

**ICE CONDITIONS ON THE LOWER VOLGA AND THE NORTH-CASPIAN SEA
DURING THE MODERATE WINTER OF 2009-2010**

P.I. Buharitsin,

Astrakhan expedition base of the Institute of water problems of the Russian Academy of Science,
Russia**ABSTRACT**

The water area of the sea port, channel and a part of the Caspian Sea to the North of the 44th parallel is covered with static ice every year. Ice forming usually starts in the second half of December. The ice cover reaches its most intensive development at the end of February. In the first half of March the ice breaks. In the second part of March the water area as a rule is free. The duration of ice period varies on a wide scale.

INTRODUCTION

Navigation is all-year-round in ports Astrakhan and Olya. In the 60s and 70s of the last century occasional ice-breaker pilotages of the fishing fleet were carried out in the winter period with the help of tow-boats with ice enhancement which belong to the fishing port of Astrakhan. In 1978 several powerful Finnish ice-breakers of river class – “Kapitan Chechkin”, “Kapitan Krutov”, “Kapitan Bukaev” – and marine class – “Kapitan Izmailov” and “Kapitan Radzhabov”. The efficiency of ice-breaker pilotages has increased since that time. The freight flow to Iran and ports of other states of the Caspian region rose in the 90s. Ice-breaker pilotages have become regular since the establishment of Marine management of port Astrakhan.



Figure 1. Finnish ice-breakers of marine class – “Kapitan Izmailov”.

The convoy consisted of 6-8 vessels that went into the sea from port Astrakhan. The same number of vessels went along the channel into the port. River ice-breakers were rented by the Marine management from JSC “Volgotanker”. Ice-breakers “Kapitan Chechkin” and “Kapitan Bukaev” were signed off to SI “Marine management of port Astrakhan” in 1998. “Kapitan Krutov” was given to one of the ports of the Black Sea basin. It became necessary to enhance ice-breaker supplies as a result of increasing ship flow and extra fleet in the Caspian Sea. The ice-breaker “Kapitan Chadaev” rented from JSC “CC “the Volga Steam Navigation”, was called for assistance to the 2 left ice-breakers during another 2 years. This ice-breaker was given to Archangelsk in 2001.

The preparation for the winter navigation of 2009-2010 was initiated long before stable negative atmospheric temperatures and freezing-over in the water area of port Astrakhan, Volga-Caspian ship canal (VCSC) and Astrakhan roads.

In the period between September and November the Federal Establishment “Astrakhan Seaport Administration” got the information from ship-owning companies on the number of vessels to work in the Caspian basin with the call in VCSC and ports Astrakhan and Olya during the forthcoming winter navigation.

123 vessels were claimed from 23 shipping companies which 50% exceeded the number of ships and companies claimed for the winter navigation of 2008-2009 and 4 times exceeded the number of vessels claimed for the navigation of 2007-2008. Ship owners partly didn't present the information in time claiming that they didn't know which vessels were going to stay in the pool and which were going to work in the Southern and middle parts of the Caspian Sea without putting in the ports Astrakhan and Olya. The major part of vessels had the sign of ice strengthening category in their symbols. This sign allows both to follow an ice-breaker and to navigate on one's own (under specific density and thickness of ice). Most vessels (53) were from 20 to 30 years of age and 39 vessels – more than 30. Some of them had gone through renewal procedure of the hull under the control of qualification committees.



Figure 2. Finnish ice-breakers of river class – “Kapitan Bukaev”.

According to the results of hydrographic surveys of the limiting areas of VCSC, the submersion 4.5m remained for the vessels. These results were presented by the navigational hydrographic maintenance service of Astrakhan branch of Federal State Unitary Enterprise “Rosmorport”. In the marine part of the channel (from the 138th to the 170th km) new illuminated ice buoy-cigars were found. Corresponding meteorological forecast was inquired and received for the forthcoming autumn-winter period. Two inline ice-breakers from Astrakhan branch of Federal State Unitary Enterprise “Rosmorport” were prepared for piloting the vessels. These ice-breakers were “Captain Bukaev” and “Captain Chechkin” that are of “M-SP” class of the Russian fluvial register. They can work in the solid ice up to 70cm thick and incoherent ice up to 1m thick.

