Design and Development of Cotton Lint Opener for Preparation of Samples in Fibre Quality Testing

Dr. S. V. Ghadge
ICAR-CIRCOT, Mumbai
9823102398
svghadge@gmail.com

Importance of Cotton Quality

- **Growers need the information**
  - to obtain an equitable price for the cotton
  - to enhance cotton quality (breeding/research)
- **Ginners need the information**
  - to optimise the ginning process
- **Traders need the information**
  - to fix the price of cotton
  - to satisfy the customers
- **Spinners need the information**
  - to assure a properly running process
  - to achieve the required quality of yarn
  - to minimize the raw material costs

Fibre Quality Testing

Fibre parameters crucial to hassle-free processing of lint include

- Fibre Length
- Length Uniformity
- Fibre Strength
- Fibre Fineness / Micronaire

In addition

- Fibre Elongation
- Short Fibre Content
- Trash & Its distribution
- Colour, Neps, etc.

Lint Quality decides

- Mechanical Processing Efficiency
- Yarn Quality ⟶ Cloth Quality

Evaluation of Fibre Quality helps

- Cotton Grower
- Ginner cum Trader
- Textile Mills

Testing Fibre Quality

High Volume Instrument

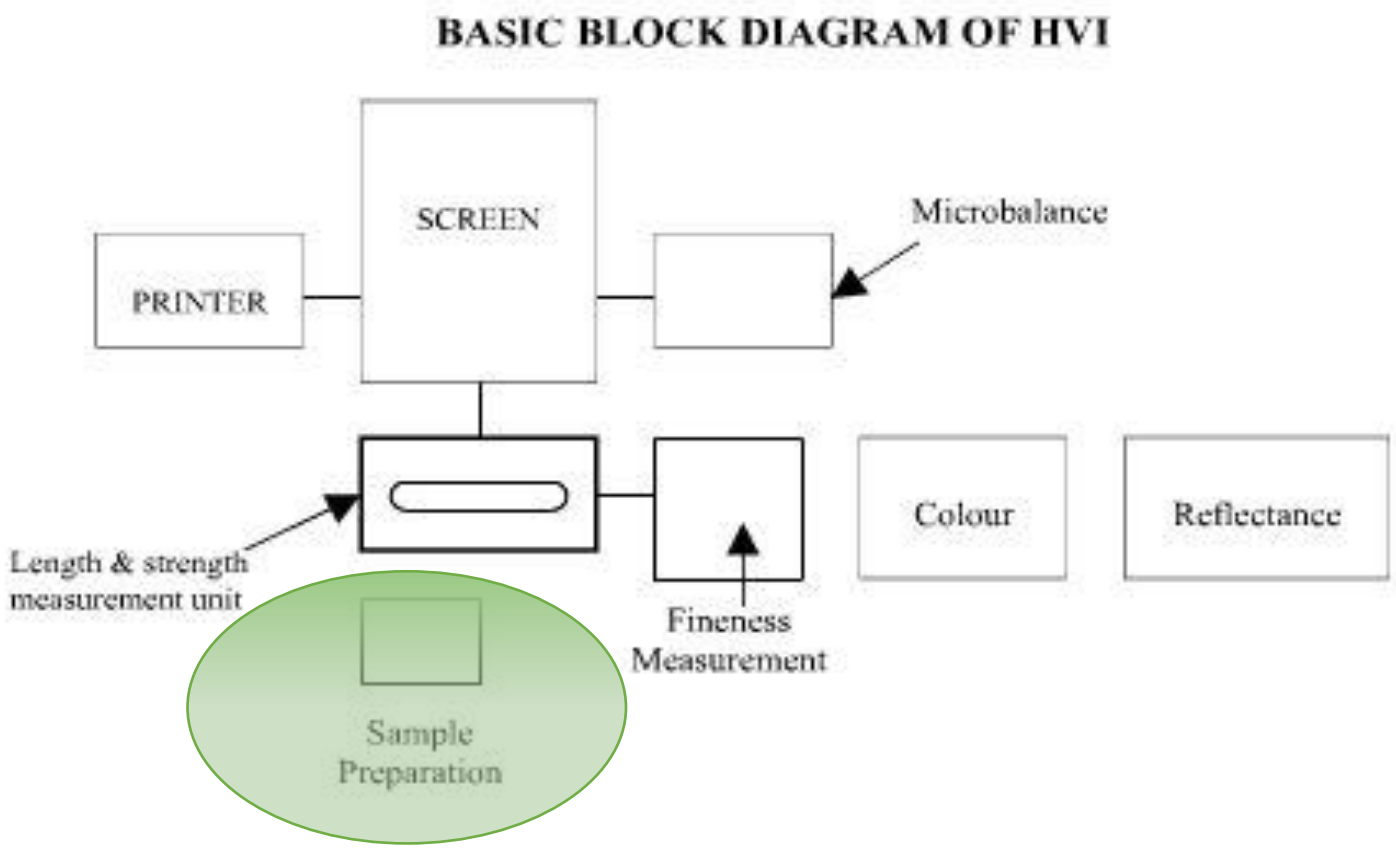
- An ensemble of conventional instruments
- Single compact operating system
- State of art technology in mechanics, optics & electronics

