

SPECIAL FEATURES



PROCESSING OF PINE NEEDLES (PERUL) FIBRES IN TEXTILE INDUSTRIES

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The yarns with 70:30 Cotton: PNF (actual in yarn stage) was successfully spun and yarns were sized and woven into fabrics using loom and the fabrics have unique look and are useful to produce Jackets, home textiles and apparels.

There are various types of fibres available as textile fibres. These are either natural or manmade (synthetic). Recent trends show that use of natural fibres is increasing all across the world as compared to synthetic fibres because natural fibres are eco-friendly, skin friendly and most importantly they are biodegradable. The Indian Himalayan region has enormous natural fibre wealth, including pine needles. These fibres are being used by the local people in a very casual way to fulfil their bare minimum needs.

Due to insufficient possibilities of employment in hills, poverty prevails in the hills. Further, the most negative and damaging impact is that pine needles (called perul in local language), fall down every year in abundance which catch fire and become highly combustible after getting dried. This leads to a forest fire causing huge losses to the people living in the region.

Thus, it can be concluded that there is strong need to open the path for generation of employment at hills. Textile is the second largest employment giving industry in India and so it is better to exploit the use of natural fibres of the region to bring happiness to the hill people by upbringing their livelihood & earnings and reducing chances of forest fires. It has been observed that the products developed from these fibres have very high domestic and export demand.

Production of Pine Neddles Fibres

The process for fibre extraction from Pine Needles (Perul) which involves low temperature and low alkali fibre extraction followed by silica removal together with provisions for softening of fibres. A plant fibre forms a fibre extracted from stem, leaf of plant and can be also produced by plant as protecting seed hairs. In existing ex-

traction process pine fibre is extracted from leaf of pine tree that is also called as pine needle or Perul. Fibre extraction is carried out by cooking the needles. Cooking constitutes a process in which pine leaves are treated with certain chemicals at boiling temperature. Design Academy Eindhoven graduate Tamara Orjola's Forest Wool stools and carpets are made from processed pine needles left over from the timber industry.

By crushing, soaking, steaming, binding and pressing the needles, Orjola extracts the pine needles' fibre and transforms it into textiles, composites and paper. The process also allows essential oils and dye to be extracted and used.

Further, the extraction processes are accompanied by manual/machine decortications of boiled pine needles. The chemicals that are used in extraction are generally alkali or salt, which are used at boiling or elevated temperature. In order to impart clean look, the process is generally accompanied by bleaching. The bleaching can be done by any of the available method like hypochlorite bleaching or peroxide bleaching etc. However, the fibres produced are short and coarse. The extraction of pine fibre by treatment with alkali followed by soaking in water, wherein material must be treated at 212 Fahrenheit. Variable size fibres can be obtained.

According to this process, the needles or pine-straw not only has the effect of dissecting the fibre vascular bundles, but the contour of the fibrils is also altered. By the constant circulation of the alkaline solution and subsequent washings with water, the pores or cells are thoroughly permeated, a great deal of foreign matter is driven out, and the place of the old natural constituents is taken by the new chemical compounds. By the decorticating process a great deal of organic matter is rubbed

out and the teeth of the cards are enabled to readily take hold of the mass to finally remove all foreign and objectionable matter and to affect the shredding of the leaves, which may be done to a greater or less degree to produce a fibre of fine or coarser grade, as desired. The pine needles are treated with warm or hot alkali. After alkali treatment needles are passed between pressure rolls. Pressure applications are followed by washing, wherein pressures are applied to loosen the silica. Silica removal is necessary as it is the constituent in the fibre that is mainly responsible for brittleness.

Also in the currently available technologies, there are no provisions to achieve softness and for textile processes flexibility is required because stiffness leads to breakages during fibre processing in different textile process.

The pine fibres are conditioned at 27 + 2 C and 65% + 5 Relative Humidity.

The treatment of conditioned pine fibres carried out with alkali for 30 minutes to 10 hours, concentration of which varies from 0.5 to 5%.

The treatment with metallic salt is conducted for 30 minutes to 10 hours having concentration of 0.5 to 5 The treated pine fibres undergoes decortication followed by washing.

The washing is done by means of soft water.

The bleaching is conducted by Hydrogen Peroxide (H₂O₂) having concentration of 1-2 grams per litre together with 0.5-2 grams per litre NaOH and 0.25-1 grams per litre peroxide stabilizer.

The drying is carried out for example at 120°C for about 20 minutes to extract fibre.

The process for fibre extraction from pine needles comprising steps of sorting of pine needles, pine fibres conditioning, dual chemical treatment, decortication, washing, bleaching, drying of fibres followed by softening and fibre extraction the metallic salt has silica removal action, which decreases harshness. This leads to softening of fibres. Thus, loosening of lignin and silica removal is carried out by the aforesaid chemical processes. The finally treated pine fibres undergoes decortication manually or by a machine. The decorticated fibres are then washed by means of distilled water.

The washing is followed by bleaching and drying. The bleaching is conducted by Hydrogen Peroxide (H₂O₂) having concentration of 1-2 grams per litre together with 0.5-2 grams per litre NaOH and 0.25-1 grams per litre peroxide stabilizer for nearly 15 minutes. The bleached pine fibres thus obtained are dried in a drying chamber for example at 120°C for about 20 minutes to extract fibre.

The devised process of invention results in produc-

tion of soft fibres facilitating the process. Softening is achieved by means of oil in water emulsion method.

The temperature is near to room temperature and said alkali is in the range of 0-8%.

Properties Of Pine Neddle Fibres

Parameters	Pine needles
Tenacity (g/den)	1.1
Min.	0.32
Max.	3.63
Average	1.1
CV%	66.8
Elongation%	5.94
Min.	0.8
Max.	10.1
Average	5.94
CV%	41.25
Count (Denier/Ne)	87.69/60.61
Bundle strength (g/tex)	5.64
Elongation%	6.9
Moisture Regain	11 %
Fiber Length Range:-	3-8 cm
Anti-Microbial Property	Yes
Average fiber Fineness	88.56 micron
Crystallinity	61.76 %

The silica removal is accomplished at low concentration of chemical for complete removal thereof.

USES OF PINE NEDDLES FIBRES ;

The pine needle fibres (PNF) have been blended with cotton in different ratios and it was found difficult to spin yarn as the percentage of PNF fibres increases. Also it is observed that there is preferential loss of PNF in carding, resulting in less PNF percentage in resultant yarn. The yarns with 70:30 Cotton: PNF (actual in yarn stage) was successfully spun and yarns were sized and woven into fabrics using loom. The fabrics have unique look and are useful to produce Jackets, home textiles and apparels.