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WATERWEGEN
VAN GISTEREN, VANDAAG EN IN DE TOEKOMST

INTERPRETATION CENTER
RIVER HERITAGE AND SUSTAINABLE MOBILITY

WATERWAYS OF THE PAST, PRESENT AND FUTURE

INDEX

THEME 1

INLAND NAVIGATION 19th AND 20th CENTURIES

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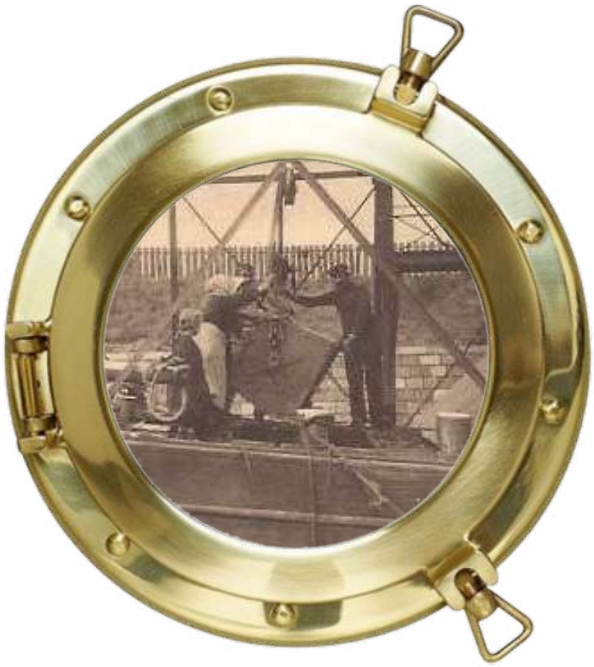
Inland navigation in the 19th century

Under the reign of Willem van Oranje (1814-1830), a large number of hydraulic projects were already designed and realized, with the aim of completing the existing waterway network. The canalization of rivers such as the Sambre and the Ourthe was carried out or improved. The Charleroi-Brussels Canal was dug at that time, canals were renovated and several new canals were added. The Belgian revolution brought an abrupt end to these projects.
After 1832, the Belgian government decided to resume the development of the waterways initiated by the Dutch regime. The north of Belgium (in particular the port of Antwerp) had to be connected with the coal and steel industry south of the rivers Sambre (Charleroi) and the Maas (Liège).



Did you know that?
From 1830 until before the Second World War, Belgium was one of the most important industrial powers, just behind England, mainly thanks to the extraction of coal and the considerable development of the metallurgical industry in the south of the country.

Rail competition

In 1839, the development of the waterways was put on the back burner by a treaty on the division of the territory between Belgium and Holland. When Holland decided to block access to the Sea Scheldt, Belgium no longer had any trade communication via the Rhine. There was also no longer any connection with the port of Antwerp and the industrial areas of Hainaut and Liège.
The Belgian government thus decided to circumvent this Dutch barrier and focused all its efforts on the intensive development of the railway. Belgium ignored the waterways and at the end of the 19th century became the country with the most dense railway network in the world.
Against this formidable competitor, the development of the Belgian waterways was very slow, with some notable achievements such as the resumption of the adaptations to the Charleroi-Brussels Canal to make it suitable for ships of 300 tons, which had started in 1854. Furthermore, in 1880 the Maas was canalized and in 1882 the Canal du Centre was deepened, connecting the basin of the Sambre with the Upper Scheldt.

Inland navigation in the 20th century

After the First World War, the Belgian government gave priority to the reconstruction and development of the waterways, in order to give a new impulse to the economy of the country. Important work was also carried out in the rest of the territory. In particular, the new canalization of the Sambre and the Maas progressed spectacularly. The Charleroi-Brussels Canal for ships of 300 tons was completed in 1933. The Albert Canal was opened in 1939, finally linking the Walloon and Flemish steel industry with the Limburg coal industry.

The 1350 tons project

In 1957, the government launched a major modernization and standardization project for inland shipping. The main waterways were adapted to European guidelines to make them suitable for ships of 1350 tons. With this, Belgium wanted to stimulate the growth of the large industrial areas in the south of the country.

