

TECHNICAL MEETING « URANIUM EXPLORATION AND MINING METHODS »

URANIUM MINING AND PROCESSING

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INTRODUCTION

- The most important societies of exploitations of uranium which are COMINAK and SOMAÏR have different methods of extraction, but their processing methods of mineral ore are approximately the same.
- COMINAK extract Uranium by underground method called rooms and pillars, when SOMAÏR exploits it by open pit method called simultaneous and horizontal trenches method.
- For processing both societies used the dynamic method. In addition to this method heap leaching is used by SOMAÏR for process mineral ore of low grade in uranium

Niger



Légende :

- Production
- Développement
- Exploration
- ▲ Siège

Des unités industrielles dans une zone enclavée



LEGISLATION AND REGLEMENTOIN FRAMWORK AS FAR AS MINING

- ordinance n°97-001 of 10th January, 1997 on institutionalization of environmental impacts study's
- law n° 98-56 of decembre, 29, 1998 on law framwork concerning environnement managment
- mine law n° 2006-26 of August 09th, 2006 on mine law by its article 95 defines the distribution of mine revenue between the state and the colectivity of region concerned by the exploitation

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- **Decree n° 2006-265/PRN/MME of 18th auguste, 2006 fixing modality and application of mine Law**
- **Order n°000073/PM of 4th July, 2005 on creation, attributions, composition and working of institutionnel dispositif of preparation and controlling the implamentation of ITIE (mine industry transparency initiative) au Niger**

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Underground exploitation Method of COMINAK

- The exploitation method by rooms and pillars takes place on two stages:
- - The first stage which is tunnels making permits to extract approximately 40% of mineral ore in the deposit and circumscribes square pillars with 18 metres of side
- In the second stage (removal) pillars are split, the opened tunnels are backfilled with cemented backfill (alternative backfilling).

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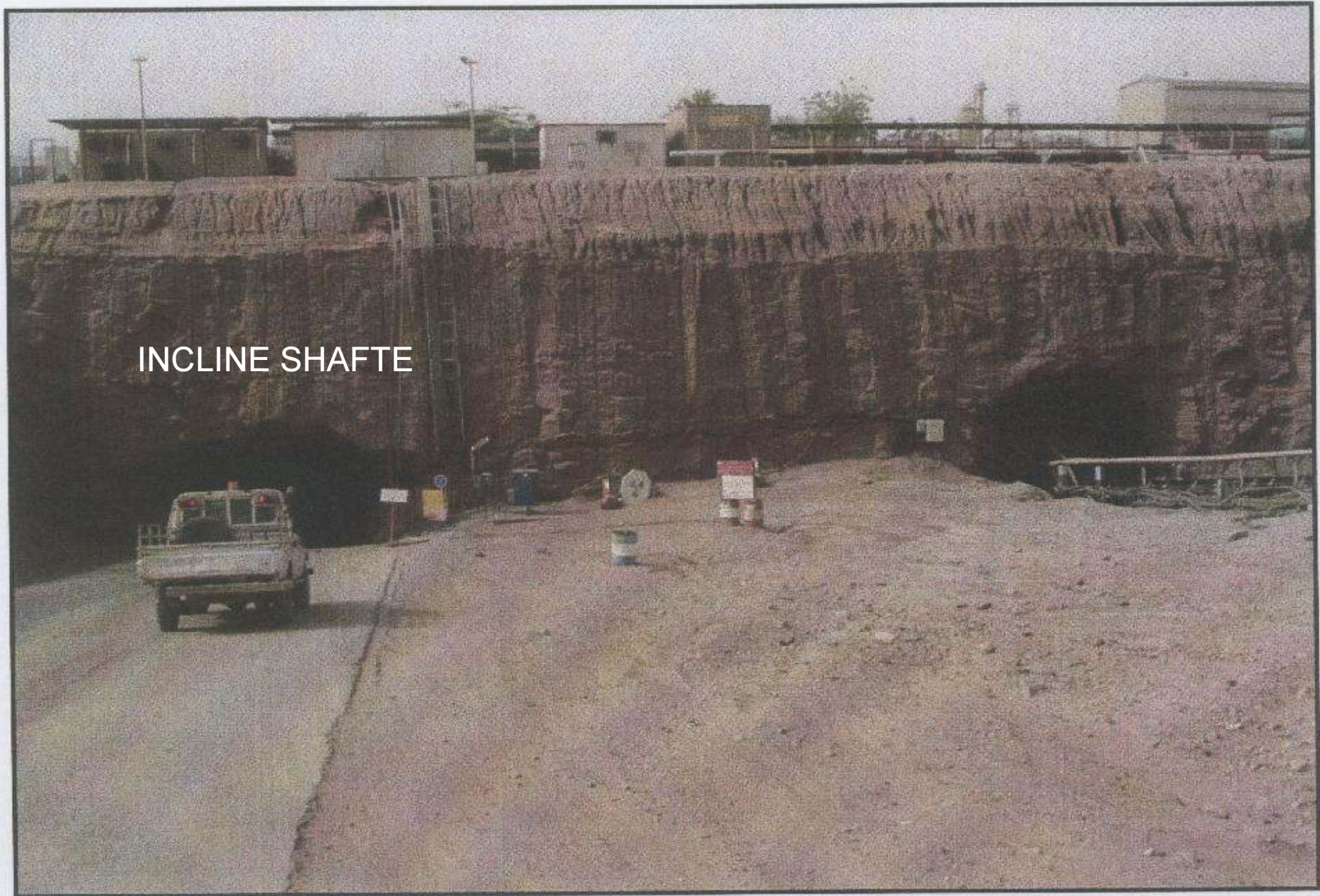


