Inland Navigation News Letter

Editorial

Dear readers,

Due to the huge impact of the Covid-19 pandemic on global business, BV has been busy helping its clients manage the crisis, providing innovative alternative ways to ensure continued safety and by focusing on new technical developments.

BV is committed to assisting the shipping industry re-start its business activities, integrating the new constraints and demands now required throughout the business chain, from institutions to end-clients.

Looking ahead, with the valuable lessons learned from this unprecedented global health crisis, BV is working on developing new services to assist shipowners in case of similar future events. These services will treat both organisational and equipment issues.

The following articles will provide a current overview of the new initiatives being developed for inland navigation for the current difficult circumstances, as well as for the better times to come.

Truly yours,
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Summary

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• BV brings expertise to river-sea transport segment
• BV reacts to Coronavirus crisis

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• Bureau Veritas’ long experience in pushed convoys
• “Estuary plus” dynamic loads
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important parameters characterizing the VT. It is determined by the number of follower vessels (FV) in the train, and the distances between them. The maximum allowable length is determined by both safety and technical considerations, such as the characteristics of the fairway, the situational awareness and the capability of the VT control and communication systems. A safe distance, taking into account the VT speed as well as the controllability of VT vessels, should be ensured between each FV and the vessel in front. VT vessel controllability is crucial for safe VT operation. A high variation in the controllability of VT vessels is not allowed, and pushed convoys and side-by-side formation are beyond the NOVIMAR scope. The influence of sailing in train on controllability has been investigated using numerical simulations. Sailing in train seems to have no influence on vessel controllability.

Other important VT features which influence the VT manning and the level of safety are the automation of systems for essential services and the degree of control. As a rule, it should be always possible for the FV operators to regain control of a FV in case of emergency or system failure. Analysis of the VT operation shows that train vessels are not exposed to the same risk and that the risk varies from one vessel to another, depending on their location in the train. Moreover, the VT vessels are not independent of each other, as is evident from the centralised control of the VT vessels from the leader vessel (LV) and the impact of an incident on one VT vessel on the whole VT operation. Two levels of assessment have been considered for VT and VT systems assessment. VT is modelled as a single nautical unit (global level) for safety and cybersecurity assessment. Verification of compliance with Rules and Regulations has been carried out at both global and local (VT entities) levels.

The risks involved in a VT operation are very similar to those for conventional vessels, but with additional issues arising from the presence of fewer crew, the use of remote controls and the new tasks for VT operators. Besides human failure, issues mainly arise from the environment, VT operations, VT vessels and other vessels in its vicinity.

The level of VT operational safety and security should remain, at least, comparable to that of conventional vessels. To achieve this minimum level of safety and security, the safety functions derived from the Hazards identification (HAZID) study, as well as those resulting from safety and cybersecurity assessments, must be met. This includes the vessel train and systems capabilities, operating limits, operational cybersecurity, as well as related human factors.

The research carried out within the scope of VT operation safety assessment shows that a vessel train may be operated safely within the operational limitations as defined by the VT control system capabilities, the crewing of the follower vessels while operating in the VT, the operational conditions on the fairway, and individual technical features of the vessels in the VT. Follower vessels must have a minimum of manning to ensure safety and the management of unexpected events. To achieve a safe operation of VTs, which rely heavily on critical systems relating to the geolocalisation of the vessels, data transmission, on board control systems and global monitoring and supervision, it is necessary to deploy technical and organizational cyber measures. Bureau Veritas’ additional class notation Cyber Secure, as set out in Rule Note NR 659, assures that these conditions have been met.
The Central Commission for the Navigation of the Rhine (CCNR) has published a report on river-sea transport, that is, partly by waterway and partly by sea without transhipment. Most of the river-sea transport in Europe is performed by small seagoing ships that comply with both maritime and waterway regulations (for example, with those for the Rhine River, and/or for ships carrying dangerous goods in the EU). River-sea shipping avoids the need for seaport transhipment, resulting in lower costs and time savings.

River-sea ships are often designed for operation in a specific sailing area and its requirements (dimensions...) and restrictions (draught...).

