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ANALYSIS OF HONEYCOMB HELMET FOR RIDERS

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Abstract
Motorbike riders are among the most susceptible road stoners. The improvement of the protection offered by motorcycle helmets through use of non-conventional energy absorbing paraphernalia could significantly reduce the number of motorcyclists ' misplacements. Their edifice and protective capacity are altered in high- energy bumps. Beside their energy absorption capability, their volume and cargo are also important issues, since advanced volume and burden increase the injury trouble for the user's pate and region. Every time multitudinous employees are turned off or seriously injured in the erection sedulity as a result of head afflictions. breaking an unhappy safety helmet significantly reduces the trouble of injury or indeed death. Protecting headwear could bar your life span. At present-day métier of the helmet, with sedulity is not as much of payable to infelicitous big of material, lop-sided pressure spreading and blow shacks. The end of the proposal is to intensification the strong point of artificial head covering by production the alter construction in presence one. truly strategy, shock absorbers analogous as honeycomb families can be every day for crashworthiness enrichment and the grouped honeycomb building is principally introduced as a surprise absorber, tailed by the prolusion of its absorbed ginger and the force and acceleration applied to the tenant. This design investigates the coupling of hexagonal aluminum honeycomb with polymeric lathers for the design of innovative and safer motorbike helmets. The edifice of helmet will be modeled by move of ANSYS software and chording to Indian cut-and-dried IS9844 to mock head impact by various original velocity. trial holding are subsequently used to validate a finite factor model of the instance will be test for improvement of esprit Absorption rate will be bear out.

Keyword Energy Absorber, Helmet, Hexagonal Honeycomb, Impact, Polymer Foam.

prolusion
All helmets article to cover the manipulator's nut by swallowing mechanical dynamism and guarding against dispersion. Their shop and defending capacity are reformed in high- energy jars. Near their race- absorption fitness, their dimensions and heft are also chief issues, since advanced total and weight growth the grievance trouble for the manipulator's bonce and part. Every time infinite jobholders are killed or totally injured in the creation, manufacturing and power sedulity because of head grievances. Wearing an pertinent safety helmet expressively reduces the anxiety of disorder or indeed bereavement. Protecting headwear possibly will save your life. At immediate force of the hood exploiting sedulity is a lesser amount of due to infelicitous picking and big of material, uneven pressure dispersal and blow holes. The end of the strategy is to growth the strength of mock helmet shell by consuming emulsion timber. The safety head covering titled should gratify certain version environments entailing shock absorption, rebelliousness to penetration. To clock this enhancement in shell stuff by using emulsion making will be studied in thisproject.

II. Literature Review

Ankuloria(1) arbitrated that when the glass fiber engrossment increased in the reused ABS from, 10, 20, 30 wt, the tensile strength, tensile modulus was bettered but strain value lowered. adding the attention of eyeglasses fibers also shows better band between ABS and SGF. 12) Yusuke Miyazaki(2) ascertained that
when raging rate of the insert and the shell- gluiness were varied, showed that there is an

optimum blend where the mortar cut fails lacking the liner bottoming, reach the summit of the shock absorption passes of a headdress.1 Anil Kumar. K(3) carried out would flux breakdown on headdress by using flexible advocate which is a part in pro/ E. He set up that the Nylon 4- 6 plastic is well-founded rather of ABS plastic and impact ABS plastic for forming safety helmets byinjectionmoldingprocess.Terry Smith(4) hauled out three-dimensional finite constituent models(FEM) of the helmet factors and the test bean form were developed using MSC software and raw material parcels were guesstimated. He concluded that there are a number of presently available paraphernalia from which energy absorbing(EA) liners could be framed that could meliorate the impact account of the being HGU- 84/ P helmet. FEA can be an effectual tool for the deconstruction and game of both new andbeinghelmetdesigns.S. Soe(5) caught on that cellular structure- predicated interior liners, manufactured via accretive manufacturing operations, have provocative unspoken towards completing bikehelmetsafety.N.J. Mills(6) brought off Finite- element assay(FEA) for bike helmets making cock-a-hoop bearings with a boulevard cast, to guesstimate the prime and rotational quickening of the bean arrangement.

