



## Geomembranes

**G** eomembranes are permeable fabrics which when used together with soil have the capacity to isolate, filter, support, protect and drain. Geomembranes were previously used as canal and pond liners. However the current and largest application is controlling dangerous wastes. In several of these applications, geomembranes are concurrently used with geotextiles or mesh which offer reinforcement or

protection to the flexible geomembrane while at the same act as outlets for gases and leachates generated in certain wastes. There is an increasingly wide range of geomembrane materials available for use as liners. These include single or co-polymer membranes and blends of two or more polymer materials. Additives such as plasticisers and carbon black are sometimes incorporated to modify the physical or long term ageing characteristics of the geomembrane material. Most polymer materials used in the construction of geomembranes are thermoplastics because they are easier to weld and repair on site

### Choosing on the right geomembranes Permeability

Liquids and gases permeate geomembranes as vapours or gases on a molecular scale by diffusion. The rate of permeation depends on the solubility of the liquid and the diffusibility of the dissolved molecule in the geomembrane. A molecular concentration or partial pressure gradient across the geomembrane will be the driving force for the direction and rate of transfer. This is in contrast to soils and clays, which are porous where the main driving force is the hydraulic head. Gas permeability varies greatly according to geomembrane type and the nature of the gas.



For example, the permeability of a sample of HDPE under test at 23°C was found to be five times greater for carbon dioxide than methane.

### Physical stress

The geomembrane will be subject to physical stresses during transport, site handling, installation and during its life. Some of these stresses can be evaluated from the liner design, for example anchorage arrangements. Other stresses may result from temperature such as induced expansion/contraction. The geomembrane must be able to withstand the physical, biological and chemical stresses it will be subjected during its installation design life. Factors which affect the physical requirements are site topography, types (physical forms) of waste, depth of waste to be accommodated, anticipated compaction equipment and hydrology/hydrogeology of the site. You must provide quantitative evidence to establish that the geomembrane will bear the stress that will be placed on it. Pay particular attention to the apex of any slopes within the site or any other abrupt changes of gradient. These areas may require either some strengthening or modification to soften the angle.

### Environmental stress cracking

A stress crack is defined as either an external or internal crack in a plastic that is caused by a tensile stress less than its mechanical strength. Under conditions of simultaneous stress and exposure to chemicals such as, soaps, oils and detergents polyethylene geomembranes can fail mechanically by cracking. Tests can be performed to indicate the susceptibility of a geomembrane to stress cracking. The opportunity for stress cracking to develop can be reduced by good design and good installation practices.

### Chemical stress

Due to the variety of wastes likely within a landfill, the effects of chemical stress on the liner system is of primary concern, particularly in the long term. The effects of chemical stress may result in degradation of the base polymer, depolymerisation, absorption of waste constituents, and extraction of components of the original geomembrane formulation such as antioxidants. The effects of chemical stress may take many decades to appear. EPA Method 9090 is intended to determine the effects of leachate chemistry on the physical properties of a geomembrane material. The test immerses the liner



material in leachate for a minimum period of 120 days, at both room temperature and 50°C. If you expect higher temperatures, the immersion testing should be at an increased temperature. Comparisons of measurements of the membrane's physical properties, taken periodically before and after contact with the waste fluid, is used to estimate the compatibility of the liner with the waste over time.

It is important that you carefully put a number of factors into consideration before settling on your perfect supplier. The point of focus during evaluation should bend towards sourcing high quality products. Megan Andrianatos, the Sales Co-ordinator at Aquatan stresses the need to source from a reputable Supply and Installation Contractor so as to avoid the pitfalls. She advises potential clients to always demand IAGI Approved Installation Contractors (AIC) accreditation, Electric Leak Detection as well as Real Time Quality control on site. Aquatan is a South African based company that supplies geomembrane products like HDPE, LLDPE, EVA, R-FPP, Hi-Drain which is combined or separately used with Geotextiles, Geosynthetic Clay Liners, Geodrains, Geocells etc. These are available laminated with conductive layers which facilitates Electric Leak Location and also with a white outer layer that reduces thermal expansion and contraction due to diurnal temperature variations. Aquatan is the only International Association of Geosynthetic Installers (IAGI) accredited Approved Installation Contractor (AIC) in Africa with more than 50% of all its welders being Certified Welding

Technicians (CWT).

### **Claiming the African market**

According to Dave Anderson, the head of Technical Sales at Industrial and Environmental Concept Inc, Africa holds the most potential of any continent on the planet. He says the continent as a whole needs to select its business “partners” wisely for

long term benefits. Adding that many African countries have tremendous wealth potential. Despite this potential however, he says Africa suffers from lack of enough money to develop its resources. Atarfil is also among the companies that have set sight on the African continent. Anabel Manzano Herrero, the company’s Marketing Coordinator says ‘Atarfil group is focusing its efforts on African economies, we contribute to sustainability, ensuring the highest level of security to all our projects. Atarfil, which is based in both South and Central Africa produces geomembranes that provide the maximum level of security in the current industry for every type of applications to a very competitive price

