

MO

S E

An integrated
system for the
environmental
sustainability

*Ing. Hermes Redi
General Manager
Consorzio Venezia Nuova*

The Venice Lagoon



Venice

Lagoon

Chioggia

Chioggia inlet

Malamocco inlet

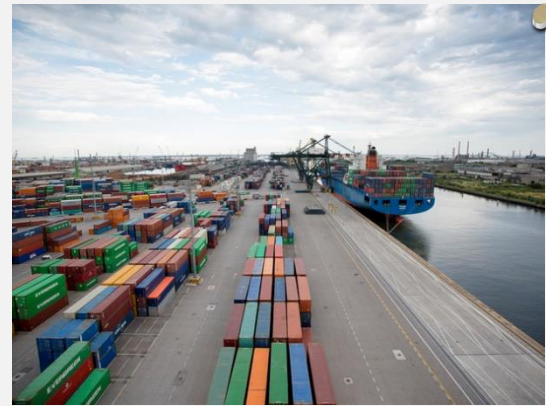
Lido inlet

Adriatic Sea



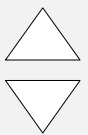
Sustainability / Environmental protection/ Collective value

People and economic activities



Sustainability/ Environmental protection/ Collective value

The historical, artistic and environmental heritage



The Mose defence system

An integrated solution for a complex environment



Environmental protection



Management and maintenance



Improved environmental resilience



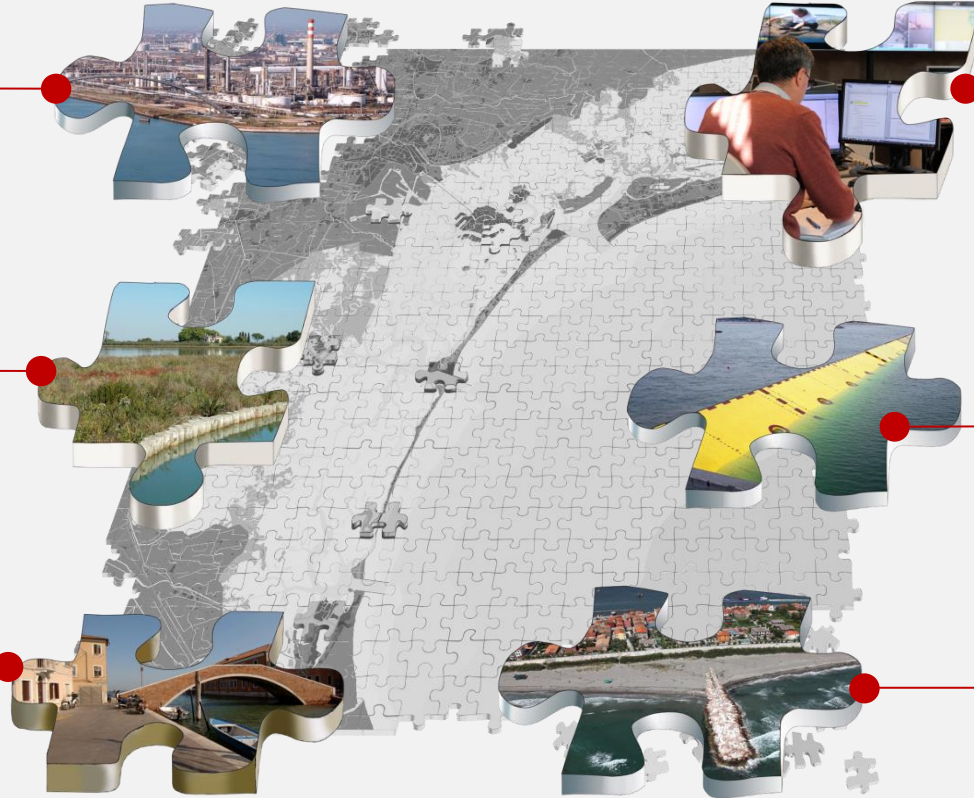
Protection from floods
The Mose



Urban defence and improvement



Protection from sea storms



Mobile barriers

Guidelines, addresses, design criteria

- The mobile barriers are the heart of the Mose system.
- These are extremely **complex works** that have responded in terms of **innovation** and **flexibility** to the constraints imposed by a territory of great environmental value and, at the same time, strongly anthropized.
- At the basis of the project there is a very articulated series of **guidelines** and **design criteria** formulated during the process that led to the definition of the works.
- The high tide defence system should not introduce significant changes in the **water exchanges** at the inlets, it should not interfere with the **landscape**, it should not interfere with the **economic activities** connected to the inlets themselves.



The high waters defence

The defence strategy. Mobile barriers and local defence

The solution created consists of an integrated system of works which includes **mobile barriers**, for tides ≥ 110 cm, and "**local defence**" interventions in the historic lagoon centers, for tides < 110 cm. This strategy makes it possible to reduce the number of the raising of the barriers as much as possible, limiting interference with the port system and reducing the effects on water exchanges sea / lagoon and in general on the environmental system.



