

Conference on Site & Soil Remediation – Turkey

“KOK stoklarının berterafi ve KOK’lar ile kirlenmis sahaların iyilestirme calismalari : En iyi teknolojiler, uygulama tecrubeleri ve karsilasilan zorluklar.”

Elimination of POP’s stocks and remediation of soils polluted by POP’s: overview of Best Available Technologies, return of experience on projects and challenges

Erdogan AKTEPE

SUEZ Bolge Muduru

prêts pour la révolution de la ressource



Contents

1 | SUEZ Group & SUEZ Turkey Presentation

2 | SUEZ Industrial Waste Specialities IWS

2.1 Overview of SUEZ Hazardous Waste Management activities

2.2 Overview of SUEZ Remediation activities

2.3 Specific treatment plants for POP'S: Incineration plant, Thermal desorption, Soil washing units, Biological treatment units

3 | Return of experience on similar projects

3.1 Presentation of a major project: Pur POP's treatment solutions and remediation of a contaminated land

Movie of the project

3.2 Presentation of a Chemical Landfill: Chlorinated compounds, BTEX, Chlorobenzen

4 | Overview on challenges & perspectives

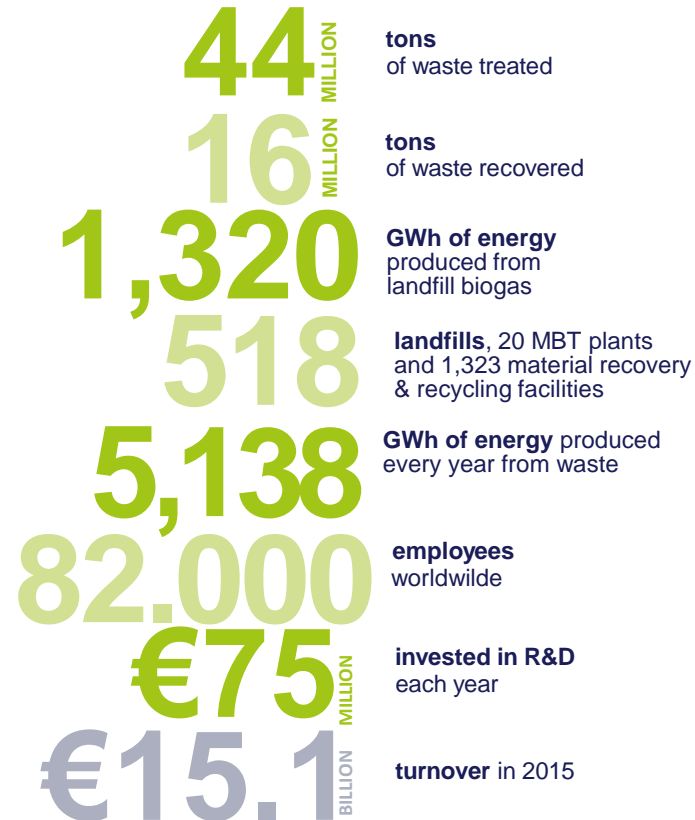
SUEZ Group & SUEZ Turkey

Presentation of SUEZ – Key figures (Waste)

- ▶ A GLOBAL LEADER IN WATER AND WASTE MANAGEMENT SERVICES
- ▶ OPERATING IN MORE THAN 70 COUNTRIES ON 5 CONTINENTS
- ▶ SERVING MUNICIPAL AND INDUSTRIAL CLIENTS

a unique profile

- ▶ Operator
- ▶ Customized & innovative solution developer
- ▶ Solution integrator



