

OPERATIONS

- ❏ Exploring new mining resources
- 🔍 **Extracting and processing natural uranium ore**
- ❏ Reclaiming former mining sites

L'EXTRACTION ET LE TRAITEMENT DU MINÉRAI D'URANIUM NATUREL



Having passed all the technical and economic feasibility tests, uranium ore can be mined using an open-pit mine (quarry), an underground mine, or in situ recovery (ISR), depending on the deposit's characteristics. Once the ore has been extracted, it is transported to a processing plant to obtain the uranium concentrate commonly called "yellowcake".

■ THREE OPERATING MÉTHODS

To extract uranium, it is necessary to access the deposit. This is done by:

- removing the rock covering shallow deposits lying at a depth of less than 150 meters (**open-pit mining**);
- digging galleries when the ore lies at greater depths, i.e., many tens of meters below the surface (**underground mining**);
- drilling and injecting an acid or alkaline solution into the ground, which is then pumped back to the surface to recover the uranium that has dissolved in it (**in situ recovery**). This method for exploiting low-grade deposits in aquifers is being used only in Kazakhstan.

Depending on the amount of ore in the ground and its uranium concentration, a mine can be **operated for 10 to 50 years**.

■ STAFF PROTECTION

The operation of uranium mines can present **health risks for miners** through the inhalation of dust or **radon**, a gas produced when uranium disintegrates. Effective protection measures reduce these risks: **spraying systems** cut down on dust, and **heavy ventilation** runs constantly in underground mines.

In some highly concentrated deposits, operations are performed by remote control, thereby avoiding staff contact with operating zones.

■ FROM ORE TO YELLOWCAKE: PURIFYING AND CONCENTRATING URANIUM

The uranium extracted from an open-pit or underground mine must be **separated from the waste rock** and rid of as many impurities as possible. To avoid needlessly transporting many tons of ore over long distances, this **concentration operation** is carried out in the immediate vicinity of mining sites.

Once the ore has been removed from the mine, it is processed in one of the following ways, depending on its grade:

■ Dynamic treatment

High-grade ore (uranium content > 0.10%) is transported to a processing plant, where it is

- crushed and ground mechanically,
- processed and purified with chemical solutions,
- extracted from the resulting liquor using organic solutions or ion exchange resins,
- washed and filtered,
- precipitated and dried.

■ Acid heap leaching

SOMAIR has been using this modern method for the extraction of uranium from low-grade ores (< 0.10%) since 2009. This process is called "heap" leaching because the ore is



AREVA CONTACTS IN NIGER



→ AREVA contacts in Niger

THE PUMA PROJECT AT SOMAIR



The PUMA project at SOMAIR

→ Project Overview

stacked up. It is the first time that leaching has been used in uranium mining. The steps in the process are as follows:

- The ore is crushed to reduce it to particles of appropriate size.
- The particles are aggregated in an agglomerator using water and acid to enhance the permeability and stability of the heaps.
- The ore is heaped up by stackers at the leach pads.
- An acid solution percolates through the ore heap for about 3 months.
- The uranium-bearing solution drains from the heap and is collected. - The uranium is extracted from the solution using a solvent in a chemical treatment plant.

After drying, a **solid, concentrated uranium is obtained** called "yellowcake" (due to its color and its doughy texture at the end of the procedure), which contains approximately 75% uranium, or 750 kilograms per metric ton.

The "yellowcake" is packaged and put into barrels containing 450-600 kilograms of concentrated uranium, then sent to conversion facilities for further chemical processing.

■ FULL TRACEABILITY

AREVA, operator of SOMAÏR and COMINAK, ensures uranium production is fully traceable, including during transport to chemical conversion plants.

- **Automated barreling** on site: the barrels are numbered, weighed and sealed.
- **Stored materials awaiting transport are guarded.**
- The **plant's input and output tonnage is checked** and subject to systematic analysis.
- **Transport** to the Port of Cotonou in Benin is carried out **under escort**. At the port, the sealed barrels are placed in containers which are then also sealed under the supervision of port authorities.
- "Yellowcake" is **sent to the customer's** chosen conversion and enrichment plants by boat. Upon arrival, the concentrated uranium is converted and enriched.



Useful links

Contacts
Legal notice

Our website sections Discover:

AREVA group

AREVA's operation

Corporate responsibility

Dialogue and transparency
Environment
Health and Security
Social initiatives

Operations

Ore exploration
Ore extraction
Ore processing
Site development

Careers

Join us



GROUP INTERACTIVE MAP