

OUTLINE OF RESEARCH AND DEVELOPMENT ACTIVITIES

A New Transmission Dynamometer has been designed and developed. The principle of working of this new dynamometer is based on a method which is referred here as 'torsional flexing of the shaft' through the use of a 'floating element' between the driver and driven shafts. The present arrangement provides for variations in both sensitivity and range.

Planning, design and development of Fluid Mechanics and Machines laboratory. Installation of fluid machineries and equipments like Pelton, Francis and Kaplan turbines, Pumps etc.

Nonlinear static and dynamic response of typical structures like thin elastic plates and beam to pulse excitations have been studied with and with out damping for isotropic, orthotropic and composite materials. The ultraspherical polynomial approximation technique has been developed and applied to get the nonlinear dynamic response. Influence of large amplitudes on free vibration of plate/beam, influence of linear and nonlinear elastic foundation parameters on beam/plate, influence of parameters like orthotropy, aspect ratio and damping on the dynamic response of isotropic, orthotropic and composite plates for various geometries and different combinations of boundary and edge conditions have been predicted. Bending of the frequency response curve, frequency shift and jump phenomena clearly indicates the hardening type of nonlinearity and chaos from experiments. It has been noticed from these studies that multi-mode effects in the analyses of nonlinear vibrations of continuous systems needs renewed attention in order to predict improved responses, especially, for systems involving orthotropy and composite materials.

Nonlinear response of an aircraft to pulse load excitations have been studied. The effects of nonlinear damping and stiffness on the response of both the aircraft and landing gear have been investigated.

Voigt dynamic vibration absorber analysis has been carried out and the response obtained. In the two limiting cases when the damping parameter tends to zero and infinity, it has been shown that the response reduces to the standard response of a two-degree-of-freedom system.

A generalized technique has been developed for the evaluation of discrete acceleration spectrum from the flight velocity test spectrum data for an aircraft with and with out external stores.

Vibration and noise data have been acquired in the field for an aircraft in stationary condition and engines running at various speeds at the rudder and inside the cabin.

Estimation technique development for vibro-acoustic levels of missile structures.

A review of impact dynamics and response studies have been carried out.

Influence of boundary and edge conditions for primary resonances have been obtained for a circular plate subjected to large deflections.

Vibration testing facility has been developed. Frequencies, displacement, velocity and acceleration levels can be measured for mechanical elements like blades, robot manipulators, beams etc.

A design software has been developed for shell and tube type heat exchanger in C using an integrated approach. Kern technique is applied for thermal design. Performance can be evaluated for the design using the software. Also, various geometries of heat exchangers as specified by TEMA can be optimised for thermal design.

Sand Mixing Muller has been designed and developed for the use in a foundry shop. The special feature of this machine is its simplicity, ease of operation and resistant to heavy wear and tear.

Dies for gravity die casting of Aluminium based alloy (LM-6) has been designed for an industry.

A flat belt drive system has been designed to drive agitator blades and to replace V-belt drive. Achieved a net saving of @ 12 to 14% in the system's electrical consumption. This translates to about a saving of 3.5 Lakhs per annum for the pulper section only.

Automated hydraulic platform has been designed with respect to the existing platform by increasing the capacity from 3 Tonnes to 7 Tonnes.

Analyses and design of robotic grippers has been carried out. Kinematic analyses of the gripper was done to determine the relationship between various input and output parameters. Improvement of this design has been achieved by incorporating the cord mechanism which allows actuators to be located remotely, there by reducing the weight of grippers and allowing greater flexibility in the overall design.

Vibration analysis, testing and reduced vibrations in motors within ISI limits in Siemens. Consideration should be given for initial tension in springs, stiffness as well as natural frequency. Natural frequency should not be such that it does not cause resonance. While selecting the bearing, the ball defect should be kept in mind.