Presentation of SUEZ – Turkey's Activities



SUEZ Industrial Waste Specialities

Overview of SUEZ Hazardous Waste Management activities

Key figures of Hazardous Waste Management

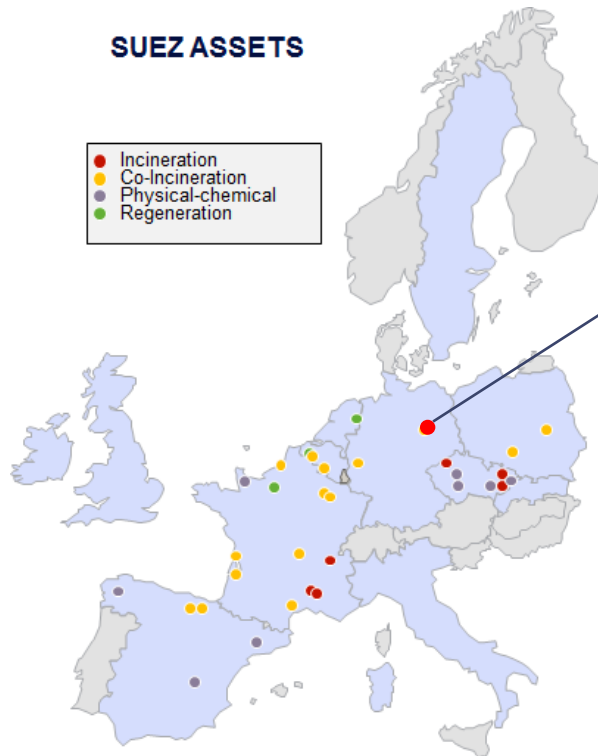
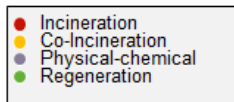
SUEZ R&R IWS

IWS waste treatment and recovery



- Key figures
- > **141** hazardous waste facilities
 - > **9** hazardous waste incineration units
 - > Over **4 000 kt** of hazardous waste treated per year

SUEZ ASSETS

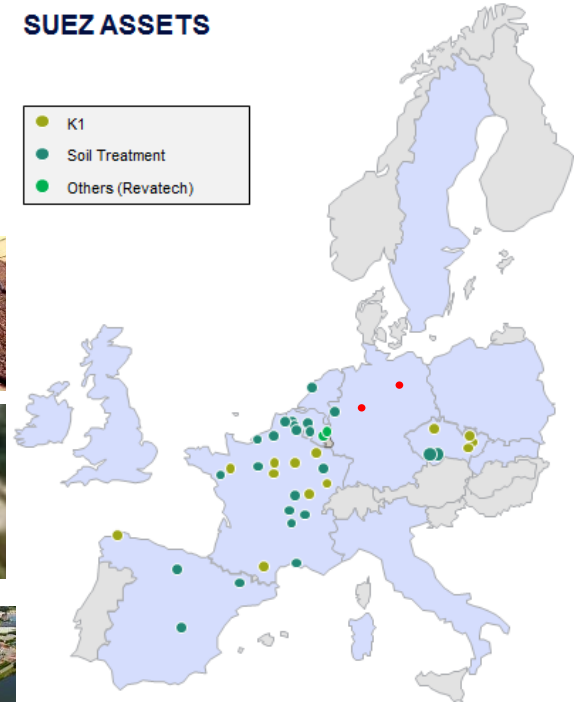
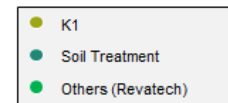


