



ATARFIL Laboratory testing of Sardich MC's technical solution for waterproofing of the leaching heaps for the Kazandol Project (15-17.11.2016)

On 14th June of 2016 Atarfil SL received from Ergoland company the request of making a test in his factory. This test has the aim of simulating the Kazandol Mining Project design located in Macedonia.

The information provided by Ergoland on 8th July of 2016 regarding the Kazandol Project design is the following:

- **GCL** liner will be installed (5000 gr./m² of Bentonite + 100 gr./m² of nonwoven geotextile and 200 gr./m² woven geotextile, TOTAL 5300 gr./m³) under the HD Geomembrane.
- Installation of HDPE liner 2,0 mm smooth / smooth.
- Crushed ORE in size of 0-16 mm in thickness of 30 cm spread on HDPE liner, as protective layer.
- Crushed ORE in size of 0-50 mm in thickness of the 80 cm spread top of "ORE PROTECTIVE LAYER" as FILTERING layer.
- On top of the "PROTECTIVE" and "FILTERING LAYER" ORE will be disposed which over the next 7 years is expect to reach 90 m in height. ORE specific weight = 2,1 tons/m³.





The purpose of the test is to confirm the integrity of the Geomembrane ATARFIL HD 2.00 mm under the certain conditions mentioned above.

As a testing mechanism a hydraulic press model Larzep, with a maximum pressure capacity up to 60 tons has been used to imitate ore pressure with years.



Provided the density of the soil confirmed by the customer is 2.1 ton/m³ with a height of waste of 90 m, the Geomembrane is going to be under 189 tons/m² Atarfil proposed to performance the test in a sample of 0.25 m diameter and the customer accepted.

To develop the test in 0.25 m diameter simulating the 189 tons/m² required by the design, sample should be pressed by 9.28 tons according to the following formula:

- Provided the Area of the cylinder: 0.049 m² and the total load 189 tons/m².
- Load = 189 x 0.049 = 9.28 tons.



In order to simulate the behavior of the Geomembrane along the years, Atarfil, Ergoland and Sardich agreed to increase the pressure on the sample by 100 %, remaining a total pressure of 18 tons for a time of 2 days.

After subjecting the sample to the compression test, it has not almost suffered superficial damage. It has not been drilled and, after a short time, the sample returns to its original appearance, indicating that, after the test, the sheet has not exceeded its yield point determined by the elastic limit point, therefore it does not suffered surface deformation.

