This is the eighteenth newsletter of the *Knowledge Centre Manoeuvring in Shallow and Confined Water*, which aims to consolidate, extend and disseminate knowledge on the behaviour of ships in shallow and confined water. In this newsletter, we focus on a study that was carried out in order to recommend new maximum speeds for the Albert Canal. In a second item, the measurement of forces in mooring lines was used in a measurement campaign that was set up to evaluate the performance of numerical models.

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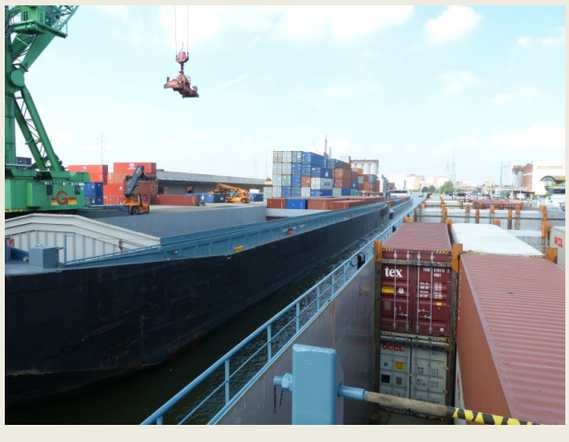
The Albert Canal, which connects Liège to Antwerp and which celebrates its 75th birthday this year, is one of the most important inland waterways in Belgium. The official regulations on allowed shipping speeds date from the early 1950s. Since then, the dimensions of both the canal and the largest ships have changed considerably. As a consequence, ships often sail a lot faster than is officially allowed. For this reason, nv De Scheepvaart, which operates the canal in the Flemish region, commissioned a study from the Knowledge Centre to determine which speeds are still safe in the actual circumstances.

The official regulations stipulate a maximum speed that depends on the draught of the vessel, i.e. 8 km/h when the ship has a draught of more than 2.50 m, 10 km/h when the draught is between 2.01 and 2.50 m, 12 km/h when the draught is between 1.01 and 2 m and 15 km/h when the draught is 1 m or less. The regulations also stipulate that the wave elevation at the bank should not exceed 0.4 m. In addition, ships should slow down when passing other ships or under bridges and when visibility is poor.

For a number of typical vessels plying the Albert Canal, including the largest vessels, the speed required to generate a wave elevation at the bank of 0.4 m was determined by following a methodology given by the German Federal Waterways Engineering and Research Institute. An important parameter influencing this speed is the blockage ratio, which is the ratio of the cross-sectional area of the submerged part of the ship to the cross-sectional area of the waterway and this speed for a particular ship will therefore vary for different sections of the Albert Canal.



When a ship passes a moored vessel, the forces on the mooring lines will approximately increase with the passing speed squared. There are no general guidelines to which value these forces should be restricted. However, there are guidelines regarding the maximum longitudinal mooring force that should occur during the emptying of a lock. Based on a value recommended by Dutch guidelines, the maximum passing speed could be determined for different vessels in different sections of the Albert Canal, making use of the ROPES software.

Together with the feedback from representatives of the Knowledge Centre of Inland Shipping in Flanders (Kenniscentrum Binnenvaart Vlaanderen), maximum speed recommendations are made

which are not too complicated to put in practice. It was decided to distinguish two types of ships: A. ships of CEMT class I or II, or higher CEMT classes with a draught of 1.50 m or less and B. all other vessels. For each of these two types, two maximum speeds are recommended for different sections of the Albert Canal, the application of which depends on the presence of (un)loading moored vessels. More details on this study and a table giving the recommended maximum speeds can be found here.

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Recently a full-scale measurement campaign of the MT Elise (105 m x 9.5 m x 2.6 m) was carried out and measurements were carried out when the ship was in the lock of Sint-Baafs-Vijve. The water level was measured together with the trim of the ship. From these water level measurements, the slope of the water line was calculated and the longitudinal hydrostatic force on the ship was determined. The water level slopes from the measurements were compared with water level slopes computed with a numerical model, yielding in a reasonably good agreement.

A comparison with the criteria from Dutch guidelines for the maximum allowable longitudinal force on a ship during levelling of a lock was carried out. During the field campaign, water level slopes of up until 1.5 ‰ where measured during the filling of the lock with the MT Elise in the lock chamber. For a CEMT class Va ship in the lock chamber, the criteria prescribe a maximum allowable force of 0.85 ‰ during the filling of a lock without the use of floating bolders. Nevertheless, during the levelling procedure of the MT Elise no problems were reported.

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Members of the Knowledge Centre attended the 33rd PIANC World Congress in San Francisco. Jeroen Verwilligen gave a presentation entitled “Manoeuvrability in proximity of nautical bottom in the harbour of Delfzijl”, while Prof. Vantorre gave a presentation entitled “Optimization of Tidal Windows for Deep-Drafted Vessels by Means of a Probabilistic Approach Policy for Access Channels with Depth Limitations”. Prof. Eloot gave an update on the activities PIANC-INCOM Working Group 141, concerning the Design Guidelines for Inland Waterways. Moreover several other speakers made reference to the research performed by the Knowledge Centre partners (e.g. in the frame research on moored ships and behaviour of ships in muddy areas). The papers can be downloaded from the Congress website.

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