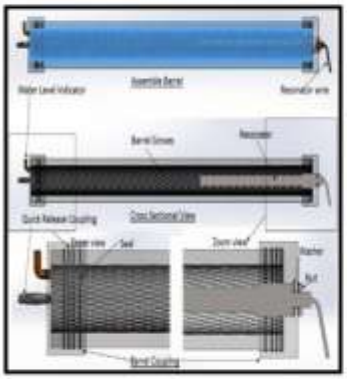
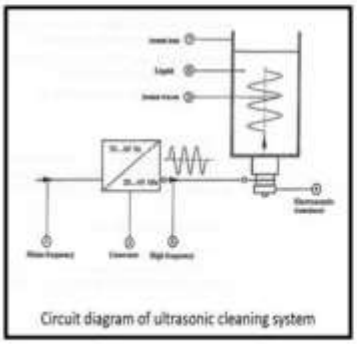
1.	Lab Name	**Vibration & Stress Analysis Laboratory**
2.	Officer Incharge	**Dr. A. Kumaraswamy**
3.	Associated Members to the Lab: RAs , PhD Scholars/ Technical Staff	**PhD – 01 (Mr.Gaurav Sharma)** **Lab Officer : Mr.Prajith P.** **Lab Assistant:- Mr. Amol Indalkar**
4.	Contact Details	020-24304191 (lab. in-charge)
5.	Infrastructure Specs (H/W, S/W,…)	Nil
6.	Area in sq units (optional)	**864 sq.ft.**
7.	Lab Facilities	• Vibration Fundamental Trainer (VFT). • High Temperature Macro Indentation Test Setup. • High Velocity Gas gun. • Electrodynamic Shaker • Vibration Simulator
8.	Consultancy / Services Offered	Nil
9.	Complete Projects (Details)	A Research Project on 'Numerical Modeling of Tribological characteristics of high pressure reciprocating hydraulic seals subjected to shock loading' funded by R&DE(Engrs), Pune (**Completed**). Design and Development of low cost High velocity gas gun to investigate high strain rate deformation behavior of materials for Defence application funded by DIAT(DU), Pune (**Completed**). Numerical investigation of penetration characteristics of preformed fragments at various obliquity angles and the development of software for prediction of spatial distribution of preformed fragments from a Directional Fragment Generator Warhead (FGW) funded by ARMREB (DRDO) (**Completed**).
10.	Collaborations (with DRDO lab, IISER, TATA, TCS, etc)	ARDE, HEMRL, R&DE(Engrs), Pune and DMRL Hyderabad
11.	Intellectual Outcome: publications/ patents/ etc..	Peer reviewed Journals-38 Conference proceedings- 32
12.	Mentors Associated: (Like Dr. APJ Abdul Kalam, etc..)	N.A.
13.	Any other relevant data	This laboratory is mainly focused towards the experiments in the field of Vibration Analysis of Discrete and Continuous Mechanical systems.

Ultrasonic Cleaning Technology for Gun Turret.



- Ultrasonic cleaning is an environmentally friendly and a technically proven technology.
- Ability to clean items in a short time scale.
- Ultrasonic cleaners can remove an almost endless variety of contaminants
- Low Power Consumption-Compared to other types of parts-cleaning systems
- Gentle Cleaning – Ultrasonic cleaners remove contaminants without abrasion.



Circuit diagram of ultrasonic cleaning system

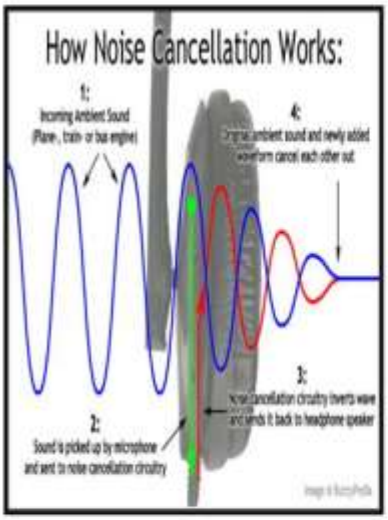
Ultrasonic cleaning uses high frequency sound waves to create cavitations bubbles in a liquid. These cavitations bubbles release energy which have a scrubbing effect on contaminants adhering to substrates like metals, glass, and ceramics

1. Vibration Fundamental Training System (VFT).

Technical Specification:
Dimensions: 30"w x 35"h x 15"d (75cm x 90cmx 40cm)
Pendulum Vibration Module: Adjustable length and weight
Spring-Mass-Damper Module: Spring: Three different stiffness, stackable for 2 DOF, Mass: Three weights, stackable, Damper: One dashpot and three fluids.
Torsional Vibration Module: Shaft: Three different Diameters, Rotor: Three rotors of different mass and inertia, Damper: One damper and three fluids (optional).
Vibration Control Module: Tuned mass damper: Hardware for mass-spring absorber, and hardware for beam absorber Beam with damping treatment: One viscous-elastic layer and one constrained layer
DAQ analysis Software.
Power Source: 110 V/220 V 50/60Hz

VFT is capable of a wide range of experiments covering all vibration concepts:
1. Lumped System Experiments
2. Continuous System Experiments
3. Vibration Control Experiments

Active Noise Cancellation Techniques for Exhaust Ducts of Submarines



- Acoustic noise generated by the exhaust in a submarine poses a serious threat to its underwater stealth abilities, so a need arises to use noise control techniques to keep it minimum. Passive noise control techniques uses the absorption property of materials and are used to line the acoustic path, but have been found to be effective only at high frequencies. Hence active noise control techniques are employed for this purpose, which may either use a feed forward or a feedback topology for achieving noise control. Various active noise cancellation techniques/algorithms have been analysed for application on exhaust ducts of submarine. The validation of techniques will be undertaken experimentally.

High Temperature Macro Indentation Test Setup

- To determine the hardness of the given specimen at different temperature using High temperature macro indentation test setup.
- Hardness of a material is generally defined as Resistance to the permanent indentation under static and dynamic load. When a material is required to use under direct static or dynamic loads, only indentation hardness test will be useful to find out resistance to indentation. In Brinell hardness test, a steel ball of diameter (D) is forced under a load (F) on to a surface of test specimen. Mean diameter (d) of indentation is measured after the removal of the load (F).

Electrodynamic Vibration Shaker System

- Vibration may be considered as on oscillating of a particle or body about a reference position. This motion can be periodic, random or transient.
- There are three main parameters used to describe vibration, they are displacement, Velocity and acceleration. Displacement is the distance move w.r.t reference point, velocity is the rate of change of displacement and acceleration is the rate of change of velocity with time respectively. Displacement is proportional to strain and acceleration to the force acting on the object.

High Velocity Gas gun.

- HVGG is used for the study of dynamic indentation behaviour for metal and alloys.
- The results obtained from HVGG is in the form of crater profile.
- The main property which is evaluated from crater diameter is dynamic hardness.
- Dynamic hardness with constraint factor (CF) gives the dynamic flow behaviour of different metals and alloys at the strain rate of $10^4 s^{-1}$.