Advantages

- High speed of testing
- Accurate, reproducible & reliable
- No operator bias

India – 350 machines, Requirement - 1000

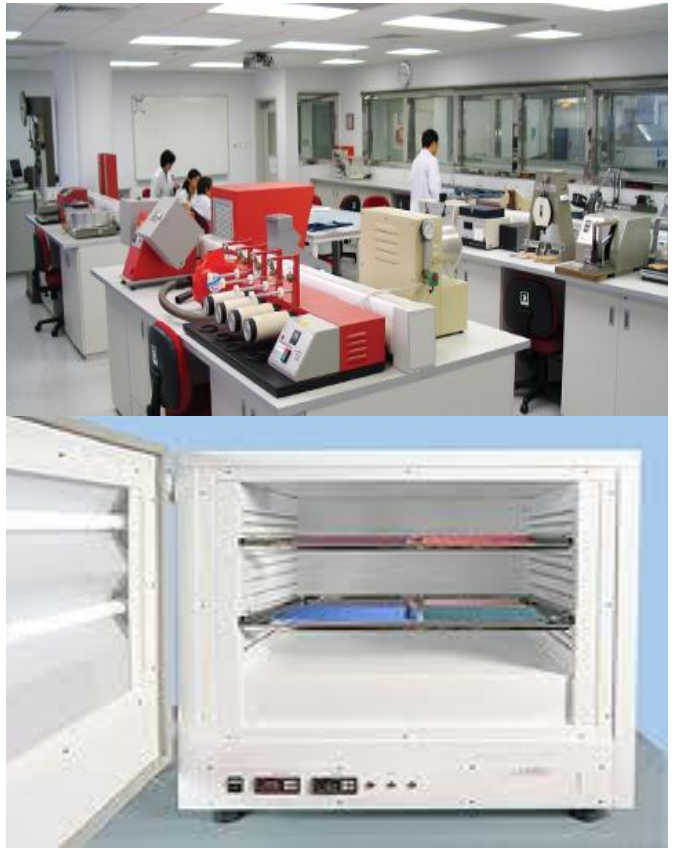
HVI Working Principle



Fibro-Sampler

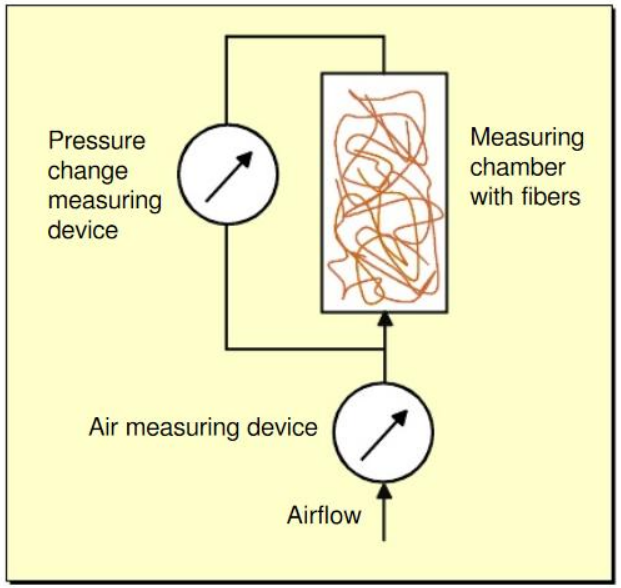
Ambient Conditions for Textile Testing

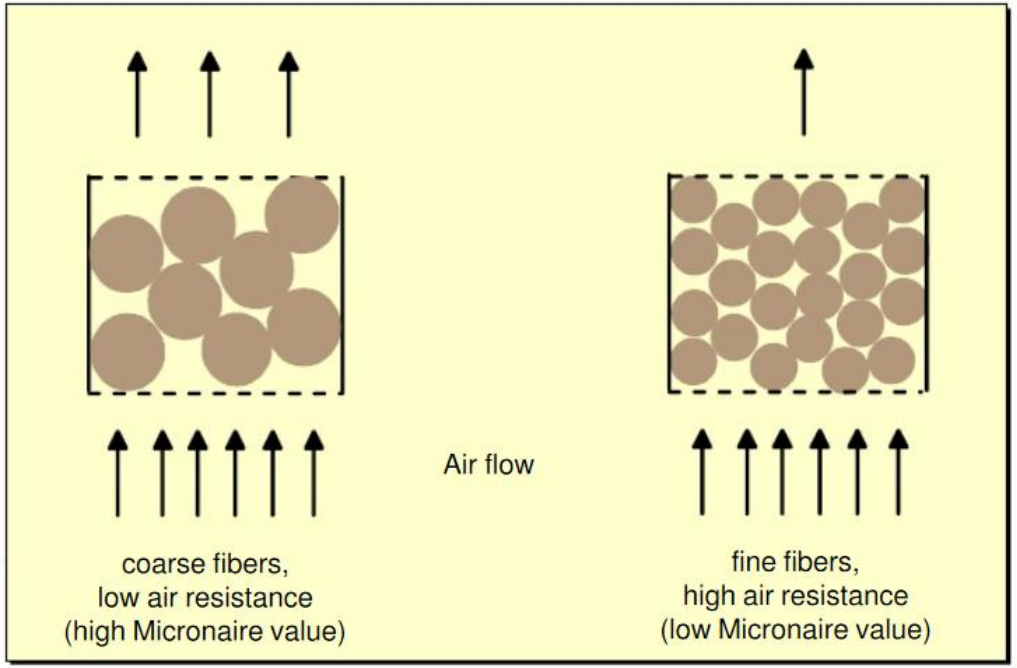
- **Relative Humidity**
  - 65 ± 2 % RH
- **Temperature**
  - 21 ± 1 ^{0}C (70 ± 2 ^{0}F)
  - 27 ± 1 ^{0}C (80 ± 2 ^{0}F) for tropical conditions
- **Sample to be conditioned before testing**
  - Recommended Time – 24 hours
    (may be less in case of rapid conditioning)
  - Moisture Content in cotton within 6.75 to 8.25 %



Fibre Fineness

- Unit of measurement is Micronaire (mic) – micrograms/inch
- The test measures the resistance offered by a weighed plug of fibres to a metered airflow.