SUEZ Industrial Waste Specialities

Overview of SUEZ Remediation activities

Treatment & Recovery Plants

SUEZ ASSETS



1 million tons of soil treated in SUEZ plants each year
+ In Situ, On site

Pre treatments and on site treatments

○ Crushing / Screening



○ Biopile



○ Volatilis®



○ Mecalis®



○ Rotalis®



10 Neoter® plateforme

○ Soil management



○ Analysis



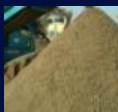
○ Soil sorting



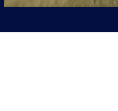
○ Mesh-Tracing



○ Treatment – Pre treatments



○ Recovery



Treatments in approval centers

○ 9 Biocentre®



○ 8 K1 Landfill



○ 1 Washing plant



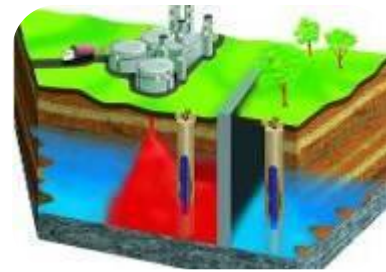
○ 1 Thermal desorption



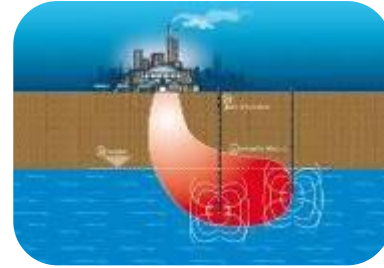
A EUROPEAN TRADEMARK



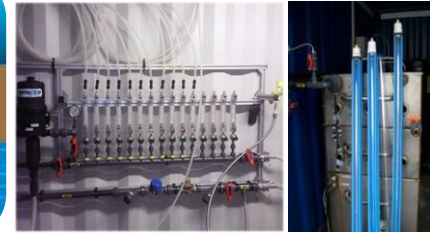
E.T.P.®



Keops®



Bionappe®



OXIDIS®



Turkey



300 active In Situ projects per year

SUEZ Industrial Waste Specialities

Specific treatment plants for POP'S: Incineration plant, Thermal desorption, Soil washing units, Biological treatment units



CALYPSO

Schkopau (Germany)
Hazardous waste incinerator



Issues

- The treatment unit called Calypso located in the Dow ValuePark® in Schkopau includes a rotary kiln for the treatment of hazardous waste and an industrial sludge dryer
- Although fully operational, the facility is operated below its technical capacity

Solutions

- The unit treats liquid and solid waste generated by Dow (on and off site), by the industrial companies located in the ValuePark®

SUEZ will supply Dow and the manufacturers on-site on a long-term basis:

- Steam produced by the high-temperature incineration of waste (up to 120,000 T/year)
- The chlorine produced by the incinerated hazardous waste, will be reused in the form of hydrochloric acid for industrial purposes.
- Suez will also dry and treat the sludge produced by the wastewater treatment plant dedicated to the local industrial activity

Benefits

- Capacity of **35 000 tons per year**. The capacity can be increased according to the demands of the market and the diversification of the treated waste
- High environmental performance
- A concrete solution for the development of the circular economy



→ **Appropriate and proven technology for POP's**

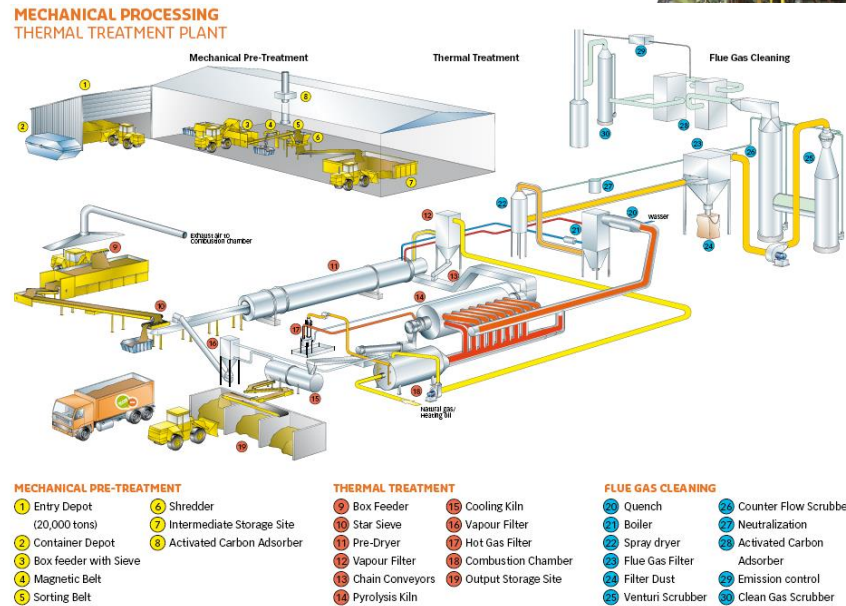
SUEZ Thermal Desorption plant: Pyrolysis

