

1. Calibration of throat tap Flow Nozzle at Water flow Lab
2. Testing of 36" valve was conducted at Water Flow Laboratory
3. Testing of mix proof valve was conducted at Water Flow Laboratory
4. Testing of valve of size 24" at Water Flow Laboratory
5. One PD flow meter of size 8" was calibrated at Oil Flow Laboratory
6. PD flow meter of size 1" was calibrated at Oil Flow Laboratory
7. Calibration of flow products at Air Flow Laboratory
8. Calibration of 1/2" Mass Flow Meter at HPATF
9. Calibration of Vane Anemometer at Wind Tunnel
10. Calibration of Turbine Flow Meter at HPATF
11. Shock Testing of Quad copter done at Environmental Qualification Lab
12. Sound power measurement of DC motor
13. Sound insulation effect of enclosure
14. Structure borne and Air borne noise measurement of valve assembly
15. Hydrotesting of 8" Mass Flow Meter at HPATF

## 1. Calibration of throat tap Flow Nozzle at Water flow Lab

Calibration of throat tap Flow Nozzle was carried out for 16" size at Water flow Lab in strict accordance with ASME PTC6 2004. The calibration was performed individually on four taps from 1million throat Reynolds number.



Calibration of throat tap Flow Nozzle at WFL

## 2. Testing of 36" valve was conducted at Water Flow Laboratory

Testing of 36" valve was conducted at Water Flow Laboratory



Testing of 36" valve at WFL

## 3. Testing of mix proof valve was conducted at Water Flow Laboratory

The mix proof valve of 65mm size was tested at four different flow directions and valve coefficient (Kv) was determined.



Testing of mix proof valve at WFL

## 4. Testing of valve of size 24" at Water Flow Laboratory

Testing of valve of size 24" was carried out at Water Flow Laboratory



Testing of valve of size 24" at WFL

## 5. One PD flow meter of size 8" was calibrated at Oil Flow Laboratory

One PD flow meter of size 8" was calibrated at Oil Flow Laboratory



PD flow meter Calibration at OFL

## 6. PD flow meter of size 1" was calibrated at Oil Flow Laboratory

PD flow meter of size 1" was calibrated at Oil Flow Laboratory



Calibration of PD flow meter at Oil Flow Laboratory

## 7. Calibration of flow products at Air Flow Laboratory

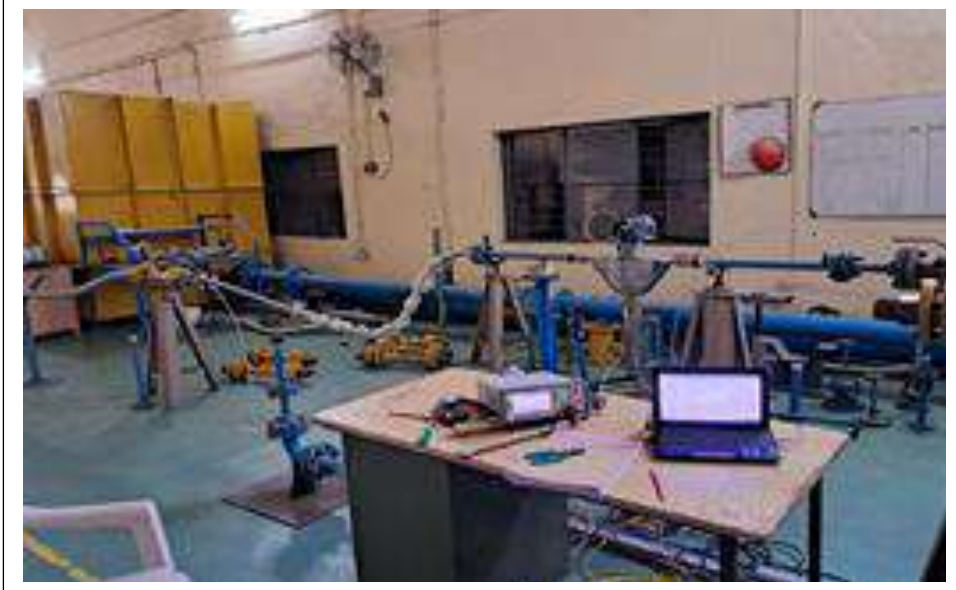
Calibration of various flow products like Laminar Flow Element, Mass flow meter, Turbine flow meter, Exhaust flow meter, Flow nozzle, Orifice meter, Blow by meter, Rotameter etc. were carried out at Air Flow Laboratory



Calibration of various flow products at Air Flow Laboratory

## 8. Calibration of 1/2" Mass Flow Meter at HPATF

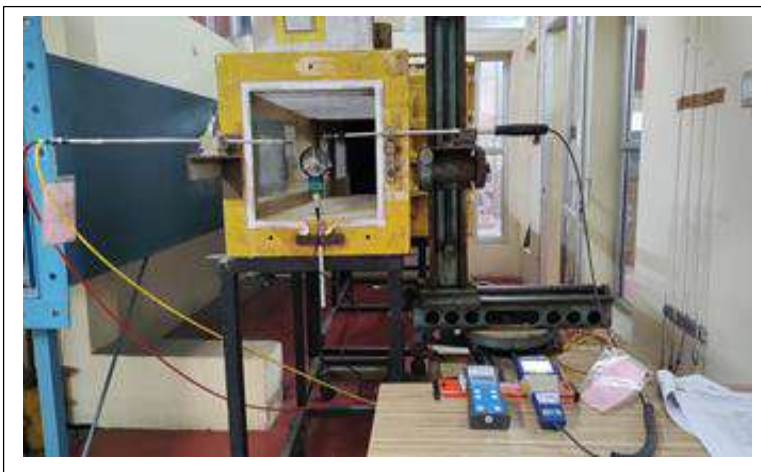
Calibration of 1/2" Mass Flow Meter was carried out at HPATF



