Approach Flow System

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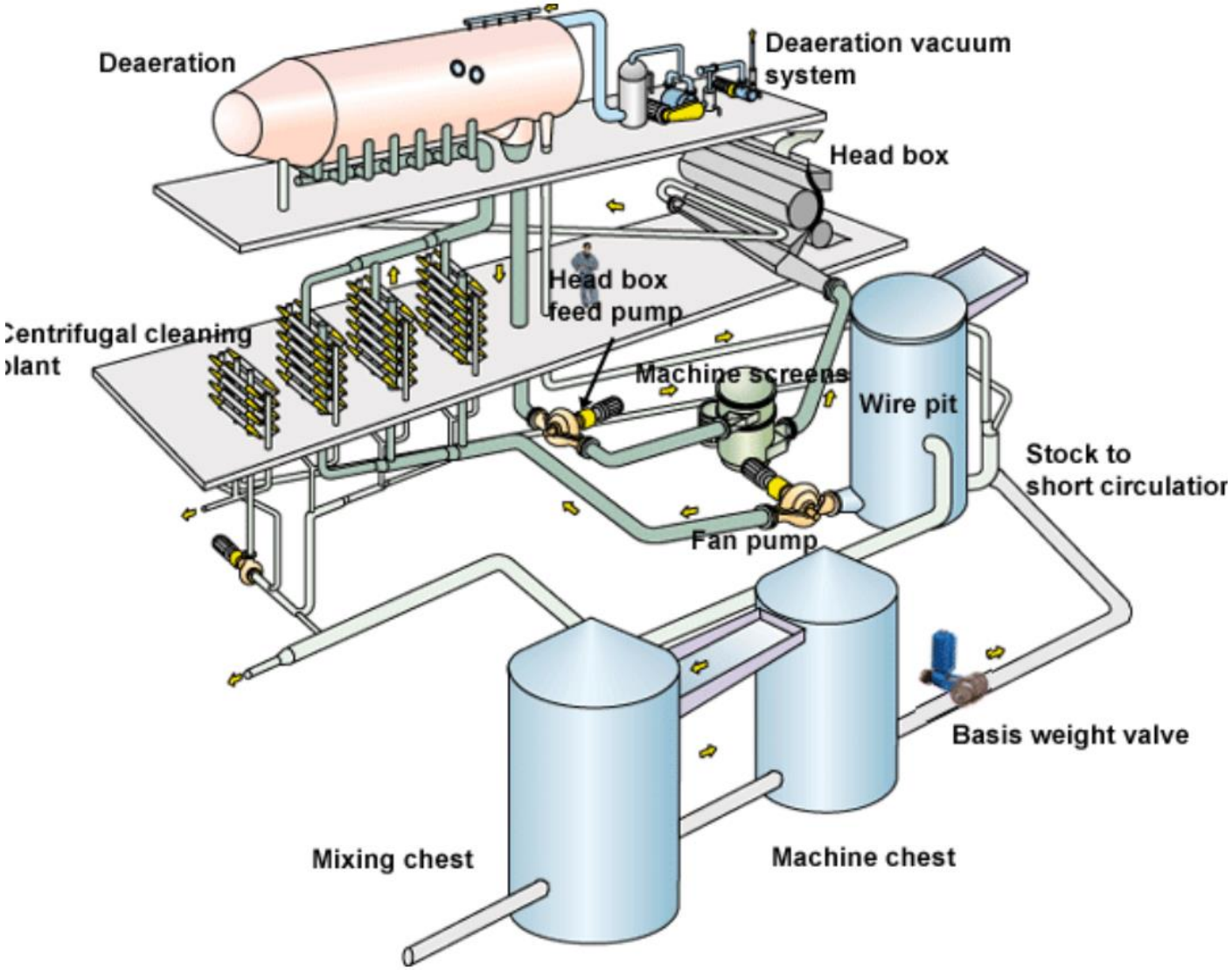
Content

- Overview of stock approach flow system
- Stock approach flow components
- Summary



