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Evolution of the *Romanian Naval Industry* in the European context

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Abstract. This article analyses, in the unitary conception, the whole evolution of the ***Romanian Naval Industry***, following the next issues:

- Development the infrastructure in the *Romanian Naval Industry*;
- Evoluţion of the shipbuilding capacity;
- Development shipbuilding production;
- Also, this article, try to estabilish the pozition of Romanian Naval Industry in the hierarchy of the European Continent.

We mention that our analysis base on statistical data that was published in different sources, archives data and own calculation for the main economic and technical indicators.

Keywords: Naval industry**,** shipyard.

1. Introduction

The first ship repair facilities appeared in our country in the middle of 19th century: Braila - 1832, Sulina and Galati - 1857, Turnu Severin - 1859, Giurgiu - 1897 and Constanta - 1893. Although in the first half of the 20th century efforts are being made to modernize the shipyards, their substantial development as well as the construction of new production capacities (Mangalia – 1950 and Tulcea – 1951) are realized only in the second half of the 20th century when the shipbuilding industry benefits from major investment programs.

In the first half of the 20th century, the country's main shipyard was Turnu Severin shipyard, bought in 1893 by the Austrian Danish Navigation Company - *D.D.S.G.* (*Erste Donau Dampfschiffahrts Gesellschaft)* where until the outbreak of the First World War, passenger ships were built for navigation on the Danube: *Principele Carol, Giurgiu, Calarasi, Mr. Tudor, Vasile Lupu* and the tugs *Mihai Viteazul, Alexandru cel Bun, Dunarea, Calafat, Chilia* with a total capacity of 1.200 GT and the external construction of the Serbian yacht *Regina Draga* [1].

During this period, the Romanian shipyards had low production capacities, generally building only ship bodies, the horizontal industry being much behind the west of Europe and consequently the vast majority of propulsion machinery and ship equipment were imported from industrialized countries [2].

2. Evolution of the Romanian Naval Industry in the european context

In the second half of the 20th century, as the national economy recovers and on the basis of the industrialization policy of the country, the shipyards are being developed starting with Galati Naval Shipyard, which in the autumn of 1960 launched the first medium tonnage vessel – the Galati cargo of

4,500 DWT. From this date until the end of 20th century, the state has made substantial investments for the development and expansion of the production capacities of the Romanian shipyards and of the horizontal industry, the shipbuilding industry including:

- 12 shipbuilding and ship repair yards, out of which: 5 shipyards located at the Black Sea and 7 shipyards on the Danube;
- 4 building factories, of which: 2 factories for dock equipment, pumps, hot pipes, etc., a shipbuilding factory up to 10 m in diameter and a shipbuilding equipment factory up to 30,000 HP;
- an Institute for Design and Research [3].

In the 20th century, practically in the second half of the century, the Romanian Naval Industry made more than 2,000 vessels with a transport capacity of about 1,745,000 tons and a power of 338.170 HP, and 278 ships with a total capacity of 5,866,148 DWT for the shipping fleet without taking into account passenger ships, self-propelled cargo ships, technical and service fleet and inland waterway fleet and military mariners. As early as the end of 19th century, Romanian shipyards had the production capacities and the technology required to carry out river ships of all types and capacities and commercial ships of all kinds and capacities of up to 300,000 DWT. They also had the opportunity to carry out a wide range of floating facilities or floating facilities for naval activities.

Until the end of the 19th decade, the Romanian naval industry recorded an average production of 320 thousand DWT /year, of which 80% was destined for the domestic market, and the rest of the export was mostly in the USSR [4].

In the old centralized economic system, the internal beneficiaries – Navrom Constanta and Navrom Galati – were paying shipyards from budget allocations, with the money coming indirectly to shipbuilders.

In the last decade of the 20th century, the country's maritime fleet is divided and transformed into commercial companies. Budget allocations are suspended according to *Government Decision 740/1990* and the newly formed companies fail to find resources to finish ships in construction (about 40 ships) or to order new ones. The internal market collapses and after the collapse of the USSR also the CAER market collapses.