Treatment T° :
soil and waste heating : 600 - 650°C,
post-combustion of vapor phases: 1100 - 1250°C,
 T° of gas after heat exchanger : 400 – 450°C
Treatment Capacity: 48.000 T/year
25.000 T/year (add. storage)
 Oxydeur de post-combustion rallongé = temps de séjour d'environ 3 secondes
 Gas washing Treatment of SO₂, HCl, HF, Hg⁺⁺, Furans
 Gas emission controls : (Parameters given by 17. BImSchV!)
 Continuously: O₂, CO₂, C total, HCl, SO₂, Hg, Dust
 Discont.: NO_x

➔ **Appropriate and proven technology for POP's**



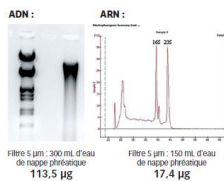
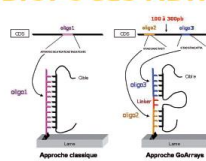
| | | |
|------------------------------------|----------|----------------|
| Cyanure | mg/kg MS | 5 000 |
| Arsenic (As) | mg/kg MS | 500 |
| Cadmium (Cd) | mg/kg MS | 200 |
| Mercure (Hg) | mg/kg MS | 1 500 |
| Plomb (Pb) | mg/kg MS | 6 000 |
| (TPH) C10-C40 | mg/kg MS | 300 000 |
| PAH | mg/kg MS | 300 000 |
| CAV - BTEX | mg/kg MS | 20 000 |
| Polychlorobiphényles (PCB) | mg/kg MS | 1 000 |
| Pentachlorophénol | mg/kg MS | 1 000 |
| Chlorinated compounds (EOX) | mg/kg MS | 20 000 |



Biological treatment possibilities chlorinated organics & POP's

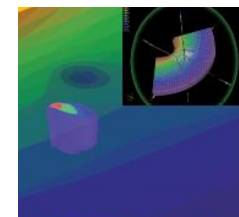
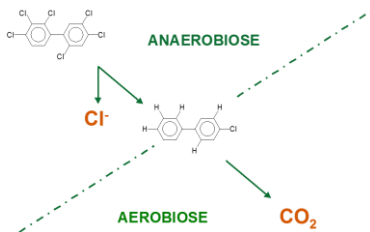
Chlorinated solvents
PCE/TCE: Positive research results, field tests and industrial projects performed

BIOPUCES ADN



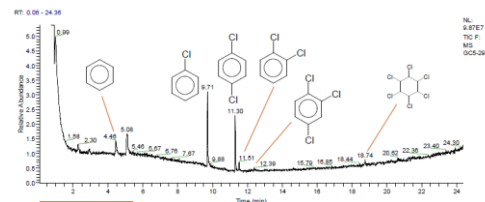
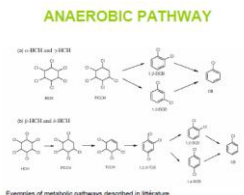
➔ Proven efficiency of biotreatment

PCB's: Negative research results, field tests performed by SUEZ



➔ Alternative treatment solutions to study: Chemical treatments??

