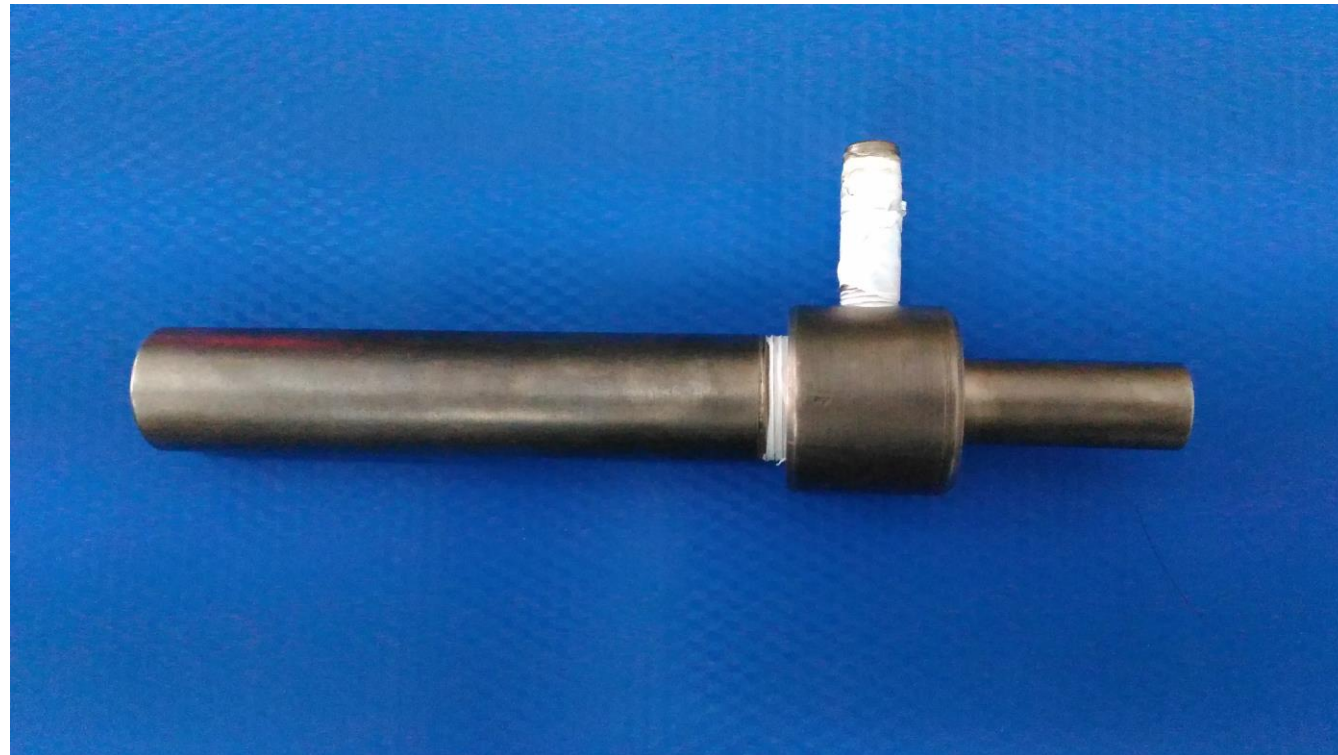
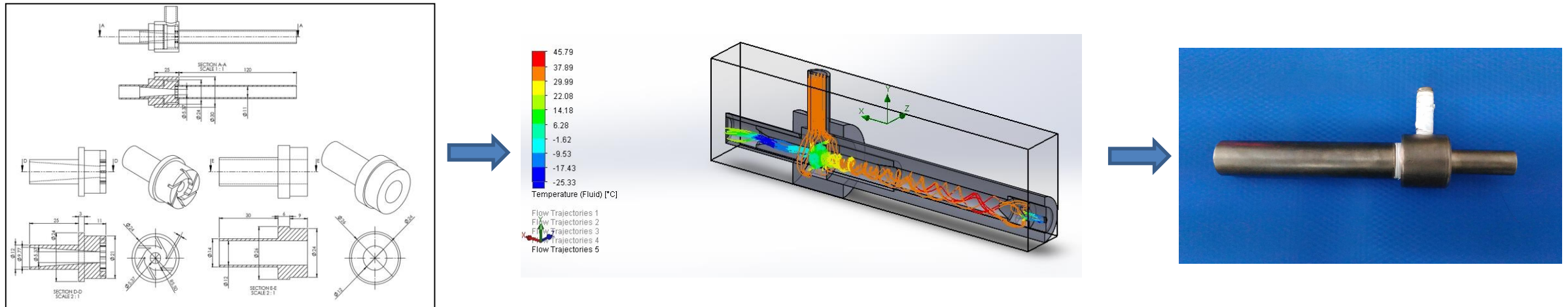


