

THE STRATEGIC MARITIME CANALS AND STRAITS

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Summary: Maritime canals and straits play a relevant role in sea transport; they shorten navigation time in transport of cargoes between sea ports and contribute to reduce transport costs. They have passed through the reconstruction and modernisation to adapt the present requirements of maritime transport because of the increase of the volume of cargoes that is transported by this mode of transport.

Key words: maritime passages, canals, straits

INTRODUCTION

Maritime and air transports are modes of transport which ensure intercontinental transport of passengers and cargoes between the continents. International companies, which have their headquarters in the developed countries, have moved their subsidiaries to developing countries because of cheap labour force, taxes and other benefits. These factors including local war conflicts, piracy or global economic crisis influence the direction of transport flows in maritime transport.

Maritime canals have been built because of saving of transport times between sea ports. Their basic goal is not only to reduce it but they also help to decrease transport costs. Some canals have undergone the reconstruction to adapt the requirements of present maritime transport.

1. THE IMPORANT MARITIME CANALS

1.1 The Panama Canal

The Panama Canal that is located in Panama in Central America shortens the distance between the Atlantic and Pacific Oceans about 7 000 – 9 000 miles. This maritime Canal, which is about 80 km long, runs from the Atlantic at Cristobal through the mountain range (the Isthmus of Panama) to the Pacific at Balboa. It has been in the operation since its opening in August 1914. Approximately 13 to 14 thousand vessels pass through the Canal every year that is about 4 % (300 million tons of cargo) of the world seaborne trade. Most of them come from the USA and China.

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Tab. 1 - Navigation of vessels through the Panama Canal or by Cape Horn

New York to	through the Panama Canal	by Cape Horn	Saving [Nm]
Los Angeles	4 923	12 949	8 026
Anchorage	7 138	15 111	7 973
Callao	3 351	9 753	6 402

Source: Sea Distances



Source: authors

Fig. 1 - Navigation of vessels between New York and Los Angeles through the Panama Canal or by Cape Horn

The construction of the Canal began under the French at the beginning of the 1880s. Ferdinand de Lesseps, who had constructed the Suez Canal, wanted to build a sea level canal without lock chambers. It was not possible due to the Isthmus of Panama. A few years later the construction works were stopped due to the financial, technical problems and a high mortality rate of workers for the tropical diseases such as yellow fever or malaria. The USA completed it at the beginning of the 20th century. In the first stage an artificial Gatun Lake was built. In the second stage the Canal was dug in the area Culebra Cut and the locks were built on both sides of the Canal.

Ships that enter from the Atlantic sail down a channel to Gatun Locks, where they are lifted to Gatun Lake. The difference in height between the Atlantic and Gatun Lake is about 26 metres. After crossing this lake ships enter Culebra Cut and run about 8 miles to Pedro Miguel where another lock chamber (Pedro Miguel Lock) lowers them to a small lake (Miraflores Lake). Across this lake at Miraflores two more locks (Miraflores Locks) lower ships to the Pacific Ocean. Voyage of vessels takes between 8 and 10 hours.

The size limit of the lock chambers of the Panama Canal influence the dimensions of ships (Panamax ships) which can sail through the Canal. The locks chambers are 33.5 metres (110 feet) wide, 305 metres (1,000 feet) long, and on average they are 25.3 metres deep (83 feet). The maximum length of Panamax ships is 965 feet (294,1 m), their maximum beam is 39,5 feet (12 m) and the maximum draught is 106 feet (32,3). Their deadweight is about

65 thousand tons. Container ships of this category may carry up to 3 000 TEUs, up to 13 rows of containers on deck.

In 2006 Panama approved the expansion programme of the Panama Canal which goal was to increase its transport capacity. Some parts of the Canal have been deepened, a new generation of lock chambers with reutilisation basins have been built on both sides of the Canal and Oceans. A new generation of vessels called New Panamax will be able to sail through the Canal after these lock chambers are put into operation this year. New Panamax container vessels will be able to carry up to 20 rows of containers on decks. (1), (2), (5)

Tab. 2 - The comparison of Panamax and New Panamax vessels

parameter \ ship	Panamax	New Panamax	difference
length [ft]	965	1 200	235
width [ft]	106	160	54
draught [ft]	39,5	50	10,5

