

EMERGENCY PREPAREDNESS FOR UF₄ TRANSPORTS IN FRANCE

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ABSTRACT

In France, ore concentrates conversion operation to UF₆ is realized in two steps; UF₄ at AREVA Malvesi plant and UF₄ to UF₆ at AREVA Tricastin Site. The transport of UF₄ between the AREVA sites is performed by road using a motorway on a near-daily basis. Together with modern transport equipment, emergency preparedness is of key importance to achieve public acceptance.

The proposed paper describes the equipment and the methods which were developed by COMURHEX in order to achieve the highest possible standard of emergency preparedness. It covers:

- Transport crisis management organization of AREVA
- Dedicated cleaning up equipment
- Emergency exercises

The dedicated cleaning up equipment will be presented in detail. It fits into a standard ISO 20 feet container and can be used at very short notice the local intervention team. It features a large size vacuum cleaner with dedicated pumps, filters and interim storage containers for the recovered material.

BACKGROUND

COMURHEX, a major international player in the Uranium processing sector, converts ore concentrates into Uranium hexafluoride (UF₆). The Malvesi plant is the only reception point of natural Uranium in France which is received from all over the world in the form of “yellow cake”.

The conversion operation is carried out in two coordinated stages at two industrial sites.

The Malvésí site

- purifies the Uranium ore concentrate to a very high level and
- converts the Uranium ore concentrate into Uranium tetrafluoride (UF₄).

The Tricastin site, near Pierrelatte in the Drôme region of France transforms the Uranium tetrafluoride into Uranium hexafluoride (UF₆).

Figure 1 show a graphical representation of the conversion process.

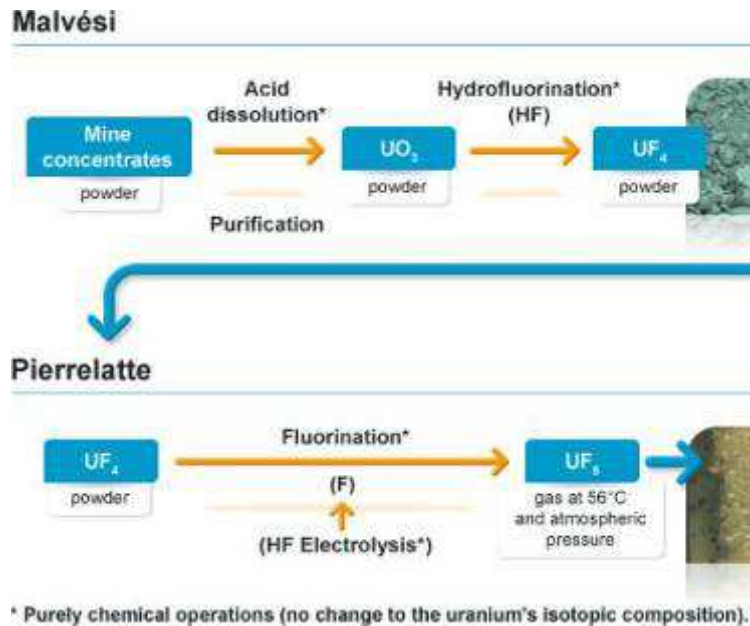


Figure 1. Conversion Process

To meet the growing needs of its customers, in 2007 AREVA decided to renovate and modernize its industrial facilities, a project known as COMURHEX II. Upon completion in 2015 the annual production capacity will be approximately 15 000 metric tons of Uranium in the form of UF₆.

INTRODUCTION

The conversion process requires the daily transportation of Uranium tetrafluoride from the Malvésí to the Tricastin sites in order to allow continuous plant operation. The transport route is approximately 230 km long and uses the French motorway system for almost the entire length, see Figure 2. The A7 and A9 motorways are amongst the busiest in France. They rank second and third in terms of traffic. The stretch around Montpellier is used by approximately 100 000 vehicles each day. A lot of the traffic is long distance haulage to and from Spain, Portugal and Morocco. In addition, the A7 and A9 motorways show important seasonal traffic peaks during the summer holiday period.