The Belgian waterways thus changed in the second half of the 20th century, in particular through the continuation of the modernization work on the course of the Meuse and Scheldt, but also through the adaptation of the Charleroi-Brussels Canal and the Canal du Centre to to make it suitable for 1350 tons vessels.

Did you know that?

The standard of 1350 tons corresponds to the Rhine-Herne canal vessel (also called R.H.K.). The ship was named after the Rhine-Herne Canal, which runs through the Ruhr area in Germany and was for a long time the most traveled canal in Europe.

Some explanations about exhibited items

Ship lamps

Red, blue, yellow, green... although very varied, the colors of the ship's lamps were anything but decorative and had a very special meaning: red to warn of a danger; blue to indicate the transport of dangerous goods, etc. Over time, these lanterns have disappeared to make way for much more modern and high-tech navigation lights.

Shipping fog horn

Long before the appearance of today's smartphones and megaphones, boatmen used a fog horn to communicate in the front of the ship or with the lock keeper when approaching an hydraulic work.

Deck equipment

At a time when technology was lacking, boatmen used various objects to, among other things, examine the water, keep their ships away from the banks or even to moor: braces, anchors were therefore essential working tools for the boatman.

THEME 2

SHIPBUILDING

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In less than a century, inland navigation has developed more than in its total existence before that time. This development would not have been possible without the simultaneous advances in shipbuilding.

Wooden shipbuilding

Until the mid-19th century, wood was the only material used in the construction of ships. Machines did not exist at that time. All the work was manual. The workers used hammers, chisels, scissors, drills, planers and many more objects for woodworking.

The different types of wood

Not all types of wood were suitable for shipbuilding. Therefore, the master carpenter had to have an excellent knowledge of the properties of the different types of wood and master all steps of the processing. The quality of the wood was determined on the basis of, among other things, the age of the tree, its firmness, its water resistance and the methods of drying and sawing the wood.
The quality and longevity of a boat depended on all these parameters.

Oak was the most popular type of wood because it is sturdy, can take a beating and is water resistant. This wood was especially preferred for the most important parts and the frame of the ship.

Elm was widely used for the construction of ship hulls. The rough and irregular surface gives the wood, once watered, an exceptional resistance to moisture.

Larch and pine were largely used for the manufacture of the mast and decks of ships, because of the strength, flexibility and elasticity of the wood.

Caulking

Caulking was a commonly used technique to make the ship as watertight as possible.
This technique consisted of filling the planks on the outside of the ship and on the deck with a type of hemp that swells in contact with water. This was done by beating with a wooden caulking hammer on special tools (caulking iron, caulking chisel), after which the work was covered with pitch, for optimum watertightness of the ship.
Over time and travel, the pitch often wore off in places, and the hemp to gradually rot. The wood then got eaten, allowing the water to reach the inside of the ship. It was therefore necessary to regularly inspect and maintain the hull, in order to guarantee good watertightness and a long lifespan of the ship.

Metal shipbuilding

During the second half of the 19th century, the approach to shipbuilding changed. The introduction of metal into shipbuilding has forever changed the river landscape. The wooden ships gradually disappeared until around 1920, when they finally gave their place to the metal ships. The carpenter was replaced by the blacksmith, the rivet replaced the nail and the works. The tools became more modern with the advent of machines (cutting machines, bending machines, and so on), resulting in considerable time savings.

The gradual transition from wooden ships to metal ships can be explained by the falling price of iron. The wood price actually rose, because wood became increasingly scarce.
Moreover, a ship made of metal, if properly maintained, could navigate for up to 60 years. A wooden ship was generally worn out after 25 years.
Finally, iron could be worked directly, unlike wood, which required a long preparation before it could be worked. This represented a considerable time gain.

The different types of metal used

Iron, steel, bronze and copper remain the materials of choice in the construction of metal ships because of their own properties. For example, iron, which is a hard and resistant material, lends itself very well to the construction of the hull, while bronze, which is particularly resistant to corrosion, is very often used for the manufacture of propellers.

Baasrode, former shipbuilding stronghold

For centuries Baasrode was counted among the most important shipbuilding centers of the kingdom. The city owed this position to its ideal location on the Scheldt, at a junction of major trading cities and the port city of Antwerp.

