

## BALL JOINT OF A LOCK-GATE

The lock gate on the "Nieuwe waterweg" (see Figure 1) consists of two caissons which in case of storm or spring tide can be towed out into the canal and subsequently sunk to close the waterway. Both caissons are connected to large ball joints on the opposite banks.

The two ball joints of a lock-gate consist of a ball with a diameter of 10 meters rotating in a faceted socket. The materials chosen during the design stage were cast steel for the ball and the socket, which were both coated with a lacquer containing MoS<sub>2</sub>. This lacquer should act both as corrosion protection of the steel substrate and as a lubricant



*Figure 1: Reinforced polymer disc*

During the first operations of the sea lock cold welding spots were observed on both the steel ball and socket. Each time the damaged zones were grinded out, material welded on, polished and a new coat of lacquer was sprayed on in situ. As this reparation was a costly operation, a new material choice for either the ball or the socket was in order.

Different solutions and material combinations were investigated at the Laboratory Soete. The proposed solution consisted of placing polymer (UHMWPE) pads in holes machined in the socket. Due to the large normal loads the polymer discs had to be reinforced to prevent plastic flow of the UHMWPE.

As the polymer discs had to function reliably under overloaded conditions during the large lifetime of the lock gate, the friction and wear behavior was investigated on a large tribological test-rig available at Soete Laboratory.

The test results indicated that this solution was acceptable. The polymer discs were installed on both ball joints and the lock-gate is up to today functioning as expected.



*Figure 2: Lock-gate on the "Nieuwe waterweg", Rotterdam (the Netherlands)*

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