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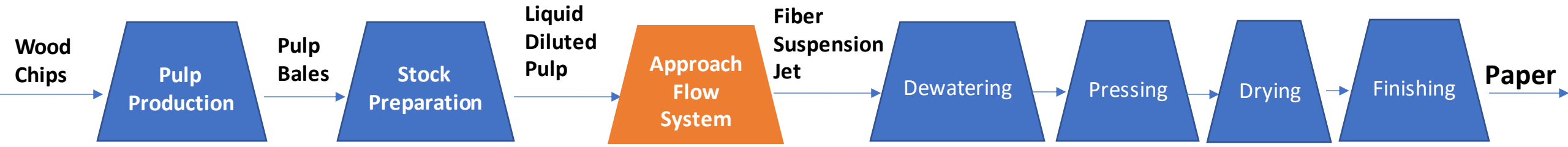
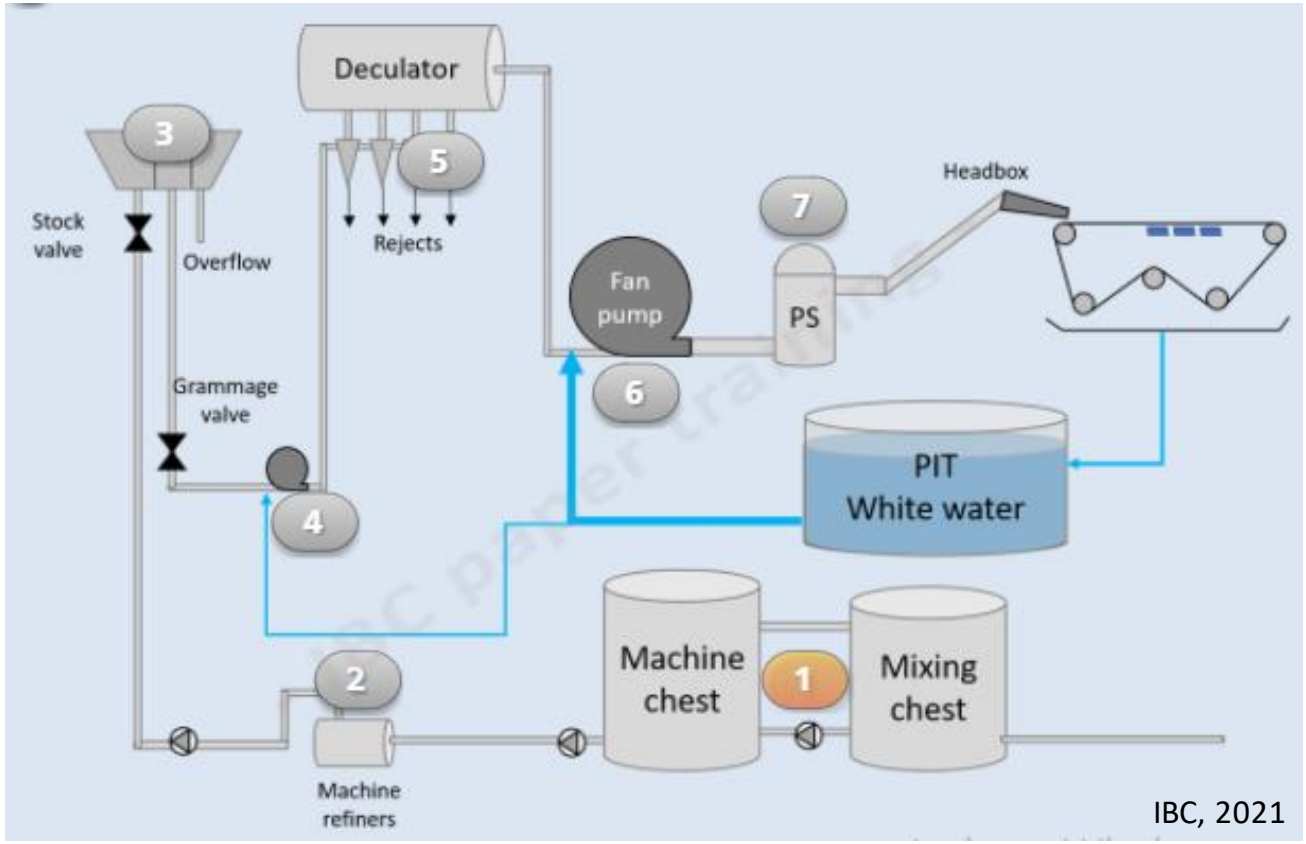
Overview of Stock Approach flow system



The Approach Flow System extends from the machine chest to the headbox lip.