On November, 30 2009 the captain of the sea port “Astrakhan” issued the an order #149 “On winter navigation of 2009-2010 in the water area of port “Astrakhan”, VCSC and Astrakhan roads”. The order claimed the beginning of winter navigation 2009-2010 from December, 1 2009. It also determined the measures for the organization and management of ice-breaking piloting including the establishment of headquarters on ice-breaking operations. The position of the head of ice-breaking operations headquarters was given to the captain of sea port

Astrakhan M.A. Abdulatipov. Members of Astrakhan region authority, state control bodies, Association of shipping agents and ship owners of Astrakhan region, employees of FSI “Astrakhan Seaport Administration” and Astrakhan branch of Federal State Unitary Enterprise “Rosmorport” as well as captains of the vessels “Captain Bukaev” and “Captain Chechkin” were included. They directly provided the operation of ice-breakers.

The key task of the headquarters was providing effective emergency-free operational activity of vessels which does not allow dead time during the work under ice conditions.

Apart from that, the following tasks were set before the headquarters:

- collecting and summarizing the data on hydrometeorological environment in port Astrakhan, VCSC, Astrakhan roads and designing suggestions on the organization of ship operation in these areas;
- building vessel convoys for their piloting in ice conditions according to the enquiries of vessel captains. These enquiries should be sent via agent services;
- coordination of partnership with frontier authorities of FSS in the Republic of Kalmykia and Astrakhan region, Federal State Unitary Enterprise “Rosmorport” and other institutions for executing vessel navigation in the convoy;
- giving the ship owners and their agents the information on the conditions of organizing the piloting;
- providing the information and announcements on winter navigation via mass media as well as on the web-site of Federal Establishment “Astrakhan Seaport Administration”;
- providing rational disposition of ice-breakers;
- limiting the time of inefficient dead time related to landing and embarkation of pilots, building convoys, preparation of vessels for leaving a port, managing mooring operations and so on.

The key principles of the operation of the headquarters were:

- equality of ports without priorities;
- demonstrativeness and informative content of ice supplement;
- regular succession of piloting according to Paragraph 31 of Common rules of navigation and moorage in seaports of Russia and on the ways to them.

The time needed to approach the ice edge is taken into account when forming convoys if there are no vessels having the right of way.

The order of setting the limits for ships according to the conditions of ice navigation was determined in the order.



Figure 3. The Caravan court in Volga-Caspian channel.

On December, 7 2009 in Federal Establishment “Astrakhan Seaport Administration” joint conference was conducted with the representatives of Federal State Unitary Enterprise “Rosmorport”. The problems of providing the safety of navigation in the water area of the port during winter navigation were being discussed. The order of ice-breaking piloting, business hours of ice-breakers, the number of vessels in the convoy and places of bunkering were defined.

On December, 11 2009 an extended session was carried out on the questions of winter navigation under the headline of captain of seaport Astrakhan. Representatives of Astrakhan authorities, Establishment “Astrakhan Seaport Administration”, Federal State Unitary Enterprise “Rosmorport”, state control bodies, ship owners and stevedoring companies were taking part in it.

With the setting of ice cover in the water area of port Astrakhan, VCSC and Astrakhan roads obligatory ice-breaking piloting was introduced from 00 o'clock on December, 24 2009 with the order of the captain of seaport Astrakhan from December, 23 2009 #72-r. The vessels not having the sign of ice strengthening in the symbol of ship class were not allowed to navigate in the mentioned areas including as part of a convoy.

With the decision from December, 25 2009 a ban was imposed on the inclusion into the ice convoys of the vessels older than 30 years except for the ones that had gone through hull renewal procedure under the control of Russian marine register of navigation and other classification committees which are members of IACS.

The ship owners were informed in advance about the forthcoming age-related and other changes in October and November 2009 with circular notes which suggested planning the work of vessels falling under the limits beyond the bounds of ice edge.

