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The Arsenals of Venice, La Spezia and Taranto between history and industrial heritage. Conservation and enhancement of sites and architectures

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Summary. Among the copious maritime industrial heritage in Italy, the Arsenals occupy a prominent place for both their historical events and their constructive aspects. The "system" of the three- arsenals pole was the key element of the new industrial military policies, which began to rebuild and mature in the decade following the Unification of Italy. The military navy becomes the epicenter of this change, and since the last quarter of the nineteenth century, in just over ten years, the Arsenal of Spezia (completed in 1870), the Arsenal of Taranto It was December 1, 1884 and only partially inaugurated on June 7, 1889) and the adaptation, restructuring and upgrading of that of Venice. They were located in three strategic points in the national territory and had all the aspects and characteristics of the military facilities in all respects controlled by the Navy. The historical and constructive events of the three military factories are located within the industrial history of our country. Since their establishment, their presence has been a factor of economic growth, due to the consistent and unequivocal contribution from the development of the war industry, which has always been among the most flourishing. The set of economic and service activities on the sea are highly integrated and have had the Arsenal as a nodal point. The contribution takes into consideration the historical and constructive events of the three sites, with particular reference to the architectural aspects of the workshops (and machines) that characterize the arsenal systems, without however neglecting the conservation and enhancement interventions that have already been realized or are in stage of realization.
Keywords: arsenals, industrial heritage, conservation, enhancement, Navy.

After the Unity of Italy, on 17 March 1861 was born the Navy of the Kingdom of Italy, unifying the Marine of the Kingdom of Sardinia, the Kingdom of the two Sicily's, the Grand Duchy of Tuscany and subsequently the Venetian Habsburg (1866) and the Pontifical Marine (1870). The Italian Navy was on time organized in three Maritime Departments: Genoa, Napoli and Ancona, and three Maritime Arsenals: La Spezia, Venice and Taranto.

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The three new arsenals followed a unitary project, which was set by Domenico Chiodo for the realization of the first in La Spezia. The choice of the three locations was born out of two important reasons. The first was linked to the dislocation in three strategic areas for Italy: Tyrrhenian, Adriatic and Ionian. The second was linked to the geographical and morphological connotations, different for the three sites, but also characterized by a substantial natural protection. La Spezia was located in the deepest and hidden part of the Gulf; Venice, was defended by the Lagoon and the coastal cordon of Lido; Taranto, was separated from the open waters of the double defense: the "Mar Grande" and the "Mar Piccolo". For Venice, there was another decisive motivation; the remarkable consistency of the built, recoverable for the new settlement. The project started with La Spezia (1862), continued with Venice (1867) and was completed with Taranto (1882).

The initial situations were different. La Spezia and Taranto were basically new settlements, but for Venice there was a profound transformation of the existing site. Even the final dimensions of the complexes were considerably different, almost double for La Spezia (85 hectares) and Taranto (90 hectares), compared to those in Venice (42 hectares)[1].

