

**DEACTIVATION OF NUCLEAR EXPLOSIONS' CAVITIES
IN THE SALT DOMES BY FREEZING METHOD**

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**КОНСЕРВАЦИЯ ПОЛОСТЕЙ ПОДЗЕМНЫХ ЯДЕРНЫХ ВЗРЫВОВ
В СОЛЯНЫХ ТОЛЩАХ МЕТОДОМ ЗАМОРАЖИВАНИЯ**

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1. There is a lot of negative consequences of underground nuclear explosions, conducted for creating some cavities of the gas condensate saving at the Azgir site and Karachaganakskoye deposit. Some of them are radioactivity escape, ground pollution, underground water pollution, as result of depressurization and irrigation of cavities. Besides that there are dissolution of infected salt, displacement of brine from the cavities. Existing prolonged radiolitical exchanges of rock-salt, brines and water can be accompanied by accumulation and throw outing of free chlorine and hydrogen with hydrochloric acid formation. («white fog» of Azgir site). These questions demand supplementary researches.

2. It is known that more dangerous fission fragments are ^{90}Sr and ^{131}Cs , with half life periods equaled 27.7 and 30.3. Duration of their existence determines a period of an object danger. Radionuclide migration come with rock dispersion or with their concentration on the different physical, chemical, including sorptive, barriers on the way of radioactive water displacement.

3. The task of prevention of negative consequences is to save the forms and sizes of cavities, to immobilize the radioactive fluid's in the cavities and closed zone for the half-life time of the main nuclide mass.

4. Solving the task by laying of empty space with hard materials (concrete, rock) demand of big expenses because of cavities size (30000-50000 m²), occurrence depth (850-900 m), high value of materials, their processing and transportation. The problem to render harmless and to utilize of displacing radioactive brines is not solved yet.

5. Freezing of flooding cavities appears to be an alternative, which allows to fill the space by hard ice and to less the moving of radioactive brines into the rocks around the cavities, and, what is more important, along the bore-holes above the cavities, blocking the radionuclides moving into the fractured rocks. It needs freezing of cavities and closed zones from +25°C till -13°C (freezing temperature of the concentrate brine). Approximate account shows that it is necessary to spare about 4-5 x 10¹³ joules of heat energy, stocked in the cavity and rocks taking into account nature deep heat flow (50 mW/m²). This process divides onto 2 stages: (1) freezing with organizing of intensive heat abstraction by energy till 400-500 kW for 1-2 years with using freezing equipment; (2) maintenance of low temperatures in regime with small heat abstraction for winter time and thermostatic control of cavity for warm spring-autumn period of time. The advantage of cavities freezing connect with absence of necessity of displacement the processing and unloading the big values of solid and dry materials. There is no need to render harm less the radioactive brines. The time of cavity maintenance in freezing condition is determined by the time to render harmless of main part of radionuclides.

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