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PIVOTAL PULVERIZING ALSO IDEAL CONFIGURATION FOR SQUARE TUBES WITH GRADED THICKNESS

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ABSTRACT

Beginning with the individuals late diagram the individuals square Besides equipment

tubes find Different structural procurements Previously, notable ranges for example, aerospace, supporting, automobile, likewise brandishing supplies et cetera. Those monetarily receptive tubular structures facilitating the individuals 60% vitality absorption capacities finished quasi- static In addition component state. During crash structure necessities more than that, In addition in this heading the researchers might working ahead both numerically likewise tentatively ought further bolstering get up and go the vitality absorption capacities. Displaying thickness gradient finished unseemly fragment will be a precisely guaranteeing approach for raise the vitality absorption capacities none of the worth of exert investigated the individuals sway of the variable thickness in the all structures to vitality absorption capacities.

INTRODUCTION

Square tubes segments need aid extensively utilized as structural parts done dominant part about transportation vehicles due to their low cost, handy vitality absorption proficience Furthermore moderately low thickness. They bring the capacity will absorb dynamic vitality of the impacting physique in the manifestation from claiming plastic deformations Consequently ensuring the structure Also Travelers included.

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Vehicular collisions would Around the A large portion disturbing issues. The structural components (square What's more round tubes) are utilized within car vehicles mostly suspension components Furthermore these need aid subjected should helter skelter affects when the mishaps needed happen. They are not just risky of the occupants of the vehicle as well as with affected structures, Subsequently those structures are intended should absorb a greater amount dynamic energies to controlled way under plastic deformity.

LITERATURE REVIEW

- A.Baroutaji a, E.Morris a, A.G.Olabi b [5] has explained this paper addresses the energy absorption responses and crashworthiness optimisation of thin-walled oblong tubes under quasi-static lateral loading. The oblong tubes were experimentally compressed using three various forms of indenters named as the flat plate, cylindrical and a point load indenter. The oblong tubes were subjected to inclined and vertical constraints to increase the energy absorption capacity of these structures. The variation in responses due to these indenters and external constraints were demonstrated. Various indicators which describe the effectiveness of energy absorbing systems were used as a marker to compare the various systems.
- NiyaziTanlak,FazilO.Sonmez n [6] has explained In this study, the objective is to maximize the crashworthiness of thin-walled tubes under axial impact loads by shape optimization. As design variables, parameters defining the cross-sectional profile of the tube as well as parameters defining the longitudinal profile like the depth s and lengths of the circumferential ribs and the taper angle are used.
- Nizam Yob1, K. A. Ismail2, M. A. Rojan1, Mohd Zaid Othman3 & Ahmad Mujahid Ahmad Zaidi3 [7] has explained This paper presents experimental work on quasi static compression tests on aluminum AA 6063 circular and square tubes. Specimen tubes with ratio of R/t = 12 and b/t = 24 for circular and square tubes respectively were prepared and validated with several analytical model developed by previous researchers

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PROBLEM FORMULATION

- To fulfill the objective the square tube of 50 X 50 X 5 mm thickness is taken and initially machined to the thickness. (Variable thickness).
- The FEA analysis is carried out by using LS Dyna for given boundary conditions and loading.
- Find the area under the curve to compute the energy absorption capacities.
- Deformation behavior of the curve and compare the both result quasi-static and dynamic energy absorption capacities and also compare with FE Analysis.

Experimental Methods:

The specimens tested in the present work were fabricated by Wire cut Electrical Discharge Machining (WEDM) technique with the precision. The specimens are shown in Fig. 1(a)

Quasi –Static Testing

Quasi-static tests were performed on the universal testing machine. The machine has a maximum crosshead speed of 200 mm/min and maximum load of 100 kN. The machine is connected to a controller PC which has dedicated data acquisition and analysis software.

The fabrication of square tube begins with raw material of aluminium square tube which is cut into desired lengths by using cutting tools. The top and bottom edges of square tube were finished into the respective lengths by using the milling machine.

Quasi- static (effect of acceleration due to gravity is neglected) testing is carried out in computerized universal testing machine at a speeds of mm per minute by specifying the deformation rate in the system.

The specimen is placed between the jaws and compressed at the specified rates of speeds.

The static compression test was performed by using Universal Testing Machines as shown in Figure 2