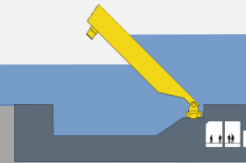
Local defence

Tide < 110 cm

Tide ≥ 110 cm

lagoon

sea

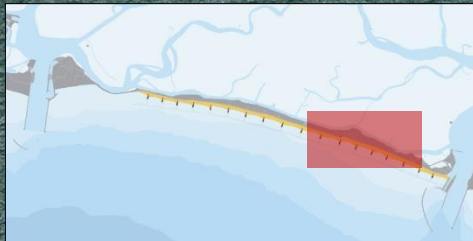


Mobile barriers

Protection from sea storms

Reinforcement of the Pellestrina littoral

Before works



Protection from sea storms

Reinforcement of the Pellestrina littoral

After works



Urban defence and improvement

Adaptation to face the sea level rise



Chioggia,
works realized



Raised shores

Raised paving

Baby Mose
gates



Improved environmental resilience

Salt marshes reconstruction

Beginning of works



Improved environmental resilience

Salt marshes reconstruction



After works



Environmental protection

Securing of polluted areas



Before works

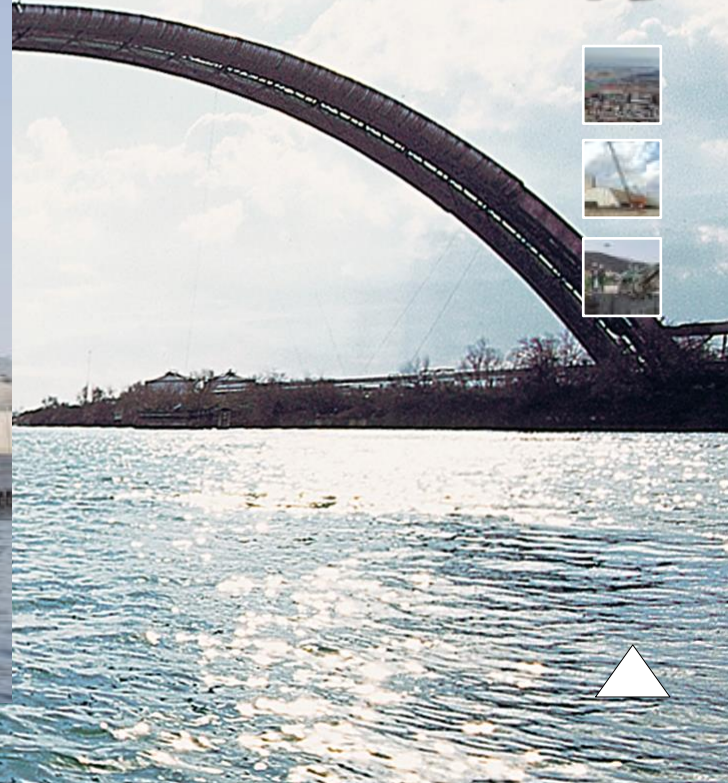


Environmental protection

Securing of polluted areas

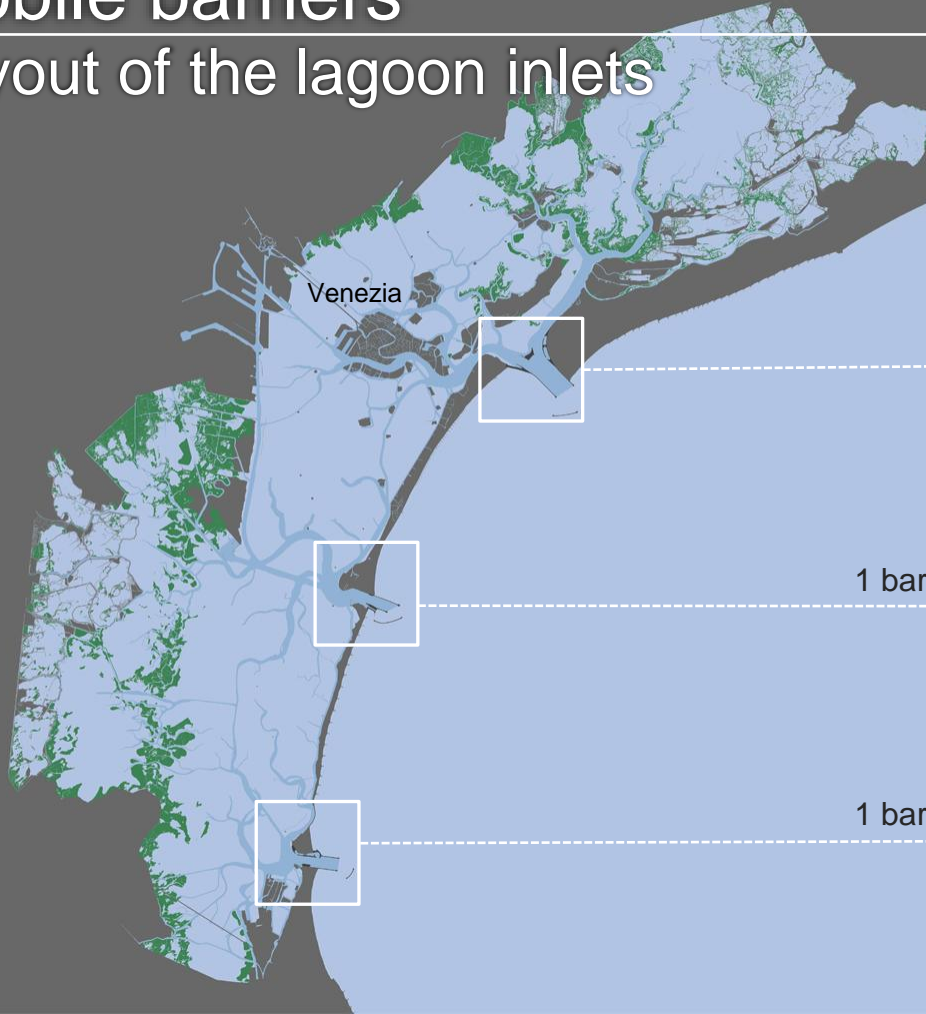


After works



Mobile barriers

Layout of the lagoon inlets



Venezia

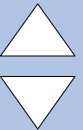
Lido inlet
2 barriers (41
floodgates)



Malamocco inlet
1 barrier (19 floodgates)



Chioggia inlets
1 barrier (18 floodgates)



