system were developed to have a number of redundant systems so that if there was a failure, it was still possible to operate the bridge safely. The drive system was also optimised to minimise the amount of power the swing bridge used whilst operating to account for the limited electrical supply to the control building.

Bennett Associates (originally founded in 1984) was acquired in 2008 by Atkins; bringing their proven technical expertise to the UK's leading engineering consultancy.

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The Dutch River Swing Bridge in Goole



One of the seven steel/Orkot bearing blocks supporting the swing bridge



Aerial view of the Dutch River Swing Bridge



Tail wheels and main drive rack