But it was not until the second half of the 19th century that Baasrode's local shipbuilding industry received the recognition it deserved. The city owed this to the skills of the Van Praet and Van Damme families, who both excelled in building wooden ships for almost 100 years. At the beginning of the 20th century, they made a permanent name for themselves with the massive production of the ship of that time: the metal 'spits' of 38 meters.

In 1955 the van Damme family stopped the activities. The shipyard was handed over to the neighbor, the Van Praet family. The now even larger Van Praet shipyard flourished until the 1970s and finally closed its doors in 1986. The closure was mainly caused by the high competition between road transport and inland shipping.

Fortunately, this rich heritage of Belgian inland navigation has been preserved. It was adapted to receive visitors. One can visit the old house of the shipyard master of the Van Damme family, as well as the old workshops, the forge and the dry docks.

Did you know that?

The arms coat of the Van Praet shipyard is represented by the lion of Flanders holding a worldfamous ship's lamp.

This lantern, called "Bostroeïner", was built in 1884 by Désiré De Smedt, a stone's throw from the shipyard. She had a solid reputation for being able to stand against all winds and never see her flame falter!

The reputation of this iconic lamp was so great that it was even patented and sold in almost 20,000 copies worldwide, until the death of its manufacturer in 1924.

The different types of barges in Belgium

As in all countries where inland navigation has played an important historical role, there is a great diversity of inland vessels in Belgium. Until the end of the 19th century, the inland fleet consisted mainly of wooden ships. These ships varied widely in size, shape, loading capacity and name.

The Baquet of Charleroi: symbol of the industrial revolution

Period : 1830 - 1940.
Material : wood / metal.
Dimensions : 62,33 ft (19 m) length / 8,53 ft (2,60 m) width.
Loading capacity : 70 tons.

The Charleroi-Brussels Canal created one of the pearls of Belgian inland navigation: the Baquet of Charleroi, also called "clog" because of its very narrow, almost square shape.
Between 1830 and 1920, more than a thousand Baquets made of wood and metal were built in Belgium. Only a few rare examples of this river heritage remain, such as "*Les deux Soeurs*" (The Two Sisters) built in the 1916s

The Wallon, ancestor of the Spits

Period : 1830 - 1960.
Material : wood.
Dimensions : 124,67 ft (38 m) length / 16,40 ft (5 m) width.
Loading capacity : 300 tons.

Because its dimensions and considerable loading capacity were perfectly adapted to the locks, the Wallon was able to navigate anywhere in Belgium and even beyond. As a result, the ship became a reference model for the conception of future generations of metal ships in Europe, including the Spits in particular.
At the oldest monument in the city of Antwerp, the Steen, wanderers can still admire a unique example of a well-preserved wooden Wallon on the Scheldt bank: the Céphee, built in 1937.

The Spits: icon of Belgian inland shipping in the 20th

Period : late 19th century to nowadays.
Material : metal.
Dimensions : 124,67 ft (38 m) length / 16,40 ft (5,05 m) width.
Loading capacity : 300 tons.

The Spits is a metal reproduction of the wooden Wallon, but with more pointed shapes at the front and back, hence the name 'Spits'. The Spits is also called '38 metres', because of its ability to navigate on almost all Belgian and even French waters. The Spits is regarded as the 'one-size-fits-all' ship in all of Western Europe.

The R.H.K : European vessel model

Period : 1930 to nowadays.
Material : metal.
Dimensions : 278,87 ft length / 31,16 width.
Loading capacity : 1350 ton.

The Rhine-Herne Kanal Ship (R.H.K.) is available to the most traveled canal in Europe, which runs through the Ruhr area in Germany. Many coal mines were located there in the 1930s. With its length of 278,87 ft, this ship can transport 1350 tons. The Rhine vessel is also now considered a reference for the larger European inland vessels.

Did you know that ?

The term "barge" was originally used to designate a particular wooden boat. Over time, this term was increasingly misused as a general designation for inland vessels.

THEME 3
NAVIGATION TECHNIQUES

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Human hauling

Until the beginning of the 20th century, most ships were still towed by human power. Towing was done using a sort of hemp or leather harness that the hauler wore around his shoulders. This tow rope was attached to the ship halfway up the mast.
In principle, children were exempt from hauling. Yet there were children from 8 years old who towed a boat!

