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**Old salt mine at Dieuze (France) revisited 150 years after being
abandoned**

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Abstract

The region of Dieuze, a small town situated in North Eastern France, is the site of a huge salt deposit of the Lower Keuper period. In some places, salt can be found at no more than about 50 m beneath the surface. A “salty aquifer” is present at the top of the salt, due to natural dissolution by fresh water. This “salty aquifer” feeds many briny springs that have been exploited by humans for at least 3,000 years.

The salt deposit was mined by the room and pillar method, at a depth of 120 m, between 1826 and 1864. The galleries were 4 m high and the extraction ratio varied from 80 to 90% depending on the sector. The mine was 550 m long and 130 m wide. It produced a total of 450,000 metric tons of salt.

The mine had to be abandoned after flooding by brine, caused by the collapse of a shallow gallery, connected to one of the two mine shafts, in which a large brine pond had been created by solution mining. This accident caused no significant damage at the soil surface.

Recently, because of a project to restore historical buildings in the area of the mine, studies were performed to evaluate its condition.

A preliminary numerical calculation was made to reconstitute the stress and strain history of the mine from its opening until the present day. It was based on the assumption that the whole 70 m thick salt-bearing formation overlying the mine could be considered as a strong and rigid monolithic bed. The result of the calculation was that, under this assumption, the pillars were not heavily loaded, in spite of the high extraction ratio. This was due to the limited width of the mine, most of the weight of the overburden being transferred to virgin rock salt on either side of the mine. In addition, the calculation showed that flooding still improved the stability of the mine because of the additional support due to the pressure of the brine present in the mine.

In addition, a hydrogeological study demonstrated that the brine could not be removed from the mine by fresh water and that there was no risk of dissolution of the pillars.

In conclusion, many arguments suggested that the stability of the mine was guaranteed.

To confirm this by direct exploration, a cored borehole was drilled above the old mine. It demonstrated that the overburden of the mine was globally strong, as assumed for the

calculation. The borehole intersected a void whose height was equal to that of the old galleries, at the depth at which the mine was expected. A sonar survey performed in the borehole confirmed that the part of the mine that could be explored with this technique perfectly matched the old mine maps and had not been damaged.

All the information provided by the borehole led to the conclusion that, almost 150 years after it was flooded by brine, the old salt mine at Dieuze was in almost as good condition as it was at the time it was abandoned and that its stability was very good.

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