In order to get out of crisis, shipbuilders in Romania are turning their attention to the foreign market. Due to the state production capacities created by the state until the end of the 19th century and the cheap labour force and a good expense in the field, the Romanian Naval Industry manages to enter the foreign market, gaining an appreciable market share-given the competition and market requirements in this domain. Until the end of the 20th century, there is practically no shipyard that does not produce for export, the main external beneficiaries being partners in the Netherlands, Germany, Norway and Belgium, the trade balance of the sector being positive.

In the 20th century, the World Naval Industry of commodities exchanged in international trade which required the deployment of large maritime transport capacities. As of the beginning of the 1900s, the World Fleet tonnage increased 1.5 times in had a remarkable evolution due to technical progress and the vertiginous increase in the volume 1914, 2.3 times in 1939, 14 times in 1990 and 19 times at the end of the century, reaching an absolute value of approx. 553.054.000 GT [5].

In the first half of the century, the development of the naval industry was favored by the generalization of steel as ship building material and steam propulsion and, since 1910, the introduction of internal combustion engines. If in 1900 the tonnage of sailboats represented about 23% of the World Fleet tonnage [6], before the outbreak of World War I, more precisely in 1913, they had a percentage of approx. 15% [7], and the year 1927 - is the first year in which the number of Diesel engine ships outperforms that of the alternative car and turbine. Thus, 51.5% of the total number of ships forming the fleet was equipped with internal combustion engines, and in 1930 this percentage reached 63.5% [8].

Parallel to the upgrading of the propulsion group, there is a stronger specialization of civilian and warships, a distinct differentiation between ships for maritime and inland waterways. Developing economic shipping systems - regular liner services and tramp shipping for occasional racing. The navigation devices also record significant advances through the emergence of the echo sounder (to

measure vessel's speed) probe, the gyrocompass (to indicate the ship's course), the electronic system of navigation (to determine the point of the ship with radio bearings) and the radar installation. With the desire to attract as many passengers as possible, comfort increases, optimum conditions, dry-dial connections, medical cabinets are created, the speed of the passenger ships increases from 12 knots to 28 knots in 1929 and approx. 31 knots in 1937, Atlantic crossing is done in three days. In conclusion, the main trends in passenger shipbuilding (boats) are the increase in tonnage, speed and comfort.

In terms of tonnage, jumping occurs in a short span. After the Titanic, the largest passenger ship since the beginning of the 20th century, in 1922, the English Majestic ship - the former Imperator German ship - and the American Leviathan - former Vaterland - exceeded 35,000 tons, and in 1929 Germany finished construction transatlantic Bremen and Europe of 51,840 tons and 48,746 tons, respectively, which developed speeds of approx. 28 knots. In 1935, the French launched the Normandy ship of 83,423 tons powered by four 160,000 HP main turbines, followed shortly by the English transatlantic Queen Mary of 81,237 tons and Queen Elisabeth of 83,673 tons, both turbines. By the end of the first half century, precisely in 1952, the United States turbine powered ocean liner, the largest and fastest US transport ship, was launched [9].

In the second half of the century, the progress of naval engineering is impressive. The specialization of cargo and passenger ships is emphasized, multifunctional cargoes are built; for bulk cargo shipments, bulk carriers and mining are being built with capacities reaching 150,000 or 300,000 DWT respectively, and ships for the transport of oil are gigantic, reaching 500,000 DWT. Ro-ro and ferry-boats are built for the goods on the wheel and for the transport of liquefied gases, ships with special installations are built that reduce the volume of natural gas (methane) of approx. 600 times by lowering the temperature to -160° C and whose construction price is very high [10].

Starting 1965, containerized freight transport [11], has evolved, with unpredictable implications for increasing labor productivity - by reducing operating times in ports with approx. 60%, pioneers of this type of transport being US companies Sea-Land and Matson. As a result of the introduction of containerized transport, the construction of port-container vessels and Lash-type vessels (port-barges) is developing. Until the end of the 20th century, automation and computerization of ships recorded exceptional qualitative leaps, electronic navigation systems were improved, hyperbolic navigation and satellite navigation were introduced, and in the seventh decade of the 20th century on the ships is installed nuclear propulsion.

