

Paper 153 – Renovation of the liquid bulk terminals – La Plata Port

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ABSTRACT: In the present work a preliminary design of the present docks of YPF ("Treasury Petroleum Fields"), La Plata Port is presented. The purpose is to update and optimize minimal standards of security, functional productivity, and lowering of costs in transport in the riverside in Ensenada as well as in the riverside in Berisso.

In the preliminary design, different soil studies located in strategic places were considered to determine the most reliable structural solutions.

A multi-criteria analysis was made to examine the different types of design to materialize the renovation aiming to determine the most beneficial one.

1. INTRODUCTION

Port of La Plata is located in the Province of Buenos Aires on the south riverside of the Rio de La Plata, 50 kilometers to the southeast of Capital Federal, and 10 kilometers far from the city of La Plata. It is geographically located at coordinates 34° 51' 09" South Latitude and 57° 53' 08" West Longitude.



First of all, it has to be emphasize that within the port jurisdiction it is located the industrial complex of La Plata (CILP) whose principal facility is the refinery, which has a capacity of 4.460.000 m³ per year. 56% of the production is oriented to the intern market, and the other 44% to exportation.

This important industrial complex is complemented with the industrial center of Ensenada (CIE) that focuses on petrochemical industry and that has a big exporting movement.

In that sense, the port terminal is located near to the shipping and reception places of the products operated from the industrial complex of La Plata and the industrial complex of Ensenada. The former principally uses the intakes from the riverside of Berisso, and the latter uses exclusively the intakes from the riverside of Ensenada, these are shipments of petrochemical products.

The terminal operates around the maneuvering dam, and longitudinally over both margins of the Gran Dock Central. It occupies an approximate surface of 160.900 m², and has a dock of 773 meters over the riverside of Berisso, and 567,95 meters over the riverside of Ensenada.

The project consists on the renovation of the liquid bulk terminals which have been granted to YPF enterprise presently. These terminals are located in the Port of La Plata.

Said renovation will guarantee security in navigation, safe tie up actions, mooring, load and unload, and the removal of the top-off tasks in the next 50 years. This allows to revitalize and put in value one of the most important liquid bulk terminals of the Republic of Argentina.



The suggested renovations will improve the efficiency of the port system of La Plata, being this a key area and natural alternative to the Port of Buenos Aires given the closeness to the capital of the country whose metropolitan area ascends over 13 million of inhabitants.

2. PROJECT OF VESSEL

The tankers that nowadays operate in the docks of YPF have an average overall length of 160 meters, however, it is worth mentioning tankers which have widely surpassed that length 220 meters. Nowadays, the tankers that surpass 215 meters of length have to previously request an authorization to the Argentine Naval Prefecture in order to enter.

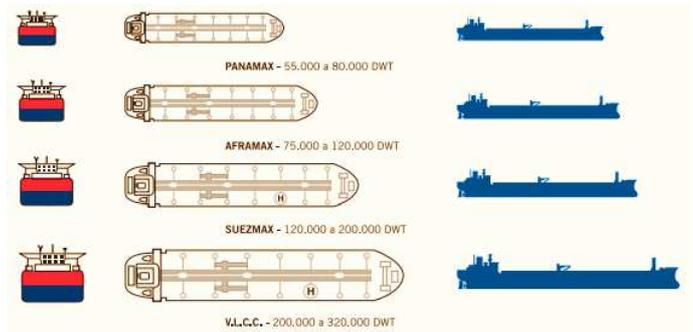
In respect to the movement of registered tankers in the last ten years it is established that 80% of vessels are small and of coasting, 13% are overseas, and the other 7% are international seaborne coasting.

Considering that the refinery of YPF is one of the most important in Argentina, the consumption of oil derived products increases considerably in relation to the growth of the population. In consequence, the quantity to transport is higher and it is necessary to establish an update in the design vessel.

The renovation of the port terminals for the riverside of Berisso as well as for the riverside of Ensenada has to foresee to satisfy the port demands on the next 50 years. Thus, the design vessel that has to be chosen must satisfy the suggested expectations in the present and in the future.

Is worth mentioning that navigation in the Rio de La Plata is determined by the depth of the main route of navigation which has nowadays 34 feet foreseeing that it could be deepened to 42 feet in medium term. It is therefore that the design vessel discussed corresponds to a Panamax tanker whose dimensions are:

- Length: 210 meters.
- Beam: 32,2 meters.
- Draft: 42 feet (12,80 m).



