# GENERATING ELECTRICITY IN ANTARCTICA: the adventure of installing thermoelectric generators in an active volcano

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Did you know that there exist active volcanoes in Antarctica? Antarctica is the coldest, driest, windiest, highest, and most isolated continent of the world. And maybe this is the reason why it is difficult to imagine that there are active volcanoes in such place. But there are some… In this talk you will learn about Deception Island, where the presence of fumaroles and the ground temperatures up to 100°C are a reminder of the volcanic activity of the island, with its last eruption in 1970.

Due to the potential eruption risk, volcanic surveillance becomes of utmost importance. For this purpose, geologists measure earthquakes, gas emissions, temperature variations… This task becomes easier during the austral summer, where researchers accommodate in the existing Spanish and Argentinian bases as the island becomes a natural research laboratory. However, during the winter the power supply of the necessary equipment becomes a challenge: there is no sun for months, and the behavior of batteries is reduced due to the low temperatures. The solution proposed by the Thermal and Fluids Engineering Research Group from the Public University of Navarre (Spain) follows the proverb “if you cannot beat them, join them”. Since the activity of the volcano manifests in the form of heat, why not transforming this heat into electricity?

The challenge requires a continuous, robust, compact, scalable and reliable autonomous power supply. Geothermal energy presents the advantage of being constant and independent of weather conditions. Thus, it is necessary to find the way to transform this energy into electricity while achieving the rest of the requirements. How can we do so? The answer is by means of thermoelectric generators, the same technology that NASA uses in order to power its space probes and rovers. Thanks to Seebeck effect, thermoelectric modules transform a temperature difference into electricity. The higher the gradient, the greater the generation. This is why heat exchangers play a critical role on thermoelectric generators.

In this talk you will learn how a group of researchers from the Public University of Navarre have, for the first time in the world, succeed in generating electricity from volcanic fumaroles by means of thermoelectric generators. The developed device is made of high-efficiency heat exchangers that maximize power generation with no moving parts, being able to power different sensors and emit their data via satellite. The device installed at Deception Island has been successfully working since January 2024 with very promising results. The upcoming challenge is to withstand the harsh conditions of the Antarctic winter, so that its robustness and reliability are definitely proven and the technology can be extrapolated to other volcanoes in the world.

Are you gonna miss it?