



TXL 221: Yarn Manufacture I

3 Credits

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Marks Distribution

Minor:	40
Quiz :	20
Major:	40



Attendance Policy

- **Minimum Attendance** : 75%
- **Attendance less than 75%** : One grade down
- **Attendance more than 95%** : 5 bonus marks will be added to the final marks.
- **Late attendance** : Will be marked as absent after attendance has been already registered.



Course Outline (Lecture)

Opening/Blowroom:

- ✓ Principle of fibre opening in blow room
- ✓ Principle of fibre cleaning in blow room
- ✓ Opening and cleaning machines
- ✓ Principle of fibre blending
- ✓ Recent developments

Course Outline (Lecture)



Carding:

- Objective and principle of carding
- Machine elements and operations
- Sliver formation and fibre configurations in sliver
- Automation and recent developments

Course Outline (Lecture)



Drafting/Drawframe:

- ✓ Objectives, principles and methods of roller drafting.
- ✓ Purpose and principle of condensation of fibres.
- ✓ Causes of mass variation of sliver and control.
- ✓ Automation and recent developments in draw frames



Reference Books

- ✓ A Practical Guide to Opening and Carding, Short-staple Spinning Series (Volume 2), By W. Klein
- ✓ A Practical Guide to Combing and Drawing, Short-staple Spinning Series (Volume 3), By W. Klein
- ✓ Fundamentals of Spun Yarn Technology By Carl A Lawrence
- ✓ Handbook of Yarn Production-Technology, Science and Economics By Peter R. Lord
- ✓ Spun Yarn Technology By Eric Oxtoby
- ✓ NPTEL lecture series, IIT Delhi



Introduction

What is a yarn?

“A yarn may be defined as a product of substantial length and relatively small cross-section of fibres and/or filament(s) with or without twist, used for interlacing in processes such as knitting, weaving, or sewing”

Different Types of Yarn

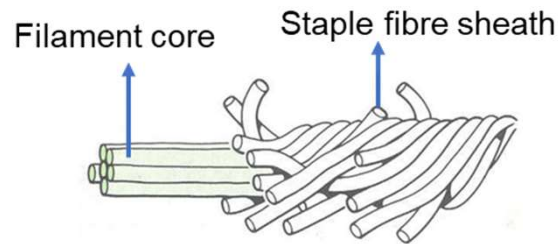
- Continuous filament yarns



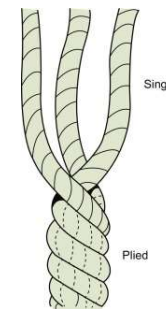
- Staple spun yarns



- Composite yarns



- Folded/plied/doubled yarns





Production of Staple Yarn: Cotton and Blends



Removal of cotton
fibre from seeds



Ginning process



Seed fibre, cellulosic, hydrophilic



Cotton Bale

227 kg each
 0.2 g/cm^3

How to make cotton yarn from bale?

- ✓ Opening
- ✓ Cleaning why?



Impurities in Cotton Fibre

- **Vegetable matter (50-80%)**
Seed fragments, stem fragments,
leaf fragments, etc.
- **Mineral matter (10-20%)**
Dust, sand, soil, etc.
- **Fibre fragments**
- **Others**
Metal particles, cloth fragments,
packaging materials, etc.