Animal hauling

At the beginning of the 20th century, man was gradually replaced by the mule and the horse in the hauling of ships. The boatman, or more often his wife, drove the animals along the towpath. Some boatmen sollicited the expensive services of hauling compagnies for some parts of canals. Others set up their own stables on board their ships. The disadvantage of this was a reduced loading capacity.

Mechanical hauling

The gradual transition from animal-powered hauling to mechanical towing was often distressing for the boatmen and not without protest; after all, a horse could tow just as fast as a locomotive or a tractor. But with a locomotive or a tractor you could tow in all weather conditions and they never got tired : a considerable saving of time!
Various modes of mechanical hauling followed from the late 1800s to the 1970s, including electric locomotives, both on wheels and on rails, and diesel tractors on pneumatic tires.

Hauling with river tugboat

The tugboat appeared from the second half of the 19th century and became common with the canalization of the rivers. The tugboat was steam-powered and could pull several boats in succession at the same time, depending on the chosen waterway and the cargo to be transported. With the advent of the diesel engine and the motor-driven ship, this technique disappeared in the 1930s.

Motorized ships

Although the steam engine already existed in the 19th century, the boatman initially ignored it because of the high installation costs and the large space required for the installation of the tank with a decreased loading capacity. In addition, an expensive engineer was needed on board. The boatman only accepted the autonomous propulsion with the advent of the combustion engine, whose handling was much easier. Motorization of the ships started in the 1920s-1930s. Mechanical hauling and river tugboats gradually disappeared as a result.

GM-Detroit Series 71 diesel engine

The 71 Series GM-Detroit diesel engine was produced from the late 1930s to the mid-1990s. It was one of the most common engines in inland navigation due to its unparalleled performance and exceptional value for money.
Technological developments, combined with the advent of cleaner and more fuel-efficient engines, unfortunately marked the end of this mythical engine in the 1980s.

Boat speed through time

Human hauling	300 tons boat	0,40 to 0,50 mi/h	(700 to 800 m/h)
Animal hauling	300 tons boat	1,25 to 2,50 mi/h	(2 to 4 km/h)
Mechanical hauling	300 tons boat	2,50 to 3,75 mi/h	(4 to 6 km/h)
30 Cv/Hp motor	Spits 1930s (300T)	3,75 to 5 mi/h	(6 to 8 km/h)
350 Cv/Hp motor	Current Spits (300 T)	6 to 9 mi/h	(10 to 15 km/h)
1700 Cv/Hp motor	Grand Rhine (2500T)	9 to 12,50 mi/h	(15 to 20 km/h)

Inland navigation code

Current inland vessels could navigate faster, but this would not be without consequences, especially for the banks that would be damaged by the waves caused by the passing of ships. That is why speed limits are imposed and navigation rules exist with many types of signs along the canals to warn boaters of, for example, the height of the bridges, depth or width of the waterway, all to ensure safe navigation.

Specific boats

Contrary to what one might think, transport on the waterways is not limited to the simple transport of goods. In some cases, it even has a major advantage over road transport, especially with regard to the transport of dangerous goods.

Tank and cement ships

In certain cases it is necessary to take all necessary measures to ensure as much as possible the transport of combustible materials and substances potentially hazardous to the environment. For example, some inland vessels are equipped with tanks or loading yards that are specially designed for the transport of specific risky materials such as fuel, concrete or even acid.

Waterway maintenance

In the absence of freight transport, certain ships perform other very specific functions such as the maintenance and widening of the waterways that give access to ports. These vessels are equipped with long suction hoses to remove loose materials such as sand, clay or gravel from the bottom of the water. These materials can then be reused, especially in construction and brickyards.

THEME 4

HYDRAULIC WORKS

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Construction of canals and locks necessary

Some rivers, such as the Sambre, were at some points too tortuous, too narrow or not deep enough for ships. Their curves therefore had to be corrected. The water flow in the river had to be regulated by means of dams. The river was also made deeper and canalized by building locks in it. Over the centuries, engineers around the world showed their expertise with increasingly perfected waterworks such as sloping locks and boat elevators.

Main differences between rivers and canals

Rivers are formed by nature

Rivers are formed by nature. They are natural waterways of medium importance, flowing from the source to the mouth.