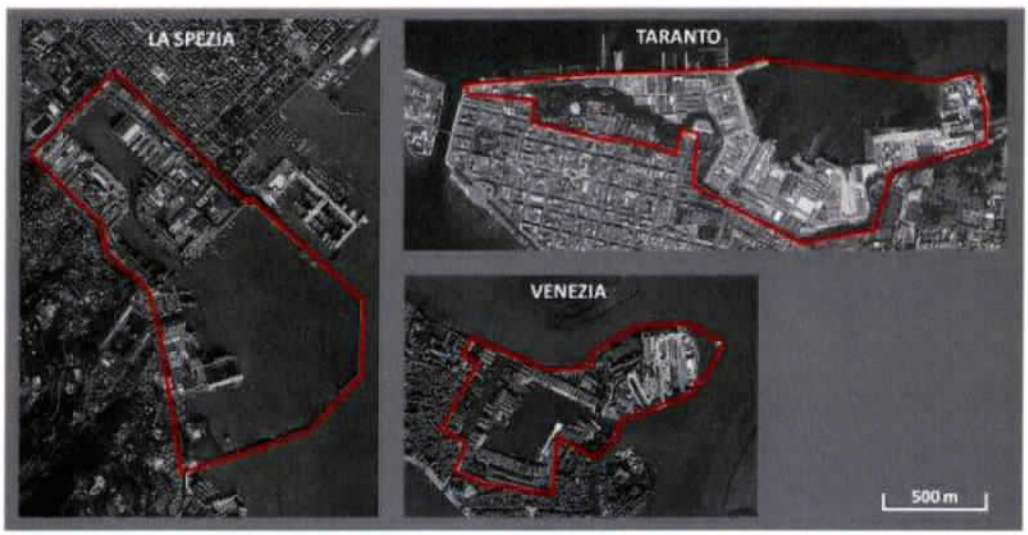

Fig. 01 : The Arsenals of La Spezia, Venezia and Taranto in comparison

[1] The actual size of the Arsenale is 48 hectares, before last extension for an external wet basin toward East, in 20th -21th century.

The new shipyards had to have structures, machinery and dimensions completely different from those of the past, because in those years there was a real shipbuilding revolution that descended directly from the formidable evolution of artillery, started after the mid-nineteenth century.

At the heart of everything there was the progress of steel, with the introduction of Bessemer (1855) and Martin Siemens (1869) furnaces, which made possible low cost steel production in large quantities, and which in fact led to obsolescence cast iron guns, which were replaced by steel concentric barrels. For the effects of this evolution over a decade, between the sixties and the seventies of the century, the canons, which earlier than just exceeded 10 tons, came to weigh over 100 tons with a huge in terms of destructive potential. Immediate response was to shipbuilding, which led to the definitive abandonment of ships with wooden hulls and to the definition of a new type of warship, capable to contrast the new powers of fire. So the battleships were born, with almost double dimensions and displacement at least five times greater than the previous first-class vessels. For the effects of the evolutionary processes just mentioned, over the course of about twenty years, everything changed into the world of artillery and naval military shipbuilding. Regarding the whole affair involving the formation and transformation of the new arsenal complexes, it should be noted that, as far as artillery production is concerned, the navy of the Kingdom of Italy, as it did not yet have its own resources[2], was commercially dependent from England and, in particular, Armstrong & Mitchell of Newcastle upon Tyne, which provided both guns and lifting machines to Italy: the well-known 160-tonne hydraulic cranes that were installed in the three arsenals of the kingdom.

Modern shipyards would have to be equipped with many structures absent in past, as:

- Stone-masonry's Ramps for ship-building and launching;
- Dry docks for the maintenance of hulls;
- Large Wet-docks to move ships of more than 100 meters in length;

[2] The Society *Altiforni, acciaierie e fonderie* of Terni was established on 10th March 1884.

- Quays for ships arming;
- Hydraulic lifting machines, for guns, armor plates, and other heavy parts;
- Specialized mechanical-workshops.

Below we briefly report the events that interested the maritime arsenals of La Spezia, Venice and Taranto, from the Unity of Italy to this day (birth, development, decline and finally the launch of any recovery processes).

La Spezia

Cavour had promoted to transfer the Arsenal from Genoa to La Spezia (L.04/07/1857), within a broader political view of Ligurian harbours, which provided a new launch of the Genoa's merchant port, with the extension of docks in wet-basin in the new free spaces of the Military Arsenal. He chose a new and innovative project, which would to compete with the great Mediterranean arsenals, such as Toulon and Pola.

The plan of Major Domenico Chiodo identified a new location for the Arsenal on the plain of San Vito, west of the city, that offering the possibility of greater extension, easier protection from sea attacks and, by the proximity of city, an easier solution for staff accommodation. The project was approved in 1861 and the Arsenal was inaugurated 28th August 1869, although still missing some parts.

To overcome delays of the works the construction of a Naval Shipyard (14 ha) was planned at San Bartolomeo, in the eastern part of the Gulf, where the shipyards of La Spezia would later be set up.

At the end of 1880, the structure consisted of 2 wet basin (16 ha), 4 dry docks (2 of 110 m and 2 of 132 m), and 2 slipways (100 m), 23 buildings/workshops (Sails Workshop, Ropes Workshop, Foundry, Blacksmith, Carpenters, Caldera, etc. on 84,000 m^2), the forearm (100 ha) to -10 m below level of the sea, defended by two cliffs, two diving pits for seasoning timber (2,6 ha), a naval tank, the square of arms (25 ha), of internal roads, of the swing bridge, of the ditches, of the squares, of the inner railways, of the plants and equipments (including the 160 t hydraulic crane). The Ammiragliato Palace, the barracks, the hospital, and the court were built outside the walls.