DESIGN AND EXPERIMENTATION ON VORTEX TUBE



Objective:

1. Developing vortex tube setup for experimentation
2. Understanding effect of geometric and flow parameters on the performance of the vortex tube
3. Improving spot cooling capability of the existing equipment

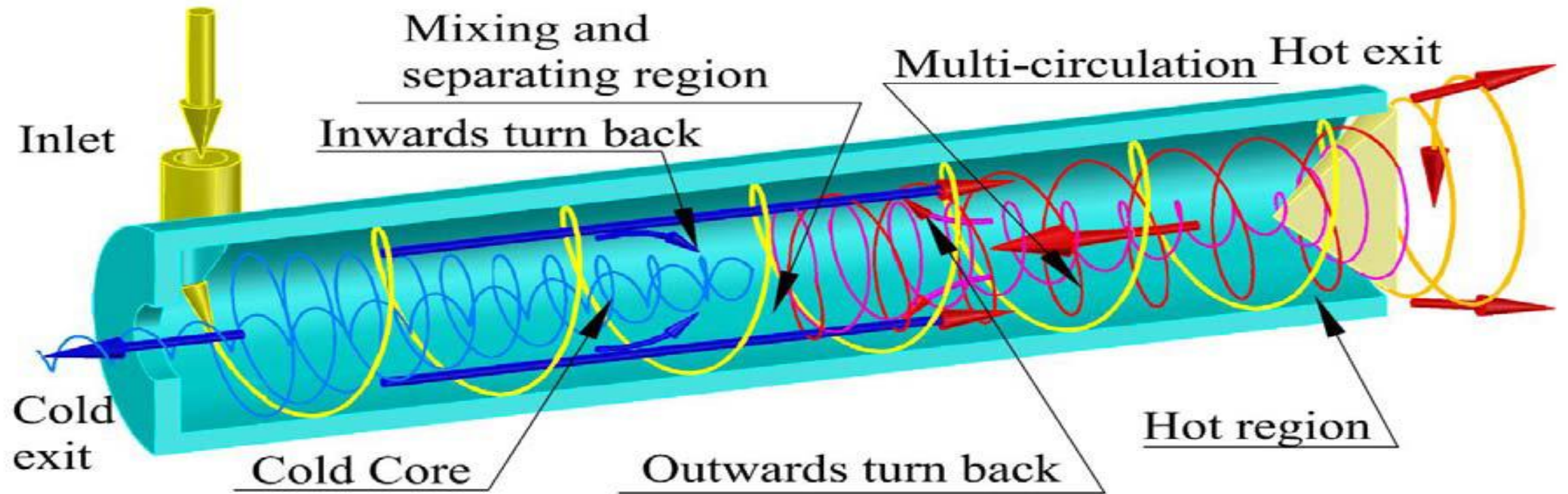


Outcome:

1. Maximum drop of 54% in the flow temperature compared to the inlet temperature
2. Recorded 23% cooling enhancement compared to the literature.
3. Manufactured the vortex tube in half the market price.