Canals are made by humans

Unlike rivers, canals are man-made waterways, designed and constructed entirely by man. They connect rivers.

Rivers need to be controlled

Navigating on rivers is not always easy. The water level is by no means always the same and the flow rate of the stream in periods of heavy rainfall or extreme drought sometimes makes rivers unnavigable. Dams are built along the rivers to regulate the water level and flow of the stream.

Canals need water supply

If a canal is not directly connected to a river, it depends on water supply to maintain water level and flow. If there are no streams, water is pumped directly from gigantic reservoirs specially constructed for this purpose. Such as in particular the the Eau d'Heure Dam, the largest lake in Belgium.

Rivers flow around obstacles

Because rivers flow around geographic obstacles, they often become meandering and go meander. This makes rivers more difficult to navigate and lengthens the journey time.

Canals overcome obstacles

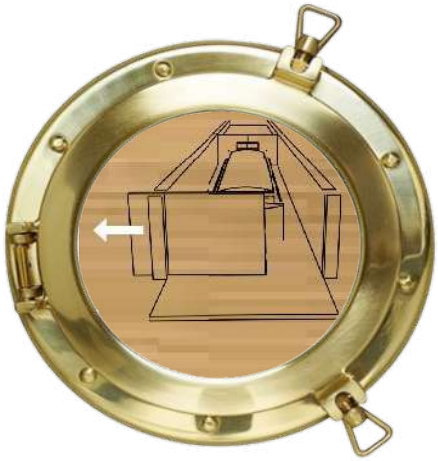
In order to make the course as straight as possible for the easiest possible navigation, canals go over or across geographical obstacles. The most famous waterwork that goes over an obstacle is undeniably the sluice. Thanks to the lock, ships can overcome a level difference, according to the physical principle of communicating vessels.

The different types of locks

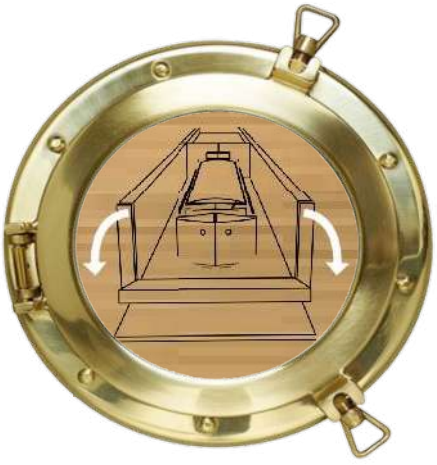
A lock is by definition a waterwork that allows boats to overcome a level difference. Depending on the chosen waterway, the boatman may encounter different types of locks.

Lock « flights »
The most common and best-known lock. When the doors are closed, they are at an angle perpendicular to the water flow, so the pressure ensures the closure and watertightness.

Guillotine lock
This lock opens by lifting the doors vertically. In closed position, watertightness is ensured by the weight of the lifting door exerting downward pressure.



Lock with sliding doors
This somewhat atypical model lock is equipped with large doors that slide in a lateral space when the lock chamber is opened.



Lock with flaps
This less common lock is equipped with large flaps that are folded under water when the lock opens and unfolded again when the lock chamber is closed.

Ship tunnels

Because engineers in the 19th century did not yet have the modern technical means to overcome geographical obstacles, they sometimes had no choice but to dig underground passages to get ships cross the crest of the watershed.
As in the 19th century at the Charleroi-Brussels canal, where the biggest obstacle was the excavation of an artificial waterway, taking into account the dual problem of watershed (water from the Sambre and the Senne). Thus, two underground tunnels were created in 1832 and 1885 respectively: the Tunnel of La Bête Refaite and the Tunnel of Godarville.

Ship bridges

Over the centuries many bridges have been built over the waterways, with different shapes and sizes. The bridges allowed different modes of transport to cross each other at the larger cities. Fixed bridges, lifting bridges, bascule bridges, swing bridges and also canal bridges through which boats can navigate over road and cars!

Aerial view of the ship's bridge « Pont Canal du Sart », upstream of the Strépy-Thieu funicular lift.

