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### Design and analysis of bullet proof jacket

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#### ABSTRACT

A ballistic vest or bullet-resistant vest, often called a bulletproof vest, is an item of personal armor that helps absorb the impact and reduce or stop penetration to the body from firearm-fired projectiles and shrapnel from explosions, and is worn on the torso. Now-a-days the Indian Army using bullet proof jacket that weight's 15-18 kg and above. Also the design of jacket is straight and curve shaped structure. The straight shape structure will pass through the vibration full bullet proof plate. So it breaks when the bullet attacks for more vibration. So we are planned to change the design of the bullet proof jacket.

**Index words:** Design, Vibration, Structure

#### INTRODUCTION

Now-a-days India using bullet proof jacket is made by Kevlar. The Kevlar has high impact strength compared to other material using bullet proof vest and also it is a composite material. The vest is straight and curve shape structure. The design of composite armor is a very complex task as compared to conventional single-layer metallic armor, due to the exhibition of coupling among membrane, torsion and bending strains, weak transverse shear strength and discontinuity of the mechanical properties along the thickness of the composite laminates. This has drawn attention of several researchers to study the penetration phenomenon in composite armors.

The first protective clothing and shields were made from animal skins. As civilizations became more advanced, wooden shields and then metal shields came into use. Eventually, metal was also used as body armor, what we now refer to as the suit of armor associated with the vehicle design.

The ballistic vest are very strong fibers to "catch" and deform a bullet, mushrooming it into a dish shape and spreading its force over a larger portion of the vest fiber. The vest absorbs the energy from the deforming bullet, bringing it to a

stop before it can completely penetrate the textile matrix. Some layers may be penetrated but as the bullet deforms, the energy is absorbed by a larger and larger fiber area. Some vests designed for bullets offer less protection against blows with the knights of the Middle Ages. However, with the invention of firearms around 1500, metal body armor became ineffective. In general, the battlefield demands durable, reliable, light, maneuverable and fast vehicles which, at the same time, can provide the required level of protection for the vehicle occupants. The traditional steel armor, while providing the required level of protection for the on-board personnel and do it at a relatively low cost, contributes a prohibitively large additional weight to the battle vehicles, often increasing the loads beyond the levels anticipated during from sharp implements, such as knives, arrows or ice picks, or from bullets manufactured with hardened materials, those containing a steel core instead of lead. This is because the impact force of these objects stay concentrated in a relatively small area, allow them a better likelihood the fiber layers of most bullet resistant fabric's used in soft armor. Contrast, stab vests provide better protection against sharp implements,

but are generally less effective against bullets. however, soft armor will still protect against most slashing stocks.

## LITERATURE REVIEW

- Anish A, Gokul R, Kirankumar C, Marimuthu S, they tells about Analysis of Nano-Nickel Coated Kevlar Bullet Proof Vest. Design and analysis of a bullet proof vest with and without Nano metal reinforcement. The base material is Kevlar (ballistic material) and nickel is used for Nano metal coating. The optimum weight of the bullet proof vest when reinforced is determined in order to compensate for the body performance with less bullet penetration.
- Dr.JawadKadhimOleiw Dr.AbassKhammas Hussein SuraHameed Ahmed, they tells about Experimental and Numerical Analysis of Bulletproof Armor made from Polymer Composite Materials.
- Naveen Kumar A, they tells about Bulletproof Vest and Its Improvement. The aim of this paper to study bulletproof vest. The material Kevlar, spectra shield, twaron are used in making bulletproof vest. History of armors used in many countries. Making of Kevlar and by using it making of bulletproof vest. Study and classification of bulletproof vests - Type I, Type IIA, Type II, Type IIIA, Type III, Type IV. Quality control and tests for vest like fiber and yarn tensile strength, the tensile strength of the resultant cloth Spectra is also tested for tensile strength by the manufacturer. Bulletproof vests are tested both wet and dry.
- PuranSingh,PriyawartLather,Vikas Malik, they tells about Carbon Nanotubes (CNTs) Futuristic Body Armor. The project aims at studying various composite materials used in bullet-proof vests and to analyze their effectiveness by using FEM technique. Hence obtained data would be utilized for designing an optimized bullet-proof vest. When a handgun bullet strikes body armor, it is caught in a "web" of very strong fibers. These fibers absorb and disperse the impact energy that is transmitted to the vest from the bullet, causing the bullet to deform or "mushroom." Additional energy is absorbed by each successive layer of material in the vest, until such time as the bullet has been stopped. Most anti-ballistic materials, like bullet proof vests and explosion-proof blankets.
- Sandun E A K Fernando, they show the design of a bullet-proof vest using shear thickening fluid. Bulletproof vests are used to protect the user from bullets fired at them. Various such vests are currently available and are bullet resistant to a particular threat level. The protection is given by the material used to produce the ballistic panel. Different types of materials can be used to obtain various properties and different strength levels. While the material imparts strength, the amount of material used also affects the protection. The current focus in the market is to produce vests with minimum weight and thickness. The target of this research was to develop a ballistic panel using textile materials. Further, the possibility of using a Shear Thickening Fluid was explored in order to reduce the amount of textile fabric used.
- Sujith N, Chethan K, Sandeep M, Sanjay M, ShaikhKhader Bas, they tells about Impact Analysis of Bullet on Different Bullet Proof Materials. When a handgun bullet strikes body armour, it is caught in a 'web' of very strong fibers. These fibers absorb and disperse impact energy that is transmitted to the vest from the bullet causing the bullet to deform. The project aims at studying various materials used in bullet proof jackets and to identify the best one based on directional deformation, total deformation, shear stresses and principal stresses when it is subjected to bullet impact. This work focuses on the preparation of polymer matrix composite specimens by (Hand Lay-Up) method to make bulletproof armor from the unsaturated polyester resin (UP) as a matrix reinforced by Kevlar fibers at different volume fractions with and without (3%) of Al<sub>2</sub>O<sub>3</sub> powder. The tensile test was performed for these composite specimens which include: (modulus of elasticity, tensile strength and elongation percentage), in addition of ballistic test were studied. The results of this work show that the values of tensile test increase with increasing the volume fraction of fibers.
- Trushant Dhode, GirishPatil and E Rajkumar, they tells about Impact analysis of side door of a