Influence of Opening on Micronaire Value

Variety	Micronaire Values		Deviation
	Opened	Unopened	
H.6	3.0	3.4	0.4
LRA.5166	3.3	3.7	0.4
H.4	3.6	4.0	0.4
G.Cot.16	3.6	4.3	0.7
Jaydhar	5.4	5.8	0.4
RG 8	7.7	8.4	0.7

- **Classification of cotton according to Micronaire value**

Category	Range of Micronaire value
Very fine	Below 3.0
Fine	3.0 to 3.9
Average	4.0 to 4.9
Coarse	5.0 to 5.9
Very coarse	6.0 and above

Existing Methods of Lint Opening

Manual Method

- Improper & Insufficient Fibre Opening, No Trash Removal, Low Capacity, High Cost of Labour Requirement and Drudgery of Operation.

Trash Analyser

- Low Capacity, High Initial Cost of Equipment, Costly Repair & Maintenance, Requirement of Highly Skilled Manpower for Operation, Repair & Maintenance.

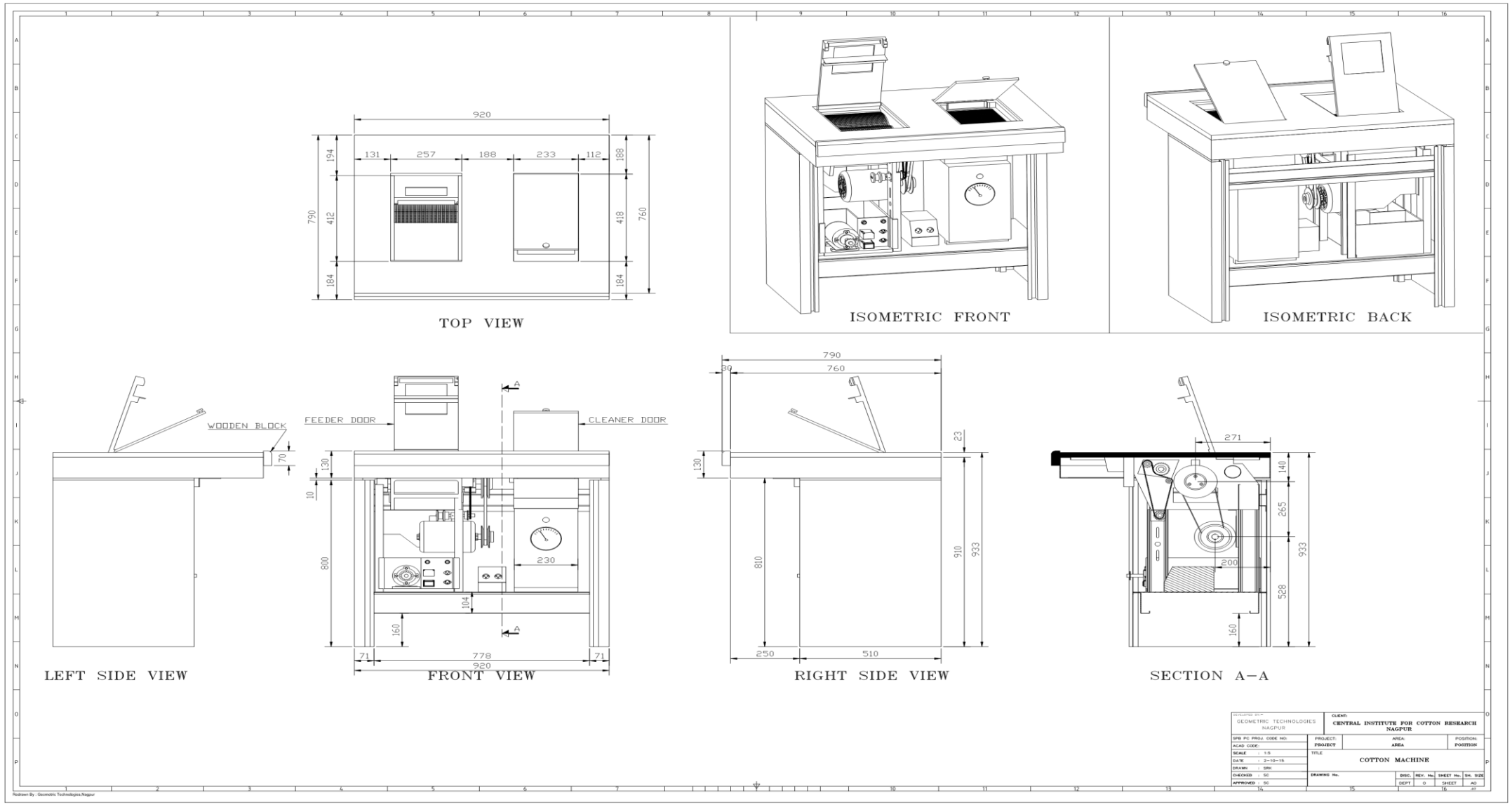
Requirements of Sample Opening

- Capacity: About **30 Samples/h** (Sample Weight: 20g)

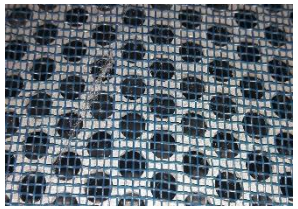
  i.e. **10 g/min**

- Desired level of opening
- Simple design and low maintenance
- Less electronic controls
- Easy operation
- Safety during operation

