Strategies and Examples of Landfill Closure

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Introduction – Situation

- At the moment 355 landfills operation. It is expected that 70-80 % (~250-285) will be closed in 2005
- Since 1995 already 119 landfill have been closed
- In 1975 in Germany (-West) 4415 landfills had been in operation
- Landfill closure will be a main task and need a lot of money (own estimation: 10-12 billions of €)
Legal aspects concerning landfill closure

• Due to German Law after the end of deposition landfills have to be closed with adequate technologies (top cover sealing (two layer system), gas collection utilization, leachate collection and cleaning). This happens according to the following picture:
Legal aspects concerning landfill closure

- If huge settlements have to be expected temporary sealing can be used until the settlements have decreased.
Special regulations for “old landfills”*

* and landfills where deposition will be ended before 15. July 2005

- Authorities can agree exceptions concerning the above mentioned technical standards if prove is given that the environment will be durable protected especially the groundwater.
- Authorities can agree that
  - Other gas collection and treatment system can be used especially “passive systems” with methane oxidation processes
Special regulations for “old landfills”*
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- Other sealing systems can be chosen especially with:
  • Different kind of sealing layers
  • Different thickness of sealing layers
  • Different members of sealing layers
  • Different materials for sealing layers f. e. special types of wastes
Special regulations for “old landfills”*

- The landfill is stabilized by blowing (sucking) air into the landfill body to
- Other leachate treatment systems especially simple natural systems like “plant treatment systems”
Special regulations for “old landfills”*

- gas wells for aeration and discharged air
- operation flat:
  - container for aeration
  - waste air collection and -treatment
  - workshop, etc.
Special regulations for “old landfills”*
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- Authorities can agree that the water (including leachate) is infiltrated into the landfill body to accelerate degradation processes depending from the following points:
  - Sealing at the bottom
  - Working leachate collection system
  - Working gas collection system
  - Final Cover sealing or temporary sealing
  - Still degradable organic waste in place
  - Prove of stability
  - Systems for water infiltration and controlling
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Examples

- Landfill “Bruchsal” in the south of Germany (Deufel, 2004, Stuttgarter Berichte zur Abfallwirtschaft)
Examples

granulate material, d = 30 cm
flexible membrane liners (FML)
protective layer 0/20 mm
equalizing layer d = 30 cm
landfill

seepage layer
d = 0.50 m

water reservoir
layer d = 1.5 m

non-woven fabric
Examples

- granulate material, $d=30$ cm
- flexible membrane liners (FML)
- protective layer 0/20 mm
- equalizing layer $d=30$ cm
- landfill

- restoration layer $d=1.0$ m
- drain layer
- flexible membrane liners (FML)

Landfill
Examples

- Landfill “Sprendlingen” in the south-west of Germany (Egloffstein et. al., 2004, Stuttgarter Berichte zur Abfallwirtschaft)
Examples

- Landfill “Brandenburg” in the north of Germany
  - Still two layer sealing system but
    - Clay layers instead of $5 \times 10^{-9}$ m/s $\Rightarrow 1 \times 10^{-8}$ m/s
    - Plastic layer instead of 2.5 mm thickness $\Rightarrow$ 2.0 mm
    - Instead of water balance layer conventional earth cover