Two inline ice-breakers participated in the work on piloting the vessels – “Captain Bukaev” and “Captain Chechkin”. Controlling and operating staff from the department of ship organization and management were collecting information and working out the daily plan of ice operations.

On January, 18 2010 a storm warning on the forthcoming progress of ice processes, intensive ice drift and its stratification due to arctic air outbreaks from North-West and strengthening of Eastern and South-Eastern wind was received from the hydrometeorological center of the Caspian fleet. Intensive ice hummocking and stratification as well as its sinking to the bottom as a result of its own weight and forming of grounded hummock were expected in VCSC. Increasing water level was expected under storm surge 1-1.5m in the North-Western part of the North-Caspian Sea.

Progressing ice formation, constant negative atmospheric temperatures and a storm warning led to an emergency business meeting of the headquarters of the ice-breaking operations on December, 19. The meeting concentrated on designing the measures that could provide safe ice-breaking piloting with regard of hard ice conditions. As a result, a decision was taken to direct the vessels, that would gather on Astrakhan roads for filling up the supplies and waiting for the improvement of weather conditions, to other ports of the Caspian Sea. Ship owners and captains were informed about this decision and corresponding coastal warning was announced.

At the same time in the open area of VCSC from Bolshoi povorot to Malyi povorot (the 2nd bend of VCSC, 151st – 170th km) ice formation was progressing due to constant Eastern winds 12-18 and more m/sec of strength, retaining for 5 days, and freezing temperatures at night. Within navigable waters of VCSC intensive compression, hummocking and stratification, near Malyi povorot – intensive ice movement were observed. In these conditions following an ice-breaker was impossible. Ships with power-plants of low capacity or in ballast had to be tugged

after the ice-breaker to avoid throwing the ice to the channel edge and possible hull damages. Ice-breakers were working 100% hard. Sometimes they had to resort to ramming ice-breaking.

The second complicated area was a closed part of the channel near Iskustvennyi island (from the 100th to the 135th km of VCSC) with the ice of 10 points of mashing character. In this area the shipping was impossible without being tugged by an ice-breaker. The construction of the channel's bottom in this area contributed to massive collection and stratification of ice which made this area a heavy road even for a single ice-breaker. Every piloting took 3 hours and more.

Despite round-the-clock work of the ice-breakers, they didn't have enough time to pilot all the vessels in these areas to say nothing of piloting the ships along the channel to Astrakhan and from Astrakhan. The most difficult ice conditions were observed from the last ten days of January to the first ten days of March 2010. Ice edge reached 44°18' North latitude. Suchlike situation was also observed during winter navigation of 2002-2003 when ice breaking piloting began on December, 10 and ended on March, 13.

By the beginning of February 2010 ice conditions became considerably difficult as a result of sharp worsening of weather (storm wind of Eastern direction more than 20m/sec of speed with later change of direction to the West, fall of temperature below -20° C at night). The situation was characterized with intensive ice formation, movement of ice fields, change of ice structure. The ice became harder. These factors resulted in serious difficulties during ice-breaking piloting. Ships began to gather in the inlets and outlets waiting for ice-breaking piloting. Some days ice-breakers could not work in the open area of VCSC at all because of meteorological conditions. During this period they were tugging the ships through a difficult area near Iskustvennyi Island. The number of vessels waiting for ice-breaking piloting on Astrakhan roads to ports Astrakhan and Olya reached 50. The same number of ships were expecting piloting in ports Astrakhan and Olya to VCSC up to the 100th km (above the dyke near Iskustvennyi Island) and between the 135th and 145th km (below the dyke).



Figure 4. The most difficult ice conditions were observed from the last ten days of January to the first ten days of March 2010.

The captain of the port was onboard one of the ice-breakers and controlled ice-breaking operations on Astrakhan roads on his own. Later representatives of the headquarters of ice-breaking operations were constantly onboard ice-breakers and coordinated their work. As a result of difficult conditions the headquarters gathered for business sessions every day from 9.00 am to 16.00 pm. Weather forecast and information from ice-breakers and captains of ships waiting for piloting was listened to at the conference. Direct connection was set up between captains of ice-breakers and headquarters representatives onboard. They analyzed the situation, worked out the decisions as how to implement ice-breakers rationally and avoid emergencies.