The Venice lagoon defence measures

What has been done

Reinforcement of the coastal littoral

56 km of reconstructed and protected beaches

12 km of restored and naturalized coastal dunes

11 Km of reinforced breakwaters

Urban local defence

100 km of urban and lagoon embankments raised and reinforced

Environmental protection

40 km of industrial canal banks secured

7 former dumps secured

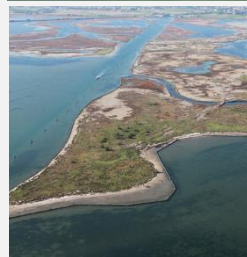
39 hectares of phytobiopurification areas recreated

Improvement of the environmental resilience

39 km of protected salt marshes

12 minor islands recuperated

16 km² of reconstructed and naturalized salt marshes



Mose system

Mobile barriers. Localization



Venice



Lido inlet



Lagoon

Malamocco inlet



Chioggia inlet

4

Mobile barriers

78

Floodgates

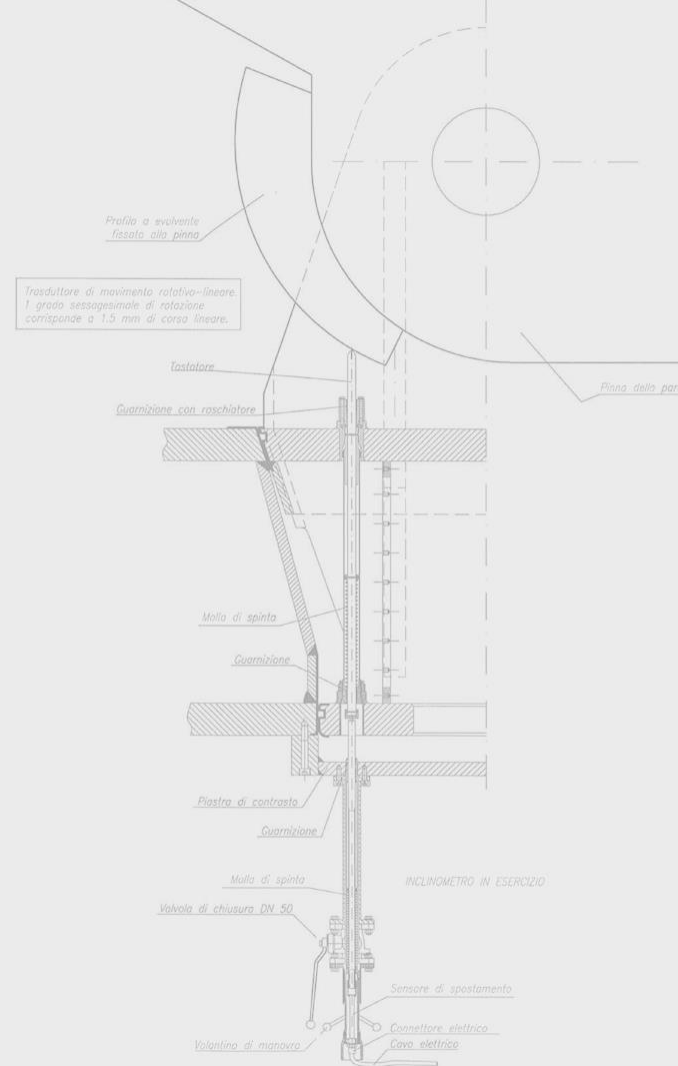
1.6 km

Extension of the
barriers



Mobile barriers at the lagoon inlets

Main components of the system



Main components of the system

Gate housing caissons. Construction

Abutment caisson

Gate housing caisson

Platform for the
caissons (Syncro)