In this context, in 1953 at Hamburg, Tina Onasie oil tanker of 45,720 tons is built while in the U.S. World Glory, 45,509 tons is built. The oil tankers capacity is growing, and not long after, the Universe Leader ship of 85,000 tons is built and in 1965 the British Admiral tanker of 100,000 tons is launched in Britain. The Japanese naval yards launch at the beginning of 1966, the 150,000 tons Tokyo Maru oil tanker, followed by Idemitsu Maru of 210,000 tons, and in 1968 the Universe Ireland tanker of 312,000 tons is built. Also, in 1968, the first Ottoman Hann of 15,000 tons was built in the Federal Republic of Germany, which could navigate 500 days without stopping. In 1971 at Saint-Nazaire shipyards in France, the 554,000-ton Battilus giant oil tanker was built, and by the end of the decade seven British build passenger Queen Elisabeth II of 65,000 tons and 293 meters long, the open deck area reaching 5,000 square meters, the perfection of the navigation facilities and the great comfort offered to the passengers being quite remarkable for that time [12].

In the second half of the century, after the launch of the first medium tonnage cargo ship which was built in Galati Shipyard (1960), our country will make significant progress in shipbuilding.

The Shipyards from the Danube have built and delivered to the National Shipping Fleet river barges of 1000 tons – 3000 t; flatboats and barges of 1000 tons, cargo ships of 2,400, 2,850, 3,200 and 6,000 DWT, cargo ships of 7,500 - 8,850 DWT in different variants; multipurpose cargo ships of 15,000 - 16,000 DWT, bulk carriers of 55,000 DWT; 8,000 DWT containers, 280, 560, 720, and 1,200 HP tugs, 500-3600 HP waterways, 2,000 DWT river-freight motors, 3,000 DWT, 3,300 DWT and 5,000 DWT, floating docks of 500 tons and 800 tons, floating cranes of 25/32 tons of force, and in Brăila ocean fishing vessels of the Atlantic and Super Atlantic type are being built for the Ocean Fishing Fleet [13].

The Black Sea naval shipyards built and delivered to the National Transportation Fleet 55,000 DWT, 65,000 DWT, 165,000 DWT ore carriers, 54,615 DWT, 64,360 DWT, 64,820 DWT, 64,854 DWT, 64,897 DWT, 165,000 DWT bulk carriers; oil tankers of 150,000 DWT, 161,477 DWT, 163,647 DWT, 163,857 DWT, 12,000 DWT ferry, etc [14].

An outstanding achievement of the Romanian Naval Industry is the construction of marine drilling platforms and floating oil installations in the Black Sea mainland, the first of which was built at Galaţi Shipyard, put into operation in 1976 - and which ensures even today a part of the Romanian oil. In the same year 1976, the first ore-carrier of 55,000 DWT was built in Galati, and in 1979 the first large-capacity oil tanker was built in the country, the 163,857 DWT Independenta. Since 1980 the ro-ro, container and ferryboat special vessels have been built in the country, and since 1989 the Cărbuneşti and Comăneşti bulk carriers of 171,875 DWT, built in Constanţa Shipyard, have been put into operation.

At the end of the 20th century, after facing the 10 years of transition and changing the configuration of the market by directing trade flows to external partners, our country becomes a member of the European Shipbuilders' Association (AWES), together with the most important states on the international market, reaching about. 3.39% of the total ships made by AWES member countries.

Table 1. Romania in European Ship Production, at the end of the 20th century

No.	Country	No. of ships delivered	Thousands of (CGT)	Percentage in total Europe (%)	Total value (mil. euro)	Export value (mil. euro)	Percentage of export in total value (%)
1	Denmark	12	275.71	6.07	538	-	-
2	Finland	2	279.62	6.15	908	908	100.00
3	France	38	342.63	7.54	1,098	930	84.70
4	Germany	63	976.07	21.48	2,329	1,654	71.02
5	Greece	-	-	-	-	-	-
6	Italy	29	543.69	11.97	1,829	1,574	86.06
7	Netherlands	157	587.34	12.93	1,163	815	70.08
8	Norway	56	373.48	8.22	1,115	533	47.80
9	Poland	34	502.53	11.06	897	890	99.22
10	Portugal	5	56.26	1.24	96	66	68.75
11	**Romania**	**22**	**153.81**	**3.39**	**257**	**257**	**100.00**
12	Spain	58	400.41	8.81	1,150	964	83.83
13	Great Britain	13	51.60	1.14	180		0.00
	Europe *(AWES)*	**489**	**4,543.13**	**100.00**	**11,560**	**8,591**	**74.32**