The power consumption of fan has been reduced by using a aerofoil design fan blade instead of flat blade. Aerofoil blade has a very high lift-drag ratio and has a good efficiency compared to flat sheet metal blade fans because of low drag ratio. Aerofoil section reduces energy loss due to greatly decreased air flow turbulence and lack of flow separation. The separation of flow of air for both blades have been compared.

For tightening of bolts at critical sections such as engine mounting and undercarriage, a DC tool or an impact wrench has to be used. For this operation, the worker has to repeatedly lift the tool from its housing, use it and then replace back into its original position. Also, he needs to have a steady hand while using the tool. The tightening torque of the tool ranges from 80 N-M onwards. The 'Articulated Arm' was designed for precise torque application.

Pressure vessels, boiler, nuclear reactor and missile barrel require periodic machining operation like facing, turning, chamfering, boring etc. A flange facing machine has been designed which is portable, simple in operation and construction with three motions automatised, two simultaneous feed and can be easily mounted on the job.

Project on broach tool theory and design was undertaken to offer an insight to the broach tool and provide all aspects of design of broach tool which will help the company to design the tool based on their own specifications thus reducing the cost of manufacture. The case study gives a thorough insight to design approach and methodology for design. Also, the software "Broach Designer 1.0" will provide the aid in design of broach which provides the solution within a short time and minimal effort for the designer. Henceforth, the designer has to collect and feed the input data and relax. So, the time is saved leading to higher efficiency for the company.

Fuelling machines operates in an environment like high temperature, high pressure and water environment. Special bearings are required for this purpose of rapid evaluation of materials and tested using four ball tester. Design has been carried out for ball rod tester.

On the basis of KAIZEN, proposed the changes in the factory layout and to be implemented for the better material flow, ergonomics, safety, time and keeping in mind workers integrity.

Power manipulator ie a robot arm which works on electric power to lift a 5 Kg object placed in a 10 ft room and place it in the room where required.

Time study has been carried out for various operations in the Voltas Limited and suggested measures to reduce the time.

Reactor vessel contains radio active argon cover gas and IFTM cell contains fresh argon gas. In order to avoid ingress of radio active argon gas into IFTM cell, gate valves are provided on the ramps of both primary and secondary side. Gate valve remains closed during refuelling operation and gets open/closed as per requirement. Gate valves are mounted over the flanges of ramp liners. Gate valve has been designed for the above purpose.

Designed a centrifugal pump for crude methanol and suggested about various factors of maintenance.

Analysis of diesel locomotive braking system for WDM2 has been carried out.

Gap analysis between ISO 9001:1994 and ISO 9001:2000 standards have been carried out considering the differences and new requirements in design, manufacturing, marketing, material and quality assurance departments.

Noise measurements have been done for notching press and suggested the techniques of noise reduction.

Optimization of production of liner tubes and end fittings have been carried out.

Designed an assembly to reduce the time for alignment of shafts and also to ensure the proper alignment of shafts by the newly designed fixture.

Some modifications in the design have been carried out for EOT crane.

The implementation of trimming system on polyextruder lamination machine has been carried out.

A reciprocating pump has been designed for 1426R01 reactor. Need for pump in reactor is or creating vacuum inside the reactor space.

Modifications were suggested for oil filtration system.

Improvements have been carried out for various processes of kitchen furniture in view of ISO 9000-2000 model.

Designed a multi-legged robot which will have platform always horizontal and perform operations; it should walk on normal ground, climb up on steps and carry a payload upto 50 Kg while maintaining payload platform horizontal.

Designed a 20 Ton capacity EOT crane at Mazagon Dock and suggested about maintenance and lubrication.

The entry of air into the fan system has to be continuous and gradual without occurring pressure losses or sudden obstruction. By modifying the fan cowl design, the flow will be gradual without any losses. The material of the blade suggested is plastic which is a good alternative for cast iron or aluminium. The noise in the induction motor for axial flow fans has been reduced by 10 dB.