For the defense of the Gulf was then made between 1873 and 1879, on the project of the same Chiodo, the 2.225 m long dense dam between Santa Maria and Punta Santa Teresa, with two side gates respectively of 400 and 200 m, guaranteeing safety at the gulf of La Spezia. The execution of such imposing work was also made possible by the use of new techniques and tools, which Chiodo had derived from English and French experiences, particularly in Toulon. However, must be attributed to himself the development of new excavation techniques for dry-docks, carried out at 15 m below sea level[3].

In the following years, to allow the construction of larger naval units, the stairs were progressively stretched (1899-1912), two other dry docks (1899-1890), expanded the second dock, the internal communication channel, was built a new 64 m (1914) revolving deck and other buildings were built to meet the new technological requirements.

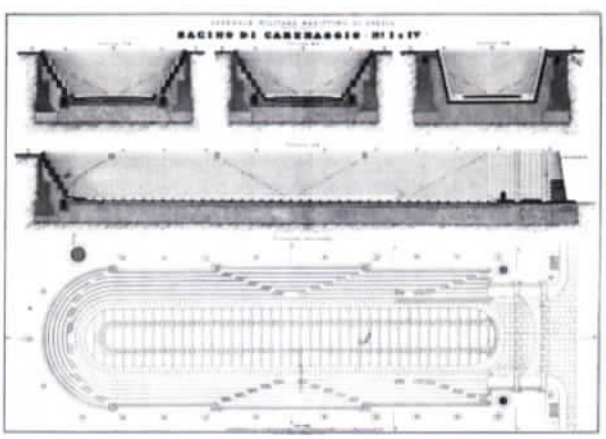

Fig. 02 : Dry-docks 1-4(Archivio Storico del Muggiano - Fondazione Fincantieri)

The main activity of the Arsenal was the construction of naval units for the Navy: not only the ships hulls, but also the machinery, weapons and systems needed for both propulsion and combat. Between 1871 and

[3] Comitato delle Armi di Artiglieria e Genio, *Atlante a corredo delle Relazioni intorno ai principali lavori eseguiti nell'arsenale militare marittimo di Spezia, Roma 1881.*

1923, 8 battleships, 6 cruisers, 2 torpedo boats, 2 cannons, 9 submarines and numerous support units were launched.

The Arsenal's realization deeply influenced the development of the city, which had to adapt rapidly to the new requirements, in terms of accommodation, services and infrastructures. The Regulatory Plans of 1862 and 1870 definitively designed the nineteenth-century city, with a pattern of orthogonal plots that pursued full formal and functional unity with the Arsenal, extending it in the direction of the sea, which was reconfigured with the blanks of the resulting material of the Arsenal excavations. The plan also indicated the construction of a worker's quarter, Umberto I[4], for the workers of the Arsenal, which will be built following the cholera epidemic of 1884, with the construction of 992 houses in the north zone, between the Arms Square and the new railway station. The construction of the Arsenal marked the beginning of the process of industrialization of the gulf, especially in the shipbuilding, maritime and armament sectors. But over time, the private industry, linked to the great monopoly concentrations - Ansaldo - San Giorgio, Odero Terni Orlando (OTO) - gradually replaced the Arsenal, state industry, which was facing a slow decline.

Fig. 03 : Revolving bridge (photo S. De Maestri)

During the Second World War the bombings caused considerable damage to the Arsenal. To allow for the operation, it intervened on the

[4] S. De Maestri, *Ricognizione e Catalogazione delle Company Town in Liguria*, research of Regione Liguria - *Dipartimento di Ingegneria Civile, Chimica e Ambientale dell'Università degli Studi di Genova, Genova 2016*, in part on *www.culturainliguria.it*.

individual buildings mostly in the manner of pre-existence. Over the years several interventions have been carried out.

Today many structures are still in use, even if not in fullest extent possible: in the Arsenal no longer ships are built, only maintenance and modernization of the naval units are present.

Most of the structures in the arsenal are now constrained, although for many the constraint concerns only the exterior of the buildings. More attention is being paid to the renovation work than was done in the past, as in the recent intervention on basin n. 4.

As far as the buildings outside the walls are concerned, is in progress for several years an interaction with the Municipality of La Spezia to evaluate its sale with a new compatible use destination, as in the case of the Military Hospital which was recently sold in a free use fee at the University of Genoa, for the transfer of Naval Engineering Polo.