LITERATURE SURVEY

CONCEPT AND FLOW VISUALIZATION



LITERATURE SURVEY

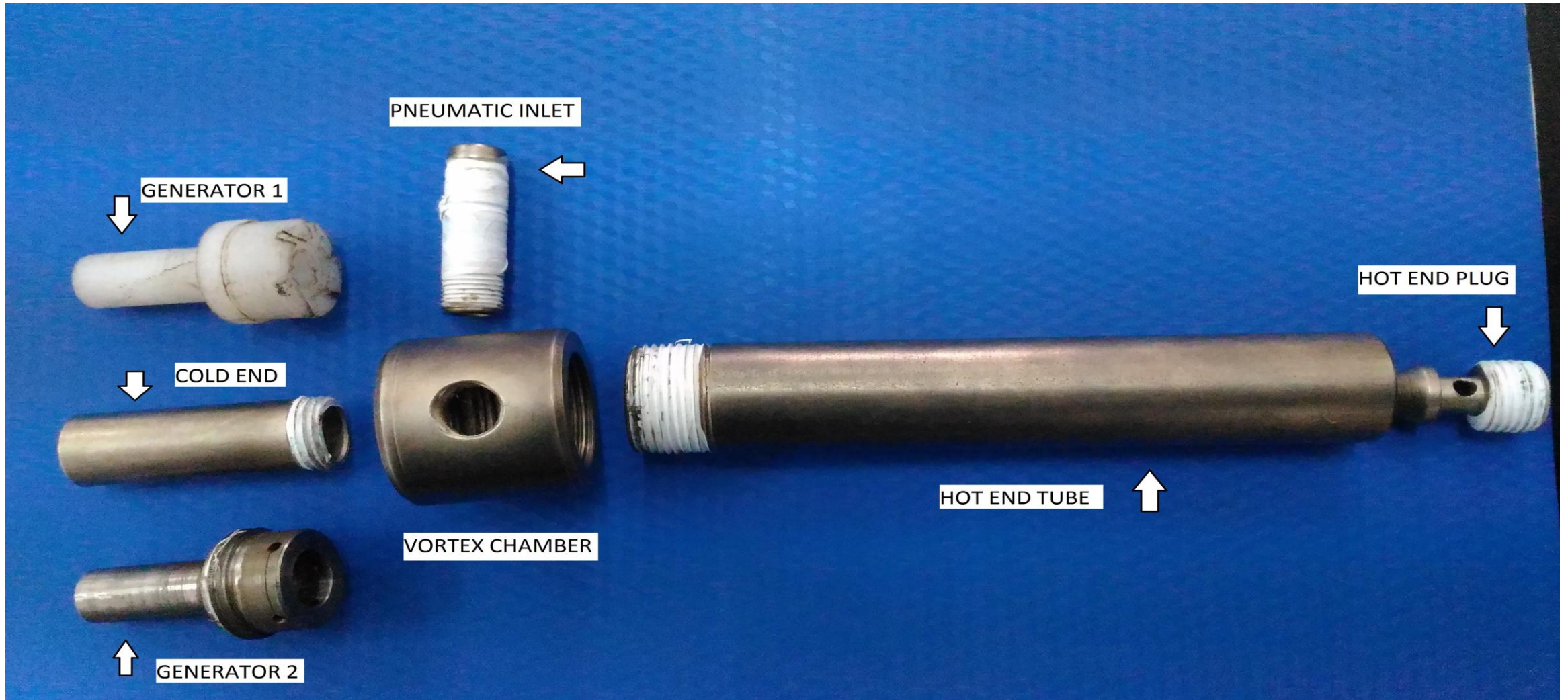
- There are critical values of
 1. Length to diameter ratio
 2. Nozzle area to tube area
- Design of generator nozzle directly affects the formation of vortex flow.
- Counterflow tube performs better than uniflow tube making design of hot end plug a crucial part.

MEASUREMENT PARAMETERS

- Input variables:
 1. Mass flow rate
 2. Cold orifice area
 3. Inlet pressure
- Output variables:
 1. Temperature of cold air
 2. Temperature of hot air