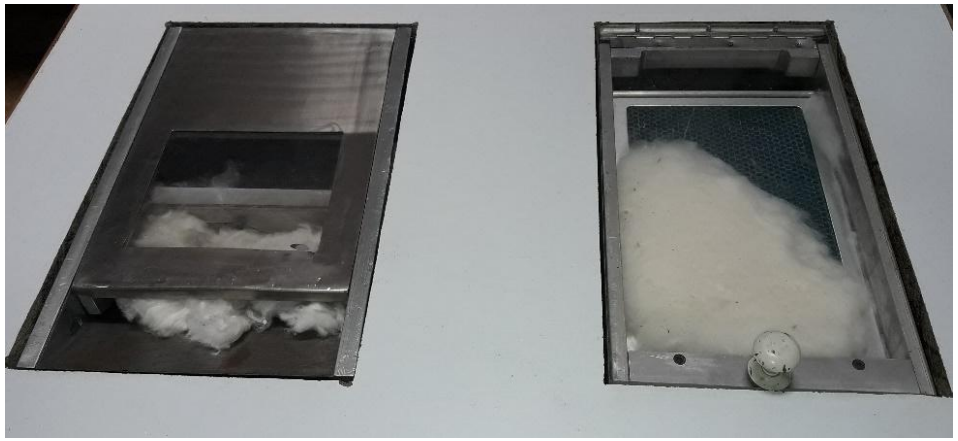
Cotton Lint Opener CAD Drawings



Cotton Lint Opener Specifications

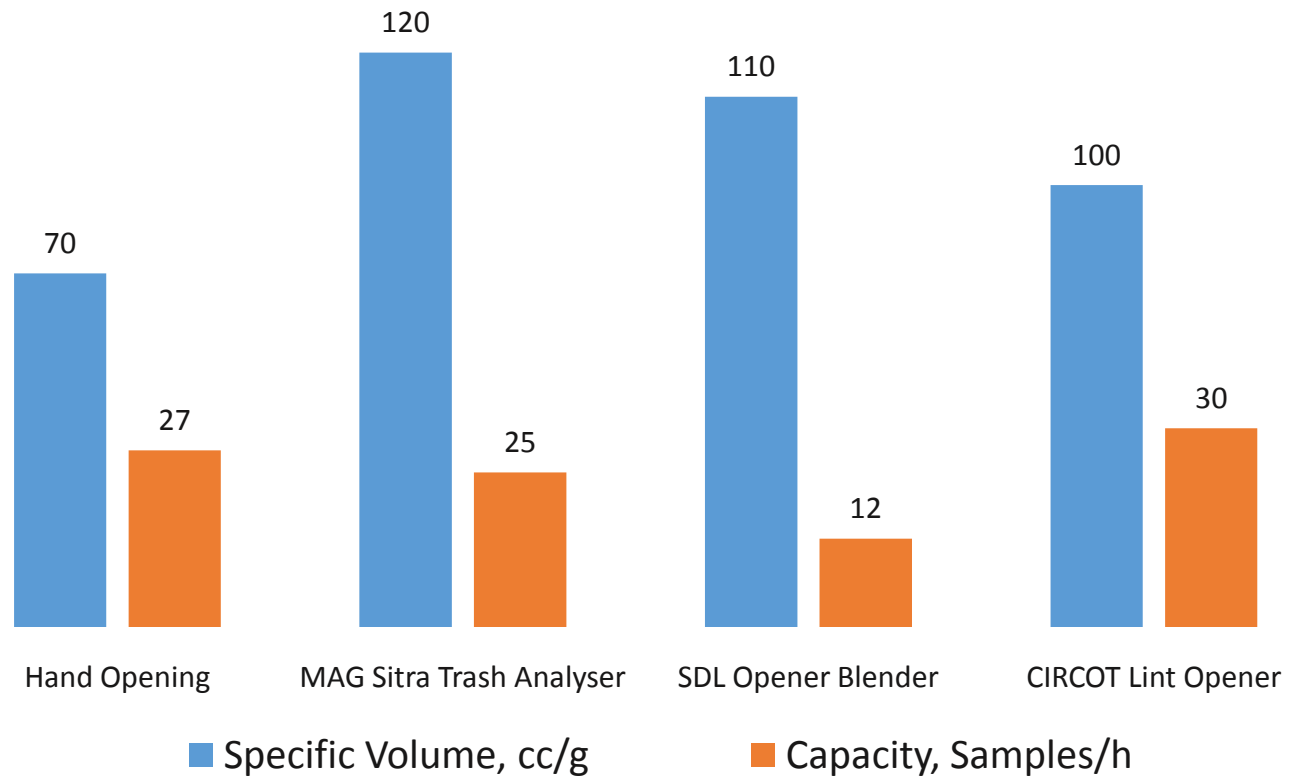


- Licker-in Cylinder Assembly
  - RPM – 800 rpm
  - Cylinder Dia – 225 mm
  - Cylinder Length – 300 mm
  - Shaft Dia – 30 mm
- Feeder Roller Assembly
  - RPM – 8-10 rpm
  - Dia – 50 mm
  - Cylinder length – 300 mm
  - Shaft Dia – 30 mm
- Suction Assembly
  - High Voltage brushless blower of 200 mm WGP
  - HDPE piping for suction of opened lint
  - Lint collection chamber for 20 g opened lint
- MS Mounting Frame
- SS Screen of 3mm thickness
- Drives - Motors, V Belt, Pulley and Chain



Performance Evaluation

Samples obtained from CICR - Medium Staple Cotton, Mic - 5.4



Conclusions

- Cotton lint samples used for testing fibre quality parameters must be clean and free from any non-lint content. **Opening up of cotton lint samples** is essential for obtaining **correct micronaire** readings.
- Presently, HVI testing laboratories open cotton lint samples either manually by hand or by using **trash analyzer** and **opener blender**. The extent of lint opening is not uniform and optimum in both these methods and the speed is also slow, which leads to a tendency of testing samples without opening.
- **ICAR-CIRCOT Cotton Lint Opener** is simple in design, easy for operation and gives desired level opening.

Capacity	Specific Volume
~ 10 g/min (30 samples/h)	**~ 100 cc/g**
(Sample Weight ~ 20 g)	(Unopened Sample ~ 50 cc/g)

Thank You !