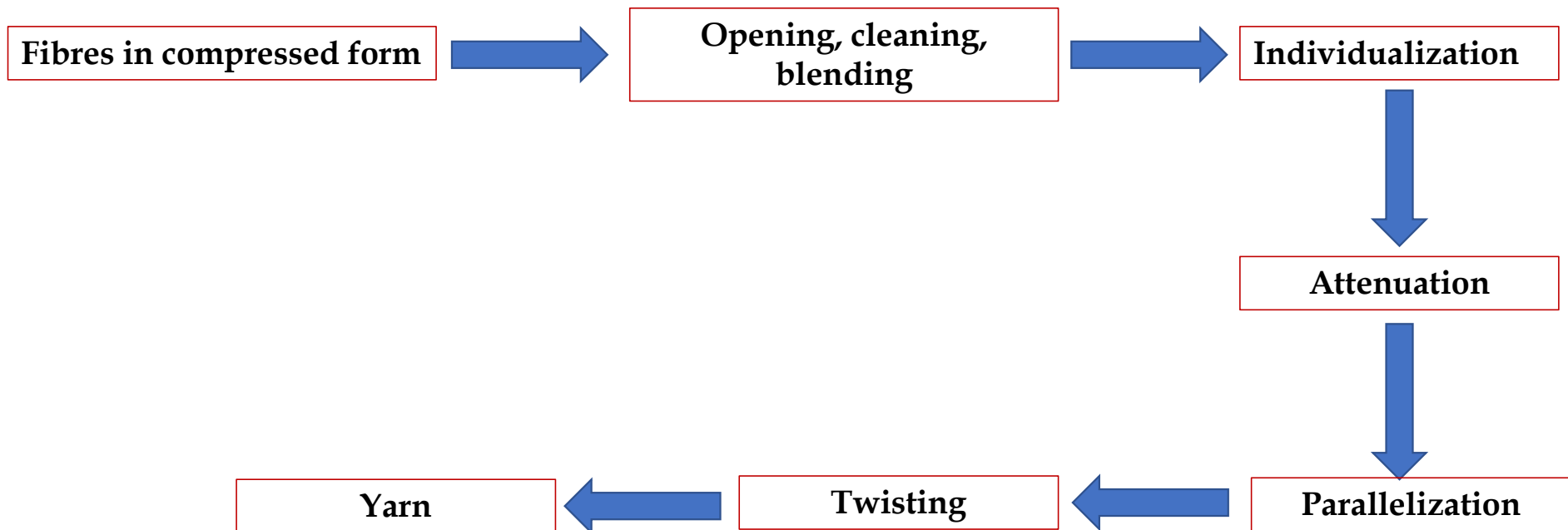
Trash size > 500 micron
Dust < 50 micron
Micro dust < 15 micron

Problems?

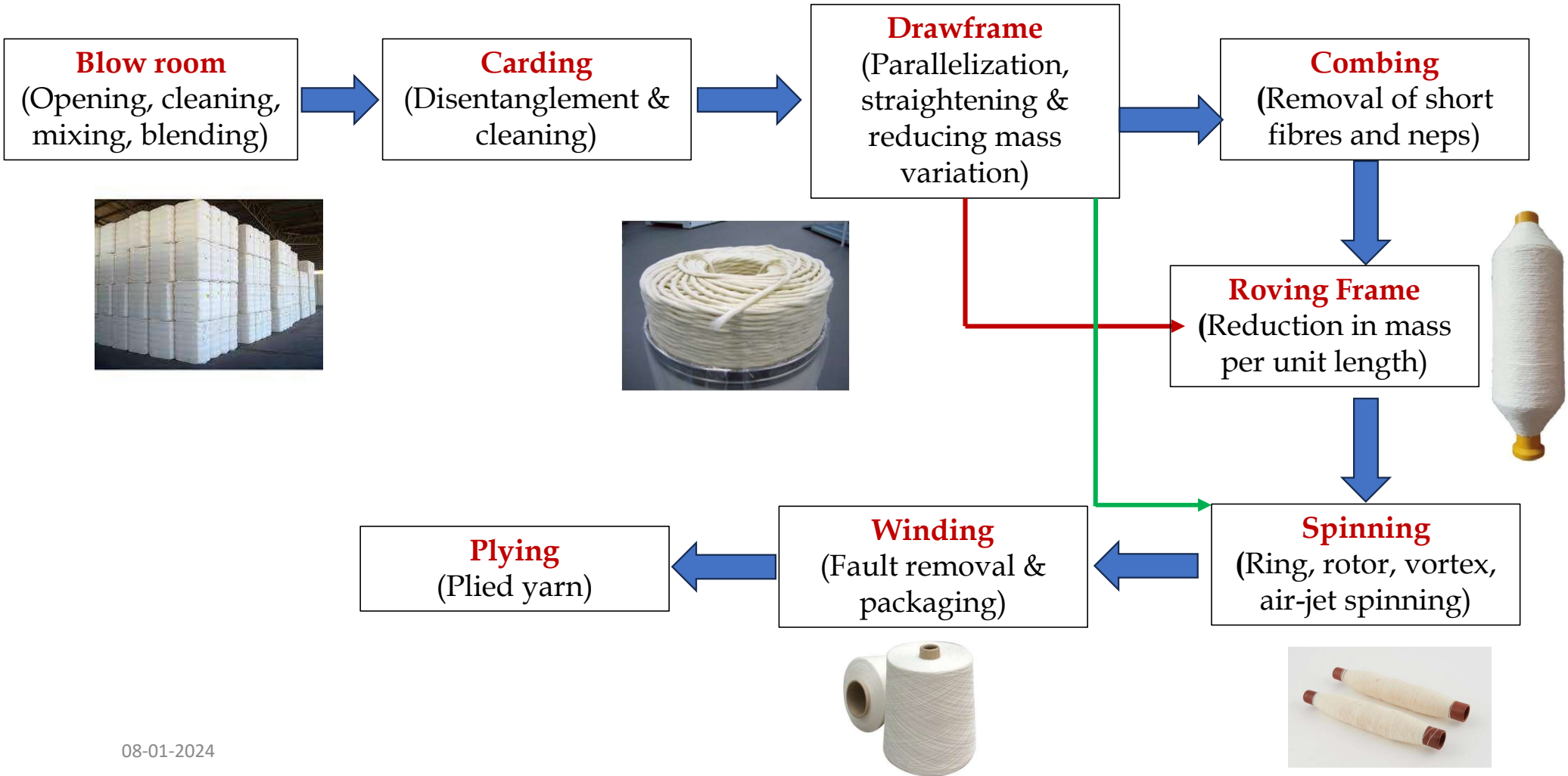
Yarn fault, damage to machines, health hazard to the workers