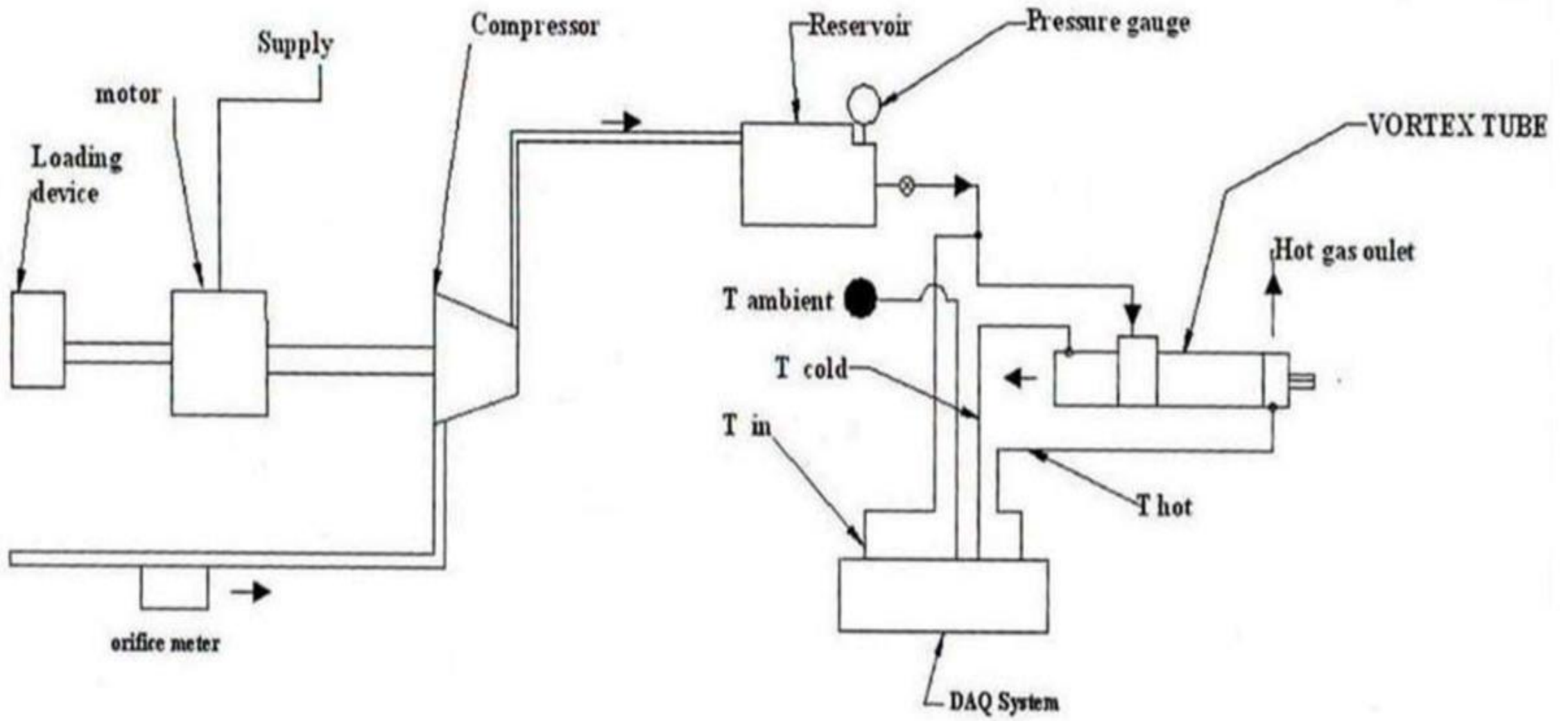
DESIGN AND SIMULATION

CONSTRUCTIONAL FEATURES OF VORTEX TUBE



EXPERIMENTATION OF VORTEX TUBE

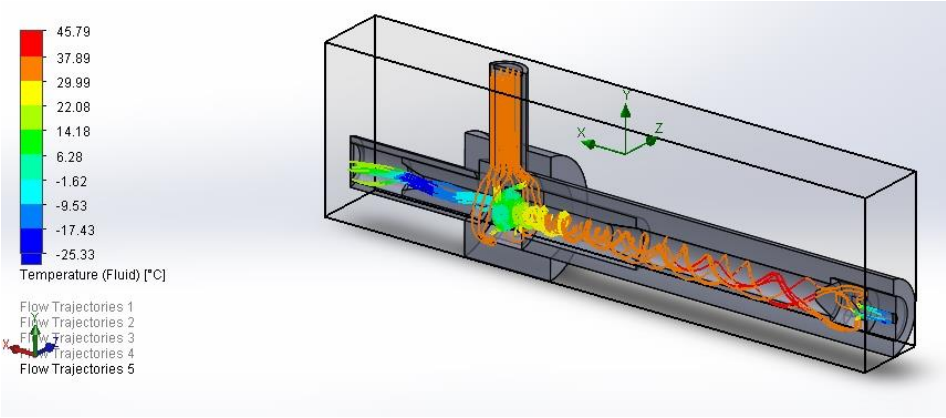
EXPERIMENTAL SETUP



EXPERIMENTAL PROCEDURE

- Compressor was initially run for certain time to get a stable compressor air tank pressure
- Pressure is set and compressed air passed through the nozzle of the vortex chamber
- Wattmeter and flow meter readings are measured.
- The pressure temperature readings at the orifice in hot and cold end stream are to be noted.
- The hot end valve is varied to get the output variables. The Pressure is varied to obtain various output variables.

Parameters Designs	Number of Nozzles	L/D Ratio	Hot Tube Diameter
Design 1	6	10	12
Design 2	2	5	12
Design 3	6	16	5.6
Design 4	4	12	10



Sr. no	Inlet pressure bar	Cold Temperature		Hot Temperature	
		Reference	Experimental	Reference	Experimental
1	5	23.74	19.8	32.86	54.3
2	6	21.33	16.4	33.26	56
3	7	19.71	-	34.02	-

