



LIFE MARINAPLAN PLUS  
LIFE15 ENV/IT/000391



D2.1 - TECHNICAL PUBLICATION (PROJECT DESCRIPTION AND TECHNOLOGY)

## D2.1 - Technical publication (project description and technology)



**Reliable and innovative technology for the realization of a sustainable  
MARINE And coastal seabed management PLAN**

**LIFE Environment and Resource Efficiency project  
LIFE15 ENV/IT/000391**

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## Project partners

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Disclaimer

1. Technical publication

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## D2.1 - TECHNICAL PUBLICATION (PROJECT DESCRIPTION AND TECHNOLOGY)

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## D2.1 - TECHNICAL PUBLICATION (PROJECT DESCRIPTION AND TECHNOLOGY)

### Chapter 1. Technical publication

Trevi published one info page about its ongoing European project, including the MarinaPlan Plus LIFE project, on March 2019 edition of “*Platinum*”, which an international magazines distributed by the Italian newspaper “*Il Sole 24 Ore*”, edited by the Italian Industries Association. The article is of two pages, one in Italian and one in English.

Trevi published also a two pages interview on the March/April 2019 number of the international magazine “*Marina World*”.

### Annexes

Annex 01	Technical publication on “ <i>Platinum</i> ” magazine
Annex 02	Technical publication on “ <i>Marina World</i> ” magazine

# Safeguarding the environment

*Coordination and problem-solving, looking at the substratum, earthquake protection and the harbour seabed*



Collaborazione di programma  
"Orizzonte 2020" dell'Unione europea



LIFE PROJECT: WORKING GROUP AT CERVIA HARBOUR ENTRANCE UP TO THE EDGE OF THE TEST FIELD, 07.2017

Trevi Spa has specialized in underground engineering and deep foundations since 1957. Work on substrate engineering and in the Oil & Gas sector by each of the companies in the group

follows a business model whereby technological information is continuously shared to favour innovation and continuous improvement. The company is also involved in several European projects to develop innovative technologies for application on an industrial scale. Specifically, two Horizon 2020 projects and one LIFE project were acquired in 2016: “three equally important projects for many different reasons,” explained Giovanni Preda from the Cesena-based company’s Design, Research and Development Service. Our understanding of the environment has led us to work in a variety of fields and these projects give us an opportunity to explore issues which we may be able to further develop and find solutions to.”

“TTMJ (Tension Track Milled Joint), an H2020 project which Trevi is le-

ading, looks for pioneering technical solutions to eliminate safety, quality and environmental risks in underground works. Perfect joints can be achieved at any depth, regardless of panel verticality. The second Horizon project is called “Liquefact” and looks at the effectiveness of a series of mitigation actions to improve the ability of a community to withstand liquefaction produced by earthquakes. The project will produce a suite of tools to aid decision-makers identify the most appropriate mitigation actions for their specific circumstances. The final project, LIFE Marina Plan Plus, again coordinated by Trevi, aims to test an innovative and sustainable technology targeting harbour entrance sea beds. Early results from Cervia harbour formed the basis of the system to be installed in the Adriatic city in April. 🇮🇹



LIQUEFACT PROJECT: GROUP PHOTO DURING THE CONSORTIUM MEETING IN NAPLES, OCTOBER 2017



TTMJ PROJECT: BOOTH AT THE DFI CONFERENCE ON DEEP FOUNDATIONS IN NEW ORLEANS, OCTOBER 2017



# In difesa dell'ambiente

*Coordinamento e problem solving: dal sottosuolo alla sicurezza sismica fino ai fondali dei porti*



Co-finanziato dal programma  
"Crescita 2020" dell'Unione europea



PROGETTO LIFE: GRUPPO DI LAVORO  
SULLA BOCCA DI PORTO DI CERVIA  
ALLA FINE DEL CAMPO PROVE, 07.2017

**F**in dal 1957, Trevi Spa opera nel settore delle fondazioni speciali: le diverse società del Gruppo sono impegnate sia nell'ingegneria del sottosuolo che nel settore Oil & Gas, con un modello di business caratterizzato dallo scambio continuo di informazioni tecnologiche, dalla predisposizione all'innovazione e da una