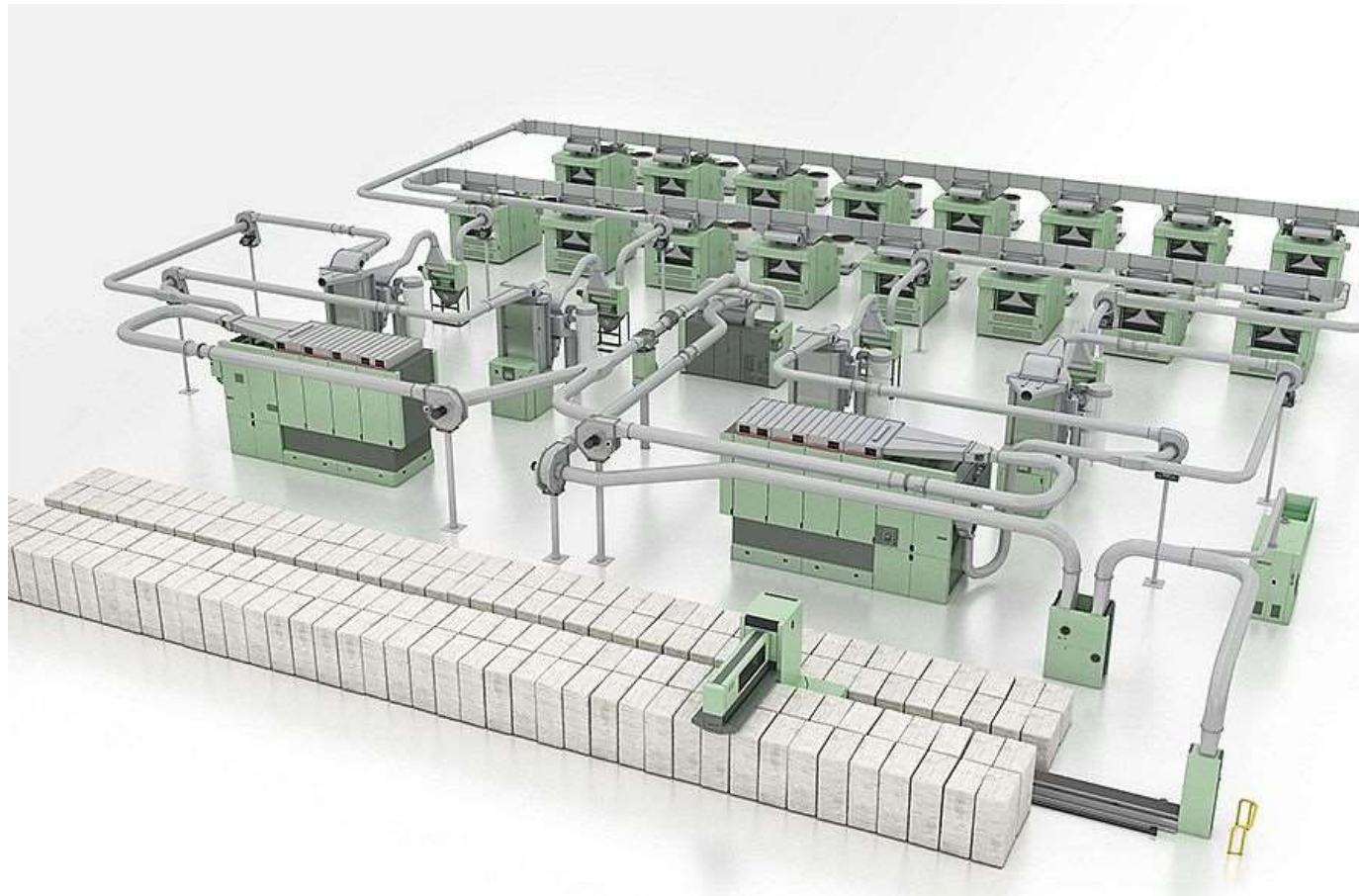
How staple yarns are produced?