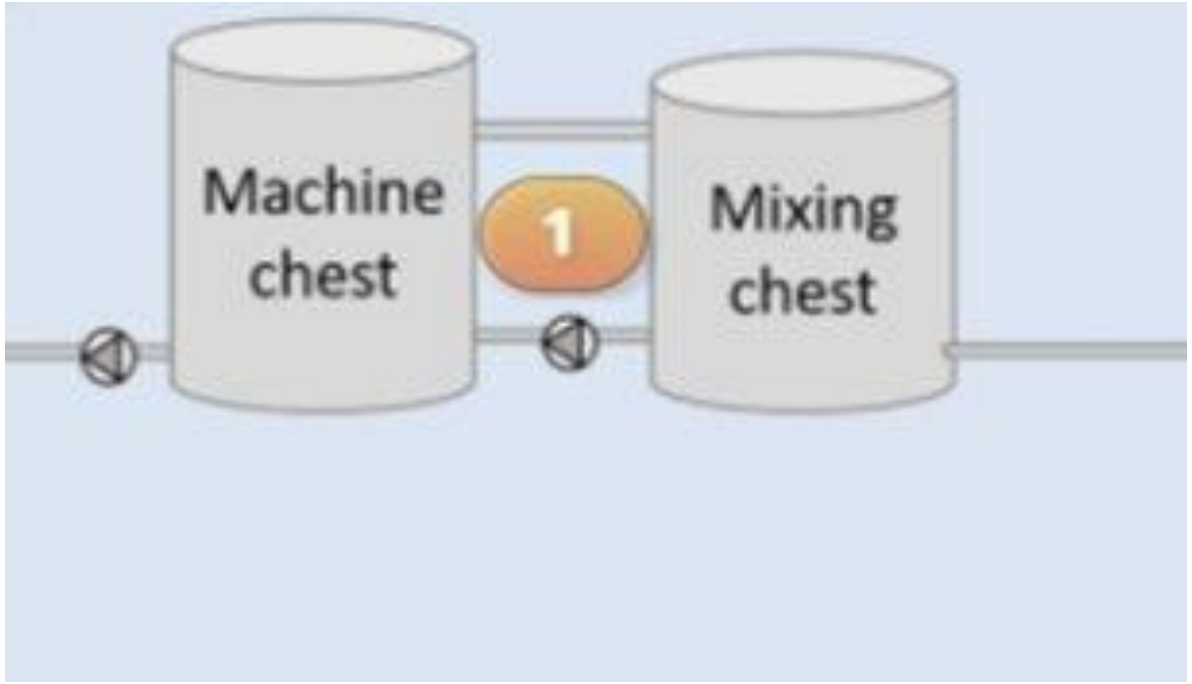
Goals:

- Store pulp stock.
- Change fiber morphology.
- Regulate the stock going into the paper machine.
- Stock cleaning.
- To dilute the stock.
- Reuse water from dewatering
- Blend stock with other chemicals, fillers and additives not added in stock preparation
- To meter and provide stock to the paper machine.
- Spread and distribute evenly the stock unto the paper machine.

Stock Approach flow components

Machine Chest

- Last stock storage chest before the paper machine.
- Holds reserve stock for the paper machine in case pulping operations are shut down or interrupted.
- Dry strength additives are included here.
- The thick stock concentration is 4%, the typical consistency for storage and pumping before a paper machine.