Lindane : Biofeasibility lab tests performed by SUEZ



- Activated carbon cartridge
- Gaseous part (measurement O₂ / CO₂)
- Inox column (Ø=10cm, H=30cm)
- Peristaltic pump (aeration)

Monitoring :

- Respirometric measurement
- HCH analysis
- Sub-products research
- pH
- Molecular biology

| | Control | Aerobic | Mixed |
|----------|----------|----------|------------------|
| Soil | 2.5kg | 2.5kg | 2.5kg |
| Nitrogen | Yes | Yes | Yes |
| Compost | No | Yes | Yes |
| Carbon | No | No | Lactate |
| Aeration | continue | continue | 5j ana / 6j aero |

➔ Positive results

➔ **Appropriate technology for POP's**
 ➔ **Development efforts to pursue**

SUEZ Similar References on POP's Operational REX on Major Projects: *MOVIE*

Construction of tents for the confinement and airlocks



- Air lock with double doors and truck/container washing system



Installation Of A Specific Laboratory On Remediation Site



Conditionning/Transport And Disposal Lowly Polluted Materials

Lowly polluted
materials

Loading by closed
conveyor with air
extraction and treatment



Transport by barge
(river transport)



Treatment by thermal
desorption



Conditionning/transportation and disposal

Highly polluted materials polluted materials

Highly polluted materials

Loading under tent in sealed containers
Containers and trucks are washed under tent

Transport Road/Sea



Treatment by thermal desorption
And Incineration
(regarding to the concentration levels)



- Sealed Hard top containers
- 25 t of transport capacities
- Appropriate for road, train and river transport
- Equipped with active carbon filters
- GPS for follow-up

Conditionning/Transport and Disposal - *Pur products*

Pur products

Pur products are conditioned in drums under tent
Drums are washed under tent



Transport Road by tautliner



Treatment by incineration



- Drums are filled under tent
- System semi-automatisé
- Drums are closed under tent
- Drums are hermetic
- Drums are washed under tent (water is treated)
- Personnal with breathable air and special clothes (see picture)

HQSE



Air extractors : 40 000 m³/h
Associated air treatment



Drivers' cab pressurization with breathable air injection :
15 machines are equipped
Special pressurized trucks on site

SUEZ Similar References

Remediation of a former chemical landfill

Chemical Landfill Remediation

Chemical landfill characteristics

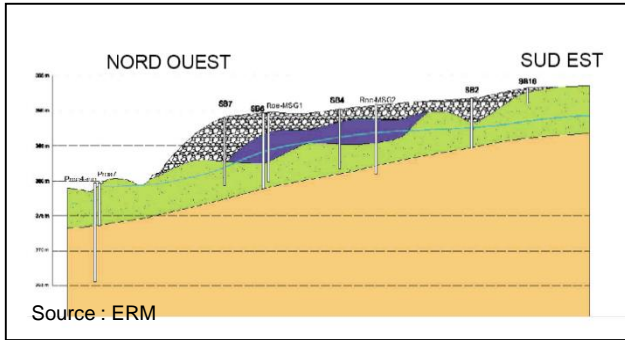


Description of project

- ➡ 4000 m³ of roofing compounds slightly polluted
- ➡ 4000 m³ of chemical waste and contaminated materials associated
- ➡ Contaminated materials ➔ filled in the landfill between 1957 and 1960

Chemical Landfill Remediation

Chemical landfill characteristics



Roofing backfill : sandy silt/loam with cobblestone and gravels and/or demolition debris/cuttings

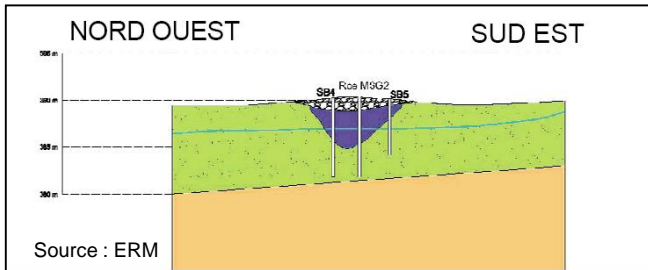
→ Small impact or no impact

Combined horizon : sandy, nearly argillaceous matrix/template which contains demolition debris/cuttings and chemical wastes

→ slags, distillation ash and tarry wastes from the agrochemical and pharmaceutical industry.