Venice

As mentioned, the realization of a modern arsenal in Venice did not consist in the construction of a new shipbuilding, but in the expansion and adaptation to new functions of an already existing complex.

Complex of remarkable breadth (30 hectares) and of great consistency and architectural quality, which had almost seven hundred years of activity.

The Arsenal played an exceptional role in the history of Venice. The wealth of Venice, which gave rise to the splendor of the city, was based from maritime trading activities. The Arsenal was the place where the ships, for these activities, were built, and where the technology of shipbuilding was advanced.

The Arsenal occupies the extreme eastern part of the city of Venice and corresponds to about one twelfth of the area of the city. Since the beginning of the thirteenth century, through continuous works of transformation, the Arsenal, before 1866, reached the size of 30 Hectares.

The last expansions, carried out during the Italian kingdom, took place in two periods: the first between 1867 and 1885, and the second between 1903 and 1917, when reached the size of 42 Hectares.

The Arsenal transformation initiatives were undertaken by the Navy Ministry in 1867, which established a provisional Military Genius Office in Venice, and entrusted to Colonel Domenico Chiodo, which was then carrying out the work of the Arsenal of La Spezia, which presented a first study on 1867.

The project retraced the solutions proposed for La Spezia in 1861, in smaller proportions. It involved the demolition of a lot of shipyards to create a large wet-basin and the construction of two dry-docks and five slipways for ship-buildings.

The events that marked the design path were very articulate and complex, with a succession of different proposals.

A substantially different projection was proposed by Eugenio Giani. To find a definitive solution was established a special committee, which decided on halfway solution. The works started in 1871 under supervision of Giovanni Morando.

Felice Martini in 1873 developed the final reorganization plan, which included a second dry dock, and in 1885 completed the works.

Fig. 04 : The "Officina Congegnatori Aggiustatori" building (1877-1885 - photo C. Menichelli)

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At the beginning of the twentieth century the works was restarted. The first interventions concerned the northern part of the complex. Between 1903 and 1908 the quay was created and shipyards were transformed into workshops and warehouses. In 1908, was established to build a third dry dock. The works started in 1909 and in 1917, during the First World War, was completed. The length of the new dry dock (250 meters) was more than double the previous ones and appropriate to new building requirements. The transformation works involved also painful losses, as the *Isolotto* Shipyards (Fourteenth century), of which now remains only one, or as the reduction of the *Squadratori* building (Eighteenth century).

Until the First World War the shipbuilding activity was significant. Between 1867 and 1916 a total of were built 32 warships, of which 5 large size ships[5] and 7 submarines.

After the end of First World War started a phase of decline, with a brief recovery during the Second Conflict, followed by intense acceleration immediately afterwards. At the end of the 70's of the last century much of the complex was in a state of marked degradation. Starting from the early 80's began a systematic restoration activity of the Ministry of Cultural Heritage and the use for exhibitions of some buildings by the Biennale Foundation. Much has changed in the last decades. The birth of Tethis, the launching of the Maritime Institute of Military Studies of the Navy, the impressive restoration works and projects of the Ministry of Public works, the activity of the Società Arsenale, the entering of the National Research Council, the intensification and expansion of the activities of the Biennale foundation, the persisting of restoration and research activities of the Ministry of Cultural Heritage, and finally the change of ownership of large part of the Arsenal from the State to the Municipality of Venice, produced many initiatives and changes.

[5] *Francesco Morosini*, battleship (length: 105m - displacement 11,200 tons), *Sicilia*, battleship (1891- length 130m, displacement 13,400 tons), *Amiraglio Saint Bon*, armored car (1902 - length 111m, displacement 9,480 tons), *Francesco Ferruccio* - armored cruiser (1902 - Length 112m, Displacement 7.350 ton), *Quarto* - Explorer (1911 - Length 130m, 3.280ton Deployment).

Fig. 05 : "Tese della Novissima", building n° 105, restored in 2010-2012 (Società Arsenale - project, A. Holguin, A. Solis Sanchez, D. Morales Hernandez. photo C. Menichelli)

Taranto

In 1883, a Commission for Mechanical and Naval Industries, chaired by Minister of the Navy Benedetto Brin, had the task to identify those mechanical factories, which provided the best guarantees in constructions for Navy. The situation was particularly critical in the south of Italy, which was devoid of ironworks. Following the start of the work of the Arsenal of La Spezia, the new kingdom of Italy needed the construction of an Arsenal for the southern provinces that formed the second Maritime Department. Already in 1864, in order to choose the most suitable place for this Arsenal, a commission had been proposed Taranto. The defeat of Lissa in 1866, with the coming to government of the Historical Left and the choice of protectionist policies, proposed with even more force the industrial question in Italy with a nationalist spirit.