3. PROJECT

Having expressed all of the above, the liquid bulk terminal from the Port of La Plata plays an important role. Thus, it has to be updated, modernized and perfected aiming to guarantee minimal standards of security, functional productivity, and lowering de costs in transport, among others.

The project consists on two phases:

- Renovation of the terminal of the riverside of Ensenada.
- Renovation and updating in the riverside of Berisso.

In order not to leave without operation the YPF terminals, a 5 stage plan was made to make the remodeling:

- Stage 1: The adequacy of work area.
- Stages 2, 3, 4: Renovation of the riverside of Berisso.
- Stage 5: Renovation of the riverside of Ensenada.

With this plan stage by stage, it is guaranteed that while the project of renovation and modernization of the terminals is being held, the terminals would not stop working.



3.1 RIVERSIDE OF ENSENADA

3.1.1 Introduction



CGPLP: *La Plata Port Management Consortium*

Over this riverside the terminal occupies a dock length of 567,96 meters and a surface area of 20.186,60 m².

This riverside has three mooring stations and three functional intakes, being two of those operable. Each intake has nine main lines where each pipeline is used to a specific product. There is also, as mentioned before, a third intake whose use is for fuel consumption.

Each one of the mooring stations has a length of 172,65 meters and there is a 20 meter separation between each one of them.

In respect to the loading movements, this terminal (riverside of Ensenada) represents 20% of the approximate overall movement in 800.000 tonnes a year whose main load is the exportation of chemical products and the unload of oil for Biodiesel.

The highest percentage of vessels that were moored in this riverside in the last 10 years, estimated in 60%, correspond to overseas vessels whose beam surpass 25 meters of length. The other 40% it is divided into national and international coasting vessels.

In respect to the present structure, it is built through a dock of causeway built in the year 1890 by the Spanish. It has a depth of 28 feet in reference to the port's local zero.

3.1.2 Description

Taking into account the aforementioned, the suggested resolution was projected contemplating the security from the point of view of Security and Safety.

Bearing in mind that the CGPLP (La Plata Port Management Consortium) developed on its terminal of public use -next to the dock of YPF- a renovation in its dock through a cover structure of sheet piling,

a similar resolution was considered so as to accomplish a structural continuity.

The projected resolution consists on placing the new structure -one meter ahead the present dock- in order to reduce significantly the active earth pressure produced by the effects of the soil.

The computation was realized contemplating the "Earth support method for penetration in clay soil" projecting a metallic sheet pile "AZ 13" set until reaching a depth of dredge depth of -9,75 meters below the reference plan which coincides with the port's local zero.

The existent intermediate hollow between both structures (existent and suggested) is going to be built with concrete H-17, and over it is going to be built the capping girder reaching a height of +4,55 meters.

In addition, it is planned the placement of turnbuckles of 1 ½ inches of diameter- with a distance of 1,30 meters between each other- whose length to the anchor wall is of 28 meters.

3.2 RIVERSIDE OF BERISSO

3.2.1 Introduction



Over this riverside the terminal occupies a dock length of 773 meters and a surface area of 111.496,13 m².

This riverside has four mooring stations and three functional intakes. Each intake has fifteen main lines with a maximum pumping capacity of 4.100 m³/h, where every pipeline is used for a specific product.

Each mooring station has a length of 173,30 meters and a separation of 20 meter between each one of them.

In respect to loading movements, this terminal represents an 80% of the approximate overall movement in 3.900.000 tonnes per year whose main load is the transportation of liquid fuels.

The highest percentage of vessels that were moored in the riverside of Berisso in the last 10 years, estimated in 75%, correspond to national



coasting vessels whose beam surpass 25 meters of length. The other 25% corresponds to overseas vessels. The cause of the great amount of national coasting vessels is due to the top-off tasks that must be carried out in the outskirts of the port in order to complete 100% of the loading.

Regarding the present structure, it is built mostly through a dock of causeway in the same way the dock of the riverside of Ensenada is, whereas another part was rebuilt with dock over piles. Both docks with a depth of 28 feet in reference to the port's local zero.

3.2.2 Description

As regards the renovation of the riverside of Berisso, the first action taken was to update the design vessel previously developed in section 2.

The adopted tanker presents a beam of 32,2 meters -not fulfilling the recommendations given by PIANC in relation to the width of the inner navigation channel Dock Central which make reference to the five beams of the design vessel the must exist between both riversides.

Accordingly to the exposed and in order to satisfy what is mentioned in the report of PIANC InCom WG 121-2014 Harbour Approach Channels – Design Guidelines, it was consider to pull back the present structure of the riverside at issue. In this manner, the "Grand Central Dock" will be 170 meters of width -fulfilling the aforementioned recommendation.