Source: *Association of European Shipbuilders and Shiprepairers, Anual Report, 2003-2004, p.52-53*

From the above table, in the case of Romania, it is noticed that the share of the export in the total value is 100%, the entire ship production is delivered to export, the demand on the domestic market being null. This observation is not a novelty, since in the last decade of the 20th, the domestic market took only 6 vessels, the demand becoming non-existent since 1994 [15]. This was due to the economic, managerial and structural crisis that sealed Maritime Navigation Companies, one of the decisive conditions underlying this crisis being the end of any kind of subsidies through the *Government Decision no. 740/1990* and the non-involvement of the state in solving the problems of the Maritime Fleet.

We mention that in most of the world's states with shipping fleets, except for the USA and Canada, all shipbuilders receive subsidies from the budget. In the Asia-Pacific region, for example, at the end of

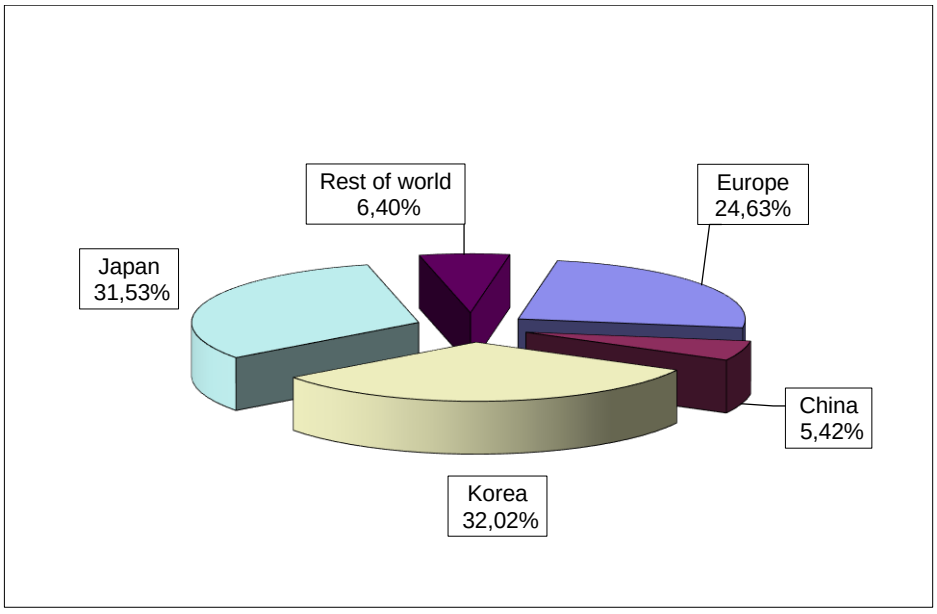
the 20th century, government subsidies even exceeded 30%, and in Germany and Norway, companies investing in shipbuilding were exempt from tax [16].

Until 1996, the date of entry into force of the Shipbuilding Grant Agreement signed by the OECD member states [17], the ***European Naval Industry*** was strongly subsidized, but even after that date, National Fleet Support measures were implemented, either indirectly, by granting advantageous loans or by applying protectionist measures, or even by direct subsidies that have continued in some states [18].

In our country, the *Government Decision no. 740/1990* decision to cut budget allocations was taken in a dangerous and suspicious way without a prior study, the Maritime Fleet being allowed to cope with the principles of a market economy without the functioning mechanisms of this market, which in the developed countries were created a few centuries ago. Moreover, by alienating Fleet management to SPF (the state property fund) in 1993, the state withdrew also the support of competent people with training in the field, since the new structures of the Boards of Directors and the General Shareholder Meeting did not include a representative of the Naval Transport Department, the SPF "specialists" having nothing to do with the specificities of shipping problems, which through their complexity and the high degree of technicality of the ships requires adequate training and good experience in the field.