Source: Panama Canal Authority

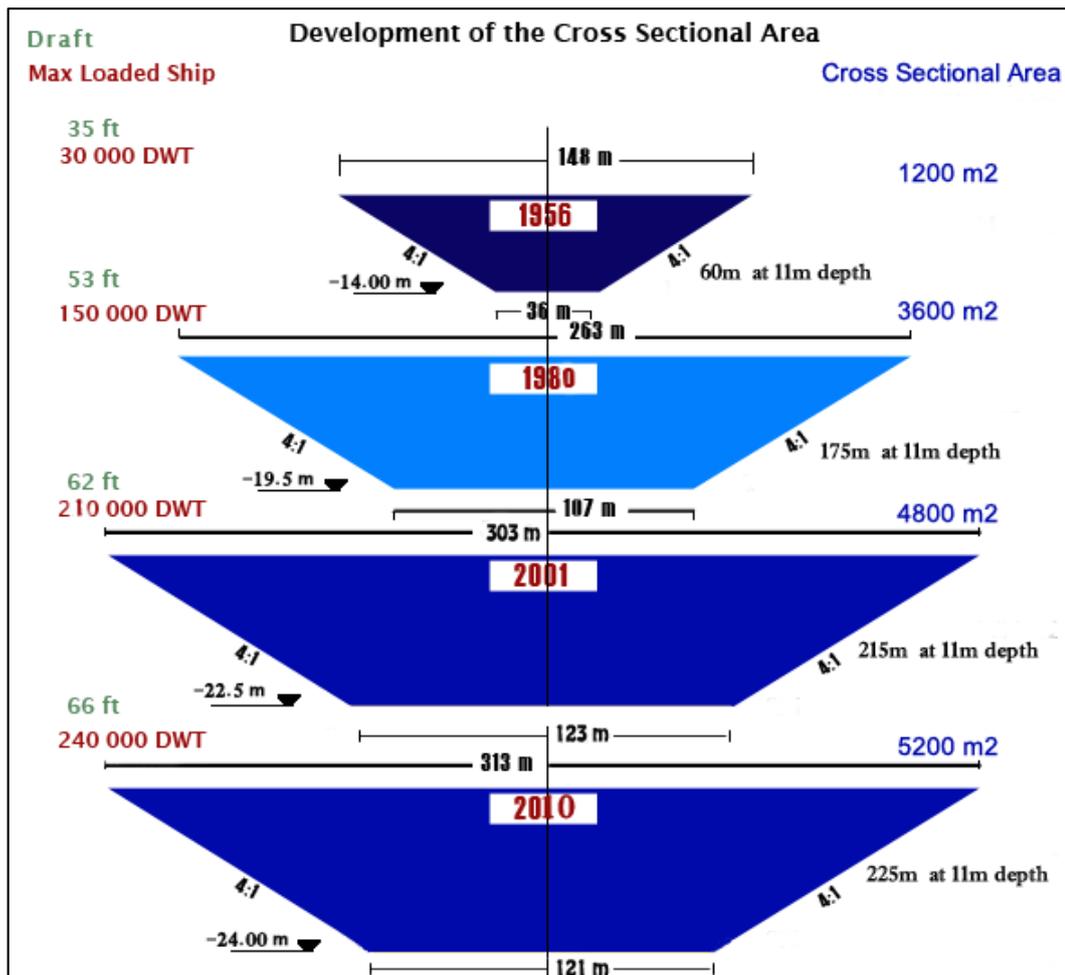
1.2 The Suez Canal

The Suez Canal provides a much shorter route between the North Atlantic and the Indian Ocean than the alternative route round the Cape of Good Hope. The Canal, which is located in the northeast part of Egypt, links the Mediterranean Sea at Port Said with the Red Sea at Suez. It was opened for international navigation in 1869 after 10 years of the construction. The present Canal is about 193 kilometres long; transit of vessels in both directions (bypasses) is possible in the length of 113.3 km. The Canal is about 310 metres wide at the surface and from 205 to 225 metres wide at the depth of 11 metres. It is the longest canal without locks in the world and is navigable 24 hours a day.

Tab. 3 - Navigation of vessels through the Suez Canal or by the Cape of Good Hope

Rotterdam	through the Suez Canal	by the Cape of Good Hope	Saving [Nm]
Shanghai	10 525	13 411	2 886
Singapore	8 288	11 755	3 467
Hong Kong	9 748	13 061	3 313

Source: Sea Distances



Source: Suez Canal Authority

Fig. 2 The development of the cross section of the Suez Canal between 1956 to 2010

The Canal consists of the canal / by pass and three lakes such as Lake Timsah, Great Bitter Lake and Small Bitter Lake. Navigation of ships starts at Port Said which lies on the coast of the Mediterranean Sea, and then vessels pass through the canal / bypass and three lakes: Lake Timsah, Great Bitter Lake and Little Bitter Lake to the Egyptian sea port Suez which lies on the coast of the Red Sea. Transit of vessels takes between 13 and 15 hours. The two convoys pass through the Canal daily, the two convoys sail from the north and the one convoy sails from the south.