The headquarters recommended the ship captains to follow and ship owners (or agent companies) to direct the vessels to fill up the supplies or to wait for the improvement in the ice conditions in other ports of the Caspian Sea. Critical situations could be caused, apart from other factors, by the lack of fuel and other supplies on board.

Some of the captains took advantage of that opportunity. However, the majority of the ships were staying on Astrakhan roads with the risk to run out of fuel and food. At the same time the captain of port Astrakhan was constantly receiving panic radiograms with requests to include a vessel into a convoy for ice-breaking piloting right off. Ship owners, that had directed their vessels into other ports to refill the supplies, were grateful to the headquarters for timely given recommendations.

At the beginning of March ice formation stopped with growing temperatures. Wind strength became moderate and there emerged the opportunity to pilot the vessels unhindered. The captain of seaport Astrakhan issued the order #9-r from 16/03/2010. According to it, from March, 18 ice-breaking piloting and the validity of the orders related to winter navigation were terminated. Independent navigation (without ice-breaking piloting) was allowed in the water area of port Astrakhan, VCSC and Astrakhan roads. At the same time the ice breakers were in level readiness for giving all the necessary aid to the vessels: one in port Astrakhan and the other – near the 150th km of VCSC where, as a rule, there is drifting ice in spring.

The captain of port Astrakhan stroke down with the order from March, 22 2010 #41 the order from November, 30 2009 #149. From 00 o'clock 23/03/2010 winter navigation was considered illegal.

From December, 23 2009 to March, 17 2010 the ice-breakers carried out 32 piloting operations and accompanied 542 vessels which was 10% more that during the previous winter navigation. The number of the piloted vessels could have been much more considerable if there were one or two more inline ice-breakers. Maximum length of ice-breaking piloting comprised 140 miles. Maximum latency for the ice-breaking piloting reached 19 days for leaving the port and 40 days – for making the port.

All in all, 149 carriers were working during winter navigation in the Caspian pool with landing in VCSC and ports Astrakhan and Olya. 1090.3 tons of cargo was transported.

7 incidents with vessels were recorded during winter navigation. These were generally losses of anchors with cables while waiting for ice-breaking piloting on Astrakhan roads (4 cases). Later in two cases the anchors were found by the members of the crews and fixed in the regular places. There was also setting down of motor ship “Ulus Star”, hull damage of “Langepas” and a collision between motor ships “Linda” and “Sail Duke” that stemmed from insufficient distance between the vessels while navigating within a convoy.

Maximum ice thickness in the marine part of VCSC reached 50cm, in some places – 1 m and in hummocks – up to 1.5m. Grounded hummocks up to 8m of height were observed. Ice thickness reached 25-30cm, in layers – up to 50-80cm in the coastal area of the channel. All the necessary information for navigation in the ice was timely passed to ship owners and navigators. Unfortunately, there are unsolved questions in port Astrakhan. They directly concern the organization of ice-breaking piloting and the work of port terminals. This is primarily related to ice-breaking piloting. The two ice-breakers available do not manage with the growing number of vessels participating in the ice navigation. This problem has been raised time and again in at various levels. But after winter navigation it is forgotten. The problem arises again when vessels are making giant queues waiting for ice-breaking piloting.

It is also necessary to solve problems with port ice-breakers which could do the ships this or that service, for instance, moving the vessels on berths and roads or providing safety measures while navigating in ports. It is also possible in this case to tackle the opportunity of their work in the area between ports Astrakhan and Olya. They could offer the service of keeping ice cracks for three ferry passages in the given area in an appropriate state.

Besides, one needs to continue the work on development of VTMS with the aim to control the vessels on Astrakhan sea roads; equip ice-breakers with the means control of their location (SMS "Victoria") and allow access to these means for the captain of the port; to tackle the equipment of ice-breakers with modern navigation systems that meet the demands of international conventions on the safety of navigation.