Foot – Comfort Materials (Research - Technologies)

Mathivanan.S
Senior Principal Scientist ,SDDC,CSIR-CLRI

Locomotion

The foot is a highly complex structure and is a mechanical marvel for human- locomotion. In a life time, an average individual will walk around the world more than 4 times – approximately a distance of 115000 miles. Therefore, it is not surprising that even a healthy person can develop many foot problems

Footwear

Footwear is a ever-demanding consumer product. Footwear becomes increasingly reliant on new materials and technologies to meet the growing consumer needs. In the present scenario, the consumers are constantly looking for footwear with next level of comfort and durability. Footwear is a product providing remedial solution for the customers.

Future Technologies of Footwear

To design and development of next generation footwear, it is the need of hour to bring together high quality and state of the art contributions from designers, bio-mechanists, ergonomists, engineers, podiatrists, pedorthists and scientists from academia and industry. The composition of professionals from multidisciplinary background will be a way forward for the future.

Professionals for next generation Footwear

Podiatrist

Footwear Stylist

Bio-Mechanist

Ergonomist

Pedorthist

Shoe Maker

Gait

Gait is the pattern of movement of the limbs of animals, including humans, during locomotion over a solid substrate.

Foot-Comfort Materials

- Shoe Inserts
- Arch Supports
- Metatarsal Pads
- Heel Cups

Shoe Inserts

Shoe Inserts are helpful to correct varied foot bio-mechanical problems. These inserts will be inserted into the footwear to gain therapeutic benefits for the end-users.

Arch Supports

Arch Supports are used to provide extra support for those with high arches or flat feet and these would be helpful to reduce foot-pain problems. The foot in a neutral position is possible by using arch supports.

Metatarsal Pads

Metatarsal Pads are placed under the ball of the foot to primarily decrease the pressure on the metatarsal bones. These bars would be very much useful for athletes and those experiencing pain in mid foot region.

Heel Cups

Heel cups are often prescribed by physical therapist to reduce symptoms of foot pain , heel pain and plantar fasciitis. These cups are used to cushion the heel and helpful to decrease the stress on plantar fascia.

Polyurethane Foams as Shoe inserts for foot-comfort applications

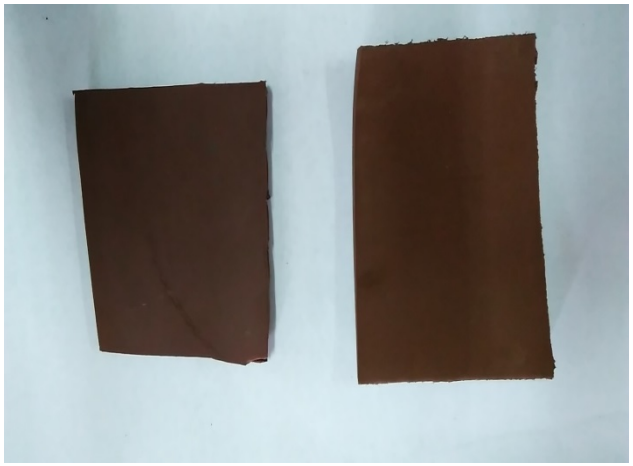
In SDDC, the PU foam materials of varied density characters were assessed following physical test methods.

Static Compression Universal Machine Dynamic Compression

The appropriate material of choice as shoe insert was scientifically ascertained and recommended for foot-comfort benefits for end-users. This research findings was published in Journal of Polymer Engineering.

Ethylene Vinyl Acetate Foams

The EVA foam materials have been sourced for research and the experiments are in progress in SDDC.



Design Innovations in Footwear

The Primary objective of design innovations in footwear is to reduce the plantar pressures exerted during locomotion.


Height - 40 MM (Mid-line)
Angle - 10 degree

Exploring Research using Gait facilities

The Gait laboratory established at SDDC is a boon for Footwear research applications. The shoes developed can be experimented with the participation of subjects using the gait facilities.

Force Platform

Pressure mat system

Plantar Pressure Analysis

Plantar Pressure Analysis – Pedar System

The shoes with varied heel configurations (18 nos) would be scientifically investigated using Pedar system. The shoe displays minimal plantar pressure value would finally be recommended for the beneficiaries. Later, the research findings will be submitted for international publication.

Inspiration on Smart Footwear

The idea behind Smart footwear is to improve performance and augment user's lifestyle.

Smart footwear with embedded sensors that could track distance travelled, calories burnt and other bio metric data.

Footwear for sporting activity with soccer cleat patterns to maximise agility and responsiveness.

Footwear with super light weight feature.

Think – A Step ahead

It is a need of hour for the footwear industries to gradually transform into foot - care materials based industries.

The Manufacture and Technology of foot- comfort materials would be the future direction for industries. Let us take a stride for the future challenges.

S. MATHIVANAN, Senior Principal Scientist,CSIR-CLRI, INDIA