At the end of the 20th century the World Shipbuilding Market has the following configuration:

Figure 1. The structure of the World Shipbuilders Market, at the end of the 20th century.



Source: *PhD. Eng.* Dumitru Corduneanu, *Naval Transport System from Romania in the XX Century*, CTEA Publishing House, Bucharest 2010, p. 235.

From the data presented, it is noticed that the world ship production is dominated by two states: Japan and South Korea, followed by European countries, which in total hold a market share of approx. 24%.

Due to technical and technological performance, and enviable economic behavior, after World War II, Japan became the largest shipbuilder in the world, registering in the last quarter of the century 40.51% [19].

Ships made by Japanese builders had a high degree of technicality and the lowest production costs. The widespread introduction of automation and robotization of the production process since the end of the 7th decade of the last century has led to a reduction of up to 60% [20] in labor cost, and the permanent technological revolution has led to an increase in labor productivity, only between 1993-1995, with

approx. 27% [21]. Shipbuilding is concentrated in several powerful industrial groups, considering that Japanese shipowners traditionally command ships almost exclusively to native sites, Japan remaining a leader in the international market, having significant export orders.

However, in the last quarter of a century, Japan's international shipbuilding market will meet a remarkable competitor - South Korea, which will see notable progress in this area, doubling its production by the end of the 8th decade, 8 times at the end of the 9th decade and almost 32.5 times at the end of the 20th century, even has surpassed Japan by half a percent. Korea is distinguished by dynamic marketing with an aggressive pricing policy. There are funding programs for ships commissioned by Korean shipowners. Shipbuilding is concentrated in five large industrial groups, some of which have developed different forms of collaboration with construction sites in China or Eastern Europe.

To the end of the 20th century, an important percentage on the International Ship Construction Market is held by China, which will reach a market share of approx. 5.42%, with high growth trends in the next period, according to forecasts made by economic analysts. This was due to the economic growth recorded by this country in the last period, which between 1990-2000 reached an average rate of approx. 9.3% [22], the world's largest economic performance in the last decade of the last century.

From *Figure 1* it is noticed that the USA is missing, although they held in 1979 a share of approx. 9% of international orders, towards the end of 20th century their contribution to the global market is insignificant compared to other states, mainly due to the fact that the American Naval Industry is directed more towards the domestic market, protected by proper legislation since 1920 [23].

Although in the last quarter of the century the European Naval Industry has held an average share of approx. 35.44% on the market, with all state funding support, over the past two decades a decline of approx. 15.8 percent in world ship production is registered, compared with only 9.7 percent in Japan - mainly due to the economic recession of the 1980s. In order to counteract the effects of the decrease in the physical volume of production, European shipyards have virtually abandoned the production of tanks and large cargo ships dominated by Japan and Korea, concentrating instead on the production of high-value special vessels, such as liquefied gas and chemical tankers, ferries and cruise ships. Their share on the analyzed market represents only about 10% of the total tonnage, but about 34% of the total value.

Another feature of the ***European Naval Industry*** policy since the end of the 20th century is given by the fact that the system that is widely practiced in Western Europe is that of executing orders through subcontracting or co-operation, a system which, under the economic conditions of those countries, increasing productivity. We also point out that the European Naval Industry operates at higher production costs compared to the Japanese or Korean Naval Industry [24].

At the end of the 20th century, the situation of the ***European Naval Industry*** was as follows : [25]

- provided approx. 20-24% of world ship production, with a value of approx. 14 billion euros, and the value of the shipyard repairs was about. EUR 2 billion;
- had a market share of about 62% in the construction of high-tech complex ships, and approx. 42% of the volume of repairs made to these types of ships;
- included approx. 103 companies, of which 12 were large, delivering approx. 65% of ship production and developed a network of approx. 9,000 subcontractors whose input amounted to 60-75% of the production value;
- the labor force employed in the ***European Naval Industry*** covers over 129,000 specializations, the horizontal multiplication effect of which is estimated at approx. 500,000 jobs.
- 10% of the production value was reinvested in research, development and innovation expenditure.