Chemical wastes characteristic compounds :

Chlorobenzen, anilines, chloroanilines, les nitrobenzen, heavy metals



Underlying natural soils : old alluvias compound with lean clay

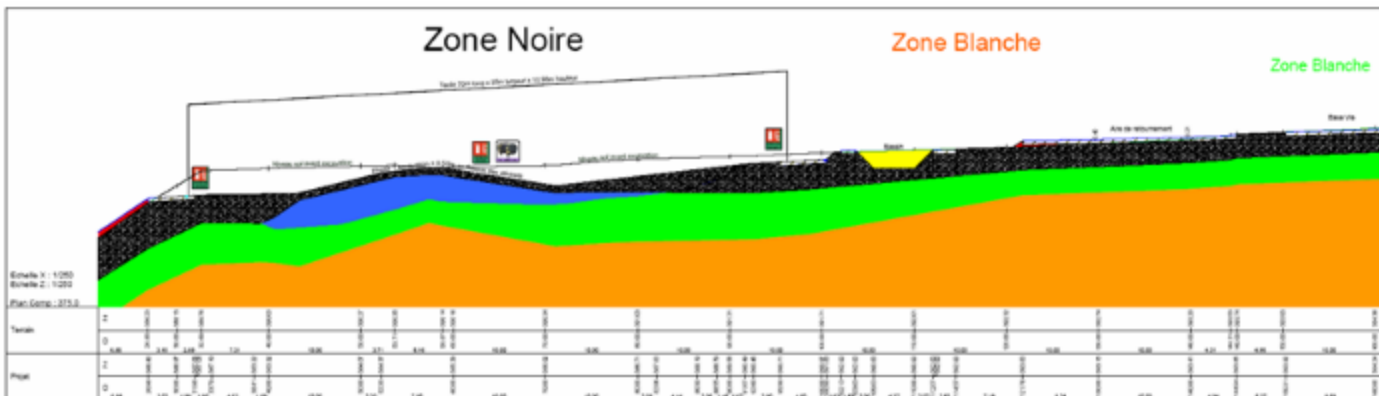
→ Impact noticed

Presence of a ground water in the alluvium level

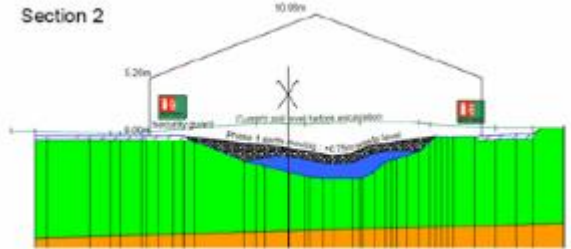
Chemical Landfill Remediation

Work designs

Preliminary work designs for the installation of a temporary containment



Section 2



Technical work studies for the design of a temporary containment

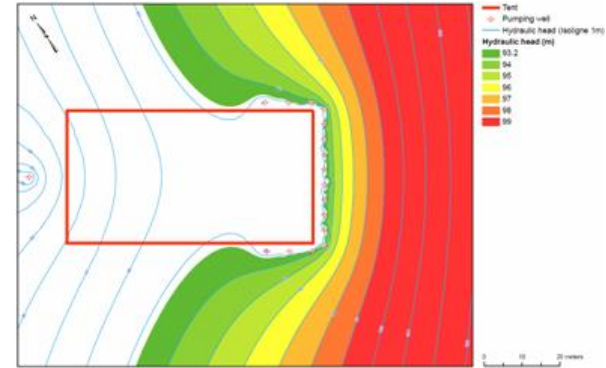
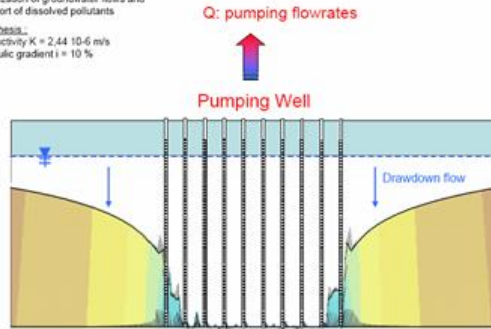
- Building size :
- length: 70 m
- Width: 35 m de large
- Height: 11 m max.

