

## **The new ship lift in Niederfinow**

### **Niederfinow - tradition of hydraulic engineering**

In the year 1745, the artificial inland-waterway "Finowkanal" from the Baltic Sea via Stettin to Berlin was opened. Two of its locks are still near Niederfinow; today they are used by holiday boats. During the 19<sup>th</sup> century, traffic on the canal increased, and the locks were duplicated to increase their capacity. The route was more substantially enlarged to 600-tonne vessels from 1906 to 1914 by rerouting the waterway between Niederfinow and Oranienburg and reducing the number of locks from 19 to 7. A flight of four locks served to drop the canal by 36 m from its summit level in Niederfinow. From 1927 to 1934, the existing ship lift was built. After its opening, the flight of locks got out of use, their passage took too much time. In 1972, the locks were closed because of their dilapidated state.

### **The new ship lift**

The capacity of the existing ship lift is not big enough to manage the prospected traffic volume. Also after seventy years of operation, the costs of maintenance are increasing. Therefore the WNA Berlin was assigned the task to plan and erect a new construction to surmount the 36 m height incline in Niederfinow.

An extensive study, exploring different options for construction and location, has resulted in a vertical ship lift as the best solution. The favourable location for the new ship lift is between the flight of the old locks and the existing ship lift. It takes navigability, environment, and costs into consideration.

The guidelines of the Trans-European Transport network anticipate that links like the waterway from Berlin to Baltic Sea would belong to the EMCT class V. Due to these requirements the ship chamber will have a useable length of 115 m, a width of 12.5 m and a depth of 4 m, so that it can take 110 m long and 11.4 m wide ships (Großmotorgüterschiffe) and 114 m long pushing units.

The new ship lift is part of a complex consisting of a lower dock, the ship chamber section (ship lift), a canal bridge and an upper dock with an emergency gate. The design of the new ship lift is geared to the proved and successful construction of the existing ship lift. It is characterized by following features:

The ship lift consists of a ship chamber with counterweights and a supporting concrete construction. The main dimensions of the construction amount to length/width/height 133 m/ 46.4 m/ 54 m. The foundation is constructed as an 11 m deep concrete trough. The construction is symmetrical and consists of four u-shaped towers, one in each quarter, and 12 columns. The lift operates with 14 sets of concrete counterweights balancing the deadweight of the ship chamber and the water volume up to the operation level. 224 wire ropes run from the chamber to the

top of the lift, over pulleys, and down to concrete weights. These vertical loads of 2 x 8,500 t are transferred into the concrete structure by two rope pulley beams, each of them placed along the side of the construction on top of two towers and six of the columns.

Four engines with total 1280 kW move the chamber by a rack-and-pinion drive; each engine comprises of two electric motors and corresponding gears. They are situated in engine rooms at the sides of the chamber. The engines are synchronised by shafts and also electronically. Because of the counterbalanced system, only a small amount of power is required to overcome the friction in the bearing and guiding systems and to accelerate the chamber. In the case of imbalance, for example caused by an empty chamber, the rack-and-pinion drive cannot stand the load. For this purpose the ship chamber safety system was developed. The system consists of a rotary-lock-bar, shaped like a screw with a diameter of 1085 mm, embedded in a 36 m long split-inside-thread. The rotary-lock-bar is connected with the chamber across the split. Normally the rotary-lock-bar is spinning without touching the split-inside-thread during the lifting or descending. If the chamber and counterweights get out of balance the engines stop, and the rotary-lock-bar settles on the split-inside-thread, enabling the chamber to stand still in every position.

The operation centre is situated at the top between the eastern towers. From there one person controls the procedure with video display terminals.

### **Visitors and Information**

The existing ship lift is a tourist attraction in the region. Visitors can mount a gallery placed outside of the construction and watch the ships entering the chamber, lifting, and leaving. From this gallery, they will also be able to observe the building process of the new ship lift. When the new ship lift is put into operation, visitors will be able to enter it and get an idea of its operation process. A special lift will enable handicapped persons to reach the visitors' platform.

### **Schedule**

The official approval was released in the beginning of the year 2005, giving the WNA Berlin the permission to build the new ship lift in Niederfinow. Following the approval, the design were elaborated in more detail for the public competition of carrying out the erection of the new ship lift. The construction work have restarted in 2008.