Different kinds of boat elevators

The hydraulic lift

Working only with the power of water, this unique work of art allows you to cross greater differences in level than a traditional lock, while greatly reducing water consumption at each maneuver.
The two tanks are dependent on each other and operate on the basis of different physical principles such as communicating vessels, Archimedes' principle and Pascal's principle.
The Historic Canal du Center (300 tons), parallel to the canal you are in (1350 tons), has four hydraulic lifts - all inspired by the Anderton boat elevator (England), the oldest one in the world (1875) - , each spanning a difference in level of about 55,77 ft (17 m) for a total drop of 216,53 ft (66 m) over a stretch of 3,7 miles (6 km).

The sloping lock

This type of construction, a longitudinal of transverse type, is entirely composed of one or two independent inclined planes equipped with water tanks, balanced by counter-weights and moving from one bank to the other.
The Ronquières sloping lock is still nowadays the longest in the world, with its slope of 4698,16 ft (1432 m) and allows 1350 tons vessels to go through a level difference of 223,09 ft (68 m) on the Charleroi-Brussels canal.

The funicular lift

The funicular lift is the modern and high-tech version of the hydraulic lift: a fully automated vertical boat elevator equipped with gigantic fully dependent tanks suspended with cables and equipped with enormous counterweights.
The Strépy-Thieu funicular lift is the largest in Europe with its 239,50 ft (73,15 m) meters level difference, is equipped with two 8,000-ton water tanks, each equipped with 8 1000-ton counterweights!
Since 2016, the boat elevator of 3 Gorges Dam (China) has been the largest funicular lift in the world with a staggering 370,73 ft (113 m) level difference!

THEME 5

NAVIGATION 2.0

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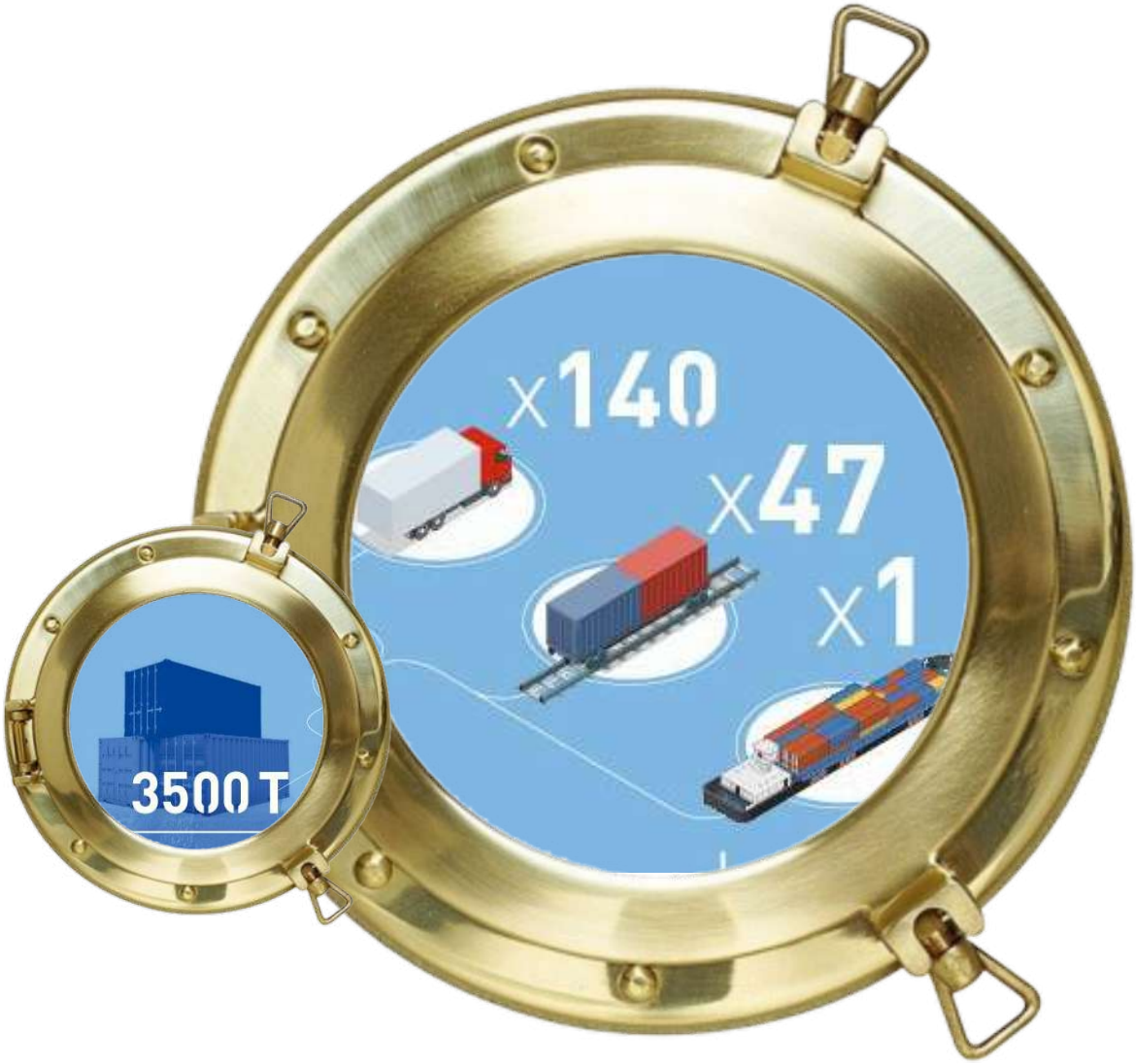
Towards environmentally friendly transport

