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Pushing the boundaries in geotextiles

As countries industrialise, there is a greater need for efficient infrastructure and for this to be built quicker and more effectively. According to the International Monetary Fund (IMF), growth of the global economy, estimated at 3.1% in 2015, is projected to rise to 3.4% in 2016 and 3.6 percent in 2017. Most of this growth will be in emerging markets and developing economies, which currently account for over 70% of global economic growth. Correspondingly, the global geotextiles industry is currently growing at 10% annually, expected to reach a value of US $16 billion a year by 2016. This trend is partly driven by regulatory support and increased environmental regulations including the management of water-related issues in civil engineering and mining. Nonwoven geotextiles are increasingly being employed in infrastructure projects around the world due to their unique stabilisation properties and flexible qualities which allow them to be tailored to specific terrains. Every year, approximately 750 km^2 of nonwoven geotextiles, equivalent to more than 185,000 football pitches, are manufactured and sold.

Visitors and exhibitors will gather at INDEX™17, the world's leading nonwovens exhibition, in Geneva from 4^{th}-7^{th} April 2017, to gain first-hand knowledge of the latest developments in nonwovens for geotextile applications, with exhibitors showcasing the astonishing functional qualities of these versatile materials, and expert speakers in a dedicated seminar sharing latest trends and case studies.

Geotextiles, typically made from polypropylene or polyester, are being employed in pioneering infrastructure projects around the world, including the world's largest artificial island and the world's longest and deepest railway tunnel. These projects rely on layers of nonwoven geotextiles, which are specifically designed to meet extensive physical requirements and high mechanical demands.

Palm Jumeirah

Nonwoven geotextiles were pivotal in the construction of many of the Gulf region's major landmarks, including Dubai's Palm Jumeirah, an artificial island described as the 'Eighth Wonder of the World'. The island was created using land reclamation and employed 90 million m^3 of sand and rock, extending Dubai's shoreline by 520 km. Engineered fabrics were used in the breakwater to separate the rock base from the sand beach, and to stabilise the roads on each of the island's 17 fronds. Nonwovens were also used for landscaping and in drainage and storm water sewers. These materials had to take into account water depth, wave height and puncture resistance, being flexible enough to conform to irregular sea beds and sufficiently porous to retain fine particles, while allowing the free flow of water. In areas where wave heights were high, this required geotextiles with a puncture resistance of 12,000 newtons.

Gotthard Tunnel

Inaugurated in June this year, the 57 km-long Gotthard Tunnel (the world's longest and deepest railway tunnel), also employed nonwoven geotextiles. Nonwoven fabrics were used to successfully waterproof the tunnel, which was backed with a 200 g/m2 PP geotextile waterproofing membrane, laid inside the tunnel to provide long-term protection support. The Gotthard tunnel is expected to

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revolutionise European freight travel, providing a high-speed rail link under the Swiss Alps between northern and southern Europe. The tunnel overtakes Japan's 53.9 km Seikan rail tunnel as the longest in the world.

Glacial ice melt

In addition to this, the use of nonwovens is one of the measures being taken to reduce glacial ice melt. It is widely documented that many of the world's glaciers will disappear if drastic preventive measures are not taken. Warmer than average temperatures cause snow to melt rapidly, directly exposing glaciers to the sun in the summer. Glaciers are important tourist attractions, however, more importantly, they are a central component of the hydrological cycle and stores of water. During hot dry summers the melting from these reservoirs can balance or reduce any shortcomings in water availability. However, it has been observed in the Peruvian Andes for example, that such natural annual cyclical phenomena are seriously endangered by the effects of global warming, thus dramatically affecting annual water supply.

Nonwoven geotextiles are being used in Switzerland to reduce glacial ice melt and shield snow and ice layers from heat and UV radiation, thanks to their unique, high-tenacity, UV resistant fibres. Often, a two-layer composite needle punched nonwoven is used. In Switzerland, glaciers play an important role as water reservoirs for hydro-power production, generating 50% of the country's electricity. Following similar principles, nonwovens have proven to be advantageous to certain Swiss ski resorts, by reducing the melt rate of snow, thus extending the ski season and ensuring that an adequate supply of fresh snow remains for skiers.

Conductivity

Additional innovations have been made in conductive geotextiles, which are being coated with graphene for advanced manufacturing – a potential game changer for the nonwoven geotextiles industry – with a first successful field trail carried out by Australian companies, Imagine IM and Geofabrics. Graphene is 100 times stronger than steel and a powerful conductor of heat and electricity. Graphene-enhanced geotextiles make leak detection easier and more reliable, and deliver improved performance at lower investment levels. Applications are foreseen in civil engineering, including lining systems for landfills, mining, wastewater treatment plants, reservoirs, industrial processing facilities, dams and other containment projects.

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For any further media inquiries, please contact the INDEX™17 Press Office:
Virginie Bonjour
Burson-Marsteller Geneva
Tel: +41 22 593 69 22
E-mail: virginie.bonjour@bm.com