Figure 2.6 Descenderies d'accès à la Mines Souterraine

BLASTING

Blasting in the tow case(making room, removing of pillar) involve on 6 stages

- Drilling
- Blasting
- ore Selectivity and extraction
- Removing of hanging rocks blocs
- Bolt fixing in the underground roof (toit)

FILLING

It makes by alternative backfilling

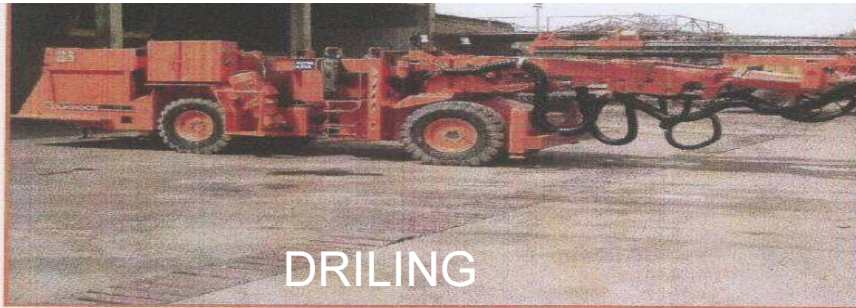
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Remblayage (2)
FILLING

Traçage (1)
ROOM

Dépilage (3)
PILER
RECOVERY





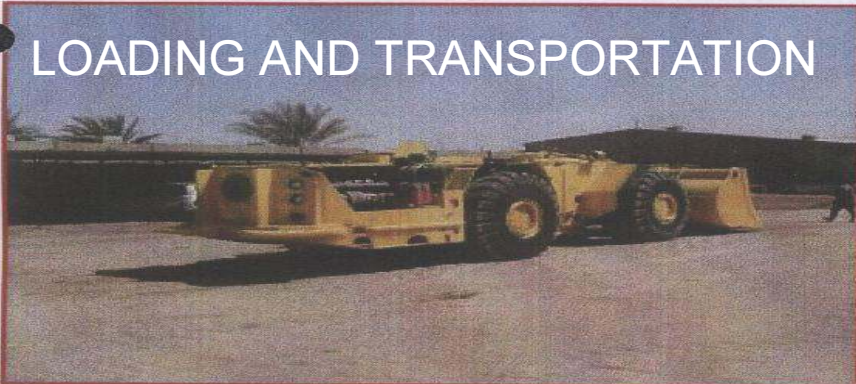
DRILING

1. - Engin de Foration



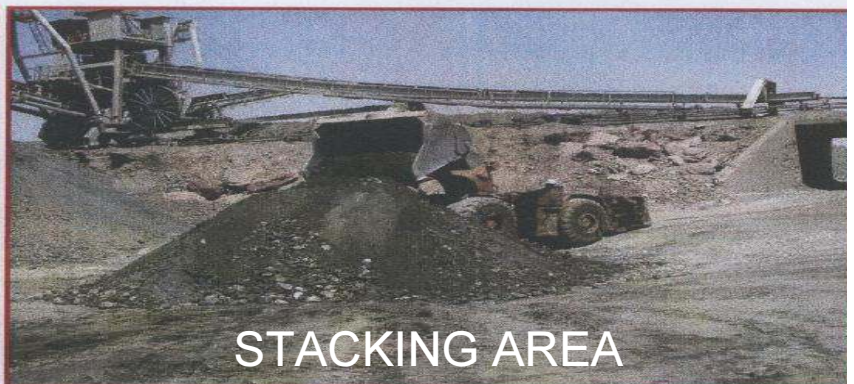
REMOVING OF HANGING
ROCKS BLOCS

2. - Engin de Purgeage