River-sea transport takes place on the major European rivers navigable by seagoing ships and represents 90 million tons of goods in Europe. More than half of this is in the United Kingdom and around a quarter in the Russian Federation where the number of ships reaches 1,200. Belgium represents the highest volume in western Europe. There are also some areas where inland vessels are permitted to sail at sea between two ports of the same country when they comply with specific requirements, for example in Belgium and France when harbours are not directly connected to waterways.

BV was pleased to contribute to the CCNR report with its long experience in these upgraded inland navigation vessels (cf. newsletter nr.46).

Indeed, such vessels cannot operate in international trade since they do not hold IMO certificates. However, they may be designed and optimized for a given operating area with regard notably to wave and swell particulars, the risk of shipping water, the exposure to strong wind, the route and the distance from shore and refuge, as well as weather conditions. Investment costs may be lower compared to similar seagoing ships sailing on the same route. Although commonly these are self-propelled vessels, pushed barges designed for sailing at sea are also being considered. In the European Union, the Directive 2016/1629 allows Member States to define zones 1 and 2 (estuaries and restricted maritime areas) and to apply stricter technical requirements. Some countries may also regulate particular types of navigation by laying down specific regulations (e.g. in Belgium, India, Russia, China).

BV can offer tailored solutions, especially classification according to Rules NR217 together with the "Estuary plus" notation, which is suitable for inland navigation vessels operating in estuaries, large lakes and other maritime environments where the significant wave height is up to 2m. The operating area is included in the notation, stating sailing conditions such as wind and route.

The notation also states the relevant requirements relating to hull structure (depending on wave height), minimum forward draught (to avoid slamming), bow height, freeboard, position of non-weathertight openings, freeing ports, intact stability (weather criterion), bulwark and guardrails, as well as self-sufficiency (propulsion, power source, bilge system) and survey schedule.
Behind and ahead of us lies a time of great change: changes in business, changes in thinking, changes in everyday life. Thanks to the enormous effort, courage and mobilization of its employees, BV has been able to continue its business and provide daily services. We are currently analysing the new reality and what we can learn from it. In this difficult period, we can show our creativity and adaptability: hard times demand custom solutions. At Bureau Veritas, we have implemented a coordinated approach at every level, ensuring clear guidance for staff together with interactions that prioritize health, safety and welfare. In line with the relevant national directives, all necessary actions and measures have been established to ensure that Marine & Offshore surveys and the delivery of services continues. Remote surveys have been implemented, as well as the possibility of short-term class certificate extensions in certain conditions where it is impossible to perform regular surveys on board. BV permits an extension of up to 3 months for certain surveys in exceptional circumstances on a case-by-case basis, or through general authorizations and instructions issued by the Flag Administrations. Deferral may be granted either administratively [Offline Remote Survey] upon confirmation from the vessel’s Master and Chief Engineer that the ship is in good condition together with evidence (photographs/videos/weekly or monthly inspection reports of essential equipment such as Hull, Machinery, FFE, etc). Alternately, deferrals may be granted after a full or partial Online Remote Survey (using information supplied from on board the vessel to be confirmed by a BV surveyor remotely). We are also offering the latest class and statutory inland navigation news on our Bureau Veritas Marine & Offshore Website in order to keep clients and the BV network updated: [https://marine-offshore.bureauveritas.com/newsroom]. Our office employees remain available to ensure service delivery. For more than three months now the following measures have been in place: applicable government instructions, self-isolation requirements when necessary, travel restrictions, remote working for all staff where possible, use of protective equipment, and compliance with the site health and safety measures, ensuring our global network is updated about SARS-CoV-2 coronavirus pandemic news. Internal communication is ensured using available tools such as chat, virtual meeting platforms, document work, file sharing, and conference calls for business, management and training purposes. We are meeting virtually with our colleagues and conducting business as before. Remote working, remote surveys and service delivery have ensured effective business continuity in response to the crisis.