Today, inland navigation joins the global discussion on sustainable development and the reduction of CO_2 emissions, which are partly responsible for global warming.
In our industrialized society, more and more trade is conducted. Goods transport is growing at lightning speed, which cannot be kept up with by road alone. The number of trucks on the road is growing daily, as is the risk of traffic jams and accidents. And then we haven't even mentioned the emission of toxic exhaust gases and noise pollution.
In the context of traffic problems and pollution, inland shipping is now positioning itself as the indispensable link in the transport chain of tomorrow. Transport by water is cleaner, cheaper and fewer trucks need to be on the road. Moreover, transport by ship is much safer – certainly when transporting hazardous substances.



Did you know that?

A truck emits between 80 and 100 grams of CO_2 per ton per kilometre. An inland vessel carrying the same cargo only emits 30 grams!

Towards modes of transport that complement each other

For centuries they competed with each other, but now inland shipping, road freight and rail transport are joining forces for a better environment.
The aim is to combine the advantages of all modes of transport and thus meet economic (lower transport costs, speed) but also environmental objectives (fewer trucks on the road, less CO_2). To this end, existing inland ports are being modernized and logistics platforms are being built along the major canals, close to major roads and industrial zones. The construction of this involves large terminals of several hectares, for the storage of thousands of containers with standardized dimensions, which are suitable for both road and rail transport. For example, the transfer of goods from one mode of transport to another should be made easier.

Did you know that?

The autonomous port of Liège is Belgium's most important inland port and is the third largest European inland port, just behind Duisburg (Germany) and Paris (France). More than 20 million tons of goods are traded annually.

Towards connected European waterways

The inland shipping sector is constantly developing and growing every day. The number of projects for modernization and expansion of the waterway network is growing on a European scale. Canals are being widened, locks are being enlarged and new waterway connections will soon be added. The main goal: maximum development of the connection between the different networks for large ships. This makes it possible to connect hundreds of cities and industrial areas in a large part of Europe.

The Canal Seine-North Europe project: the missing link in Europe's waterways

At the moment, all eyes are on the Seine-North Europe Canal project, 107km long, which will connect the Seine basin (Paris region) directly to the Netherlands and Germany, via Belgium.
The Canal Seine-North Europe will become a driver of economic development in the medium term. Not only for the northern part of France, but also for northern Europe: all inland ports of the Paris basin and northern France will be connected in the same waterway network. This means a decrease in transport costs. Finally, the export capacity of all countries will increase and improve significantly. Existing multimodal platforms will be strengthened and seaports will also benefit from this.

Towards a new generation of inland vessels

In about a hundred years, ships' sizes have doubled, if not tripled, and their loading capacity has increased tenfold!
A new generation of ships is arriving: even bigger, even more efficient and even better equipped to meet the demands of the market. This new generation of ships includes radars, integrated navigation systems, cameras, telescopic bridges and autopilot.
Moreover, it should be possible to reduce CO_2 emissions to zero by 2030, thanks to the application of the latest developments in hybrid engines and biofuels.
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Did you know that?