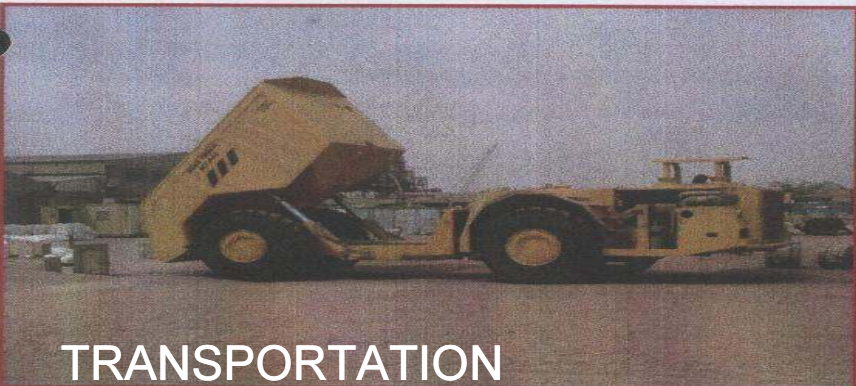


LOADING AND TRANSPORTATION

3. - Engins de Chargement - Transport



STACKING AREA



TRANSPORTATION

4. - Camions de transport Minerai AFASTO

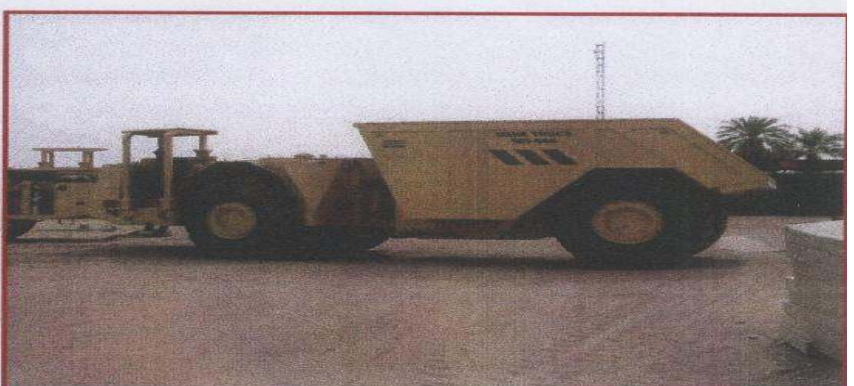


Figure 2.7 Engins Miniers

VENTILATION

- Primary ventilation through vertical shaft and secondary ventilation (in the mine) are fitted to weather conditions created in the mine by hot water, radon emission, radioactive gases present in ore deposits, smokes and exhaust gas of mines engines.

MINE DRAINAGE

Mine drainage is a big problem for exploitation in Cominak because of water flow rate (average $250\text{m}^3/\text{h}$) coming principally from :