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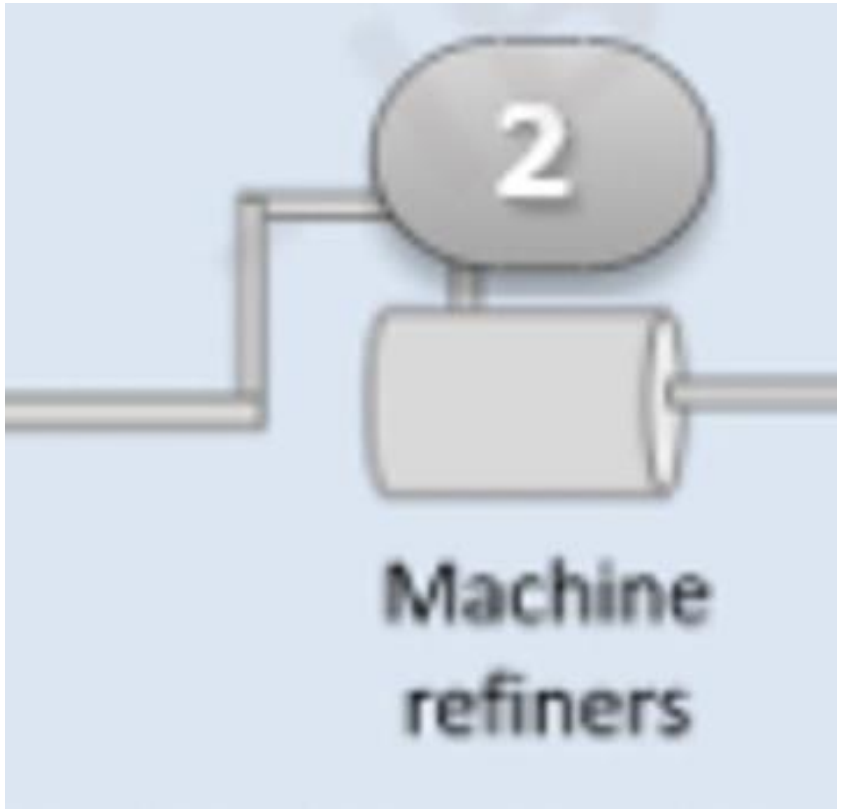
Machine Refiner

- This finishes stock preparation refining.
- Light refining is carried out in the machine refiner in order to get rid of fiber bundles and flocs.
- Ensures a low reaction time to adjust sheet properties such as strength.
- Refining helps to improve sheet strength



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Stock valve

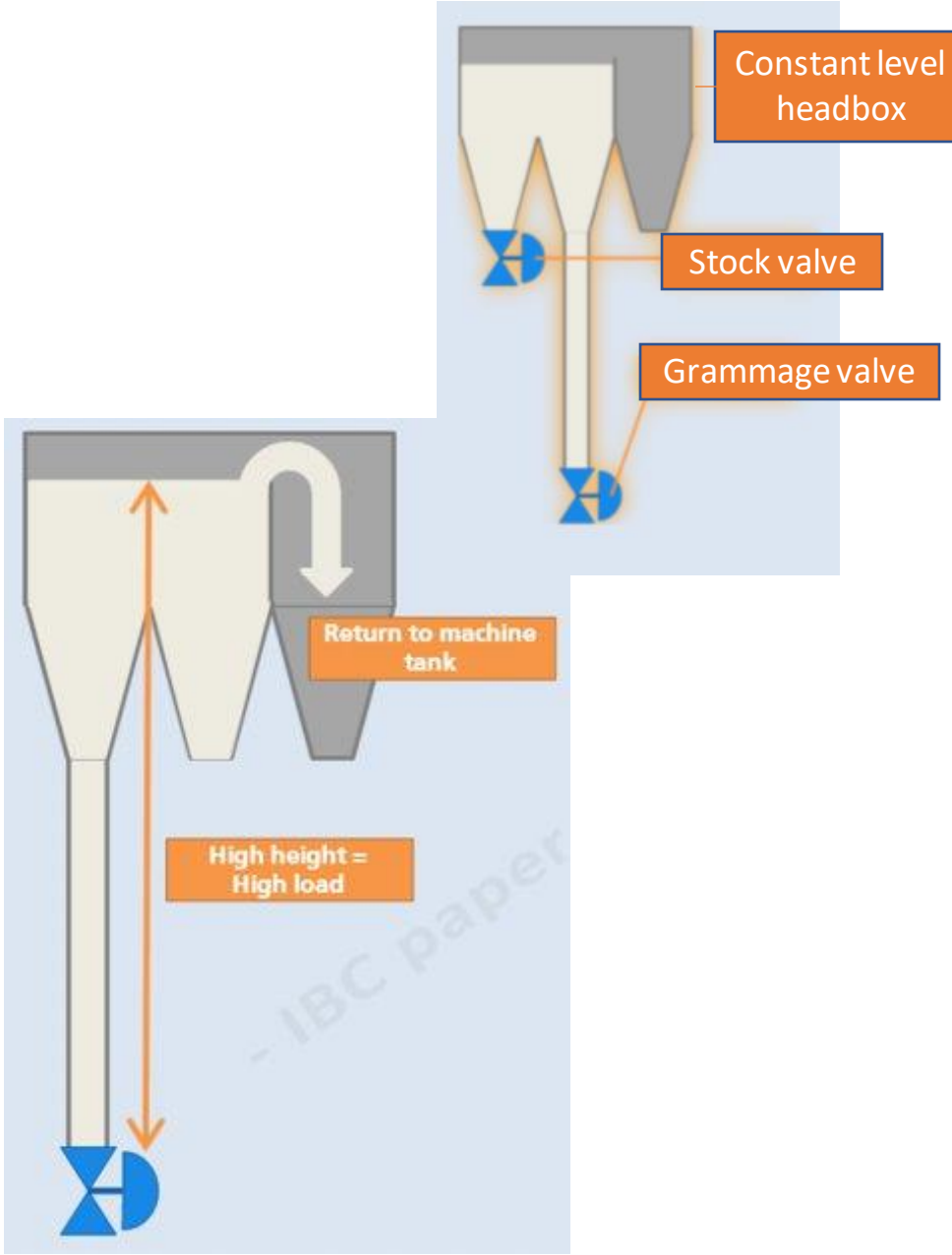
- Stock valve allows stock to go through onto the machine
- Can be shut during an emergency

