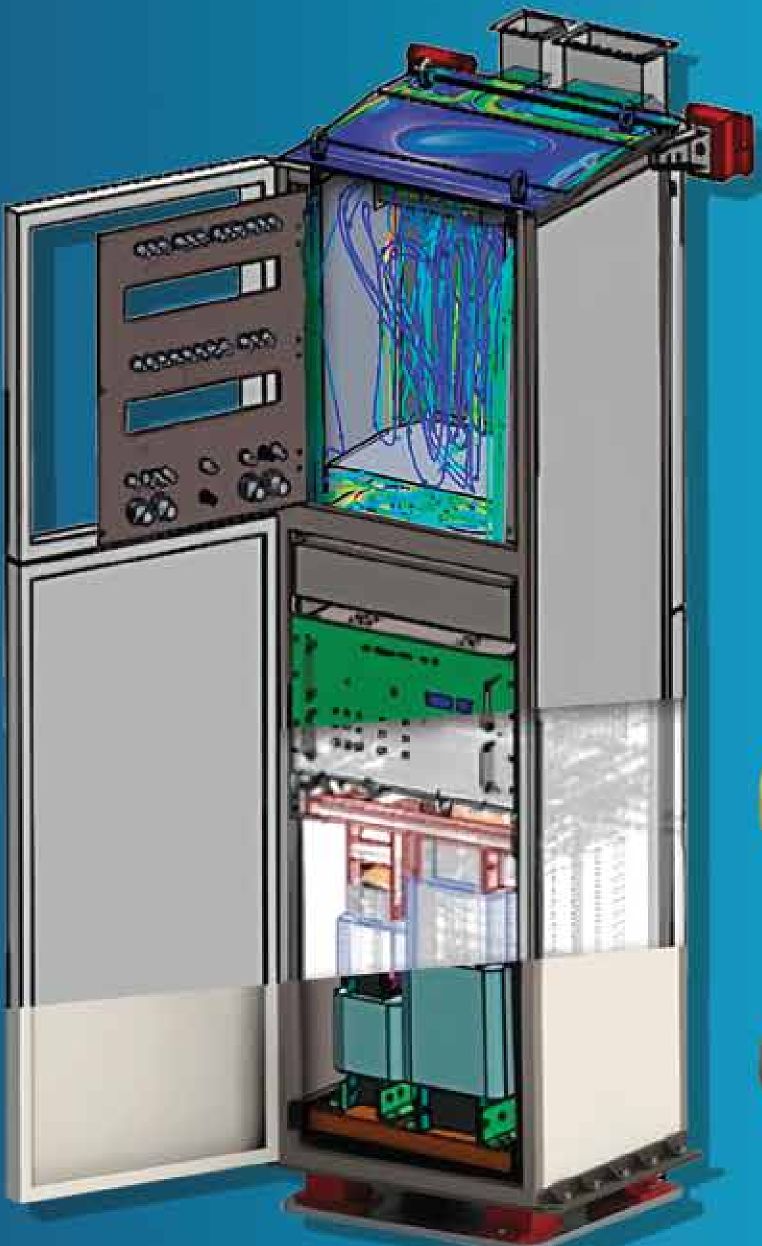
CM Techno
Engineering Service
& Consultancies



ENCLOSURE DESIGN
AND MANUFACTURING

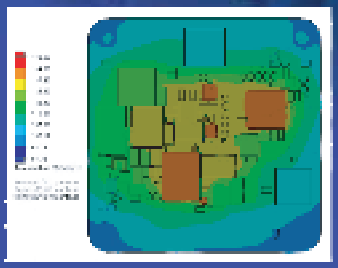
MIL Design | Manufacture | Prototype Testing | Certification Support | Mass Production

Enclosure Design

MIL Design | Manufacture | Prototype Testing | Certification Support | Mass Production

- **Do your PCBs frequently fail due to overheating?**
- **Do you find Designing and Manufacturing rugged enclosures a challenge?**
- **Do you find it difficult and laborious to design an enclosure that dissipates heat effectively?**
- **Do you find difficulties in designing and manufacturing an enclosure for shock, vibration, higher IP rating (MIL-grade) for supplies to Aero Space and Defense requirements?**
- **Do you find correct selection of shock and anti vibration mounts (S & V) a daunting task?**
- **Do you have difficulties in qualifying your enclosures to EMI & EMC standards ?**
- **Quality & Certification: Manufacturing prototypes, testing in NABL accredited laboratory for type testing and certification.**