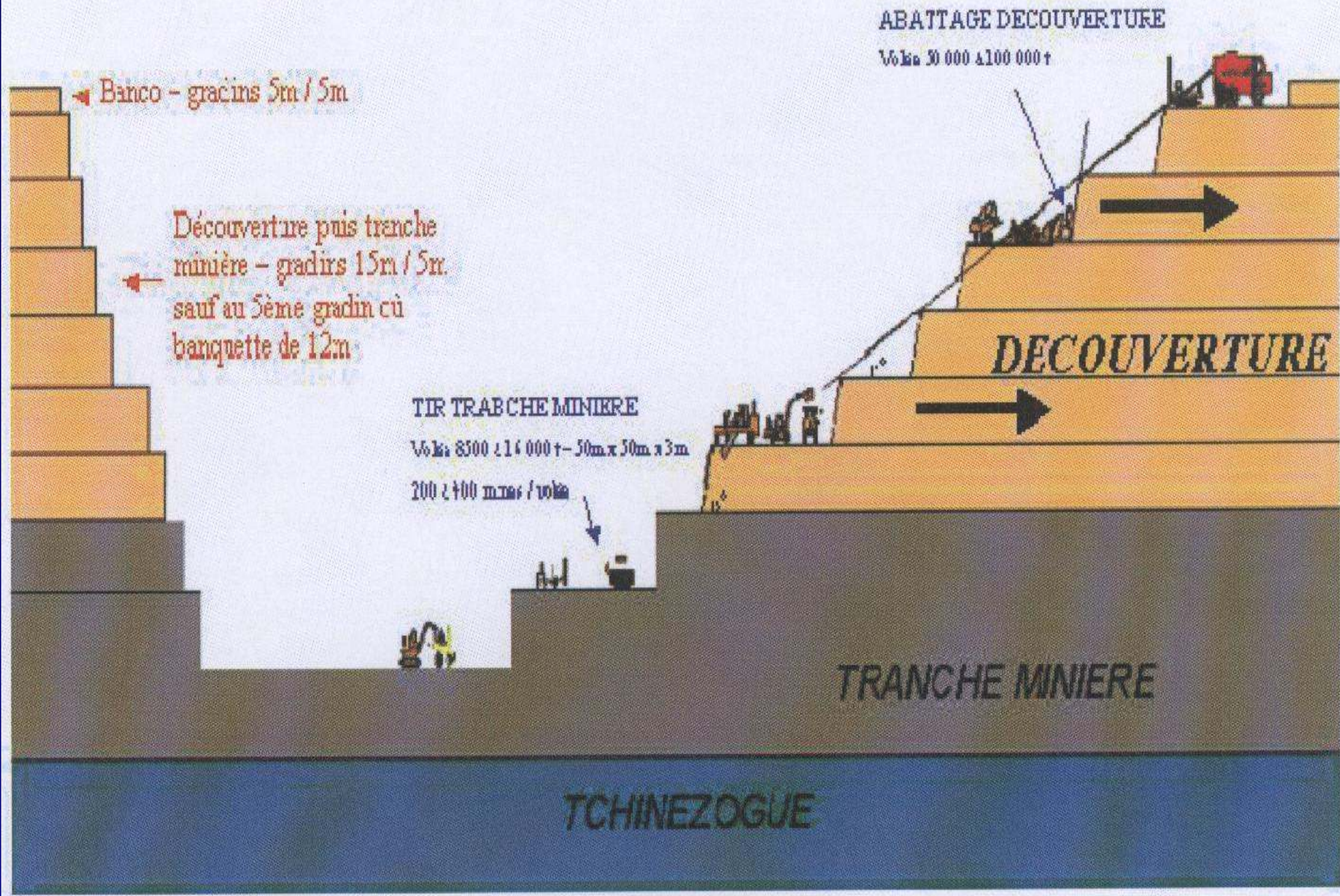
- Ventilation shaft that crosses over Tarat's groundwater;
- Hydraulic engine operations ;
- Flows from aquiferous Guzzouman (exploited level).

SOMAÏR Open pit exploitation method

Open pit exploitation by “simultaneous and horizontal benches” method (used by Somair) consists of:

- Removal of overburden and;
- Extraction of mineral ore.

GRADINS DEFINITIFS



Removal of overburden

It is an anticipated extraction by big means which permit an important output in order to reach the mineralized zone.

The operations are :

- Pre-splitting
- Drilling
- Blasting
- Auxiliaries activities

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EXTRACTION OF MINERAL ORE

This requires a selective exploitation method depending on the lentils of ore (discontinued layer).

The operations are:

- Pre-splitting
- Drilling
- Blasting (fracturing)
- Radioactivity sounding
- ore Selectivity and loading
- Auxiliaries activities

Backfilling

It is used to optimize the haulage by reducing transportation distance, economizing surface stock pile space and environmental disturbance.