Calibration of 1/2" Mass Flow Meter at HPATF

## 9. Calibration of Vane Anemometer at Wind Tunnel

Calibration of Vane Anemometer was done at Wind Tunnel



Calibration of Vane Anemometer at Wind Tunnel

## 10. Calibration of Turbine Flow meter at HPATF

Calibration of Turbine Flow Meter was carried out at HPATF



Calibration of Turbine Flow Meter at HPATF

## 11. Shock Testing of Quad copter done at Environmental Qualification Lab

Shock Testing of Quad copter was done at Environmental Qualification Lab



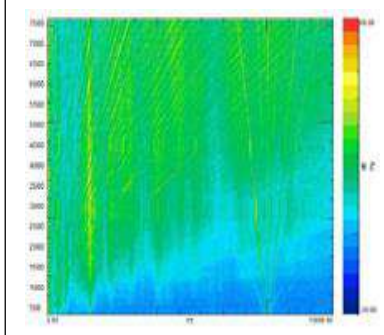
Shock Testing of Quad copter

## 12. Sound power measurement of DC motor

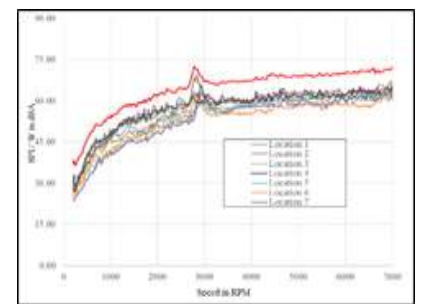
Acoustic measurements are done in hemi anechoic chamber to have a control over the background noise level. The investigated electric motor was placed on the reflecting plane and noise measurements were performed for the run-up operation, both for the clockwise (CW) and counter clockwise (CCW) rotation. The electric motor was powered by variable frequency controller to vary the speed. Sound power level was estimated from sound pressure measurements with ten microphones. For the run-up operation, the noise signature testing was performed using following conditions; bandwidth of 20480 Hz, Frequency resolution of 2 Hz, Hanning window value format was RMS. Tacho tracking was set from 200 rpm up to 7000 rpm with an increment of 25 rpm. An A-weighting filter was used.



Microphone location



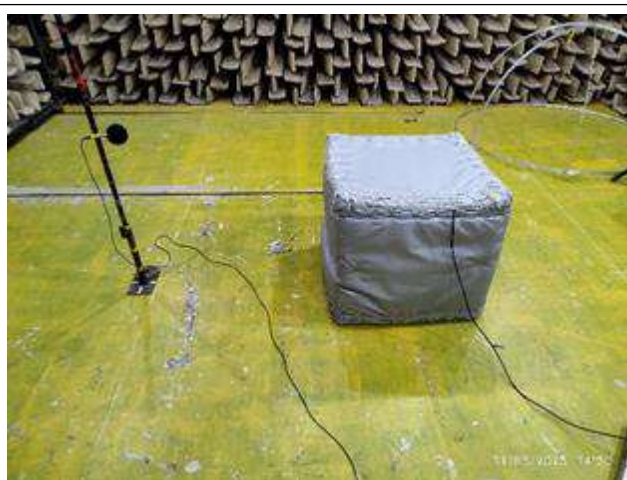
Spectrogram of the acoustic data



Sound power level spectrum vs speed

## 13. Sound insulation effect of enclosure

The thermal enclosure was tested as per ISO 3744 at the hemi-anechoic chamber available at FCRI. The Reference sound source was kept in center of the hemi-anechoic chamber and sound pressure levels were measured around the source as per ISO 3744 for a 1m away from the size of Insulating chamber. After this the Insulating chamber was kept at the center of hemi-anechoic chamber and the Reference sound source was kept inside the Insulating chamber and close the open side with the side wall of chamber and repeat the above procedure. Reduction in sound power due to the thermal enclosure was reported.



Acoustic measurement for insulating chamber

## 14. Structure borne and Air borne noise measurement of valve assembly

The valve assembly to be tested was assembled in the test loop available in water flow laboratory of FCRI. Special purpose resilient mounts were used with the cylinder head assembly, for supporting the piping and the product. Flexible connections were used on the upstream side of the unit to avoid the external vibration influence on to the valve. The accelerometer was mounted on outlet flange of the unit using proper adhesive. The measurements were done in three mutually perpendicular directions i.e., flow direction, perpendicular to flow and in vertical. Structure borne vibratory acceleration measurements were carried out as per the standard MIL-STD-740-2(SH)/1986 at various flow velocities. One-third octave band spectral characteristics were recorded in the frequency range of 5 Hz to 10 kHz.

Air borne noise measurements were carried out as per the standard MIL-STD-740-1 at various flow velocities of and its overall SPL is reported.



Valve under structure borne



Instrumentation for structure borne vibration studies

## 15. Hydrotesting of 8" Mass Flow Meter at HPATF

Hydrotesting of 8" Mass Flow Meter was done at HPATF



Hydrotesting of 8" Mass Flow Meter at HPATF

### FLUID CONTROL RESEARCH INSTITUTE

[Autonomous Body Under Ministry of Heavy Industries, Govt. of India]  
Kanjikode West, Palakkad, Kerala – 678 623.