The term Suezmax is used for ships which can sail through the Suez Canal. Their deadweight is up to 240 thousand tons and their maximal width is 46 metres. These ships also have some limitations such as:

- the draught - ships which draught is more than 20,1 metres (66 feet) cannot sail through the Canal,
- the air draft – ships which are higher more than 70 metres cannot sail because of the Suez Canal Bridge.

Since its opening it has been closed twice because of two war conflicts: Suez Crisis (1956 - 1957) and Six Day War (1967-1975). During its second closing oil tankers had to sail around the Cape of Good Hope. Ultra large crude carriers were built by shipyards, their

displacement increased up to 500 000 tons at the draught of 30 metres. After the Canal had been re-opened these carriers could not navigate through it because of their draught. (1), (2), (7)

1.3 The Kiel Canal

The Kiel Canal, which is located in Germany, connects the river Elbe at Brunsbüttel (the North Sea) with Kiel Fjord at Kiel-Holtenau (the Baltic Sea). It shortens the distance between the North and the Baltic Seas about 250 miles than the alternative route round the Jutland Peninsula. The transit of vessels takes from 6 to 8 hours. The Canal, which is about 98 km, has got two lock chambers located at each end of the Canal. It is used by ships which transport cargo between the port of Hamburg and the Scandinavian and Baltic States. (8)

Tab. 4 - Navigation of vessels through the Kiel Canal or by the Skagerrak

Hamburg	through the Kiel Canal	by the Skagerrak	Saving [Nm]
to St Petersburg	869	1 201	332
to Stockholm	595	930	335
to Helsinki	728	1 056	328

Source: Kiel Canal



Source: Kiel Canal

Fig. 3 - Navigation of vessels through the Kiel Canal or by the Skagerrak

2. THE IMPORANT MARITIME STRAITS

2.1 The Strait of Malacca

The Strait of Malacca belongs to the busiest and most important waterways in the world. Over 50,000 vessels such as container vessels, tankers and bulk carriers pass through the Strait per year. Tankers and bulk carriers transport raw materials such as coal, iron ore to manufacturing centres in Southeast and Northeast Asia. About a quarter of all oil carried by sea passes through the Strait, mainly from the Persian Gulf suppliers to Asian markets such as China, Japan, and South Korea.

The strait is about 500 miles (800 km) long but it is very narrow and shallow. It runs between Sumatra Inland and the peninsula of Malaysia and links the Indian Ocean and the South China Sea. The Strait of Malacca belongs to the most vulnerable places due to attacks of pirates.

The term Malaccamax is used for ships which can sail through the Strait of Malacca. The limitation for vessels is their draught (25 metres). (3), (4)

2.2 The Strait of Hormuz

The Strait of Hormuz, which links the Persian Gulf and the Gulf of Oman, is an important chokepoint for maritime transport because of transport of oil by tankers between the oil fields located in the Persian Gulf and Asian markets (China, India, Japan and South Korea). The Strait is from 50 to 80 km wide but navigation is limited to two 3 km wide channels. Each channel is exclusively used for inbound or outbound traffic. (2)

CONCLUSION

The basic goal of the article was to focus on the most important canals and straits in the maritime transport. The majority of bulk, general and liquid cargoes pass through them. These canals and straits enable to reduce transport times of vessels between sea ports and contribute to reduce transport costs, The Panama and Suez Canals have undergone the reconstruction and expansion to adapt the requirements of present maritime transport.

REFERENCES

- (1) STOPFORD, M. *Maritime Economics*. Oxon: Routledge, 2009. ISBN 978-0-415-27558-3.
- (2) RODRIGUE, J. *The Geography of Transport Systems*. New York: Routledge, 2013. 411 p., ISBN: 978-0-415-82253-4,
- (3) JAGELČÁK, J., DÁVID, A., ROŽEK, P. *Námorné kontajnery*. Žilina: EDIS, 2010. 262 p., ISBN 978-80-554-0207-9.
- (4) ŠIROKÝ, J. *Progresivní systémy v kombinované přepravě*. Pardubice: Univerzita Pardubice, 2010. 184 p., ISBN 978-80-86530-60-4.
- (5) Panama Canal Authority [online]. Last revision 20th May 2016 [cited 2016-05-20] online: <<https://www.pancanal.com/eng/>>.
- (6) Sea Distances [online]. Last revision 20th May 2016 [cited 2016-05-20] online: <<http://www.sea-distances.org/>>.
- (7) Suez Canal Authority [online]. Last revision 20th May 2016 [cited 2016-05-20] online: <<http://www.suezcanal.gov.eg/>>.
- (8) Kiel Canal [online]. Last revision 20th May 2016 [cited 2016-05-20] online: <<http://www.kiel-canal.org/english.htm>>.