Uranium tetrafluoride is green solid powder, see Figure 3. It

- is stable, inert and insoluble in water,
- liquefies in excess of 1000 °C at atmospheric pressure,
- classed a radioactive material of low specific activity (LSA-I),
- has no subsidiary risks,
- does not present a criticality risk when exposed to water (natural Uranium with 0,71% ²³⁵U),
- is a very low radiation emitter,
- is transported under UN 2912.



Figure 2. Transport Route



Figure 3. Uranium tetrafluoride UF₄

ISO 20 foot tank containers are used for the road transport, see Figure 4.



Figure 4. UF₄ Tank Containers

The principal characteristics of the tank containers are:

- tank type S 2,65AH on an ISO 20" frame
- Tare weight 4070 kg
- Volume 17 500 liter
- Tank made from stainless steel, hermetically closed during transport
- Filling from the top, emptying from below
- Packaging type IP-1
- Capacity 21,2 metric tons of UF₄ (equivalent to 16,1 metric tons of Uranium)

TRANSPORT CRISIS MANAGEMENT IN FRANCE

In French State is in charge of the organization and the crisis management of an incident involving the transport of radioactive material. If necessary, the Prefect of the French Local Authority

concerned will initiate a local emergency plan called “Plan ORSEC TMR” (*Plan d’Organisation des Secours – Transport Matières Radioactives*).

The following four actors will contribute to the crisis management:

- French National Authorities (ASN, IRSN, Government ministries...)
- French Local Authorities (Prefect, Fire Fighters including Specialized Radiological Intervention Unit...)
- Consignor
- Transporter

Each of them will staff at least four functions:

- Decision making: head quarters (on a national and/or local level)
- Expertise: Technical specialists
- Action: Intervention teams
- Communication

The final decision making is done by the Prefect at local level after taking advice from all parties concerned. He will request intervention from all public or private actors as required by the situation.

AREVA’s crisis management organization mirrors perfectly the French national organization. In particular, AREVA’s Logistics Business Unit has a dedicated crisis management organization which contributes to all functions mentioned above. All consignors within the AREVA group have set up conventions and crisis management protocols with the Logistics Business Unit. A dedicated Transport Urgency Intervention Plan (PUI-T) has been established for this purpose.

DEDICATED UF₄ CLEANING UP EQUIPMENT

In the unlikely event of a traffic accident with UF₄ spillage it is in the interest of all parties concerned to manage this crisis safely and rapidly. The impact to the local population and to the environment should be kept to a minimum.

Therefore, AREVA has designed and put into service dedicated UF₄ cleaning up equipment, see Figure 5. This equipment fits into a standard ISO 20” container and is on permanent call duty at a near AREVA installation.

It consists of:

- a powerful vacuum pump,
- several THE (Very High Efficiency) filters,
- an independent power supply,
- transport packages (drums and boxes) for the recovered UF₄,
- pumping accessories,
- a smaller industrial vacuum cleaner
- and a personal decontamination unit.

Instructions for use are attached where necessary. No particular training is necessary for the emergency intervention team. The standard knowledge of a professional fire fighter is sufficient.



Figure 5. UF₄ Cleaning Up Equipment

The entire ISO container is designed to be an IP-1 package. Thus, after use the contaminated unit can be transported in full compliance with the transport regulations.



**05 - Very High Efficiency Filter
11 - Power Supply
In the back - Main Vacuum Pump
On the right - Industrial Vacuum Cleaner**



Transport Container for Recovered UF₄



Recovery of UF₄ in Plastic Sacks



Transport Drums for Recovered UF₄

Figure 6. UF₄ Cleaning Up Equipment - Details

The equipment has been tested recently in a transport emergency exercise, see Figure 7. The lessons learnt from the exercise have been used to improve the UF₄ recovery unit and the emergency intervention procedures.



Figure 7. Transport Emergency Exercise

CONCLUSIONS

The transport of UF₄ between the AREVA Malvési and Tricastin sites is of vital importance for the nuclear fuel cycle in France. Together with modern transport equipment, emergency preparedness is of key importance to achieve public acceptance.

AREVA has put into place

- a transport crisis management organization,
- dedicated UF₄ cleaning up equipment,
- and emergency exercises,

in order to minimize the impact to the local population, the environment and to industrial production.