COVER PAGE

HYDRO TEST WATER - CHEMICAL TREATMENT USING FREE ENVIRONMENTAL PRODUCTS
SCPX – 48'' PIPELINE – BP PROJECT (AZERBAIJAN– GEORGIA)

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BUSINESS PROFILE

Saipem is a leading company in the engineering, drilling and construction of major projects in the energy and infrastructure sectors, both offshore and onshore. Saipem is "one company" organized into five business lines - Asset Based Services, Energy Carriers, Offshore Wind, Sustainable Infrastructures, Robotics & Industrialized Solutions. The company has 9 fabrication yards and an offshore fleet of 29 construction vessels (of which 26 owned and 3 owned by third parties and managed by Saipem) and 13 drilling rigs, of which 9 owned. Always oriented towards technological innovation, Saipem is now committed to supporting its customers to accompany them on the energy transition path and Net Zero with increasingly digital means, technologies and processes geared towards environmental sustainability. Listed on the Milan Stock Exchange, it is present in over 70 countries around the world and employs over 30,000 people of 130 nationalities.

FINDINGS

In the BP Project - SCPX pipeline across the Caucasus regions (Azerbaijan and Georgia), completed by the end of 2018, during the studies of the hydrostatic testing activities, has been evaluated how to optimize the water sources, as per the below considerations:

- 48'' pipeline – 490 Km long.
- No. 29 Hydrostatic Test Sections – 550.347 CM (cubic meters) of net volume 360.647 CM to be utilized.
- **If no bio chemicals → No. 5 Massive Water Ponds of 75.000 CM of capacity to be build, with impact of 662.500 KgCO2eq of air pollutants, and 360.647 CM of water to be disposed.**

To be able to perform safely the hydrostatic test of the pipeline, was necessary an optimized quantity of water, quantified in 360.647 CM.

At the end of the activities, it was planned to be disposed this amount of water into various large evaporation ponds, built along the pipeline corridor. The dispose was mandatory because there were no chemical conditions to reuse the water, due to the chemicals mostly available in the market, with toxic components for the environment. If there had been no environmental free chemicals for water treatment process, we would have been constrained to let the water evaporate, means thousand cubic meters of water that would be wasted.

SOLUTIONS

To avoid wasting this massive quantity of water, and to build these big water evaporation ponds (that would be big shame, also in terms of environmental impact, especially in terms of CO2 emission, during construction), has been utilized during testing activities of the pipelines, an environmental free chemical, with the peculiarity that was totally biodegradable, without leaving any traces in the surrounding environment.

The chemical utilized was OXYGEN SCAVENGER (HYCOR OX 67), and BIOCIDE (HYCOR SB) made by the manufacturer INTECNA, that is an Italian company considered as an excellence in this field.

OXYGEN SCAVENGER (HYCOR OX 67): In detail the reaction between Dissolved Oxygen and Oxygen Scavenger is practically complete so its final residual concentration in the treated water at the end of the hydro-testing procedure will be less than 0,1 ppm of Sodium Bisulphite which is the active substance of HYCOR OX 67 products.

Sodium Bisulphite reacts with Oxygen and forms Sodium Bisulphate.

Sodium Bisulphate transforms itself in Sodium Sulphate by the reaction:

$NaHSO4 + NaHCO3 ----> Na2SO4 + H2O + CO2$

Furthermore, using SODIUM, based Oxygen scavenger and **not AMMONIUM** based Oxygen scavenger, the limit of Ammonia in water discharge shall be observed.

BIOCIDE (HYCOR SB): Environmental fate studies in a river water–sediment system demonstrated that glutaraldehyde preferred to remain in the water phase [ref]. Glutaraldehyde is quickly degraded under both aerobic and anaerobic conditions.

The pseudo-first-order half-life of catabolism, based on the loss of glutaraldehyde from the water phase, was 10.6 h (hours) aerobically and 7.7 h (hours) anaerobically.

At pH 9, about 30% of the glutaraldehyde degraded over the same period. The major degradation product was identified as 3-formyl-6-hydroxy-2-cyclohexene-1-propanal, a cyclized dimer of glutaraldehyde.

Under aerobic conditions, glutaraldehyde was first bio-transformed into the intermediate glutaric acid, which then underwent further metabolism ultimately to carbon dioxide. Metabolism of glutaraldehyde under anaerobic conditions did not proceed ultimately to methane but terminated with the formation of 1,5-pentanediol via 5-hydroxypentanal as an intermediate.

In conclusion, in AEROBIC CONDITIONS, due to the wide assessed low environmental toxicity of Glutaraldehyde, and quick environmental biodegradation tested in OECD standard 301 and 306, and due to many previous experiences, the water discharged into surface water does not have remarkable environmental impact both for dilution and for **fast biodegradation**.

Literature reference for OECD degradation: CHALLENGING TRADITIONAL BIODEGRADATION TESTS: THE BIODEGRADATION OF GLUTARALDEHYDE. (Douglas McIlwaine, Ph.D. Biocides, Research & Development the Dow Chemical Company171 River Road Bound Brook, NJ 08854).

ACHIEVEMENTS

Being nontoxic chemical for the flora and fauna, this technology applied, was able to give second life to the water that is already become a precious resource, based on the following:

a) Safe discharge into the environment, as rivers/water courses.

b) The water was available, mainly to help the social communities for agriculture irrigation, or other uses, like soil compaction/earth work, construction activities, etc.

Saipem has chosen products suitable for the purposes and a partner who can condition the water both in the hydraulic test phase, and in any subsequent reconditioning, especially helping who really need this important resource that it's really shamed to be wasted.

Our client BP was really satisfied about the great result achieved in terms of environmental protection and cost saving.

Finally, the certainty of having no environmental impact is guaranteed by very effective upstream and downstream control grids.

Note: CO2 Emission has been calculated based on the following data: *10.000 hours of usage of construction equipment x 25litres/hour of fuel consumption x 2.650 g of CO2 per Liter of diesel =662.500 kgCO2eq.* (The CO2 emissions from literature for the diesel are equal to 2.650 g per liter of diesel consumed).

ATTACHMENTS

CHEMICALS DATA SHEETS

Hycor SB.pdf

Hycor OX 67.pdf