Ovaberden materials are used to bacfill the pit

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BAKFILLING



Dynamic Process Of Mineral Ore

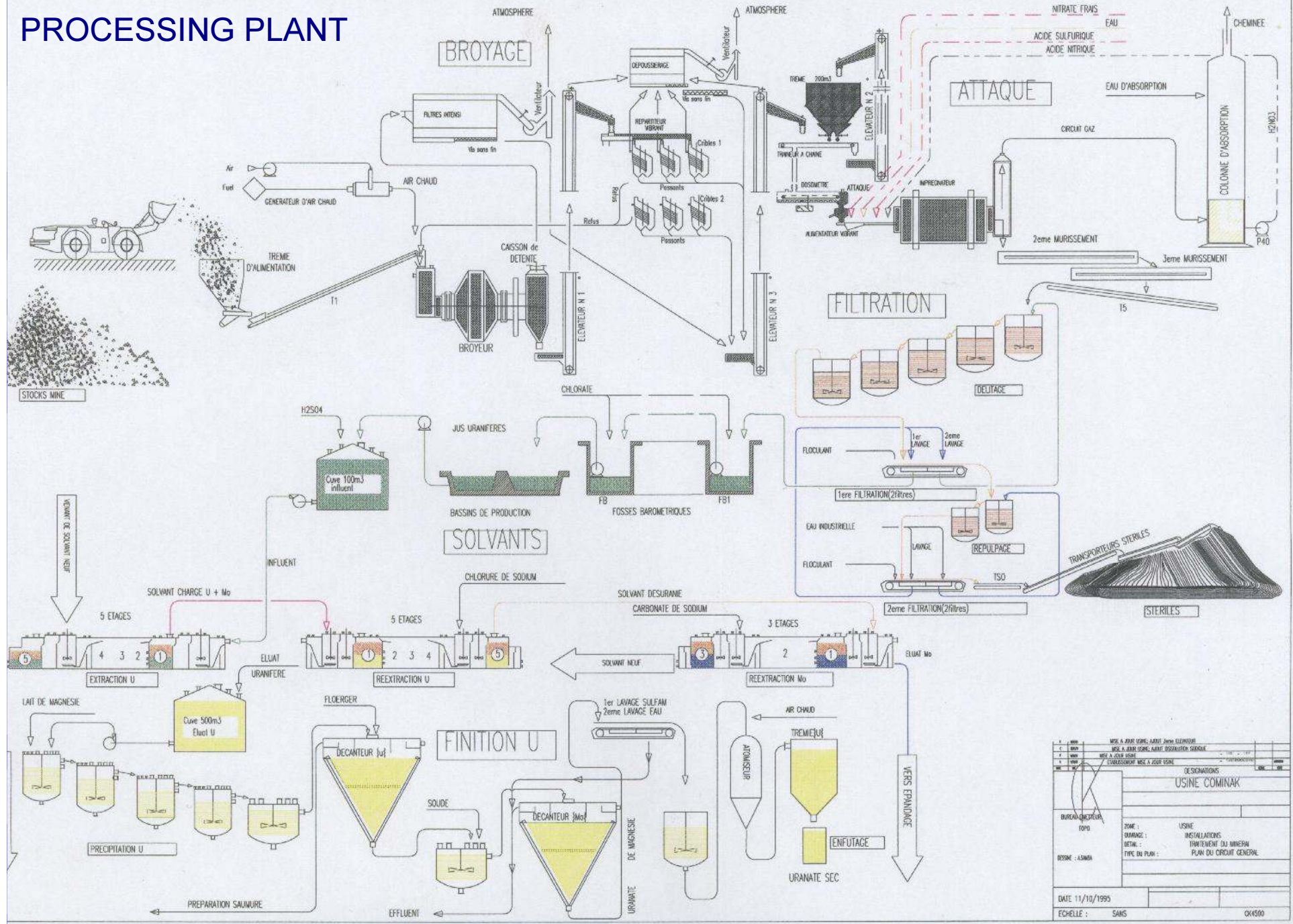
- Finish product sold by both societies is magnesia uranate (MgU_2O_7) for COMINAK and soda uranate (NaU_3O_7) for SOMAÏR. It is a pulverizing solid, which content 75% of uranium metal.
- The objective of dynamic process is to obtain, from mineral ore which contains 5 to 6 kg of uranium by tonne of mineral ore, a concentration of uranate which contains 75% pure uranium.
- Processing plant of mineral ore use for this, purpose the dynamic method. This method consists to sulphurous and nitrous concentration attack by solvent and precipitation to uranate.