The new ships are 360,89 to 459,31 ft long (110 to 140 m) and 36,08 to 49,21 ft wide (11 to 15 m). They can transport up to 3,500 tons of goods. That's the equivalent of 140 trucks in single file on the highway!

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Want to deepen the topix over the world of Belgian inland navigation?

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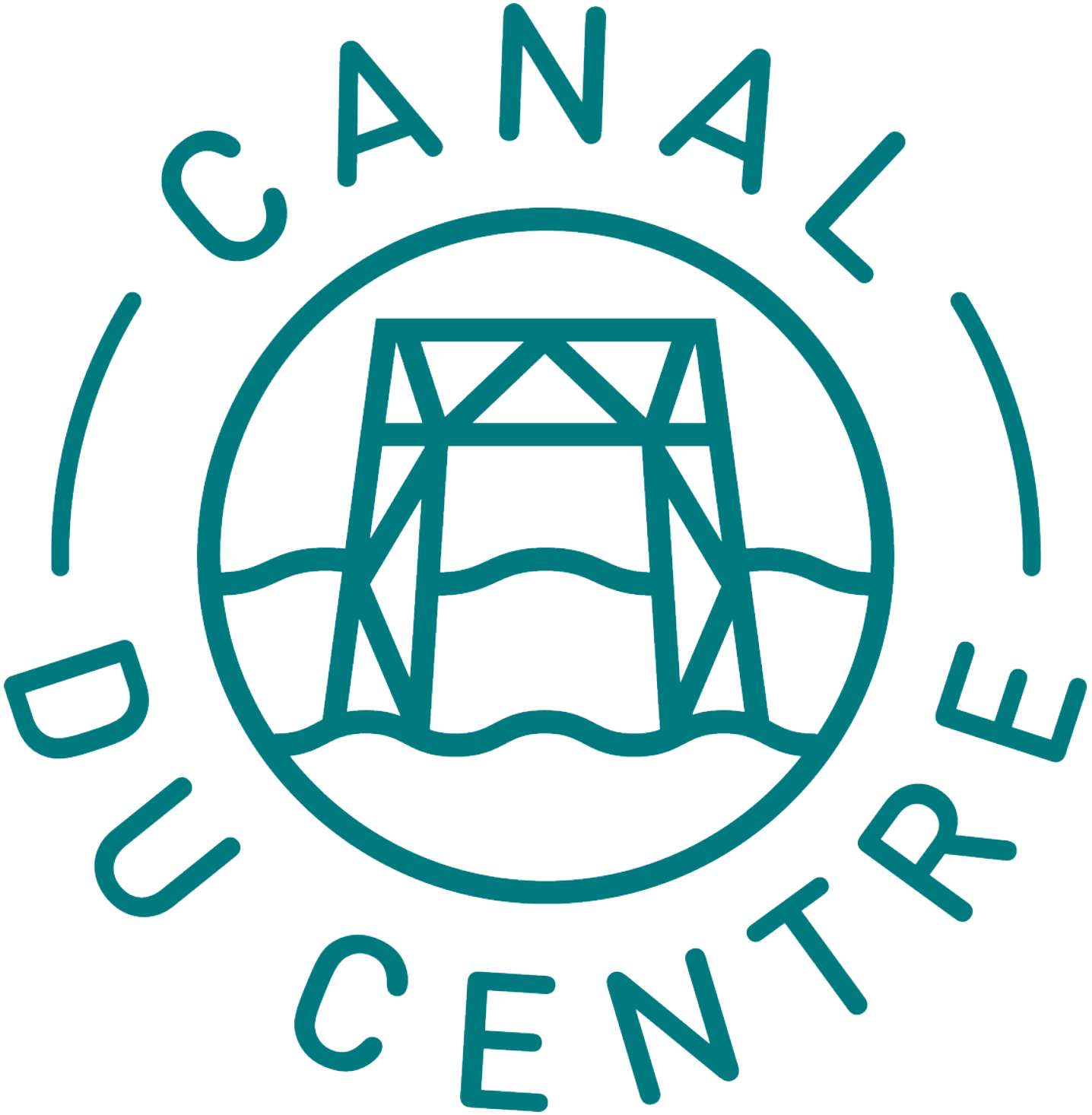

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