

Avoch & Munloch

upgrade & remediation of Scottish Highland RBC plant

Until November 2002 sewage from the village of Avoch, north of Inverness, was treated by two Rotating Biological Contactors (RBCs). However, both RBCs were problematic and as a result substantial sums of money were being expended each year to remove sludge and to maintain the mechanical plant. This occasionally was achieved by totally removing the complete RBC's rotor. Scottish Water were required to improve treatment at Avoch, together with dealing with an increase in flows at the village of Munloch.



Second rotor installation in modified RC tanks (courtesy Copa Ltd)

In May 2001, *Copa Ltd* was asked to investigate and prepare a report on the operational and mechanical aspects of the RBC assembly. It was apparent that the rotor could not be easily repaired, consequently it made economic sense for the existing rotors to be replaced when upgrading the works at Avoch.

The upgraded works is required to treat sewage not only from Munloch but also the village of Avoch, a total population of 2,400 – this required the provision of a third RBC. Tenders were invited in May 2002 and awarded in June 2002 to *Copa Ltd*

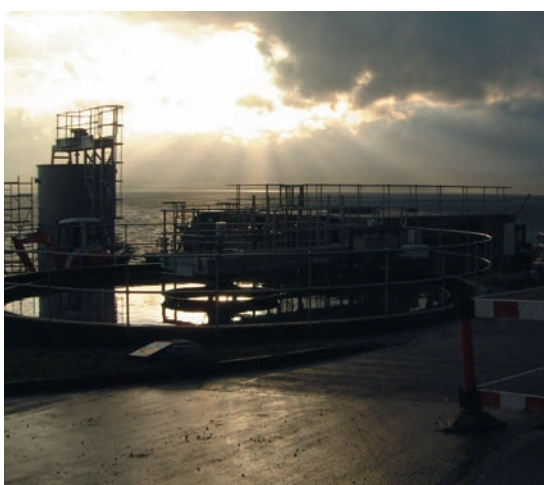
Tenders were invited in May 2002 and awarded in June 2002 to *Copa Ltd*. *MJ Gleeson* project managed the scheme, including providing the civil works. *MWH* was the consulting engineer.

Rotor

Each rotor is 3.3 metres diameter and seven metres long. In order to minimise costs, the existing tanks were modified to accommodate the new *Copa* rotors and the bottom of the tank benched to avoid sludge settlement. The third rotor is located in a free standing GRP tank designed to resist gales of up to 40 mph.



Avoch: Copa RBC - GRP tanks adjacent to original concrete tanks.



Avoch: Upgrade & remediation of plant



Avoch: GRP tanks & Moray Firth viewed from top of existing tanks

The rotors are required to meet Severn Trent Specification and Cranfield University recommendations and are designed to accommodate a 5mm biomass thickness on the coarse packs and 3mm on the fine. This fatigue stress is less than 25 MPa and the rotor rotates at 1.1 rpm.

Dr Bannister's of Cranfield University provided an audit report confirming Copa's design was in accordance with the University's requirements to achieve the Severn Trent Specification. This specification requires **zero maintenance of the rotor metal assembly for 20 years, other than lubrication of bearings and gearbox.** The Cranfield design enables the rotors to be carefully manufactured and assembled thereby minimising stress raisers.

Commissioning

The first rotor to be commissioned was in the GRP tank in October 2002. This provided sufficient capacity to enable the works to treat the incoming flow when a rotor was removed and ultimately provided sufficient capacity to treat the full flow from both villages once the flow from Munloch was transferred.

During commissioning the second (existing) rotor collapsed, consequently *Scottish Water* were compelled to operate with only one existing, and defective rotor, whilst the new rotor matured. *Copa Ltd* provided the second rotor ahead of programme to ensure that two reliable rotors were fully operational as soon as possible, at no extra cost to the client. *Copa's* contract required them to design and provide the distribution chamber serving the three RBCs. This not only ensures the distribution of flows is equal but also the

Biomass thickness is evenly distributed.

All three RBCs were installed by November 2002. The works is required to achieve a BOD: SS20:30 consent standard. The first rotor had met the standard nine days after commissioning. Final effluent is now well within the specified consent.

Other water companies

Since the summer of 2000, *Copa Ltd* have provided over 100 RBCs to a number of water companies in the UK. All of these have been provided on time, defect free and within budget.

It is a fact of life that sewage arrives at the treatment works every day and that flows cannot be stopped. Consequently, it is essential that alternative facilities are available to treat the incoming flow during remediation. Providing a long life plant ensures the cost of temporary treatment is kept to a minimum. Where alternative facilities are required the *Copa* BAF plant has been used since this is invariably cheaper than transporting sewage to an adjacent works by tanker.

A new rotor can be designed and manufactured usually within eight working weeks. The old rotor is removed and replaced by the new rotor usually in five working days. Maturation is dependent on the final effluent quality but is usually achieved within six weeks where nitrification is a requirement. The total time from order to full nitrification is usually less than four months. ■

Note: *The Editor & Publishers thank Copa Ltd for providing the above article for publication.*