continua propensione al miglioramento. Non stupisce allora che l'azienda partecipi (talvolta in qualità di lead partner) a diversi progetti europei per lo sviluppo di tecnologie innovative e per la loro applicazione su scala industriale. In particolare, nel 2016 sono stati acquisiti due progetti Horizon 2020 e un LIFE: "tre progetti importanti per vari motivi – spiega Giovanni Preda, del Servizio Progettazione, Ricerca e Sviluppo dell'azienda cesenate -. La nostra sensibilità ambientale ci ha portato a lavorare in diversi ambiti della protezione del territorio: questi progetti ci permettono di approfondire tematiche che possono avere ulteriori sviluppi e di operare spesso come problem solver". Ma di cosa si occupano i tre progetti? "TTMJ" (Tension Track Milled Joint), un H2020 di cui Trevi è leader, parte dalla necessità di trovare soluzioni tecniche innovative per eliminare i rischi inerenti sicurezza, qualità e ambiente nei lavori

sotterranei: un sistema innovativo permette la realizzazione di giunti "perfetti" a qualunque profondità, indipendentemente dalla verticalità dei pannelli. Il secondo Horizon si chiama "Liquefact", il progetto studia l'efficacia di una serie di azioni di mitigazione per migliorare la resilienza della comunità agli eventi di liquefazione indotta da eventi sismici. I risultati del progetto saranno una serie di strumenti per supportare i responsabili delle decisioni a identificare le azioni di mitigazione più appropriate per le loro specificità. Infine, il LIFE "Marina Plan Plus", sempre coordinato da Trevi, intende verificare su scala industriale una tecnologia innovativa e sostenibile per la gestione dei fondali degli imbocchi dei piccoli porti: i risultati delle prime prove sperimentali, nel porto di Cervia, hanno permesso la progettazione dell'impianto che sarà installato ad aprile nella cittadina adriatica. 



PROGETTO LIQUEFACT: FOTO DI GRUPPO DURANTE  
IL CONSORTIUM MEETING A NAPOLI, 10.2017



PROGETTO TTMJ: STAND PROMOZIONALE ALLA CONFERENZA  
DFI SULLE FONDAZIONI PROFONDE A NEW ORLEANS, 10. 2017

# HAVENSTAR

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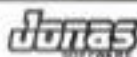


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## ENVIRONMENTAL PRODUCTS & INITIATIVES



Marina di Cervia has been selected as a key monitoring site for the new Life15 Marina Plan Plus project.

# Sustainable management of the seabed

New technology for sustainable management of the seabed is now being tested at Marina Cervia in Ravenna, Italy as the Life15 Marina Plan Plus project. Developed by the University of Bologna, it has also been pilot tested at different smaller sites, Donatella Zucca reports

Devised in 2016 but only ready to be fully implemented this year, the Life15 project is funded by the European Agency for Small and Medium Enterprises (EASME) in the 'water' sector. Its goal in this first major project is to improve access to the port entrance in Cervia by maintaining the depth of the seabed at an optimal level for boats without impacting on activities at the piers or adversely affecting the environment.

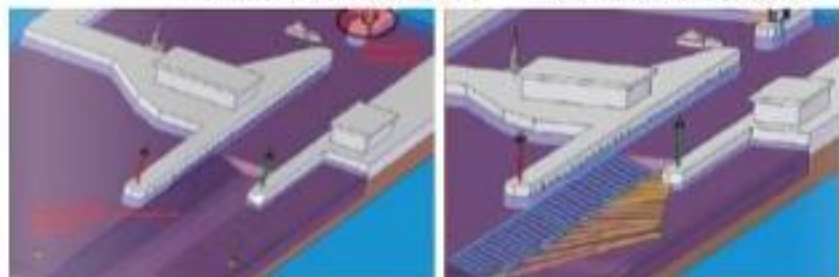
Some background is important. About 140 million tonnes of dredged material drifts along European coasts every year, harming aquatic flora and fauna and creating an imbalance in the life of the seabed. The Marina Plan Plus project technology aims to prevent this continuously shifting sediment from building up in any one site thus preventing the need for dredging, guarding against depletion of nourishment for sand, aerating water

and preventing damaging mud from diffusing into the marine ecosystem.

Invented by the university's Department of Industrial Engineering in collaboration with Plant Engineering Srl of Bologna, the technology utilises an open jet pump, called an ejector, that is fixed on the seabed. Its diameter depends on the type of sediment encountered in any specific area. It has a converging section (instead of a diffuser) whose suction is determined by a fluid jet that, by creating an exchange between two currents, activates a unique intermediate speed between the primary and secondary flow. The mixture generated has such a low concentration of solid material that it doesn't produce turbidity or re-suspension at any point in its operation. In other words, the ejectors move potential sediment from where build-up would cause an obstacle so that it can naturally be carried elsewhere.