Chemical Landfill Remediation

Work designs

Design of ground water pumping

Software : FEFLOW v6
Modelization of groundwater flows and
transport of dissolved pollutants
Hypothesis :
Conductivity K = 2,44 10⁻⁶ m/s
Hydraulic gradient i = 10 ‰



Groundwater flow modeling : Feflow®

Future confinement realized :

- 16 upstream pumping wells : pumping by ETP® (SITA Remediation patent for vacuum pumping system)
- 1 downstream pumping well : electric submersible pump
- Excavation bottom pumping

Pumping started 1 month before excavation works

Chemical Landfill Remediation / Remediation Works Performance

Building and building Airlock



Chemical Landfill Remediation

Remediation works Performance

Air extraction systems and air treatment



Negative pressure application of the building :

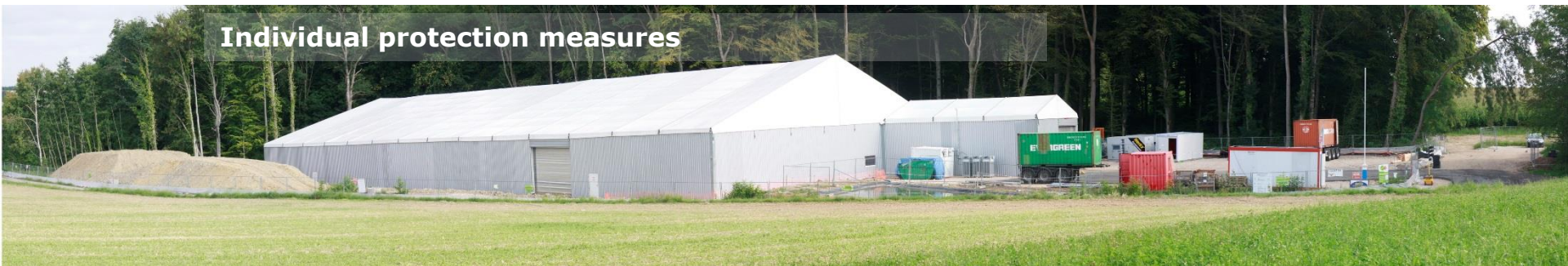
- ➔ 30 000 m³/h air extraction and treatment on activated carbon filter
- ➔ 6 000 m³/h air extraction and air treatment in the airlock
- ➔ **Air treatment** : 2 activated carbon filters in series : 13 m³ of activated carbon for each filter

Building 1,5 renewal rate per hour

Airlock : 5 renewal rate per hour

Chemical Landfill Remediation / Hygiene - Quality - Security Management

Individual protection measures



life line placed in black area



-Gas impermeable clothes : EN943 european standard
Body airing with displaceable cuttings

-Compressed air bottles : 45 minutes autonomy



Challenges & Perspectives

Challenges & Perspectives

▪ Management Reduction of environmental impacts

-Highly sensitive Hygien& Safety conditions for worker: respiratory protection, gas measures under workshops, air treatment,...

-Highly sensitive environmental controls: Air emissions, dust controls, rain water controls

-Highly sensitive transportation: Air emissions, dust controls, rain water controls

▪ Importance of preliminary studies for project design

-Importance of site studies: preliminary studies, gridding, repartition of the contamination in soils,

-Feasibility studies: Lab and field tests to perform for remediation solution design

▪ Technological solutions appropriate to Turkish Market

-Development of new treatment solutions appropriate for Turkish Market

-REX in EU projects and International R&D programs on POP's

-Thermal solutions but also, soil washing, biologic treatment to envisage for Turkish market

▪ Management of public communication

- Definition of communication plans, Emergency Plans

- **Public** meetings,...