Malamocco

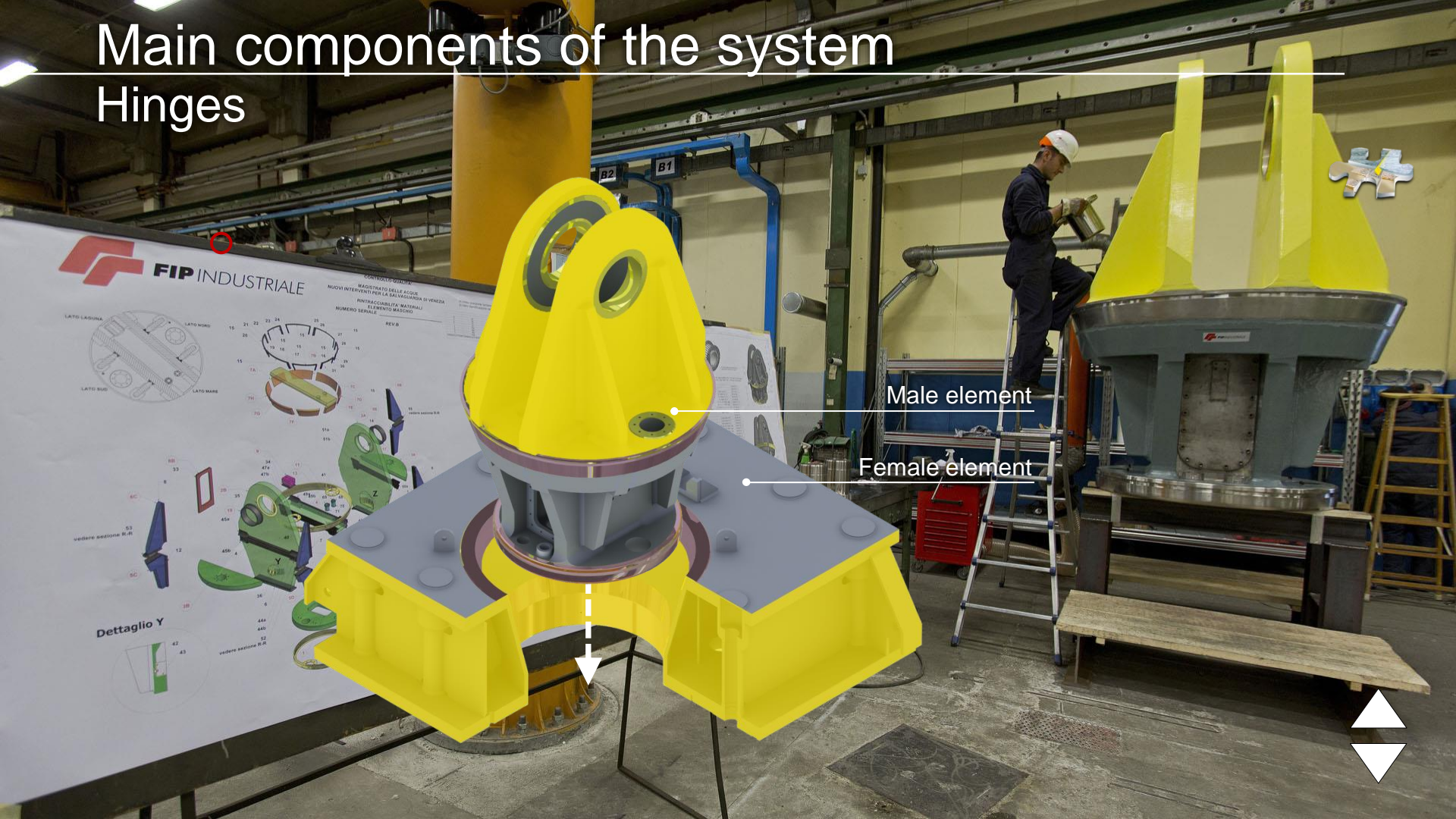
Gate housing caissons:
w. 59 m / l. 48 m / h. 11,5 m

