

Contribution to salt leaching and post-leaching monitoring issues- feed-back from a long term microseismic survey.

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Abstract:

In the Middle West of Italy, SOLVAY is producing brine by leaching a salt layer, 20-meters thick at a depth ranging from 150 to 400 m. The salt mining is accompanied by a general slow ground subsidence and occasional local collapses. This problem has been recognized and monitored for a long time and Solvay started using microseismic monitoring in 1978. A digital recorder was set in 1992 and a long term data management policy has been applied since 1997. About 16.000 microseismic events have been detected and recorded and this constitutes a unique data base on seismicity induced by salt leaching and post-leaching.

The aim of this paper is to match the history of brine production and the microseismic data base. The objective is to present the feed-back gained over such a long term continuous monitoring survey. We will describe the spatial migration of the microseismicity recorded over a 13-year monitoring period. We will present the types of microseismic behaviour we observed with respect to the mining phases.

During the active mining period, the microseismicity is associated with the leaching process and induced within the zone under mining. The “background sparse seismicity” corresponds to the general ground movement and the “burst concentrated seismicity” clearly points out a collapse phenomenon. The general birth and evolution of the induced seismicity obviously follows, with some delays, the changes in the production regime in different areas.

For abandoned zones, the microseismic readjustment is clearly decreasing after the end of the active leaching. As expected, some remanent seismicity is associated with the residual low subsidence, but the “burst seismicity” tends to disappear. In this case, the post mining readjustments on abandoned zones can be linked to the on-going water injection and brine production occurring near the boundaries of the area. With time, the readjustments and the seismicity associated become nil and these areas can be rehabilitated for the wildlife and the public.

In this study,

- We will map different microseismic attributes to characterize the type of readjustment;
- We will pay attention to events distribution versus time to highlight the link between microseismicity and brine production;
- We will draw attention to seismic occurrence and ground behaviour during a collapse episode;
- We will correlate the end of microseismicity occurrence to the end of the ground subsidence in “abandoned zone”.

Taking advantage of this long term seismic monitoring survey we will conclude on the effective feed-back and experiences gained to provide the same approach to other sites and build up new tools.