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Underground Waste Disposal

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Workshop Underground Disposal of Hazardous Waste
A world wide leader in the sectors of:

- Special and standard fertilisers
- Plant care products
- Salt products

- More than 15,000 employees
- Revenue 2010e: 4.6 - 5 billion €
- Since september 2008 one of 30 DAX-listed companies, Germany’s most important stock exchange index
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K+S Entsorgung | Profile

- A K+S Group business segment since 1991
- Disposal activities are centrally steered from Kassel
- Reutilisation, disposal and recycling at company-owned facilities
- Largest number of sites and technologies on the market
- Internationally active, with representatives in 8 countries
- Pioneer of underground waste disposal with first facility worldwide: Herfa-Neurode (1972)
- Revenue 2009: 67.2 m. €
Underground disposal:

- Safest solution for the disposal of hazardous waste
- The permanent and sustainable exclusion of the contaminants from the biosphere
- Maintenance free

Underground disposal plants (UTD):

- Herfa-Neurode
- Zielitz
- Heilbronn
- Sondershausen
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Underground waste disposal facilities | Germany

Underground waste disposal plants

1. Herfa-Neurode
2. Zielitz
3. Heilbronn
4. Sondershausen
Formation of the salt and potash deposits

- Salt deposit
- Potash deposit
- Semi-enclosed sea
- Evaporation caused by solar heat
- Barrier
- Salted sea water

Formation of the salt layers 250 million years ago
Deposit thickness up to 350 metres | Gastight
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Mining | Room and pillar system, plan view

- Mining direction
- Exhausted air
- Fresh air
- Pillar
- Crusher
- Ventilation barrier
- Conveyor belt
Prerequisites for underground waste disposal

• Waste storage only in disused, excavated areas of the mine
• Storage area has to be remote from extraction area with possibility to be sealed off from it
• Cavities remain open and have no backfill obligation
• Cavities have to be stable and must remain accessible even after prolonged time
• Mine has to be dry and free of water
• Storage areas have to be sealed off from water-bearing layers by geological barriers
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Underground Disposal | Specific safety assessment

- Technical planning
- Hydro-geological data
- Geological data
- Waste data
- Environmental impact assessment

Safety concept

Risk assessment of the operational phase
Safety of:
- operation
- stability of cavities

Geotechnical risk assessment

Long-term-safety evidence
Assessment of:
- natural and technical barriers
- incidents and contingencies
- the overall system
Not acceptable for underground disposal are wastes that are:

- explosive
- self inflammable
- spontaneous combustile
- infectious
- radioactive
- releasing hazardous gases
- liquid
- increasing their volume
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UTD Herfa-Neurode | Delivery
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UTD Herfa-Neurode | Shaft transport

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UTD Herfa-Neurode | Storage chambers
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UTD Herfa-Neurode | Separating by walls
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UTD Herfa-Neurode | Sample storage

• Internal identification codes
• 79,500 samples stored
• Clear, traceable documentation
Wastes are separated by 17 material groups:

- Alkaline wastes
- Alkaline wastes, moisture sensitive
- Acid wastes
- Acid wastes, moisture sensitive
- Cyanides (acid / alkaline)
- Mercury (acid / alkaline)
- Organic wastes (acid / alkaline)
- Hydroxide sludges
- Capacitors
- Transformers (Cu / Fe)
- Parts of transformers (Cu / Fe)
- Other wastes
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UTD Herfa-Neurode  |  A unique disposal plant

- First underground waste disposal plant worldwide
- Complex safety installations
- Complex documentation to allow precise backtracking
- Retain samples of every single waste delivery
- Retrievability of wastes for recovery of resources
- High capacities and flexibility
- Infrastructure of a major company

Shaft at Werk Werra
Natural barriers

- Salt (gastight) 350 m
- Clay (watertight) 100 m
- Bunter stone 500 m

Artificial barriers

- Packaging
- Brick walls & Field dams
- Waste repository zone dams (accesses barred by massive dams)
- Long-term-safe shaft backfilling (watertight)

→ No other post closure maintenance, wastes are irrevocably removed from the biosphere
Thank you for your attention!

The safest form of disposal is to collect the harmful substances separately in the most concentrated form possible and to remove them for good from the biosphere.