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Newsletter

OF THE GEOSTOCK GROUP

RECONSTRUCTION OF DRYER'S DEEP FOUNDATION

by Frédéric Maneille

STUDIES FOR INSTALLATION OF AN ADDITIONAL PUMP

IN AN OPERATED MINED CAVERN STORAGE

by Matthias Torquet



Reconstruction of dryer's deep foundation



GÉOGAZ has reconstructed the deep foundation of its two dryers located in a backfilled zone to ensure their resistance to earthquakes.

Frédéric Maneille, GÉOGAZ site director, Geostock



Preparation for laying down one dryer

Photo : Géogaz / Filmatik Production

GÉOGAZ IS AN LPG TERMINAL IN SOUTHERN FRANCE, located at the Étang de Berre channel's edge, near Marseille, allowing product reception by pipelines or ships, underground storage in mined caverns and product expedition through ships, pipelines, trucks and railroad.

In order to conform to commercial specification of the dispatched propane, GÉOGAZ uses in its process two dryers where propane flows through calcium chloride beds which ensure propane dehydration.

These dryers are two metallic cylinders about 17 m high and 2.8 m in diameter. Their net weight (with no equipment and no loading) is about 80 tons each and their gross weight in operation about 175 tons. Each dryer is anchored in a concrete reinforced slab. ●●●



Original concrete slab

This equipment has been built for the site commissioning in 1971 and were based on four concrete piles resting in the substratum 30 m deep in a backfilled zone of poor quality and subject to settlement of about 1 to 2 cm per year. Geotechnical and earthquake resistance studies conducted by GEOSTOCK in 2014 and 2016 have shown that resistance to seismic loads was not guaranteed and that the piles were in a worrying state of deterioration both for concrete and steel parts.

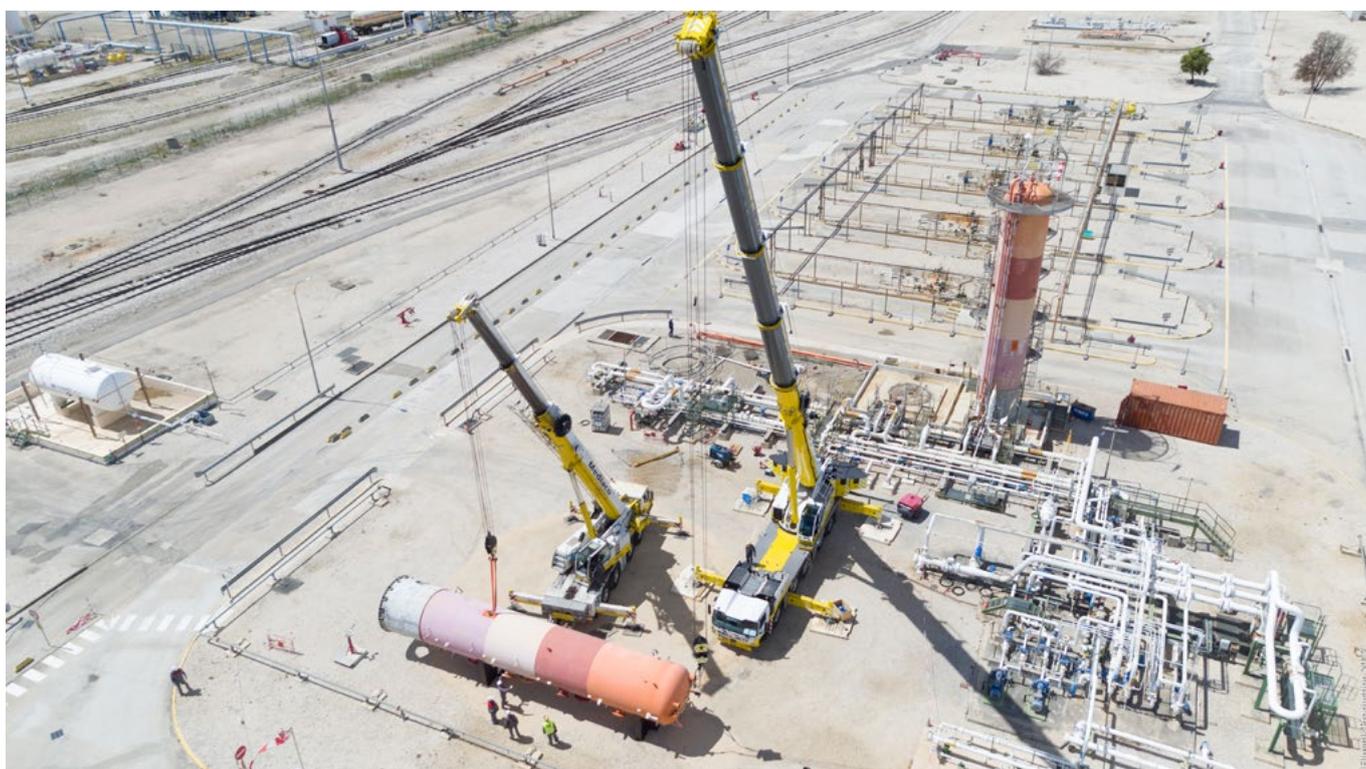
Consequently, GÉOGAZ has decided to start the reconstruction works of the foundations of the two dryers.

