

# Les Nantieux (FRANCE) – 1999 / 2000

## Remediation of an old dump with high arsenic content

Owner.....	PECHINEY ELECTRO METALLURGIE
General contractor .....	Association INERTEC – BENEDETTI
Project manager .....	SCETAURROUTE
Participants .....	SOLETANCHE-BACHY, EDG, MSSA, PRESENTS, INERIS, DRIRE
Duration .....	24 months
Treated quantity .....	98.500 tons
Average daily capacity.....	400 tons / day

### Introduction

The Nantieux deposit is located in the Tarentaise valley in Savoy (France), it has been used between 1955 and 1989 to put down the residues of the cobalt activity from the quite close iron factory, notably the iron arsenate and sodium sludge. The site was noticed in 1994 in the French inventory of polluted sites and soils realised by the Environment Ministry (among 896 others).



Initial site in 1997

### Problem

The rehabilitation of this deposit constituted a complex problem: it was necessary to face simultaneously with several problems:

• **An access problem**

The very important hillside of the deposit, as well as the risks of mechanical stability of residues, did not allow us to reach the foot of the discharge from the height of the deposit.

• **A problem of mechanical stability**

The stored residues are thixotropic and have weak mechanical characteristics.

• **A problem of chemical stability**

The deposit of sodium sludge (strongly basic) on the surface has destabilised the iron arseniate residues stored previously : this leads to an increase of the arsenic solubility, initially very low soluble.

• **A problem of risk during the interventions**

Some NaK barrels (miscellany sodium and metal potassium) were stored through the site: their exact position was not known and they may be dangerous to be manipulated during the excavation works.

### Rehabilitation solution

Among the hypotheses, and considering the importance of the volumes to be treated, the solution proposed by INERTEC quickly stood out as the best compromise:

- ▶ The principle consisted in the excavation of the residues, the stabilisation in a treatment unit settled on the site, and putting them back in place according to a specific geometry guaranteeing the stability of the site. The solidification was being made in situ.
- ▶ The excavation was made by successive vertical bands downward.

The residues are put in place downstream of the site, then following the advancement of the excavation:



### Works

1. Excavation of residues

Residues were extracted from the deposit by vertical bands, and riddled on a specific area before being brought to the treatment unit. The cumbersome and the blocks were pushed aside in order to follow another treatment way.



Separation and sifting area

An identification methodology for the research of NaK's barrels was worked out by EDG: based on the coupling of geophysics prospecting methods for the detection of metal objects in a diverse and conductive environment, this method allowed, during the discovery of barrels, to operate a specific intervention procedure to allow their elimination in complete safety by means of a remote-controlled shovel.



*Destruction of NaK barrels*

## 2. Treatment of residues

The treatment was made in the mobile treatment unit (realised by INERTEC) by successive daily lots, which allowed to adapt the formulation of treatment to the real characteristics of residues. This adaptation was realised every day by the INERTEC mobile laboratory settled on the site.



*Mobile treatment unit*

## 3. Residues treatment

The treated residues were put back in place by compacting in successive layers, the solidification making in situ.

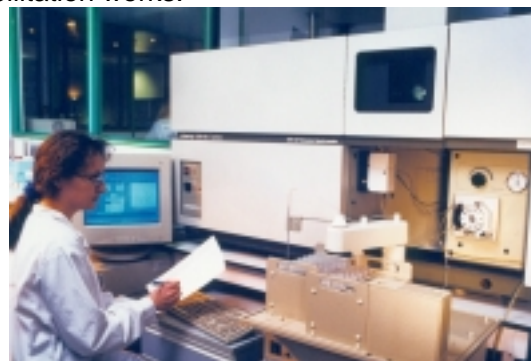
Tablecloths of geotextiles were included into the massif of treated residues, constituting a device of additional reinforcement in order to guarantee the stability of the deposit.

A metallic parement, retaining a soil layer, was arranged in the border of the massif in order to allow the reintegration of the site in its environment. Borders with trench were also realised, allowing the stability of the whole massif as well as the drainage of superficial waters.

## Work & Quality Controls

A detailed plan of controls was operated on the whole duration of the works and is based on three different kind of controls :

- ▶ Before the treatment, in order to determine the chemical treatment formulation to use the next day,
- ▶ After the treatment, in order to guarantee the quality of the realised treatment,
- ▶ On the stabilised residues, after the complete action of the stabilisation and solidification reactions: in order to check the mechanical performances and the retention of pollutants.
- ▶ On the water quality of the river, at the level of the work site, but also upstream and downstream : controls made before, during and after the rehabilitation works.



*Laboratory controls*

	Before treatment	After treatment	Required limit
Rc (MPa)	-	1,1 to 9	> 1
As (mg/kg)	20 à 20.000	< 1,5 to 6	< 10

## Conclusion

● All the treatment and delivery in place operations were made on two shifts, with an average cadence of 400 tons of residues per day.

● Surface modelling works were begun in parallel by the dismantling of the work installations, and ended in April, 2001.

● The site rehabilitation, since the initial modifications works, was so made in due time, or a little more than three years, half having been dedicated to the preliminary studies, the installation of the work means and the different materials necessary for the progress of the rehabilitation.

● ***This type of rehabilitation work is the first in Europe. It has been possible notably thanks to the INERTEC's chemistry and works know-how, which allowed to restore a physically and chemically stable site, integrated into its environment, without impact for the surrounding areas.***

**Initial view (1998)**



**May 2000**



**November 2000**



**June 2001**

