

# Investigating Grip Study of Different Types of Footwear Soling Materials in SATRA Std

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**Abstract:- An outsole is a critical bottom part of a shoe that is available in direct touch with floor in line with shoe production. Shoe outsole undergoes exclusive forms of stresses & strains even as standing, on foot, going for walks and so forth. And those stresses & traces range material to material. In this analysis, slip resistance of an outsole version using unique materials has been analyzed to discover the grip of a sole. Slip Resistance is the amount of resistance the only of the shoe exerts even as moving over the on foot floor. It is measured in COF Coefficient of Friction, which is same to the ratio between the maximal frictional pressure that the only of the shoe exerts and the pressure pushing the sole across the floor.**

**Keywords:-** Outsole materials, Soling Materials, Material properties, Slip Resistance Testing.

## I. INTRODUCTION

Footwear plays an important function in protective the foot from the alternative resources via reducing the dangers associated with trauma and allows users to have ached unfastened locomotion over quite a number walking surfaces. Footwear is considered as one of the predominant requirements of a whole gown look. There are diverse styles of shoes with one of kind buildings worn via humans to fulfill their requirements. The design of shoe varies fairly thru time and from subculture to way of life, with appearance firstly being tied to feature and extra over fashion dictated many design factors, consisting of whether or not shoes have very excessive heels or flat ones. A contemporary shoe varies widely in fashion, complexity and value. All footwear has an outsole, which is the bottom part of a shoe in keeping with shoe creation. The outsole is the layer in direct contact with the ground. Dress footwear often have leather-based or resin rubber outsoles, informal or paintings orientated shoes have outsoles made from herbal rubber or an artificial material like polyurethane. The outsole might also incorporate a single piece, or may be an assembly of separate pieces or one of a kind substance. In a few footwear, the heel of the only has a rubber plate for durability and traction, at the same time as the front is leather-based for fashion. Some special footwear will often have adjustments on this design; athletic or so referred to as cleated footwear like soccer, rugby, and baseball and golfing footwear have spikes embedded within the outsole to improve traction. Outsoles may be crafted from an expansion of materials, despite the fact that maximum current footwear has outsoles crafted from natural rubber,

polyurethane, or polyvinyl chloride (PVC) compound. Outsole thickness and density and the type of substances used in manufacture and layout also vary among manufacturers. Changes in density and thickness have been proven to affect the steadiness and balance of the user. Shoes which are synthetic with a thicker and softer outsole had been related to will increase in dynamic instability and a reduction is postural stability. Conversely footwear which has a thinner stiffer outsole enhances each stability and balance parameters. The design of outsoles immediately affects the floor response pressure strolling. In order to design a practical outsole, biomechanics and other new technologies ought to be considered and the layout procedure ought to be tested inside the biomechanics laboratory over and over. Slip resistance is the most important method to analyses the grip of a outsole. The slip resistance is all about traction and grip among a shoe sole and the floor, with this may complete gadget for measuring slip resistance, each in flooring and in shoes. Slip resistance measured on a scale based on the COF. The scale runs from 0.00, equivalent to an ice skating rink or some other extraordinarily slippery condition, up to 1.00, that's like strolling on dry carpet. So essentially, the better the quantity, the more the slip resistance.

## II. MATERIALS AND METHOD

The soling substances are Poly Urethane (PU), Thermoplastic rubber (TPR), High density polyethylene (HDPE) and Polyvinyl chloride (PVC). By knowing the COF of the specific sole material can calculate the slip resistance.