**BV reacts to Coronavirus crisis**

Behind and ahead of us lies a time of great change: changes in business, changes in thinking, changes in everyday life. Thanks to the enormous effort, courage and mobilization of its employees, BV has been able to continue its business and provide daily services. We are currently analysing the new reality and what we can learn from it. In this difficult period, we can show our creativity and adaptability: hard times demand custom solutions. At Bureau Veritas, we have implemented a coordinated approach at every level, ensuring clear guidance for staff together with interactions that prioritize health, safety and welfare. In line with the relevant national directives, all necessary actions and measures have been established to ensure that Marine & Offshore surveys and the delivery of services continues. Remote surveys have been implemented, as well as the possibility of short-term class certificate extensions in certain conditions where it is impossible to perform regular surveys on board. BV permits an extension of up to 3 months for certain surveys in exceptional circumstances on a case-by-case basis, or through general authorizations and instructions issued by the Flag Administrations. Deferral may be granted either administratively [Offline Remote Survey] upon confirmation from the vessel’s Master and Chief Engineer that the ship is in good condition together with evidence (photographs/videos/weekly or monthly inspection reports of essential equipment such as Hull, Machinery, FFE, etc). Alternately, deferrals may be granted after a full or partial Online Remote Survey (using information supplied from on board the vessel to be confirmed by a BV surveyor remotely). We are also offering the latest class and statutory inland navigation news on our Bureau Veritas Marine & Offshore Website in order to keep clients and the BV network updated: [https://marine-offshore.bureauveritas.com/newsroom]. Our office employees remain available to ensure service delivery. For more than three months now the following measures have been in place: applicable government instructions, self-isolation requirements when necessary, travel restrictions, remote working for all staff where possible, use of protective equipment, and compliance with the site health and safety measures, ensuring our global network is updated about SARS-CoV-2 coronavirus pandemic news. Internal communication is ensured using available tools such as chat, virtual meeting platforms, document work, file sharing, and conference calls for business, management and training purposes. We are meeting virtually with our colleagues and conducting business as before. Remote working, remote surveys and service delivery have ensured effective business continuity in response to the crisis.
In the middle of the 20th century, in addition to self-propelled cargo vessels, pushed barge convoys started to replace towed convoys. These reduced the manoeuvrability difficulties inherent in towed convoys, which required a helmsman on each barge. The size of a convoy, which includes a pusher and one or several barges, depends mainly on the waterway configuration and its infrastructure (pusher power, waterway depth, stream speed, lock dimensions, free height, etc.). Parameters vary widely depending on the river basin (Amazon, Parana, Paraguay, Magdalena, Rhine, Danube, river network for 38.5 m barge, etc).

Originally, these non-propelled barges were designed to transport low-value goods in bulk (coal, fertilizer, sand, etc.), and were simple, interchangeable and built in large numbers. They had to be easy to use, with smooth holds, a single hold to facilitate loading/unloading, and reinforced longitudinal strength to operate in one-run loading/unloading. Generally, dimensions of non-propelled barges are standardised and adapted to the network. Some waterways can accept convoys with a large number of barges (e.g. Lower Danube, Amazon). The use of pushers and non-propelled barges also reduces downtime in case of propulsion breakdown, and can improve goods flow. Even the deployment of one pusher with just one barge could be justified by avoiding immobilisation of the pusher during loading/unloading. Important shipping companies such as Louis Dreyfus Company, Trafigura and Hidrovias do Brasil have opted for this type of transport, mainly in Latin America where tens of pushers and hundreds of barges are navigating. Bureau Veritas classes a large number of these units. Equipment for barges transporting low-value goods is generally limited to anchors, chains and navigation lights as required by the regulations. Sometimes barges are also equipped with devices to ensure compartment drainage by means of a mobile pump.

At the end of the 20th century, more specialized barges appeared, mainly dedicated to liquid cargoes and containers. The tanker barges are equipped in the same manner as self-propelled tanker vessels (cargo pump, fire protection and fire fighting installation, bilge system, energy production) and comply with the dedicated requirements for the transport of dangerous goods. Container barge holds are reinforced under the containers’ feet and are sometimes equipped with container cells to improve wedging. With the highest level of the container’s stack often above the hatch coaming, the pusher must be equipped with an elevated wheelhouse to ensure sufficient visibility. More and more barges are equipped with a bow-thruster operated from the pusher, which significantly improves manoeuvrability. Depending on local conditions, some owners navigate convoys composed of one self-propelled cargo vessel and one pushed barge, which doubles the cargo capacity while using the same crew. Originally, this type of convoy was constructed from modified existing vessels (push knees, connection systems).

