



## Final Year Project Showcase Batch-2017 Year 2021

<b>Department: Automotive &amp; Marine Engineering</b> <b>Programme: Automotive Engineering</b>		
1	<b>Project Idea</b>	Design and development of dent resistance testing machine
2	<b>Process</b>	<p>The initial step performed is the design of pneumatic cylinder in which calculations have been done for cylinder diameter and cylinder pressure for performing both quasi-static and dynamic dent testing.</p> <p>The next step is the CAD model of the machine have been drawn and simulation have been performed on it to check the working mechanism of the machine in real time.</p> <p>For controlling and operating the machine, Arduino UNO board which is a micro-controller is used and it has been programmed so that it will take the data from the two sensors i.e. load cell and displacement transducer and perform the dent resistance test according to SAE-J2575 testing methods.</p> <p>After the data acquisition step, the results of the collected data have been displayed by plotting load vs displacement graph in an app that have been designed in MATLAB software and it would also give the results of the other parameters such as dent depth, load applied, maximum displacement, applied energy, dent area and dent volume etc. in form of a table for different load cycles.</p>
3	<b>Outcome</b>	The outcome of the design and development of this dent resistance testing machine ( <b>according to SAE-J2575</b> ) is establishment of a platform which can be used to test dent resistance and stiffness of different automotive body panels by application of variable loads and changing strain rates so as to forecast their strength and durability.
4	<b>Evidence (Theoretical Basis)</b>	Dent resistance testing machine has been designed and fabricated which have both quasi static and dynamic dent resistance testing capabilities and we can find out different parameters such as applied load, maximum displacement, resultant dent depth, initial stiffness and energy absorbed by applying different load cycles and these parameters could help us in calculating critical dent load and we would also like to recommend that by using mass flow controller, the velocity with which the cylinder rod is moving can be controlled.
5	<b>Competitive Advantage or Unique Selling Proposition</b> (Cost Reduction, Process improvement, Attainment of any SDG (Sustainable Development Goal), increase of market share or capturing new market or having superior performance over a competitor. In summary, any striking aspect of the project that compels the industry to invest in FYP or purchase it. Some detailed description is required in terms of how, why when what. You can select one or more from the following dropdown and delete the rest of them). Please keep relevant options, delete the rest of them, and correct the sequence	



<b>a</b>	<b>Cost Reduction of Existing Product</b>	In current scenario the commercial machines on which dent testing is performed are expensive resulting in high cost of the test. By making this machine in-house cost could be greatly reduced
<b>b</b>	<b>Process Improvement which Leads to Superior Product or Cost Reduction, Efficiency Improvement of the Whole Process</b> (e.g. What is the issue is current process and what improvement you suggests)	By making this machine cost be greatly reduced as commercial available machines are costlier and to get any automotive part dent test cost a lot
<b>c</b>	<b>Attainment of any SDG</b> (e.g. How it is achieved and why it is necessary for the region)	<p><b>SDG Goal 9: Industry, Innovation and Infrastructure</b> By making an in-house dent testing machine would result in getting parts tested at affordable cost.</p> <p><b>SDG Goal 12: Responsible, Consumption and Production</b> The dent testing machines commercially available in Pakistan are basically imported machines. The development of this machine in Pakistan would increase the capability of Pakistan in making such machines</p>
<b>d</b>	<b>Expanding of Market share</b> (e.g. how it expand and what is the problem with the current market)	The main purpose of development of this mechanical equipment is that this type of machine is not present in entire Pakistan and its development will significantly reduce the import duty, increase the revenue and we can also deploy this machine at university level so that the students can get benefit from it by getting the knowledge of its working principle.
<b>e</b>	<b>Capture New Market</b> (e.g. Niche market or unaddressed segment)	It will also play a significant role in economic development of the country and would help the mechanical and automotive industries in performing different static and dynamic dent tests easily which would help in increasing their productivity.
<b>f</b>	<b>Any Environmental Aspect</b> (e.g. carbon reduction, energy-efficient, etc.)	Energy efficient which comprises of less electrical/electronic components resulting in less consumption of electrical energy
<b>6</b>	<b>Target Market</b> (Industries, Groups, Individuals, Families, Students, etc) Please provide some detail about the end-user of the product, process, or service	Help Educational institutes as well as the mechanical and automotive industries in performing different static and dynamic dent tests easily which would help in increasing their productivity.
<b>7</b>	<b>Team Members</b> (Names & Roll No.)	Usama Junaid (AU# 17024) Ali Muhammad (AU# 17031) Abdullah Yaqoob (AU# 17022) Abdul Habib (AU# 17021) Hassaan Ahmed (AU# 17043)
<b>8</b>	<b>Supervisor Name</b>	Mr. Assad Anis Assistant Professor
<b>9</b>	<b>Supervisor Email Address</b>	assadanis@neduet.edu.pk

10 Pictures (If any)



Figure 1: Indenter type I (Soft Indenter)



Figure 2: Double Acting Pneumatic Cylinder

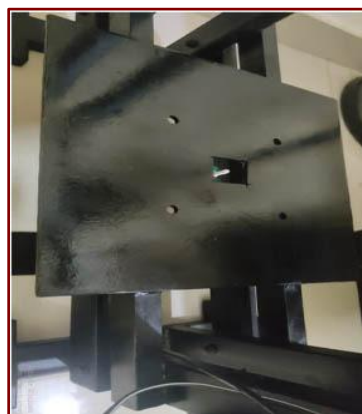


Figure 3: Test Bed



Figure 4: Ring

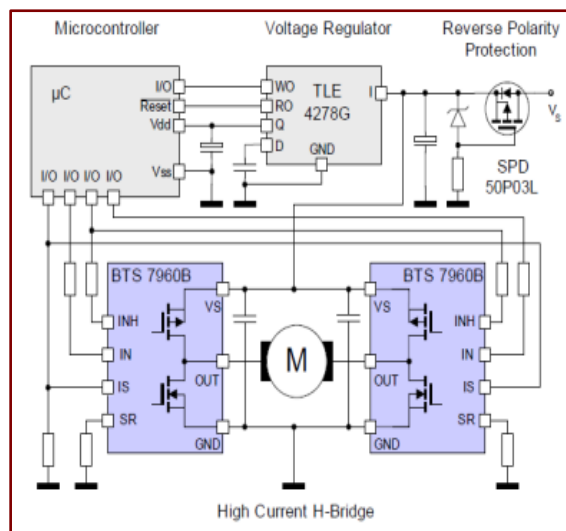


Figure 5: Motor Drive Schematics

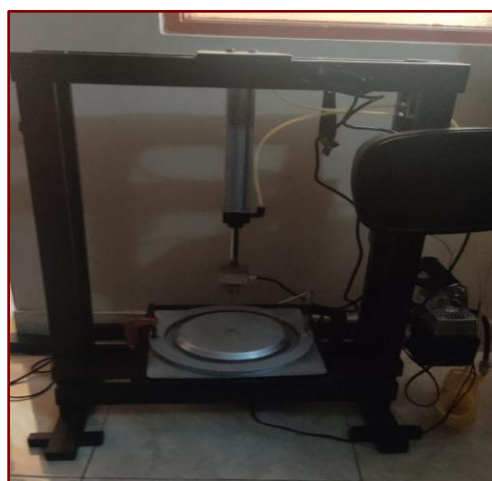


Figure 6: Frame