Works have been carried out in 2017 and 2018 during spring and summer to limit disruption on trucks and railroad operation activities.

“ A daily geotechnical monitoring of the operated dryer’s stability has been set up

The best technico-economic solution proposed by GEOSTOCK was to rebuild the dryers’ foundation through underpinning. The main phases of this project were to:

1. Lay down each empty dryer using two cranes ;



Dryer has been laid down for foundation reconstruction



Photo : Géogaz

Micropiles drilling

2. Destroy the original concrete slabs, top existing piles' head (original piles have been abandoned) and backfill a new platform ;
3. Set up by drilling twelve micropiles per dryer, distributed on the four angles of the original platform and joined at the metallic structure of the invert ;
4. Rebuild the two concrete slabs to anchor each dryer ;
5. Put back each dryer, equip them again (foot bridge, cage ladders, pipes, accessories) and recharge them with calcium chloride.

After being put down, each dryer has been closely inspected and its coating and equipment have been completely rehabilitated before being put back.



Photo : Géogaz

New concrete slab

Operation has been maintained during these two years of works by alternatively using the dryer that was not under maintenance. A strengthened geotechnical monitoring has been put in place with a daily monitoring of the operated dryer's stability and of the absence of impact of the works on the other dryer by the means of clinometers.

The overall project cost amounted to 2.3 millions euros and has complied with high HSE standards. ■

GÉOGAZ

- Created in 1971
- 303 000 m³ (167 100 tons) of LPG storing capacity
- 42% of French LPG storage capacity
- 1st LPG massive storage terminal in Europe (outside Scandinavia)



Photo : Géogaz

New dryer after foundation reconstruction nearby the remaining original dryer

Studies for installation of an additional pump in an operated mined cavern storage



Sigás storage, operated for 20 years, will soon be equipped with an additional pump that will directly feed the petrochemical complex of one of its shareholders.

Torquet Matthias, Process engineer, Geostock

Sigás installations close to Sines harbour



Photo : Total



Photo: Geostock

Electrical submersible pump

SIGÁS STORAGE IS LOCATED IN SINES, Portugal, about 100 km south of Lisbon. This 80.000 m³ storage is in operation since 2001 and is filled with commercial propane, coming from the nearby refinery or from refrigerated ships. In order to increase the cavern turnover capacity and to respond to the need of one of its shareholders, a spare casing already foreseen during FEED and installed before cavern commissioning will soon be equipped with additional pumping capacity.

The spare casing may be planned during basic engineering study to anticipate possible increasing export capacities since underground storage are long-term assets. In Geostock design, this spare casing is only equipped with one bottom casing safety valve hung by a small diameter tubing. This casing is of marginal cost at cavern construction but is very useful later as installation of new casing after the commissioning is not possible anymore. ● ● ●

“ This casing is of marginal cost at cavern construction but is very useful later



TYPICAL PRODUCT VERTICAL SUBMERGED UNDERGROUND PUMP

On the picture, the lower part corresponds to the electrical motor of the pump. The pumped fluid circulates around the motor when the pump is installed in its cavern casing. Just above the motor, is the suction of the pump. The fluid enters at this point the pump itself. The nine stages of the pump where the product pressure is increased can be seen above. The small tubing at the right of the pump stages is the supply of cooling medium for the motor.

Photo : Courtesy of KSB

For the Sigás project, Geostock was involved in the discussions between the EPC project team belonging to one of Sigás stakeholders, Sigás operation team and recommended vendors as cavern design and equipment are not very common for conventional detailed engineering companies. Geostock commented calculation notes and other engineering documents and participated to teleconference

Hazop meeting. For most of the Portuguese, Spanish and French participants, this format for Hazop was a first of kind but was necessary due to the constraints induced by the Covid crisis.



INDUSTRIAL ACTIVITIES IN SINES

- Port of Sines is the main port in the iberatlantic front and the principal port for the reception of crude, mineral carbon and natural gas in Portugal;
- GALP’s refinery operating since 1978 with a hydrocracking unit and a fluid catalytic cracking unit following an upgrade project in 2013;
- Repsol’s petrochemical plant where around a million tons of ethylene, propylene, and other petrochemical products are produced per year. A polypropylene unit and a linear polyethylene unit are to be constructed and put in operation in 2025;
- Green Flamingo initiative aims at shipping the green gas produced at Sines Hydrogen Plant to Rotterdam.



Photo : Geostock

Casings in Sigás shaft

The fruitful collaboration between all project partners has led to cost reduction in some equipment design by changing the material of the equipment initially proposed by the vendor. The exchanges also gave an opportunity to discuss some connected topics and share operation feedbacks from others mined cavern operators (cavern dewatering operation, metering skids, filtering and degassing unit). It was also possible to review some control set point or safety trigger values. This study also enabled to review and explain some design needs to the operation teams.

The next steps will be the construction of new equipment with Factory Acceptance Test and in Spring 2022, the commissioning and start-up of the new exporting facilities. ■