Spinning Process Flowchart



Blowroom



Blowroom



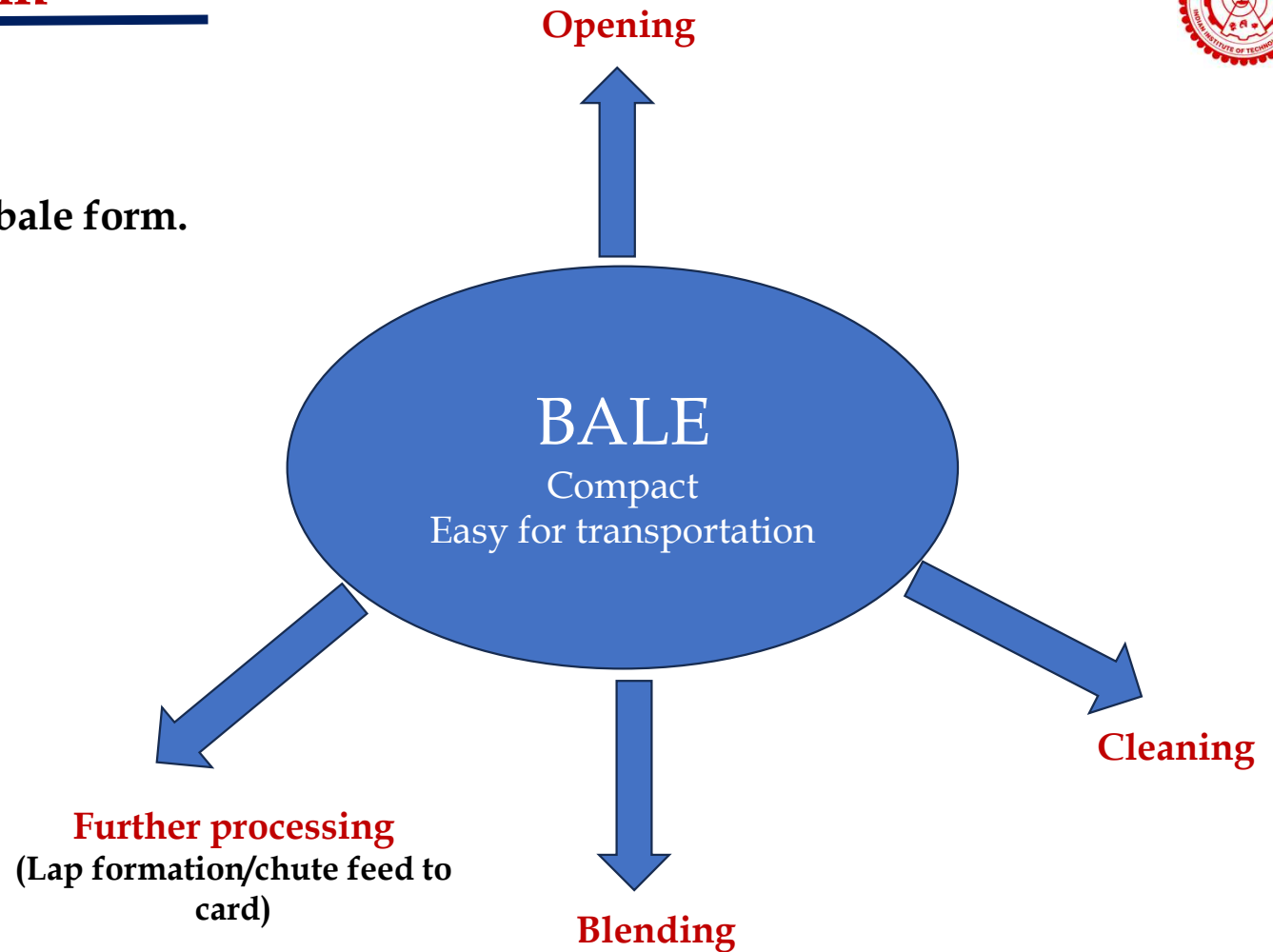
VARIOline ECOrized

30% energy savings in fiber transport



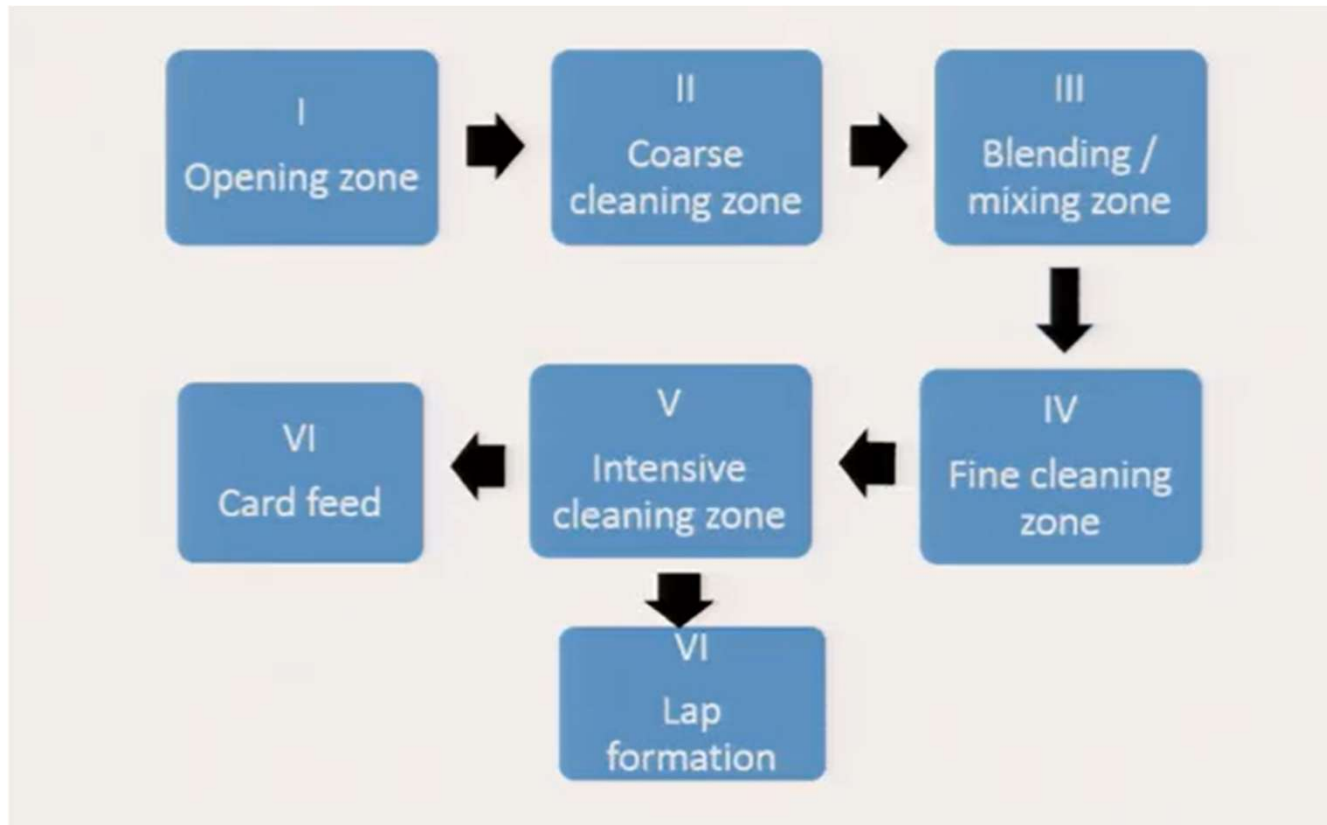
Introduction to Blowroom

Fibres come to spinning mill in bale form.





Blowroom Operating Zones



Why Blowroom has different zones and machines?



Opening of Bale

How to open bale?

- ✓ Removing individual fibres from bale ?
- ✓ Dividing and subdividing bales?