Towards the end of the 20th century, more precisely in 1995, the production capacities in operation worldwide reached a level of about 23,988 million CGT [26]**,** with a utilization rate of 60.6%. ***Romanian Naval Industry*** had a capacity of approx. 265,000 CGT, with a utilization rate of 27.73% in 1998 reaching approx. 58% in the year 2000.

Romanian Shipyards have acquired, through the investment projects of the 1970s and 1980s, a certain production profile, defined in particular by the maximum dimensions of the ships to be made using the

key workplaces: halls, cranes, docks, reinforcement, etc. In order to reduce the labor and the manufacturing cycle, as well as the increase of the quality of ship's execution, the shipyards in our country were equipped in the 8th decade of the last century with technological lines, machines and processes of high productivity and efficiency in all phases of the ship's realization. From this time onwards, however- the 1970s, when the main technological developments of our yards were held, no major modification or development was made; therefore, at the end of the 9th decade of the 20th century, the Romanian naval yards were below the level existing worldwide, where real progress was made in terms of: automation, flexibility and integration of computers in the production lines, product control and controls trial.

In the last decade of the 20th century, in order to cope with the exigency on the external market, Romanian shipyards have had to make a series of investments in new technologies and new technological equipment for shipbuilding. The pace and volume of technological upgrades achieved was rather low compared to the increased level of needs in this area, which is why non-mechanized work predominates.

It should be noted that over the years the ***Romanian Naval Industry*** has gained a rich experience in the design and construction of the ship's body, but some components delivered by the horizontal industry - naval machinery and equipment - have had a low degree of reliability due to our country's stay at the technological level of the 70s and 80s, which will make the degree of integration of fully equipped and delivered ships to be of approx. 30%, and in the case of the ship's body approx. 80%. Compared with the shipyards in the Western European countries, the degree of integration of the Romanian Shipyards is higher, close to that of the yards in Korea or Japan - the ones in the West intensively using the subcontracting system.

The market niche gained by the ***Romanian Naval Industry*** in the last decade of the 20th century has proved to be sustainable, in view of the evolution of exports during this period: from $ 99.7 million in 1991 to $ 131.2 million in 1994, $ 164.6 million in 1998 and about $ 233.1 million [27] at the end of the century; the low productivity of the Romanian shipyards, of approx. 250-400 tons / hour, compared to 40 tons / hour worldwide, being partly offset by the low cost of labor, the high production capacities in the field, and the high degree of specialization of vessels that allows for higher prices than for traditional ships.

This tendency of the ***Romanian Naval Industry*** will be preserved in the first two decades of the 21st century, Romania reaching the middle of 2018 approx. 8.63% of the total number of ships built by European countries.

Table 2. Romania in *European Ship Production* in the second decade of the 21st century [28]

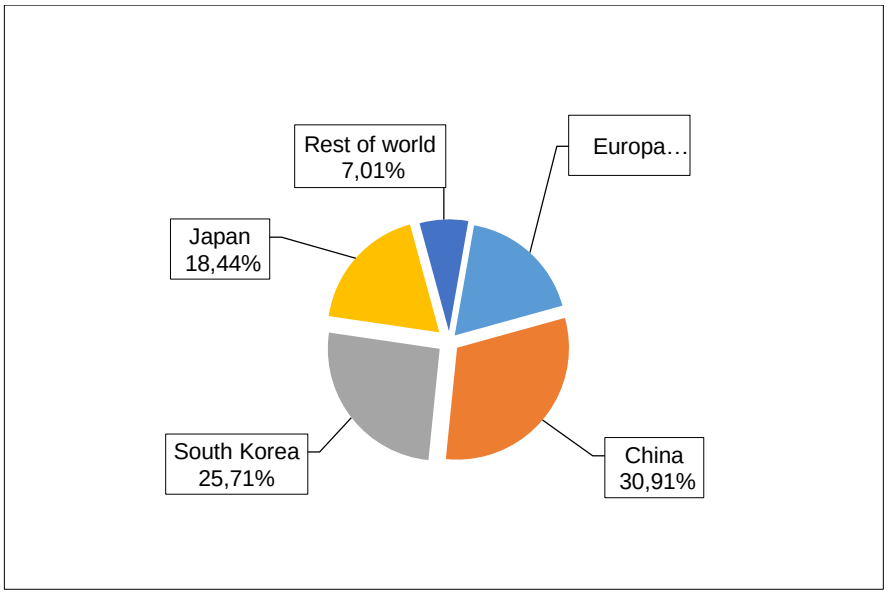
No.	Country	No. of ships delivered	Thousands of CGT	Percentage in total Europe (%)
1	Denmark	0	0.00	0.00
2	Finland	2	131.00	8.97
3	France	6	198.00	13.56
4	Germany	6	197.00	13.49
5	Greece	7	17.00	1.16
6	Italy	5	409.00	28.01
7	Netherlands	20	39.00	2.67
8	Norway	8	49.00	3.36
9	Poland	20	79.00	5.41
10	Portugal	1	1.00	0.07
11	**Romania**	**21**	**126.00**	**8.63**

