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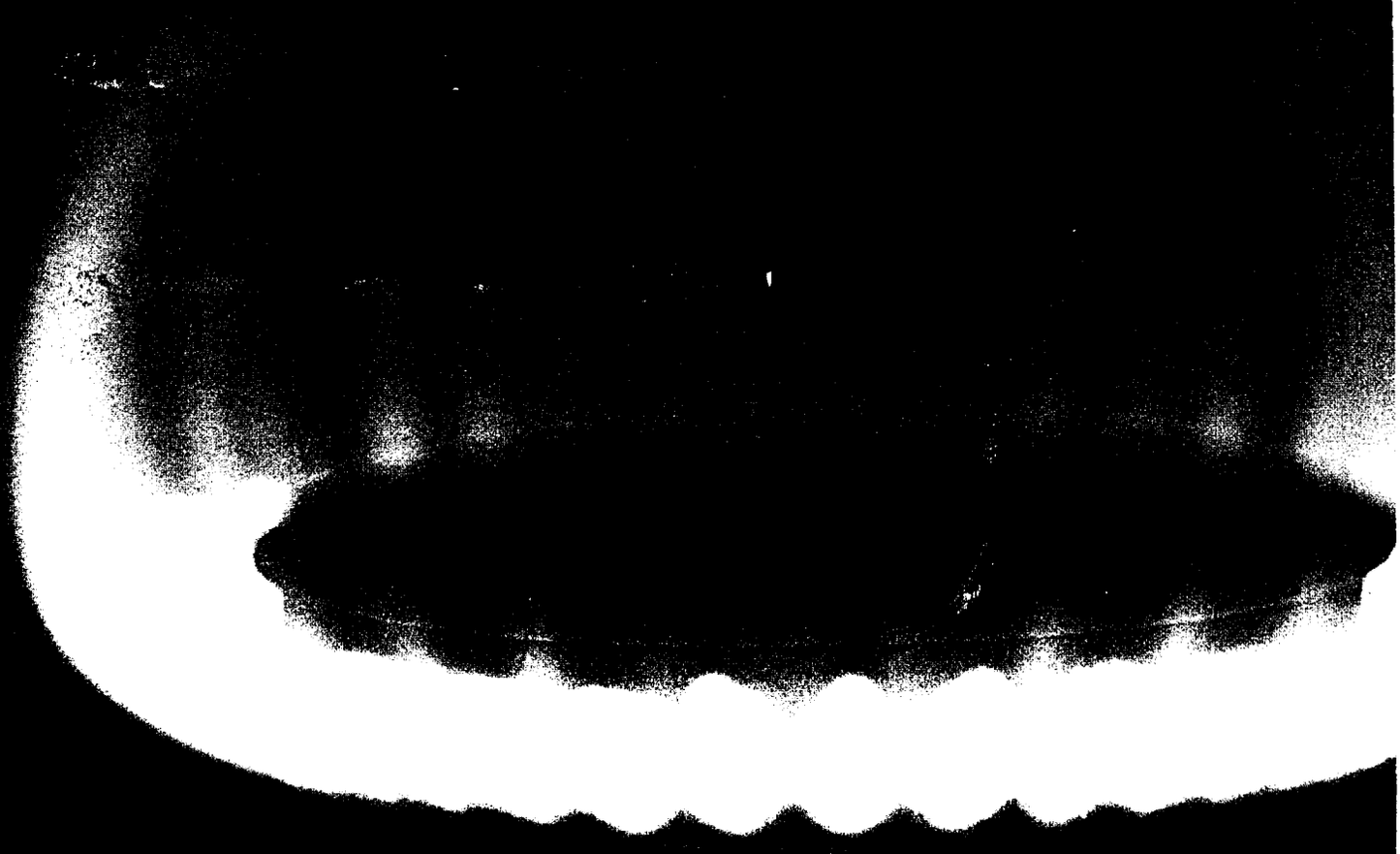

THE BIOREACTIVE LANDFILL

GCLs in Caps and Liners

Timothy Stark, a University of Illinois professor, suggests that the thickness of hydrated bentonite in geosynthetic clay liners (GCLs) might decrease in certain areas of landfill bottom liners, especially under leachate collection pipes, near a sump, at the edge of an anchor trench, or in locations where the slope changes. This is true of bottom liners and, to a lesser degree, final caps.

"Since the introduction of GCLs to waste containment facilities, one of the major concerns about their use has been the hydraulic equivalency to a compacted clay liner," Stark wrote in a paper presented at the 1998 Sixth International Conference of Geosynthetics. "Both field and laboratory tests have shown that the thickness, or mass per unit area, of hydrated GCLs can decrease under normal stress."

Thin areas caused by the migration of the bentonite can endanger the integrity of the liner system so that leachate leaking can occur if holes or tears develop in the overlying geomembrane. Likewise, in a final cap, a thin zone could allow the infiltration of rainwater or the escape of landfill gas.

Stark suggests a number of alternatives in his paper to eliminate or lessen possible migration of hydrated bentonite in a liner or cap system. The GCL may be encapsulated between two geomembranes to reduce dehydration. GCLs may be laid down in multiple layers. Smoothing the subgrade of rocks and ruts can reduce stress concentrations, and greater care can be taken to install a more wrinkle-free overlying geomembrane. He notes a light-colored or white geomembrane that has a lower coefficient of expansion would wrinkle less than the usual black geomembranes.

Stark's research also shows that the insertion of an internal structure (e.g., a geonet) within the bentonite layer of a GCL will protect the bentonite from stress concentration. The geonet used in his testing was heat-bonded to one nonwoven geotextile and the bentonite was poured into the geonet, which was then bonded to the second geotextile. Stark's experiment employed the test method of J.D. Anderson of JANCO Engineering and Sam R. Allen of TRI/Environmental, with some modification to simulate infield waste loading. The geonet appeared to protect the bentonite from stress concentration so as to reduce migration and lessen the chance of punctures.

Stark recommends that evaluators of GCL laboratory tests need to consider infield loading conditions and the presence of geomembrane wrinkles. "In summary," he wrote, "the GCL thickness may be less than the assumed thickness under actual field conditions, and conducting a one-dimensional test on a GCL may not accurately simulate the field conditions in a landfill liner system unless the design and field CQA programs eliminate nonuniform normal loads and geomembrane wrinkles."