Abutment caissons:
w. 24 m / l. 63 m / h. 28 m



Main components of the system

Hinges



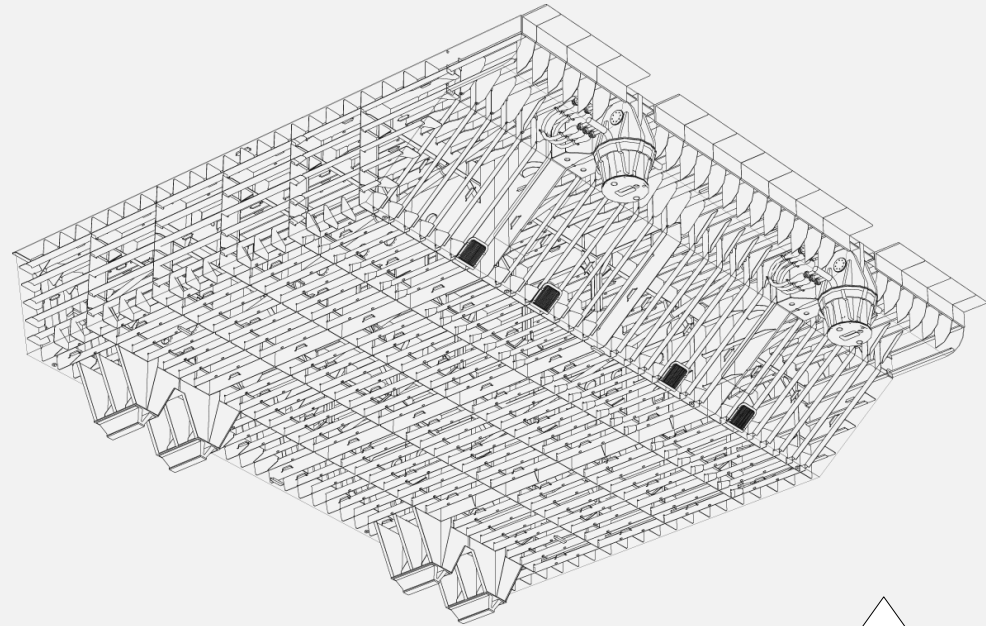
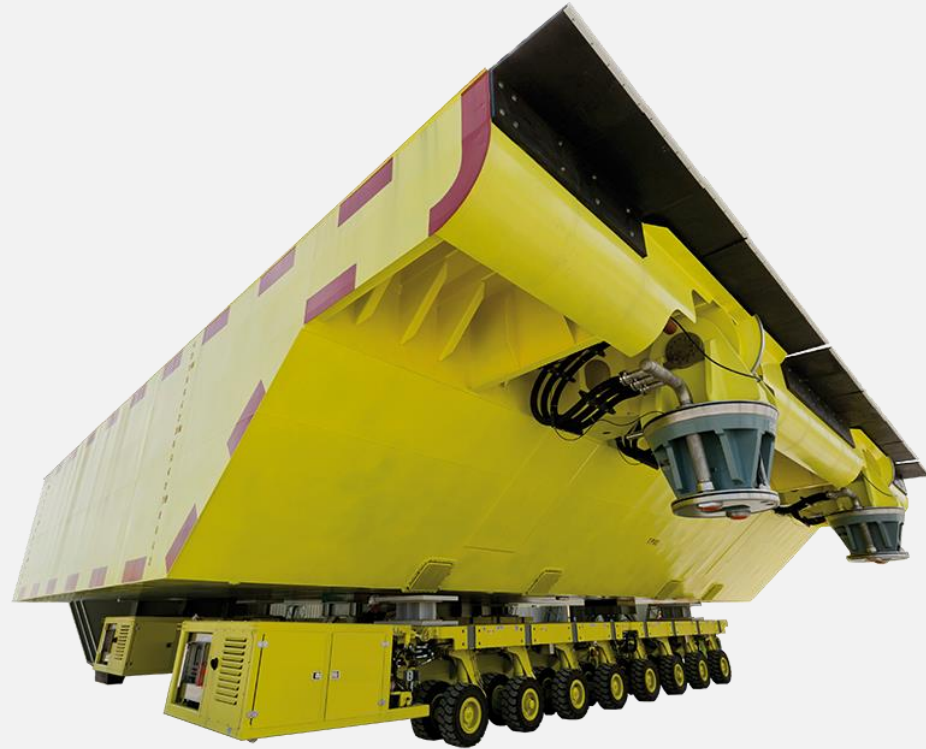
Male element