The new equipment can replace dredging even in areas where sediment treatment is required as it can be integrated with other technologies e.g. soil washing, wet oxidation or silica extraction.

The University of Bologna and Plant Engineering have also worked with other crucial partners: Teveri Spa of the Teveri Group, a specialist in underground engineering and production/design of related machinery; the Cervia (Emilia-Romagna) Municipality; the manager of the tourist port, and the International Council of Marine Industry Associations (ICMIA). The mini plant in place at the GAM Shipyards basin on the canal at Cattolica was built and installed by Teveri Spa, together with



Working structure of the Life15 system at Cervia.





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(Patent # 8,205,983)  
Patent Pending

## ENVIRONMENTAL PRODUCTS & INITIATIVES



A pilot project at Cervia is enabling the team to improve the technology although it turned out to be a size with a great deal of sibling issues.

[3in] diameter and ejectors of about 40cm [16in] diameter and a length of 60cm [24in] are the only parts that are underwater."

In Cervia, the new process removes the need for sediment clearance, which has taken place twice a year, but allows the sediment to be carried away by the current — with a little help. "We don't push or pump water to create a counter-current but create a sort of space-time door. The ejector is a bit like an airbrush or air carburettor, a device that creates a depression around it that sucks up the mixture of solids and water and then moves it." The pumps are powered as required and according to marine weather conditions.

While the pilot projects in Roscione, Portoverde di Marino and Cattolica have enabled the team to improve the technology, the installation in Cervia will help to clarify costs. "We have learned that it is important to identify materials that cannot be attacked by salinity and the marine environment," Preda notes. "In Cattolica, the port is on a river that is home to important organic matter. This means we had to clean the pumps and ejectors of a lot of marine materials and do an antifouling operation. Presumably, this would have to be done every few months and thus affects the costs. This didn't happen in Portoverde, Roscione or Cervia."

Trials will continue in Italy with a view to exporting the concept to foreign investors. "Currently there are no financed or planned interventions. We received interest from a shipyard in the USA via ICCOMA but still have to build a relationship. Albert Willemson, ICCOMA's environment executive and our reference person, promoted this technology at a conference and the shipyard expressed much interest and we are seeing if we can meet up but, in principle, we are waiting for the results from Cervia before we push or invite people. In the European context, the University of Bologna has won Blumend Eco Med Port funding, aimed at promoting the technology abroad, specifically in Tunisia, Lebanon and Greece."

Din-Unibo, a municipal sub-contractor in the sponsoring Co-Evolve project. Other pilot projects have also been undertaken but only the Marina Cervia site has been selected to monitor the impact on marine habitat and evaluate operating and management costs.

Engineer Giovanni Preda, project service, and research and development for Tevi Spa, is responsible for Life15 Marina Plan Plus. He explains how the project developed. "The technology was the idea of the Department of Industrial Engineering team of the University of Bologna and was developed independently by Ing. Saccani, professor of the department, who has patented it," he says. Finance was provided via a start-up of regional funds, enabling tests in the laboratory on the beach and in several small ports.

As Tevi Spa had been collaborating for years with the engineering department at the university, the company was aware of the technology and, in 2014, together with the university, tried to finance the first industrial application courtesy of EASME. "But although it was considered to be fundable, the project was not financed," Preda reveals. "This happened in 2015 when we re-presented it, after improving it upon the suggestions of the judges."

Tevi is coordinating all work for the Cervia project, and partners have specific roles. "The university's industrial engineering department made the preliminary design of the plant, supported the installation, management and communications and, via the BIGEA marine biology department, monitors the different matrices present at the site. ICCOMA promotes it internationally thanks to its

technical tables and those developed by European community directives. The Municipality of Cervia is involved in the financing of bathymetric activities and sediment analysis and in infrastructure, upgrading of the electricity grid and the plans for replicating the project."

The environment is a significant factor. "The environment comes into play because it is a system that reduces or even eliminates the environmental impact of small



Porto Verde at Cattolica

or medium sized ports by avoiding sedimentation and its management both at sea and on land," Preda explains. "Moreover, this plant does not use mineral oils but electric energy and it doesn't have moving parts or electric motors underwater. Everything technological — valves, mechanics etc — is on the land. Pipes with an 80mm