Constant level headbox

- Ensures a set and constant pressure on grammage valve -> stabilizing flow of pulp passing through grammage valve
- Overflow controls the level in the constant level headbox
- An alternative to a constant level headbox is a variable speed pump

Grammage valve

- Controls the amount of stock sent on the machine depending on the requested weight



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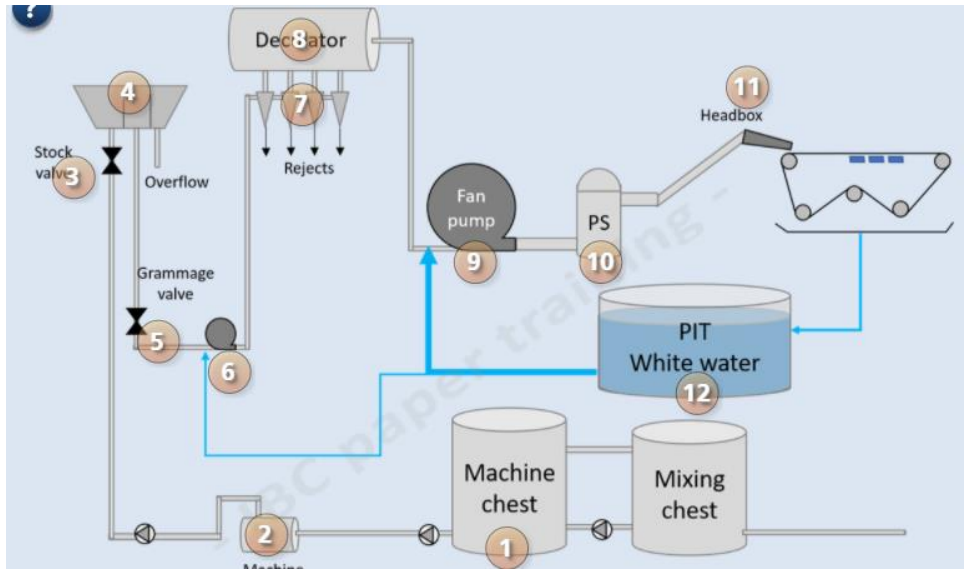
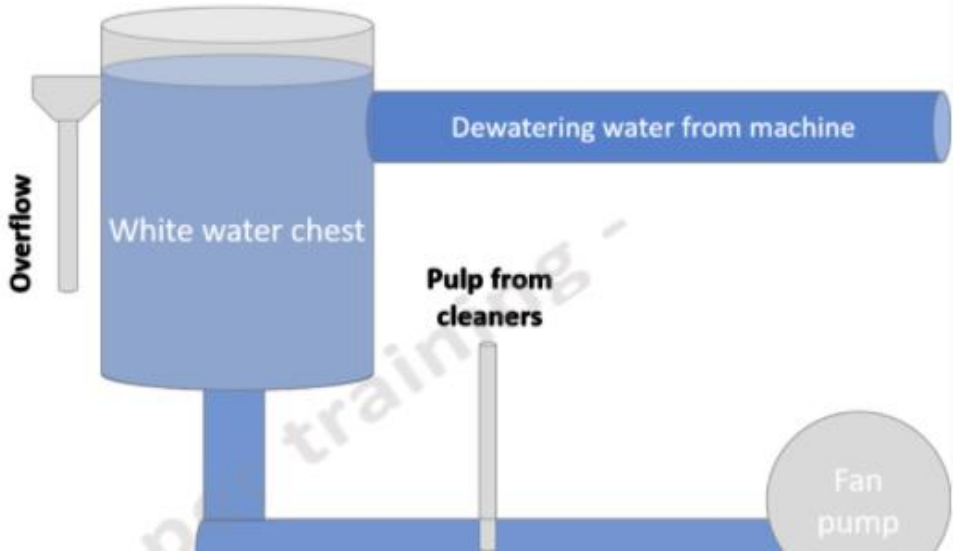
Short circulation