CM Techno, is one stop solution to meet the above challenges



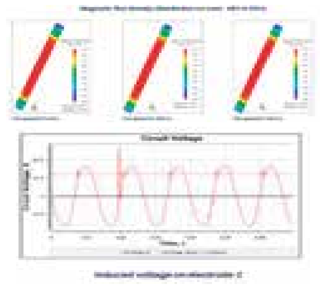
About CM Techno

CM Techno is an engineering service and consultancy company with over 12 years of experience in product design & development in mechanical engineering arena and is located at Bangalore, India. As a leading product design consultant, we have a wealth of experience across a number of sectors like oil & gas, aerospace & defense, medical, scientific, engineering, consumer products and automotive. Our comprehensive approach combines technological innovation with design & development, with need based fabrication support, prototyping and productionize with lower costs and quick turnaround time.

Our offerings for Enclosure Design

MIL GRADED ENCLOSURE DESIGN

Design of ruggedized electronic enclosures for military application and validation of the design using FEA analysis.

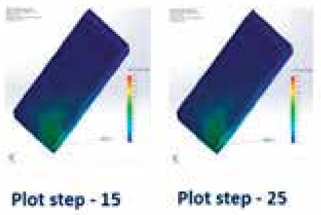


ELECTROMAGNETIC ANALYSIS

Determination of generated /induced EMF from the sensors. Analysis of the magnetic field density for a given electromagnet and very useful in assessing induced voltages in magnetically coupled devices.

DROP TEST ANALYSIS

Assessment and precise prediction of the behavior of a hand-held product when it is dropped on to a hard surface. This simulated testing addresses areas of improvement thereby enhancing impact strength of the product to withstand drop loads. This simulated testing is cost and time effective.

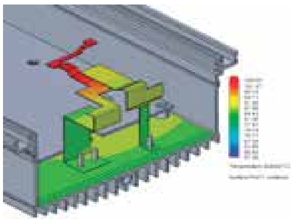


SHOCK and VIBRATION ANALYSIS & TESTING

Electronic consoles / encounter may experience shock loads (Aerospace & Defense application) due to severe service conditions, especially when mounted on moving platforms or seismic loads on ground-based equipment. Shock & seismic analysis is used to evaluate the system response to a load which varies over a very small time, such as an explosion or earth quake.

ELECTRONIC ENCLOSURE COOLING ANALYSIS

Determination of heat distribution inside electronic cabinets through CFD approach. Locating the hotspots in the enclosure and arriving at best fit cooling fan(s) and layout optimization.



Temperature Flow trajectory

THERMAL FLOW ANALYSIS

Thermal analysis gives results of hot spots, assessing efficacy of heat sinks and optimisation of size and location. This simulation can also be used to identify hot spots melting range and melting behavior and determination of heat of fusion zones. This simulation analysis can be used to predict glass transition and oxidation stability of PCB boards (both at board level and as well as at system level).

We, at CM Techno, provide reliable engineering design & analysis solutions, to validate your design for compliance to AS &D application and seismic loads. With our experience we also suggest remedial actions to address deficiencies if any.

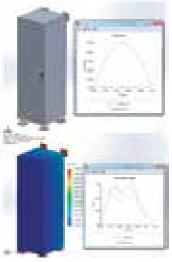
CASE STUDY 1

Problem Statement

Optimalisation of thermal design of electronic cabinet including optimisation of internal layout of electronic components, arriving at dimension of ducts and duct openings including fan selection. This design should also withstand structural strength including the selection and evaluation of SV mounts to meet the shock and vibration load.

Solution Thermal design

CFD based thermal analysis was carried out to evaluate the heat distribution inside electronic cabinet at different height of the system and assess the temperatures are within acceptable limits. Based on the CFD results optimum design of the ducts routing dimension and positioning of the components in the cabinet was calculated. By analyzing the air temperature, velocity and flow trajectory inside the cabinet optimum fan capacity was selected for enhanced heat transfer.



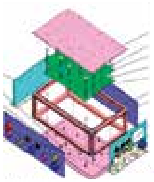
Solution Structural design

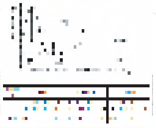
Static analysis was carried out for the cabinet by applying the static and inertial load to check its stability. Modal Analysis was carried out to determine the natural frequencies and mode shapes of the cabinet to see any chance of resonance due to input conditions. Transient Response and Vibration analysis was carried out to determine the displacements, stresses and post attenuation response of the system for given shock & Vibrational loads. Based on the results the structural integrity of the power supply cabinet was evaluated.

