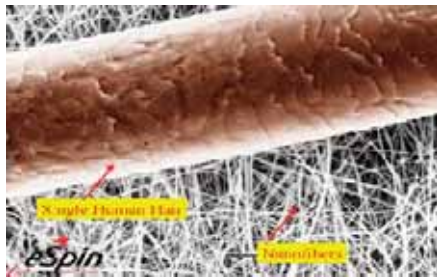


# Electro-Spinning for Technical Textiles

Mr. Nadeem Shukat, Assistant Professor at Fabric Manufacturing Department, National Textile University, Faisalabad presented his paper on, "Electro-Spinning for Technical Textiles – Special Application to Medical Textiles."

The process of Electro-Spinning has been known for almost 70 years. The first patent for this process was obtained by Formhals in 1934. Larrondo & Manley performed a similar work on polymer melts in 1981 followed by research by Reneker and Chun, who have shown the possibility to electrospin a wide range of polymer solutions in 1996. From last two decades Ramakrishna, Zhang, Yoshimoto, Dalton, Kim and so many others are working on different aspects of electro-spinning.

The conventional fibre spinning techniques for the manufacture of filaments yarns and man-made fibers are Wet Spinning, Dry Spinning, Melt Spinning and



Human hair versus nano fibers.

Gel-Spinning. These technologies are capable of producing polymer fibers with diameters down from "mm" ( $10^{-3}$ m) to ( $\mu$ m) micro meter  $10^{-6}$  m Range.

Electrospinning or electrostatic spinning is a process capable for producing polymer fibers in nano meter ( $10^{-9}$ ) diameter range.

## Variables of Electro – Spinning

The variables of Electro spinning which must be controlled effectively and accurately are listed below:

- ❖ Polymer solution variables such as molecular weight and its distribution as well as architecture (branched, linear). Furthermore the solution properties such as viscosity, conductivity, surface tension and volatility (evaporation) are important parameters.
- ❖ Process variables for Electro-Spinning of Nano-Fibers include electrical potential, flow rate of Polymer, distance between capillary & target and ambient parameters of chamber (such as temperature, humidity, air velocity).

# Benefits of Geo-Textile Reinforcement in Soft Soils

Paper on "Benefits of Geo-Textiles Reinforcement in Soft Soils" was presented by Syeda Madiha Zaidi, Assistant Professor at Department of Urban and Infrastructure Engineering, NED University of Engineering and Technology.

In order to encourage the use of geo textiles in road construction – a joint Research Project between NEDUET and TIP was initiated with an aim to explore the following two aspects.

- ❖ the degree by which the life of a pavement over soft soils can be enhanced by the use of geotextiles.
- ❖ cost savings involved ,both at the time of construction and in terms of overall life cycle of the pavement (maintenance cost).

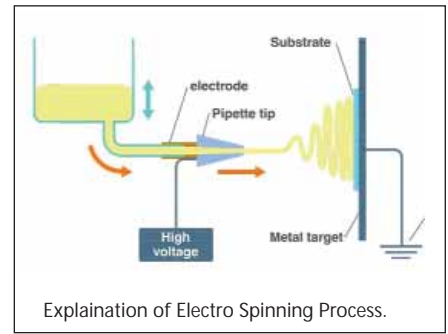
Soft soil is not suitable for construction because of the problems of high compressibility, low shear strength, low permeability, low bearing capacity and excessive settlement. Therefore, under cyclic loading, soft clayey and silts subgrades exhibit large deformation and thus leading the fine grain subgrade into graded base course.

Usual methods of soft soil stabilization are based on use of stone piles, hydrated lime, cement or cement kiln dust, lime and

coal fly ash (CFA) treatment and at times are not effective in the long run. The better option for soil stabilization in road and dam construction is geo textiles. In road construction, geo textiles act as reinforcement element with in a soil mass or in combination with soil to produce a composite with the benefits of stabilization, separation, filtration and compaction. The major functions of Geo textile are stabilization, separation, reinforcement, filtration, drainage and acting as liquid barrier.

The objective of the research work being carried out at the NED University is to highlight soft soil areas in Sindh and promote the use of Geo-Textiles as reinforcement in Soft Soils. The presentation will focus on flexible pavement Construction method, problem in soft soil construction and methods of stabilization before construction in soft soil.

The soft area is 11.4% of the total land area of Pakistan (90,400 hecstres).



Explanation of Electro Spinning Process.

## End-Uses of Nano-Fibers

Some of the end uses are self cleaning cosmetic skin masks, skin therapy with medicine, protective clothing for military personnel for anti-bio chemical gases and efficient aerosol trapping and filter media for liquid and gas filtration.

Industrial application includes photo-voltaic devices such as nano solar cells, micro and nano electronic devices, LCD devices and other application in electromagnetic interference shielding. In medical textiles, the nano technology is used for tissue engineering scaffolding. Examples include porous membrane for skin grafting, tubular shapes for blood vessels and nerve regeneration and also 3 D scaffolds for bone and cartilage regeneration.

Another very interesting facet of nano technology is application in thermal sensors, piezo electronic sensors, biochemical sensors and fluorescence optical chemical sensors. ♦

According to the data of soft soil, two major highways of Pakistan (N-5 and N-55) traverse through this area, N-5 connects Karachi-Lahore-Peshawar and N-55 (Indus Highway) connects Kotri-Shikarpur-D.G.Khan-D.I.Khan-Kohat-Peshawar.

The National Highway Authority (NHA) has planned to improve and widen the road to international standards i.e, 7.3m carriage-way with 1.3 m shoulders on either side. The 61-km long Lakhi-Naudero-Larkana section has recently been finalized for construction.

Condition of the parts of the roads which lie in soft soil areas are investigated and experimental work on Triaxial samples using Triaxial Apparatus is being organized.

Pressure will be applied on samples, with vertical and horizontal stresses acting on the samples will be determined as both woven and nonwovens samples of Geo-Textiles will be part of the experiment. The work in progress is to determine how Geo-Textiles can enhance stability of roads. ♦