Female element



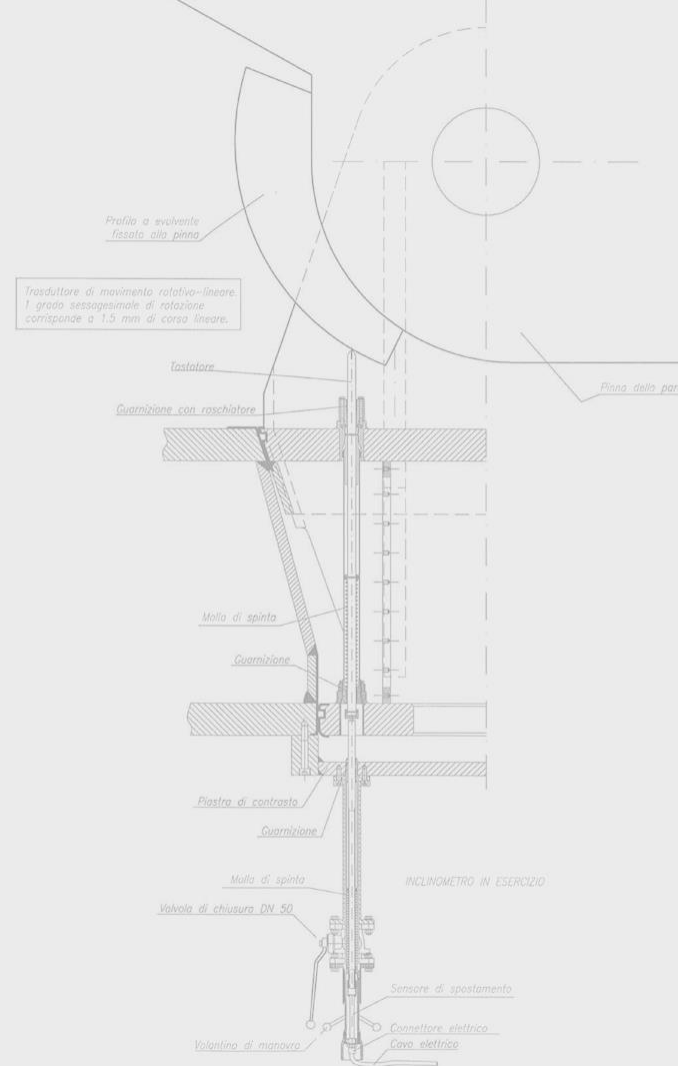
Main components of the system

Floodgates



Mobile barriers at the lagoon inlets

How do they work

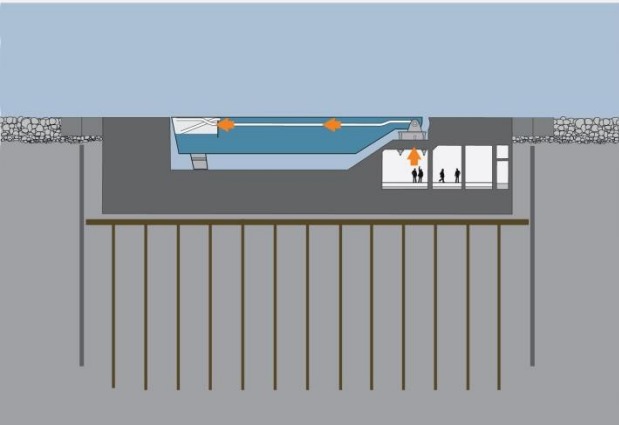


Mobile barriers

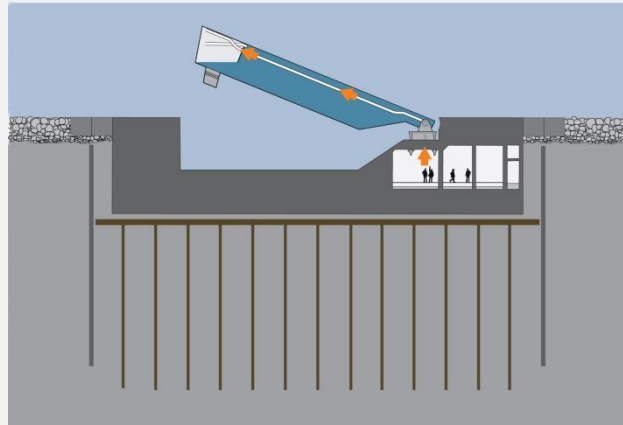
How do they work



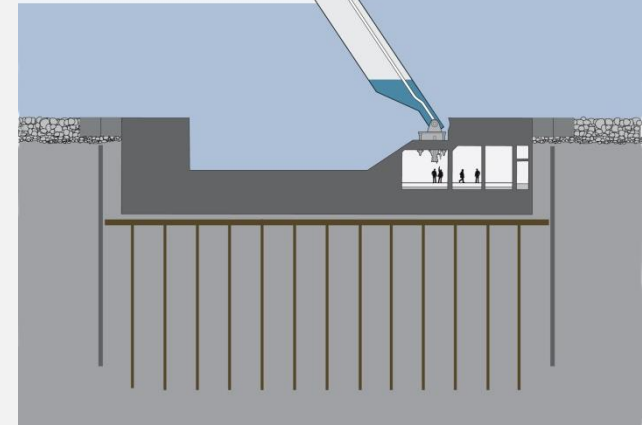
Immission of compressed air
And expulsion of water



Starting of the raising operations



Raising of the gates to the emerge position



Working position and tide tracking



Functional tests

Barrier raisings (partial or complete)



Lido



Malamocco



Chioggia



Barrier raised to defend from high water (50 events)

Lido



Barrier raised to defend from high water (50 events)

Malamocco



Barrier raised to defend from high water (50 events)

Chioggia



Arsenale. Operational and decision making room

Management of the defence system

Back up control room.



Lido inlet. Control room

The managing of the commanded operations at the inlets



Management system

- The operation of the Mose system supervises a set of management tools that **allow the objective of hydraulic defense to be combined with a very wide series of territorial, operational, environmental and marine weather variables** and with a consequent multiplicity of operating conditions of the barriers.
- It is an **integrated management capable of protecting both from exceptional high waters and from the more frequent high waters** and such as to ensure maximum effectiveness in relation to the different characteristics of the tides; maximum functional flexibility in the face of changing "surrounding" conditions; maximum compatibility with the layout of the lagoon ecosystem in its natural and anthropic components.
- Thanks to the flexibility of the system, **the barriers can be used in different ways based on the characteristics of the tidal event to face**: closure of the three inlets and/or partial closures of the barriers in the presence of particular combinations of wind and levels for medium-high tides.



A laboratory of know how "Made in Italy"

- The program of interventions implemented for defence from high waters and environmental recovery has activated a **multiplicity of multidisciplinary knowledge and operational skills**.
- The project, developed almost exclusively in Italy, has made it possible to study engineering and environmental issues in depth, finding solutions typical of "**Made in Italy**" ability and creativity.
- It is a knowledge of high technological and managerial profile which has become reason of continuous dialogue, in the scientific field, with **other countries** involved in environmental challenges.



An aerial photograph of a long, narrow concrete dam or barrier extending from the top right towards the bottom right of the frame. The structure is composed of several parallel concrete walls with a narrow channel between them. The surrounding water is a light, rippled grey. The text "Thank you for your attention" is overlaid in the center of the image in a dark red, italicized serif font.

Thank you for your attention