In order to achieve the present soil pull back, it was thought that the soil movement work could be realized in a dry way through mainly backhoe loaders. By doing so, and since the work is done in land and not in water, working time is shorten.

Similarly, the use of bilge pumps was taken into account, allowing -if necessary- water table depression as well as precipitation water evacuation or possible residual level rising.

The last stage of soil pull back -having in mind the old structure- is going to be performed by the use of a scoop dredge with the help of a hopper dredge which will transport the material to the refill area.

Assuming that the update and the renovation of the riverside at issue is fixed to operate over the 365 days of the year and in safety conditions, a preliminary design was planned so as to guarantee lower costs in transport and progress in functional productivity.

It should be noted that the soil in Port of La Plata's surroundings is divided into different layers, changing from top layers with sand to bottom layers

with silt clay. Different analysis cases were considered changing tide levels and residual levels from high tide to low tide for the purposes of determining which is the most disadvantageous computation option -verifying landslide, overturn, collapse, and overall failure of the structure.

The preliminary computation of the cover wall gave as result 1 meter wall thickness, and 32 meters height including the sheet. Its building will be with concrete H-30, having to bridge with frame an area of 123 cm².

Six lashings of grade 1550/1820 N/mm² will be used, 3 meters separated from each other, with a length of 40 meters to the anchoring wall.

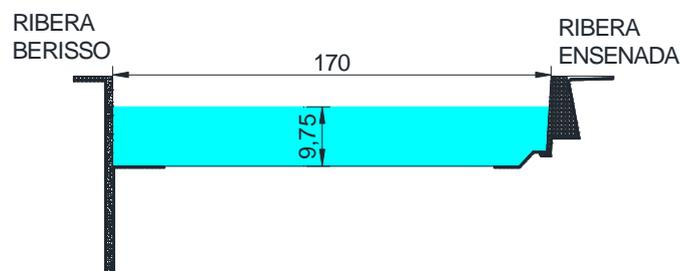
Uppermost it will be finished throughout a 1 meter capping girder which coincides with the cover thickness, and a height of 0,25 meters.

As regards the secondary structures, the renovation of the dock with 170 meter of nominal width, the placement of new bollards called simple shot hook -separated 35 meters between each other-, and the change of defense verifying a mooring power of 28 tnm separated to a 20 meters distance between each other.

4. DREDGING

The dredging of the central channel of the Port of La Plata -also called "Grand Central Dock " - will be separate into two periods, and will correlate with the depth that the navigation channel reaches from its beginning (landing pontoon km 0,000) to the intermediate channel.

In the first period, given the fact that the present determiner of the main route of navigation is set as 34 feet, both, the riverside of Ensenada as well as the riverside of Berisso will be dredged dockside to depth of 32 feet in reference to the port's local zero.



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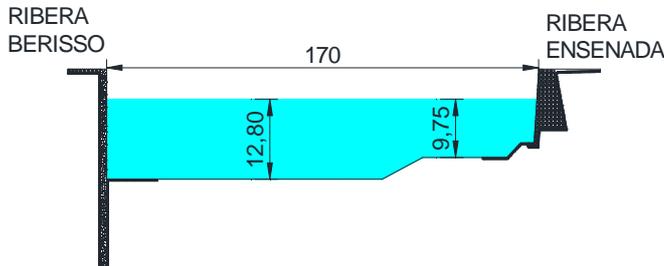
The second period, considered at long term, will be the consequence of the decisions made in relation to the depth to which the main route of navigation of Río de La Plata is taken. In such case,



and bearing in mind that the riverside of Berisso is the one with most activity, it was projected for it to be dredged dockside to a depth of 42 feet in reference to the port's local zero.

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5. CONCLUSIONS

The present work presents long term resolutions as regards renovation and updating of the present docks. The redesign will guarantee security in navigation, safe tie up actions, mooring, loading and unloading, and removal of the top-off tasks. This allows to revitalize and put in value one of the most important liquid bulk terminals of the Republic of Argentina whose loading movement could be higher at a lower cost.

In addition to the previously mentioned, secondary projects as demolition and construction of a new administrative building, relocation of pipes on the intakes of Berisso, and paving of internal streets are anticipated.

Renovations and updates proposed will improve the efficiency of the port system of La Plata.

In this way, the terminals of YPF will be able to anticipate the requirements of the demand in short term. Thus, fulfilling the present and future demands stated by the market.

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