# Environmental Containment Using Reinforced Composite Geomembranes: Qualitative and Quantitative Efficiencies in Installation and Performance

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Coal fired power plants continue to be a primary source of electric power throughout the United States, although combustion residuals management regulations have intensified in the last decade. Operations at a coal combustion residual disposal landfill required the construction of a composite lined surface contact water basin for seepage containment. The sequence of geosynthetic installation provided a case study to evaluate installation characteristics of a traditional homogeneous high-density polyethylene film geomembrane compared to reinforced composite polyethylene geomembrane. An ethnographic approach qualitative and quantitative measured the complexity of various facets of installation.

The study commenced with installation of 1.0 mm thick reinforced composite geomembrane in a 7,500 square meter contact water containment facility. Material delivery and storage, installation preparation, complexity of labor, and physical exertion of installers were all qualitatively assessed. Time of installation, including deployment, field seaming, and quality control testing were all quantitatively measured to assess project costs. Subsequently, an identical quantity of 1.5 mm thick homogeneous-film, high-density polyethylene geomembrane was installed in the same facility as a component of the composite liner system. Assessments of installation complexity and labor were recorded in identical fashion. Physical properties of the reinforced composite geomembrane allowed fabrication (i.e., advanced welding into large panels) prior to jobsite deployment, which the traditional high-density polyethylene film geomembrane did not, thereby quantitatively reducing field installation time and labor. Reinforced composite geomembranes demonstrate superior performance in tensile strength, tear resistance, and puncture resistance over homogeneous high-density polyethylene film geomembranes.

Qualitative ethnographic results of the installation comparison found the reinforced composite geomembrane offering clear advantages over the traditional film geomembrane. Documented ease of deployment, field welding, and testing were recorded through field observation and participant interviews. Quantitative reductions in labor and time were also documented, with the reinforced composite geomembrane requiring approximately 15% of the time-labor expenditure needed to install the traditional high-density polyethylene film geomembrane. These findings provide design engineers and specifiers an attractive alternative for geomembrane product selection in environmental containment applications, including water management at coal combustion residuals and other waste disposal pollution control facilities.