The connection between the pusher and barges varies, from common cables and winches to systems composed of hydraulic jackets and dedicated connection points. These systems and connection equipment must be designed to withstand induced forces, in particular bollards.

Since 1976, Bureau Veritas’ inland navigation classification rules have included a specific chapter on these types of vessel. Although most of the barges are simple, robust, of standardised construction and intended for the transportation of bulk cargo, they are subject to important longitudinal and local stresses and require a particular technical approach.
Effect of waves on coupling devices

The coupling devices used to connect barges to each other and to the self-propelled barge must have a sufficiently rigid connection to enable the convoy to manoeuvre safely. Convoys are generally used on inland waterways where the wave height does not exceed 0.6m. In the case of convoys operated in estuaries or waterways where wave heights exceed 0.6m, the dynamic effect of waves on the coupling devices becomes important and should be the subject of a special study to estimate the various additional forces which may occur. Depending on the route in relation to the waves and the type of connection, the coupling system may be subjected to vertical, horizontal and torsional forces. In particular, the following points should be studied in detail:

- Pushing knees and transom: in the case of cable coupling, the position of contacts between the pusher and the pushed barge may vary vertically and transversely. The dynamic effect of the waves can also cause shocks due to the dynamic slackening of the cables.
- The variation in trim between the coupled units should be analysed to ensure that the units touch each other only at the intended coupling points (pushing knees and reinforced areas of the transom).
- In the case of fixed type couplings (hinge or similar), waves may induce additional vertical and horizontal forces at the coupling points.
- Winches, in the case of cable coupling: the dynamic cable tensioning system should allow continuous tensioning of the cables in all potential wave conditions and should ensure that the convoy remains sufficiently rigid while avoiding cable breakage.

BV specialists remain at your disposal to examine any type of convoy designed for operation in specific areas. Contact: do_ivm@bureauveritas.com

"Estuary plus" dynamic loads

Insight into dynamic load cases for vessels assigned "Estuary plus" notation

To ensure its safety, scantling of inland vessels assigned with the additional class notation “Estuary plus” must be performed in the vessels’ most unfavourable loading conditions. To achieve this, combinations of maximized hull girder loads, such as vertical bending moment, horizontal bending moment, torsion moment etc. as well as local loads such as external/internal pressure etc. should be detected and envisaged in the rules. For vessels navigating from IN ($x > 1.2$), dynamic components contribute to a significant extent to the hull girder loads and local loads. Currently, scantling of vessels with IN ($0 < x \leq 1.2$) is usually conducted in upright vessel condition (load cases “a” and “b”), while scantling of vessels with IN ($x > 1.2$) is required in both upright – inclined vessel conditions (load cases “a”, “b”, “c” and “d”) according to the NR217 Rules for the classification of Inland navigation vessels. In the load case “b”, the target or master load is the vertical wave induced bending moment, while in load cases “c” and “d”, the master load is the horizontal wave induced bending moment and the dynamic pressure due to the wave relative elevation.

It may be interesting to scrutinize load cases in more detail. Thanks to a definition of “Equivalent Design Wave” (E.D.W.), more load cases could be generated based on different targets such as vertical wave induced bending moment due to head sea, following sea, roll motion due to beam sea etc. For other loads, rather than the master load, a load combination factor is introduced. In this way, each local load/hull girder load such as accelerations, dynamic pressure due to the wave relative elevation, wave induced bending moments, torsion etc. is well accounted for in combination with the long-term extreme value of the master/target load.

With a view to improving the load cases in the current rules, hydrodynamic calculations with the application of E.D.W. have been carried out for a ship database of around 100 vessels. Sea states used for the calculations are those measured in different coastal areas. Facing a large number of vessels and an enormous amount of sea condition data, automation techniques are used in the calculation process.

The results of the study are then examined in order to find the correlation with other load parameters in order to assess the load cases in the current rules. This will enable us to determine the need to harmonize with the BV NR 646 Tentative Rules for Structural Assessment of Steel Ships, and the feasibility of integrating the results using the E.D.W. approach into the rules.