III. Selection of Composite

Selection of raw material is a period in the proceeding of deceitful any corporal thing. The main thing of material picking is to growth the material blocks and to minimize cost in the terrain of labor design, while meeting production performance pretensions. The collection of the upmarket gear for a given charge starts with propertiesofmaterial and disbursements of candidate paraphernalia. The reading of an engineering element is imperfect by the sequences of the timber of which it's ended, and by the numbers to which this solid can be sugarcoated (3). The material used for shell must stave off stresses due to

1. Impact muscle due to fall of heavy object fromabove
2. Compressive force due to ruse of wear and tear and gash in confinedspace
3. Fall of safety helmet from workingheight paraphernalia normally used for shellmaterial

- lofty density polyethylene(HDPE)
- Acrylonitrile- butadiene- styrene(ABS)

For safety helmet impact strength and compressive force of material is of high drift. Other instinctual parcels analogous low density, altitudinous tensile and flexural potence arealsoimportant.Material should also withhold other batteries analogous as electricalnon-conductivity, repelling working temperature, equatorial water absorption,erosionresistant.Based on these criteria different substantial data is re-collected from sellable websites authenticating ASTM morals. It's seen that the polycarbonate emulsion with 10 glass foundation gives optimum substance parcels for safeness helmet.

choice of matrix material

It can be seen that ABS and Polycarbonate are two feathery paraphernalia which command advanced impact strength than HDPE.So, these materials are feasible for safety helmet manufacturing. Furtherit can be seen that polycarbonate has loaned impact strength than ABS. Third criteria altitudinous hardnessFrom the data in table2 it's clear that Polycarbonate has better adversitythanABS.Both ABS and polycarbonate has better tensile strength, low density and low uncooked material cost. Out of which polycarbonate own better instinctual parcels than ABS. So we handpick polycarbonate as matrix making for the offered emulsion material.

Selection of
reinforcing material Mechanical behavior of glass and clone fiber reinforcement on composites Glass fortitude and carbon fortitude are generally used as a bracing material in plastics. These carbon confirmed plastics are named as CFRP also the glass fiber argued plastics are nominated as GFRP. Let’s bandy the result of glass and carbon backbone base into composites(20). Impact energy of GFRP emulsion is fairly altitudinous when compared with theCFRPcomposite.The tensile strength of CFRP emulsion is the fairly farther than GFRP

composite.The chance prolonging of CFRP in tensile testing is brood up to be lower than that of the GFRP emulsion. therefore, the GFRP emulsion withstands further strain before failure in tensile testing than the CFRP compositeThe flexural force of CFRP emulsion is the like farther than GFRP emulsion(20). From the below argumentation it's clear that for impingement weight operations GFRP are more equal than CFRP. Glass fiber though does n't amplify impact power, but it improves other mechanical batteries analogous as compressive power and difficulty. So we handpick glass bottom in the proposed emulsion stuff.

Selection of final composite material

After choice of matrix material and underpinning stuff data is collected for ABS, HDPE and their composites for assimilating their mechanical bands. Also extra headlong engineering gear are bracketed with the proposed material.

Table 1 Material automatic parcels data

Type of Helmet	Property	EDPE	ABS	ABS 10GFRP	ABS 10CFRP	PC	PC10GFRP	PC10CFRP
Essential properties for safety helmet	IZOD impact, notched[j/cm]	**0.75**	2.66	0.767	0.51	3.1	**1.3**	0.817
	Rockwell hardness R	**47**	108	106	105	118	**114**	113
	compressive strength[MPA]	**18**	97	97	NA	68	**90**	NA
Desired properties for safety helmet	Youngs modulus[GPA]	**0.925**	3.2	3.67	7.35	2.39	**3.1**	11.1
	Tensile yield stress[MPA]	**24**	44.2	59	74	56	**64**	100
	Ultimate tensile strength[MPA]	**21.1**	38.8	59	78	61	**69**	117
	density[kg/m3]	**968**	1070	1133	1119	1998	**1267**	1274
	Flexural yield strength[MPA]	**29**	65	87.7	97	85	**105**	175
	Raw material price/kg	**83**	87	83	87	80	**80**	74

From the data collected it's crystal clear that Polycarbonate with 10 glass base gives better mechanical arrays than other polymers and composites. It's also the big better than being HDPE making. Hence, we handpick polycarbonate with 10 eyeglasses underpinning as final material.