car and bullet proof vest with material 'SAM2X5-630' using finite element analysis. The components which are bound to impact are subjected to deformation even though it may be for a small scale. The efforts are always on for finding the best material to take impact that has no failure or moreover, less plastic deformation. A newly found material which glass matrix steel named as 'SAM2X5-630' has astounding high elastic limit of 12.5GPa. Thus it can take powerful impact & regain its original shape avoiding the deformation of component under impact. The paper is focused on performing the Finite element analysis to assess the behavior of 'SAM2X5-630' steel under impact loading of side door of car as well as impact of bullet on bulletproof jacket on which the material is assigned. The displacement or deformation occurred during impact is found to be lesser than known materials like Kevlar in bulletproof vest and Aluminum alloy in car door.

- WaseemYounasM, they tells about Carbon Nanotubes (CNTs) Futuristic Body Armor. The body armours used by defense sector are not reliable when it comes to lethal weapons, modern bullets, and explosives with shrapnel. Carbon Nanotubes (CNTs) are very small, lightweight, and many times stronger than steel and Kevlar. The fascinating physical, mechanical, and electrical properties of CNTs are ideal for

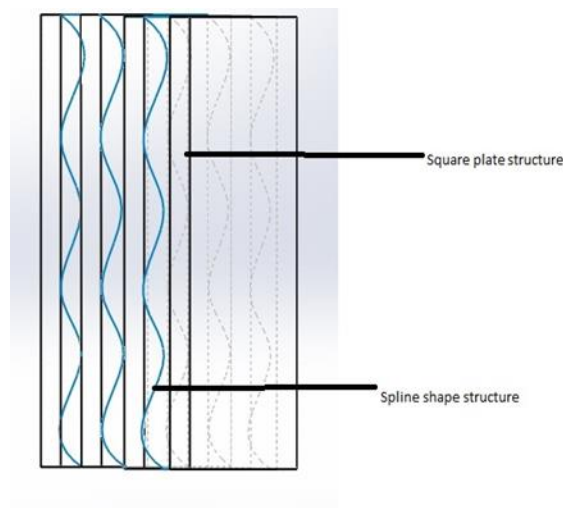
futuristic ballisticarmour incorporated with electronics and micro sensors. This paper provides an insight into the various applications by CNT'S which will enable new defense applications, including; smart lighter camouflage capable of solar energy storage.

## BULLET PROOF JACKET

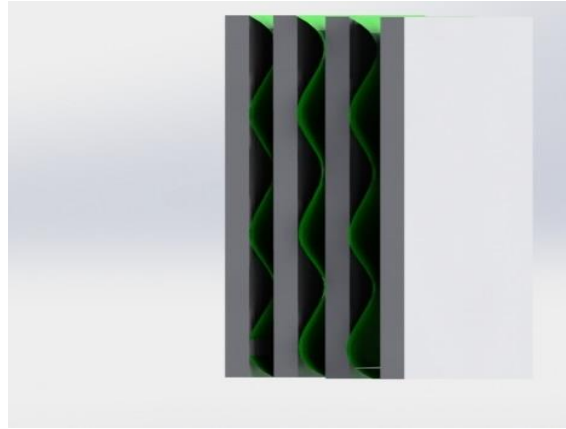
A ballistic vest or bullet-resistant vest, often called a bulletproof vest, is an item of personal armor that helps absorb the impact and reduce or stop penetration to the body from firearm-fired projectiles and shrapnel from explosions, and is worn on the torso. Soft vest are made of many layer of woven or laminated fibers and can protect the wearer from small-caliber handgun and shotgun projectiles, and small fragments from explosive such as hand grenades.