- A system attached to stock approach flow system
- Wire water is separated and used for dilution of thick stock to headbox consistency
- Removing air and impurities from the stock
- Retaining material to the system that has gone through the wire





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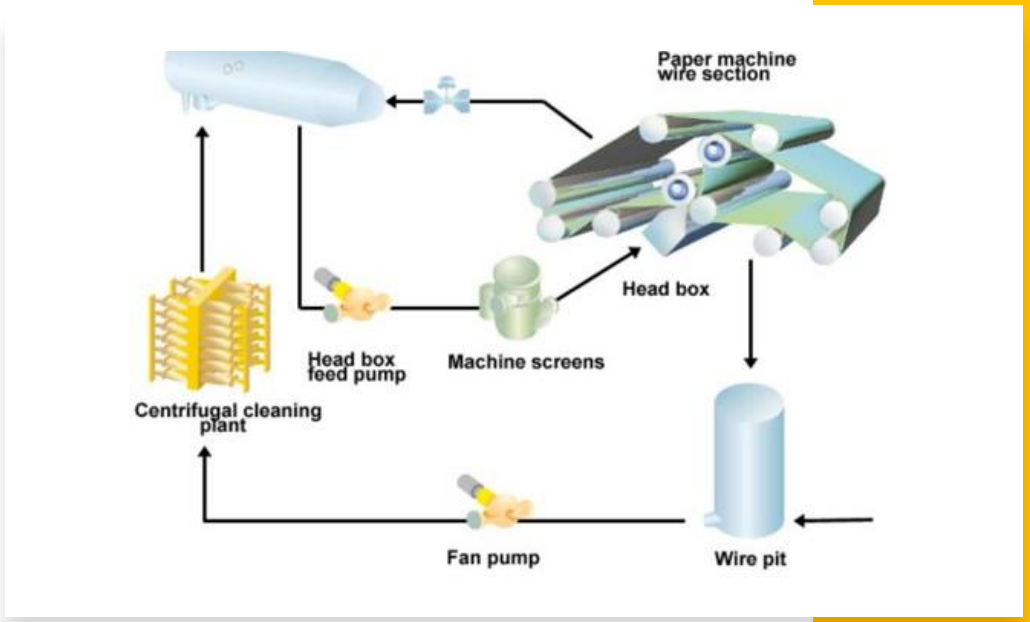
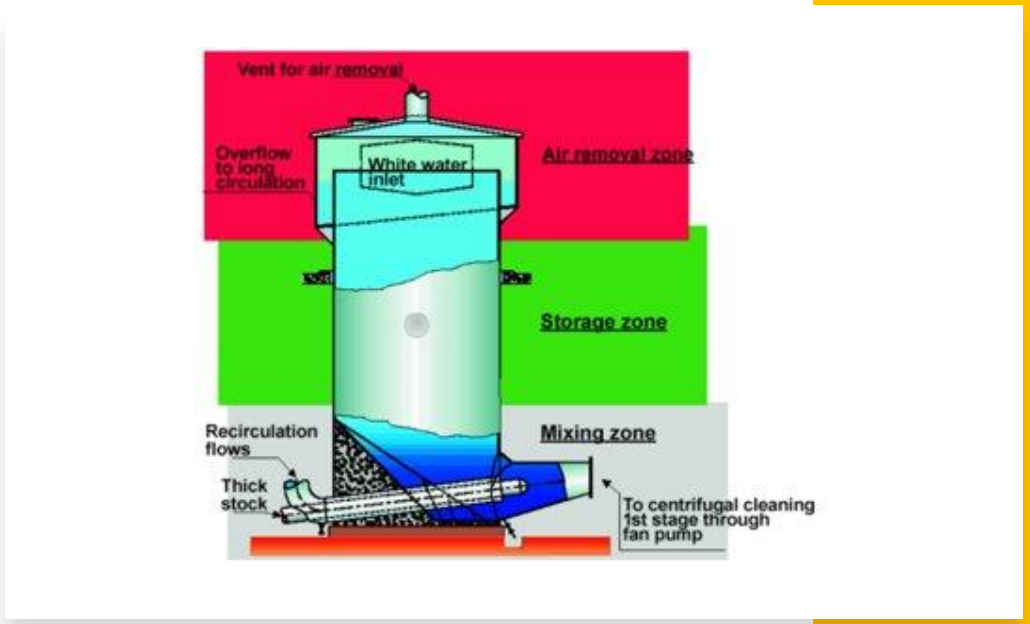
Wire pit