For the construction of the new Arsenal the attention was definitely focused on Taranto. The first "Location Project" was planned by Commander Simone Pacoret de Saint Bon in 1866. Three years later, in 1869, the Superior Council of Marina approved the master plan of the Arsenal. Starting from 1871 several bills were proposed in Parliament to create the industrial site. At last, by law of 29th June 1882, the works for the first general plant were approved. Already in 1883, under the

supervision of Major Giovanni Cugini, started the works of the Navigable canal and the first masonry Dry-dock (inaugurated in 1889).

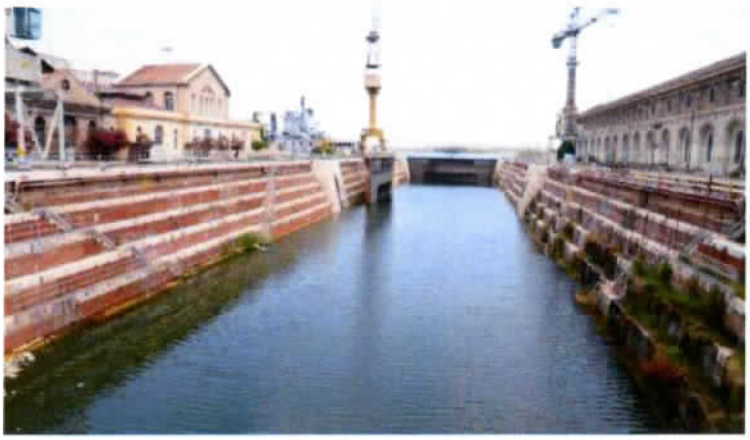

Fig. 06 : The Benedetto Brin dry-dock (photo A. Monte)

Taranto became the base of Ionian Sea and the seat of Third Maritime Department of the Italian Kingdom. This military role, born from the awareness of the centrality of Taranto within the Mediterranean political framework, completed the slow transformation of the existing city, started with the demolition of the old fortifications and continued with the construction of the Military Arsenal, with widening of the navigable canal and with the launch of a process of industrialization in shipbuilding. From Taranto departed ships for many military campaigns, as in the First World War (1915-1918), when the city played a fundamental role not only as a base for the Italian fleet but also for the French fleet, as well as being a reference point for supplies for the military contingents in Thessaloniki and Macedonia. In the Arsenal, for this reasons, between 1915 and 1935, work increased, orders increased and new workshops were built, gradually added to the early ones, some large as Galileo and San Giorgio, and other smaller subaltern, with up to fifty employees. During the Second World War Taranto resupplied the troops operating in North Africa. This was the main reason because in the night of 11th November 1940 was bombed, losing three large Italian units: the *Littorio*, the *Duilio* and the *Cavour*, battleships anchored in the Great Sea, struck by aerial torpedo departed from the English aircraft carrier *Illustrious*. In Taranto, after 8th September 1943, Admiral De Courten, Minister of the Italian Navy, and Admiral Cunningham, Commander in Chief of the British Naval Forces in the Mediterranean, signed an agreement that included the Italian fleet in the framework of cooperation with the United Nations.

Fig. 07 : The "Palazzina della Direzione Generale", headquarters of Command (photo A. Monte)

The presence of the Arsenal in Taranto was immediately a factor of economic increasing, thanks to the consistent contribution of war industry development, which has always been among the most flourishing. Until the 1950s, the Arsenal was the only industrial pole of a certain size, capable of fueling a large satellite activity. During World War II, however, the city began to perceive the first signs of an economic crisis that over the years would become increasingly overpowering. The Maritime Military Arsenal of Taranto, longitudinally extended three kilometers along the southern coast of the Mar Piccolo, covers a surface of 90 hectares. Established for the construction of military ships, since 1960 the Arsenal has been involved in the large and small maintenance of the Navy's fleet, achieving technologically advanced machining and continuing to play a primary role in the Italian military context.

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