MINERAL PROCESSING

it consist of:

- Crushing
- attack sulfo-nitreous
- solid-liquid separation
- solvent extraction & reextraction
- uranate precipitation

PROCESSING PLANT



1	PROJ	USE A JOUR 1995: ARBIT. JAMES GILBERT	
2	PROJ	USE A JOUR 1995: ARBIT. DESTINATION: SOUS-GE	
3	PROJ	USE A JOUR 1995: ARBIT. DESTINATION: SOUS-GE	
4	PROJ	ESTABLISSEMENT USE A JOUR 1995	
DESIGNATIONS:			
USINE COMINAK			
BUREAU CHARGEUR:		USINE:	
TOPD		INSTALLATIONS:	
REGION: ASAMA		TRAVAIL: MINIER	
		TYPE DE PLAN: GENERAL	
DATE 11/10/1995			
ECHELLE: SANS		OK4500	

LOW GRADE URANIUM MINERAL PROCESSING : HEAP LEACHING

- Heap leaching used by SOMAÏR is a treatment process of mineral ore with low grade additional to dynamic process, but less expensive.

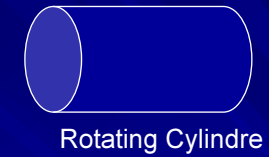
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HEAP LEACHING PLANT

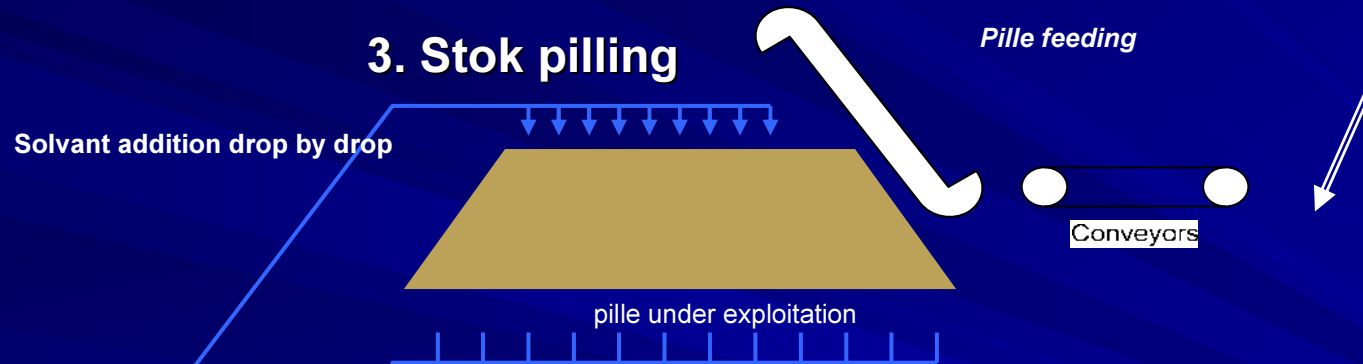
1. Ore Preparation



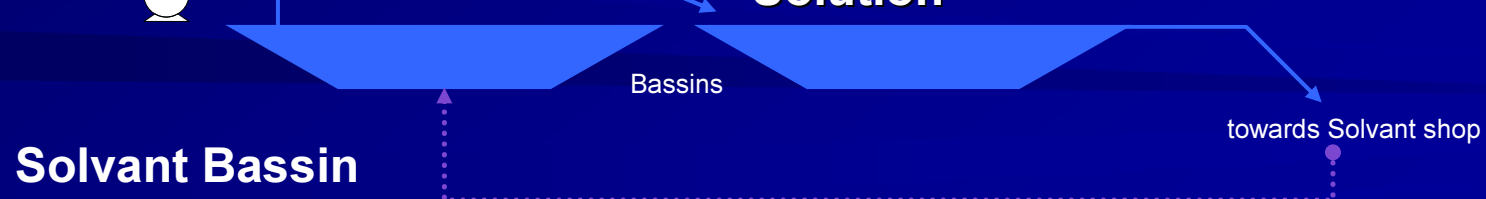
2. Agglomeration



3. Stok pilling



4. Uranium preganant Solution



CONCLUSION

- The increased interest last years for uranium has an important impact on the economy of Niger. After all, research and exploitation of new deposits will generate an important income for the country.
- The production of uranium which is 3000 tonnes for both first compagnies will be double with the new deposits which will be exploited by AREVA and SOMINA. So Niger will be in the three firsts producer of uranium in the word.

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