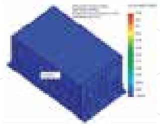
CASE STUDY 2

Problem Statement

Enclosures are required to operate at both elevated and subzero temperatures, exhibit higher tolerances to vagaries of harsh work environment including transportation on bumpy terrains and comply to EMI & EMC requirements.







Solution provided:

This need of ruggedized enclosure including EMI/EMC compliance, shock and vibration compliant with intended shock loading up to 280g was designed inhouse, checked using simulation tools (FEA), manufactured, tested at NABL accredited laboratory and then on type approved 15 sets of MIL graded electronic enclosures were supplied for marine application.

Design:

The enclosure design posed a challenge to achieve the adequate strength with low weight to meet the warship shock and vibration. Hence only machined structures to design was used to achieve structural rigidity.

Shock & Vibration Analysis:

FE Shock analysis & Vibration Analysis was performed to access the withstandability of the enclosure to the shock of 280g max and areas of improvements were identified and addressed.

Electrical Routing:

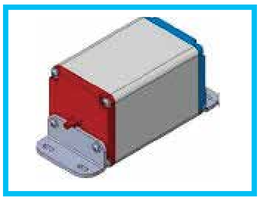
The electrical cable routing of densely packed enclosure was carried out in 3D model from electronics modules (PCB to connectors) and cable clamping positions and wire lengths were calculated during design stage.

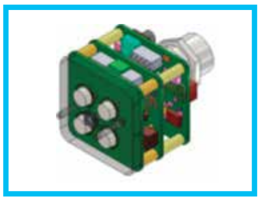
Physical Testing:

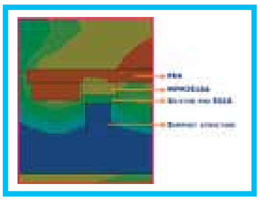
The prototype was shock tested at NABL accredited M/s Wipro Tarang Laboratory, Bangalore, with electronic components of equipment under working condition. The equipment was qualified for intended design shock rating in the very first attempt thereby saving cost and time of the client.

Proper QA procedures ensured NIL rejection

CASE STUDY 3







Problem Statement

Overheating of the equiment leading to unstable operations calling for design changes and optimisation.

Solution:

Transient thermal flow analysis was performed to evaluate the temperature distribution at board and enclosure level. The temperature at power board level experienced overheating due to insufficient heat dissipation. Design modification were made by changing materials of construction namely use of Silicon pad 5516 and replacement of plastic covers with aluminium cladding to enable effective heat dissipation.

Revalidated the updated design by CFD simulation and found that the heat removal had significantly improved leading to reduced heating of components and temperatures within acceptable levels.

Design validation was carried out through calculations using classical method.

ALUMINIUM ENCLOSURES

Special Applications

PLASTIC ENCLOSURES

We are one of the well established designers of plastic injection molds and have third party / channel partners through which we supply high quality injection molded plastic components such as small plastic enclosures, PCB enclosures suitable for electronics devices, measuring instruments, wireless communication devices and control units. Based on the end use, the design is tailored to meet ingress protection standards like IP 45/68 etc.

In addition, we generate CAD models fit for use in 3D printing and print them using various processes depending on the end needs as part of rapid prototyping. At times these 3D printed items are used as mockup for training prior to embarkation of actual work of maintenance to achieve shortest turnaround time.

Our range of plastic products made from PC, PMMA, ABS, PLA, etc... have stood the test of time.

OUR OTHER OFFERINGS

MANUFACTURING

- Re-Engineering
- Retro Fitment
- Access Solutions
- 3d Printing And Rapid Prototyping
- Special Purpose Machinery

FEA/CFD ANALYSIS

- FEA - Static Analysis
- FEA - Fatigue Analysis
- FEA - Shock Analysis
- FEA - Vibration Analysis
- FEA - Drop Test
- CFD - Hydraulic Flow Analysis
- CFD - Thermal Flow Analysis
- CFD - Electronic Enclosure Cooling Analysis
- CFD - Lift & Drag Analysis
- PLASTICS - Mold Flow Analysis
- MIL Grade Shock Testing

DESIGN & ENGINEERING SERVICES

- New product design & development
- Re – Engineering
- Research Development & Technological activities
- Conceptual & Detailed Design
- Shock & Vibration analysis
- EMI & EMC Analysis
- 3D printing Service
- Failure Analysis
- Prototype development & Testing
- Manufacturing Support

OUR KEY CUSTOMERS

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