Ballistic vests use layers of very strong fibers to catch and deform a bullet, mushrooming it into a dish shape, and spreading its over a larger portion of the vest fiber the vest absorbs the energy from the deforming the bullet, bringing it to be stop before it can completely penetrated but as the bullet deforms, the energy is absorbed by a larger and larger fiber area.

The new design has reduce the vibration of bullet attacking.so it quickly cannot be brake.



**Fig.1 Shows side view of bullet proof vest**

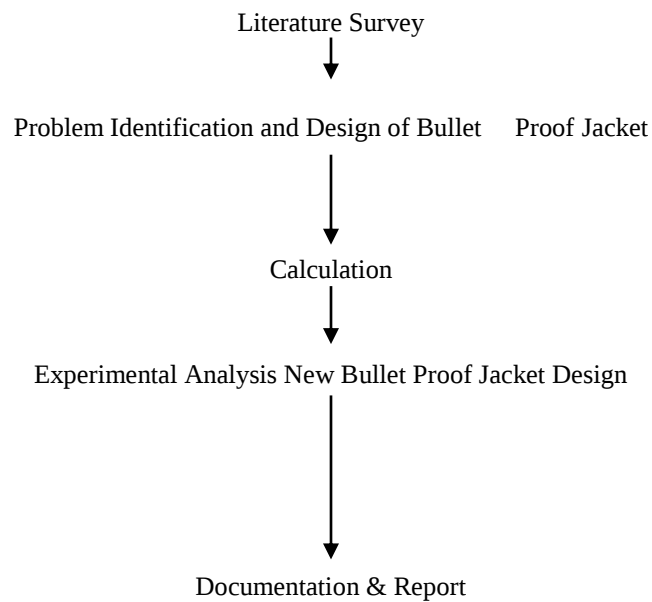


**Fig.2 Shows wire frame model**

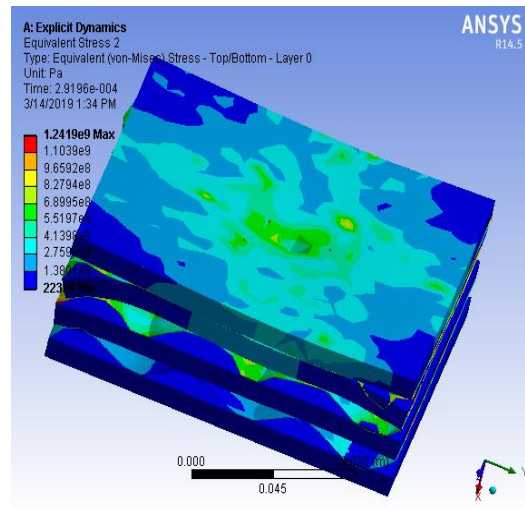
## PROBLEM IDENTIFICATION

- The current bullet proof jacket weight is 15-18 kg.
- It can't able to with stand more vibration when bullet attacking.
- In the design of bullet proof jacket is straight structure. Fig.1 Shows side view of bullet proof vest.

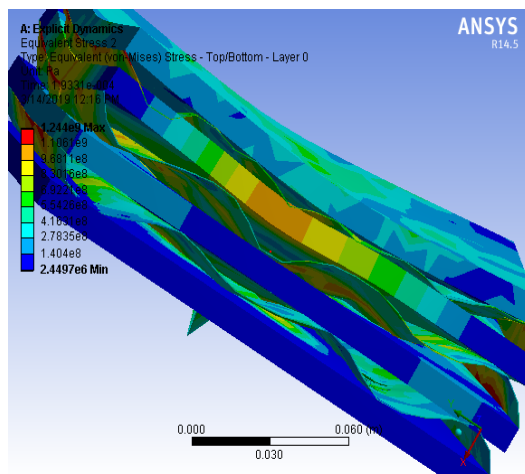
## METHODOLOGY



## RESULT



**Fig.3 Impact analyze using copper bullet**



**Fig.4 Impact analyze using stainless steel**

## CONCLUSION

The project carried out to reduce the weight and withstand more vibration for using the Kevlar

for withstand high impact strength compare to now using bullet proof vest.

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