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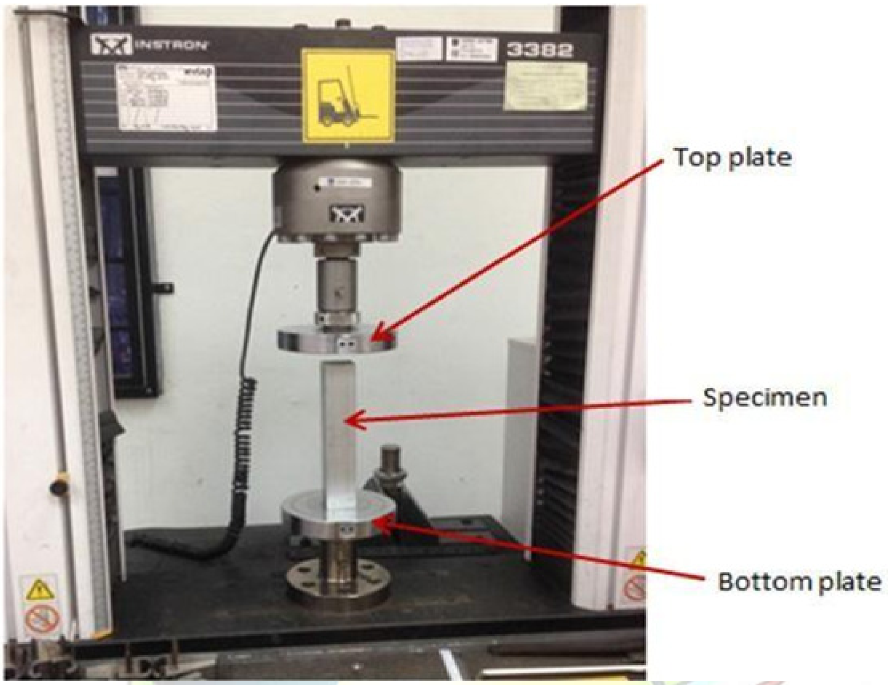

Fig2 Universal Testing Machines

- **Dynamic Testing (Drop weight testing machine)**

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Dynamic tests were performed on the test rig as shown in Figure. The machine can be fitted with a drop mass ranging from 3 kg to 250 kg. With a drop height of 1.6 m and spring assisted, a maximum speed of 4.4 m/s and impact energy of 500 J can be achieved. The instrumentation is attached to the machine to catch the response of the system. Position transducer is of optical encoder type and force transducer is of strain gauge/ piezoelectric type. The test rig is connected to a controller PC which includes dedicated data acquisition and analysis software.Drop weight testing machine is used to compress or crush the specimen at higher velocities. The layout of the machine as shown in fig.3

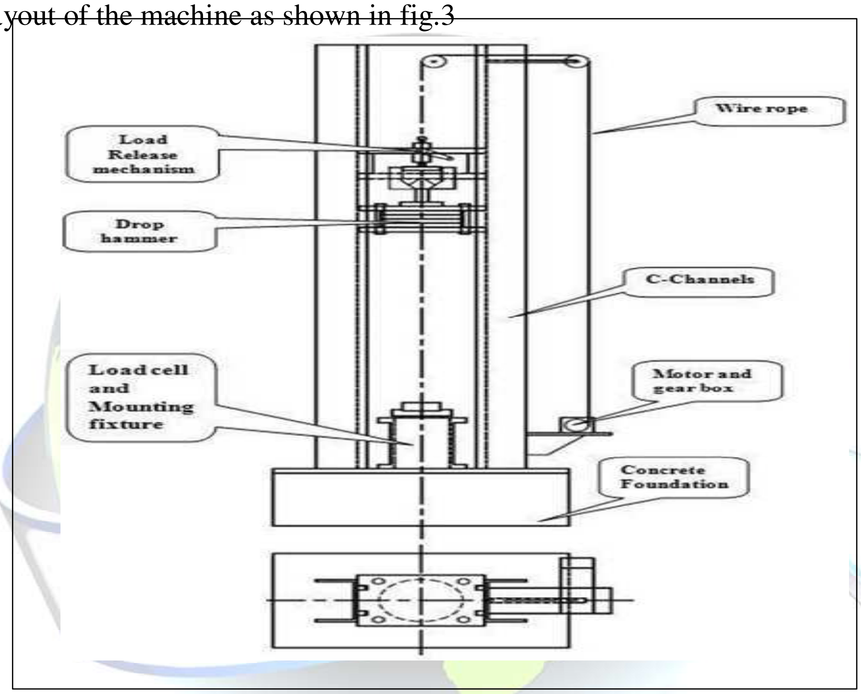

Fig 3: Drop weight testing machine

SCOPE AND OBJECTIVE

- To fulfill the objective the square tube thickness is taken and initially machined to the thickness. (Variable thickness).
- The tubes are crushed under quasi static and dynamic conditions and tabulate the load deformation curves.

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- And find the area under the curve to compute the energy absorption capacities.
- FE simulations are carried out on both quasi static and dynamic conditions and compare the results
- FE Simulation under similar conditions using LS-Dyna software, comparison of experimental results with FEA was also done.

APPLICATIONS

- Crashworthiness of vehicles (cars, lifts, civilian and military aircrafts, and ships)
- Crash barrier designs
- Safety of nuclear reactors
- Collision damage to road bridges
- Offshore structures

CONCLUSION

This Experimental carried out for square tubes with two types of thickness distributions and numerical analyses are then conducted to simulate the experiment. Both experimental and numerical results show that the introduction of graded thickness in cross-section can lead to up to 30–35% increase in energy absorption efficiency (specific energy absorption) without the increase of the initial peak force. In addition, structural optimization of the cross-section of a square tube with graded thickness is solved by response surface method and the optimization results validate that increasing the material in the corner regions can indeed increase the energy absorption efficiency of a square tube

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