## III. MATERIAL PROPERTIES

Polyurethane is a circle of relatives of polymers containing urethane chemical linkages formed through reacting substances containing hydroxyl chemical agencies with isocyanates. Good footwear ought to be cozy, long-lasting, and in shape for cause – not to mention lower priced. Polyurethanes allow designers to meet all of those objectives. Light but exceedingly abrasion-resistant polyurethanes are perfect for hardwearing shoe soles, with remarkable lengthy-time period mechanical residences. Thermoplastic rubber is one of the maximum not unusual materials for making shoes outsoles. TPR is a shape of artificial rubber this is thermoplastic. There are some of reasons for its reputation as a soling fabric, now not the least of that is its ease of molding. Other benefits encompass: the slip resistance of TPR sole that is advanced to almost each

different commonplace soling cloth; flexing resistance is likewise superb, acting in particular nicely at very bloodless temperatures. PVC is a thermoplastic fabric. Thermoplastic materials are people who may be melted time and again. These substances may be heated to a positive temperature and could harden once more as they cool. Besides technical performance, environmental performance is likewise of fundamental significance in selecting the substances today. PVC is one of the materials that first-class satisfies each requirement. HDPE is extremely harder and extra opaque and it may resist instead higher temperatures. With a high energy-to-density ratio, HDPE is used inside the manufacturing of plastic bottles, corrosion-resistant piping, geomembranes, and plastic lumber. HDPE is usually recycled. HDPE is understood for its big electricity-to-density ratio. It is likewise more difficult and extra opaque and can resist really higher temperatures (a hundred and twenty °C/ 248 °F for short durations, one hundred ten °C /230 °F constantly).

#### IV. SLIP RESISTANCE MEASUREMENT

Slip resistance dimension is one of the most crucial boundaries to the development of slip resistance shoes. A current rely identified round ninety two techniques for the check of slip resistance the use of sixty two distinct gadgets since the first recognized tool was developed within the 1930s. All the check methods calculate the CoF by means of measuring the vertical and horizontal pressure along with the movement guidelines. However, the test outcomes aren't regular despite the equal take a look at methods and testers. One of the most essential motives is that the friction properties are sensitive to intrinsically noisy and outside versions, e.G. Slip velocity, contact strain, touch attitude, sort of floor, form of contaminant, and fabric abrasion resistance. Thus its miles continuously changed as a characteristic of those complex variations. There are numerous factors of slip resistance size which are predicted to be further studied and clarified. X Validity. Legitimate approaches have to offer pertinent measurements that are correlated with the actual slip resistance during strolling. In order to enhance the validity, extra studies is expected no longer most effective at the CoF of shoes under unique conditions however also on distinct varieties of gait, accelerations, decelerations, in addition to conditions particular to on foot through curves. In addition, the study on the relationship among problem evaluations with bodily measurement would also gain for increase the validity. X Reproductively. Slip resistance may be very sensitive to the ground surfaces which can be in contact (ground fabric kind, roughness), to contaminants gift between the floor and shoe (amount, viscosity), and to the motion of the shoe at the surface (slip speed, contact pressure, contact angle).

#### V. CONCLUSION

Research institutes like SATRA has completed enormous paintings on checking out techniques and layout tenet for higher slip resistance. This paper summarized the know-how and pointers which shed some light on how to choose the slip resistance and choose the shoes. It requires expertise and accumulation to select the right shoes healthy to one of a kind applications and purposes. It is even extra hard to develop shoes to achieve exact slip resistance towards distinctive programs. It has already acquired significant outcomes and gathered expertise at the improvement of slip resistance cloth and pattern layout. However, greater research and technological step forward are required to expand merchandise that would considerably reduce the threat of slips and falls and ensure the protection of employees. For instance, greater paintings desires to be carried out to find out the correlation and magic of the complicated aggregate and interplay of cloth ingredients, residences, sample layout and dimensions, and so forth. While it may take enormous time to make the leap forward and conquer the demanding situations, protection managers should usually unfold and enhance the primary knowledge (suggestions, benefits, and boundaries of slip resistance shoes) as a way to better assist their employees in choosing suitable merchandise against the particular application for stopping slips and falls. In this paper, the authors also mentioned destiny challenges and top unsolved issues the shoes producers are going through inside the regions of slip resistance development and development. Hope the discussion helps to advantage insight into the reputation quo and future instructions in slip resistance research and opens a provocative discussion board for dialogue.

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