No.	Country	No. of ships delivered	Thousands of CGT	Percentage in total Europe (%)
12	Spain	16	67.00	4.59
13	Great Britain	4	5.00	0.34
14	Belgium	0	0.00	0.00
15	Bulgaria	0	0.00	0.00
16	Croatia	2	5.00	0.34
17	Cech Republic	0	0.00	0.00
18	Estonia	0	0.00	0.00
19	Ireland	0	0.00	0.00
20	Latvia	2	3.00	0.21
21	Lihtuania	1	10.00	0.68
22	Slovakia	0	0.00	0.00
23	Slovenia	0	0.00	0.00
24	Sweden	0	0.00	0.00
25	Other European	36	124.00	8.49
26	**Europa Total**	**157**	**1,460.00**	**100.00**

Source: *SEA Europe Shipbuilding Market Monitoring Report No 45, October 2018, p. 20*

At the same time, in terms of value, the World Shipbuilding Market had the following structure:

Figure 2. *The structure of the World Shipbuilders Market in the second decade of the 21st century.*



Source: *SEA Europe Shipbuilding Market Monitoring Report No 45, October 2018, p. 11*

In the first half of 2018, Global shipyard output in value terms accounted for 38.5 billion dollars, of which European shipbuilding grossed 6.9 billion dollars, Japan - 7.1 billion dollars, South Korea - 9.9 billion dollars, and China -11,9 billion dollars [29].

Europan shipyards continue to harvest the benefits of their specialisation and successful focus on high tech niche markets, with a few benefiting from the extraordinary cruise ordering boom.

3. Conclusions

The evolution of the shipbuilding sector in the last decade of the 20th century has demonstrated a high degree of adaptability to the market conditions, managing to move from 85% of domestic production and 15% export to CAER countries to reverse, where over 85% of Romania's shipyard production is destined for Western Europe, the first year in which this phenomenon is recorded being 1997, reaching 100% at the end of the 20th century.

If at the beginning of the period 1989-1997 the orders received by the Romanian yards were mainly made up of ship's bodies, in 1997 the share value of the fully armed vessels was 75%, reaching the second decade of the 21st century to a share of over 90%.

At the same time, it is noted the increase of the complexity of the ships carried out by the Romanian Shipyards, the number of specialized ship orders increasing significantly. In particular, we have delivered containers, liquefied gas transport vessels and technical vessels, the products made by the Romanian Naval Industry joining the range of high-tech products.

However, from the previous presentation, it can be appreciated that the technology and the productive performances of the ***Romanian shipyards***, corrected in the last three decades with some equipment upgrades, are able to ensure competitiveness on the foreign market [30].

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[28] *Note:* The data in Tab. 2 refers to the first half of 2018.
[29] *SEA Europe Shipbuilding Market Monitoring Report No. 45*, October 2018, p. 11.
[30] *Abbreviations*: GT – gross ton, DWT – deadweight tons, CGT - Compensated Gross Tons, HP – horse power, USSR - Union of Soviet Socialist Republics, CAER - The Council for Mutual Economic Assistance, OECD - The Organization for Economic Co-operation and Development; LASH - Lighter Aboard Ship.