Question: In a spinning mill, cotton fiber is supplied in compacted bales of about 226.8 kg each. The bale dimensions is typically $1.4 \times 0.53 \times 0.64$ m, and the bale density is 478 kg/m^3 . If the individual fibers are 30 mm in length and 1.7 dtex fineness and the production rate of the plant is 500 kg/h, then how many fibres need to be separated per second from the bale?

Ans:

No. of fibres in each bale = 45 billion (approx.)

No. fibres to be separated per hour = 98 billion, 27 million fibers per second



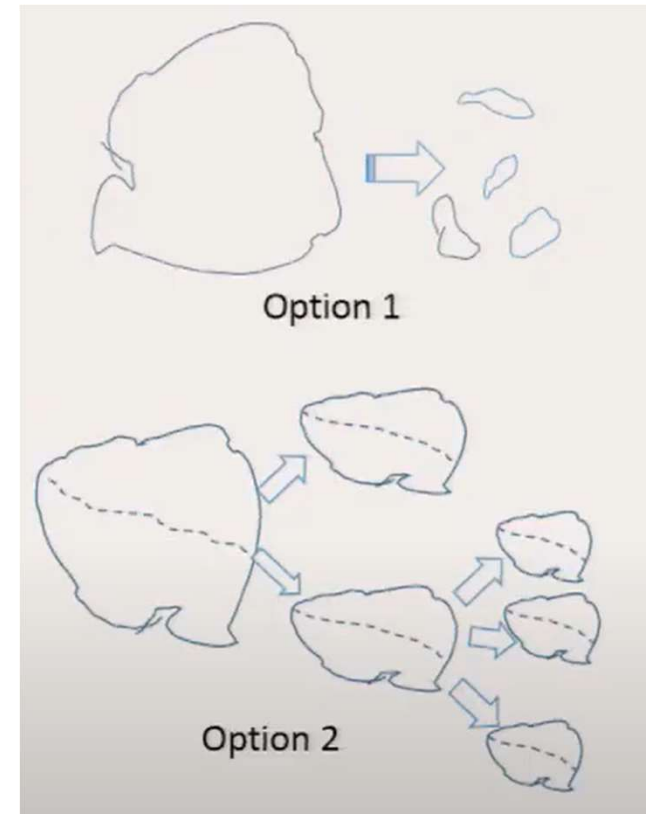
Opening of Bale

How to open bale?

Removing large clumps of fibres from a bale



Progressively dividing the large clumps into many smaller pieces.

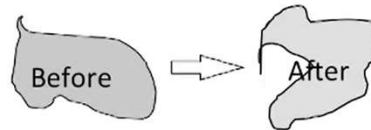
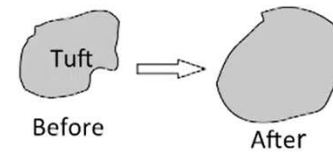


Opening of Tufts



Different Possibilities

- ✓ A large tuft is divided into several smaller tufts
- ✓ Volume of tuft increases without disintegration
- ✓ Shape of the tuft changes



How to measure fibre openness?

- By measuring specific volume