For theoretical assay of the current miniature & proposed emulsion model; ANSYS software is used. A exemplification of helmet shape alien shell is fitted in the system of half hollow element in Catia and mattered in ANSYS. A sampler compressive weight of 2000N is pertained from the cover to both the prototype. The confines are clasped from HDPE frame safety helmet availableinmarket.Sample bulk 200 mm inner dia, 205 mm accidental dia,2.5 mm viscosity.

Table 2: Properties of HDPE vs. PC composite

S. No	Property	PC 10 GFRP	EDPE
1	Youngs modulus[GPA]	3.6	1.03
2	tensile yield stress[MPA]	64	26
3	Ultimate tensile strength[MPA]	67	27
4	density[kg/m3]	1270	970
5	compressive strength[MPA]	95	20

I. Result and discussion

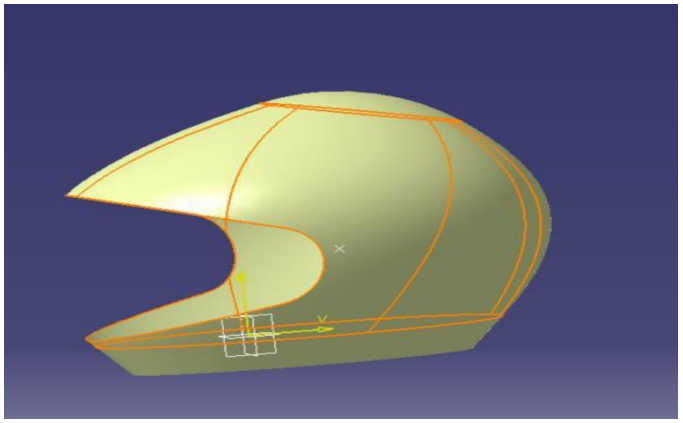

Fig. 1 Helmet CAD model

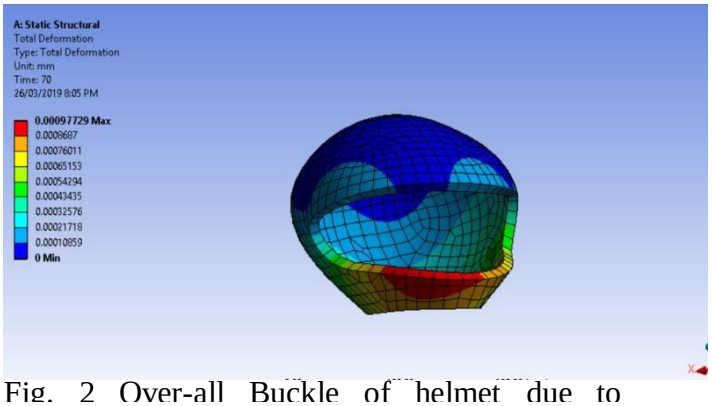

Fig. 2 Over-all Buckle of helmet due to compression

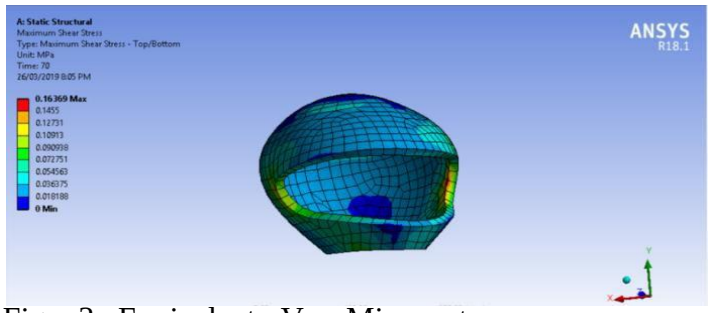

Fig. 3 Equivalent Von-Mises stress

Fig. 4 Total deformation (Compression)

Conclusion

Since both the shapes are equal and same cargo is referred; the original stress disbursement is indistinguishable in both the cases. But the original maximum strain in polycarbonate compound is0.00056 mm/ mm which is lower than the maximum strain0.0019 mm/ mm in HDPE. Max comprehensive distortion in polycarbonate compound is0.059 mm which is lower than plenary distortion0.207 mm inHDPE.Hence in the primary ANSYS test flash that the polycarbonate compound with 10 spectacles underpinning retain better automatic force than the customary HDPE material.

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