- Collects water that has filtrated through the paper machine wire section
- Collected water mixed and reused to dilute thick stock
- Acting as deaerator preventing air from mixing into circulated waters
- Thick stock flows through into 1st and 2nd fan pump together with retained water





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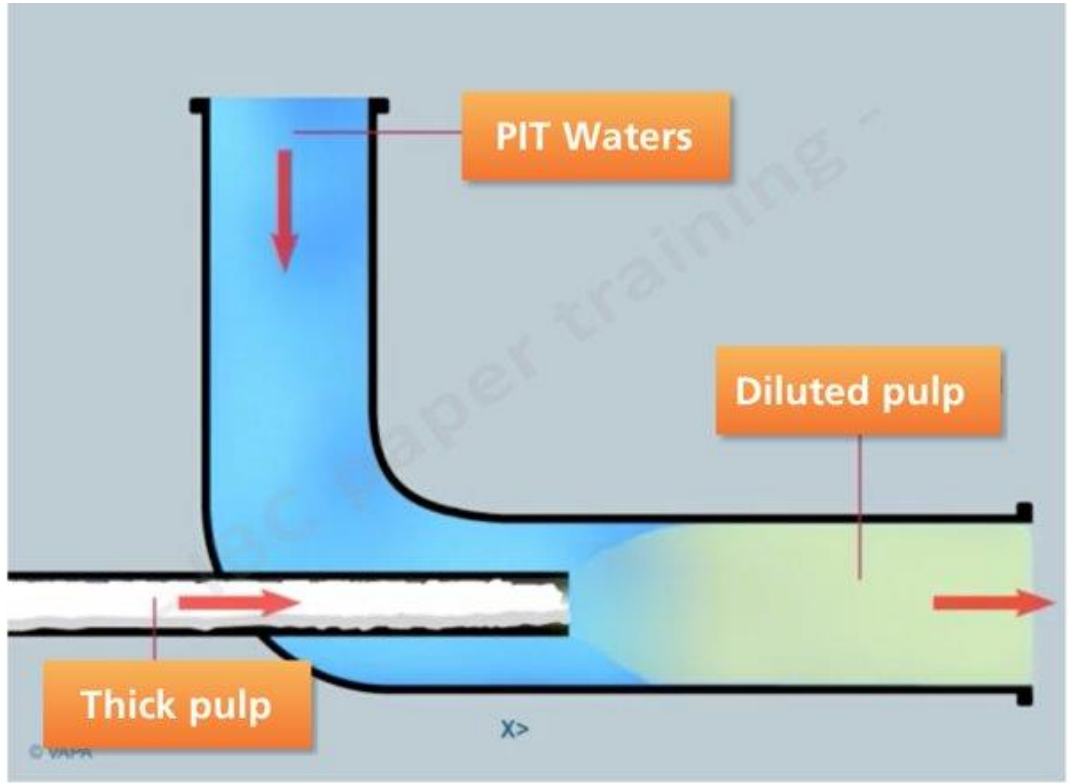
1st Fan pump (predilution pump)

- Thick stock coming from the machine chest and water coming from pit mix in the fan pump
- Reached consistency is 4 %
- Good mixing is obtained through turbulence
- Dilute stock to ensure efficient contaminants removal in the cleaner
- Fillers and dyeing agents are added here for better dosage and better regularity



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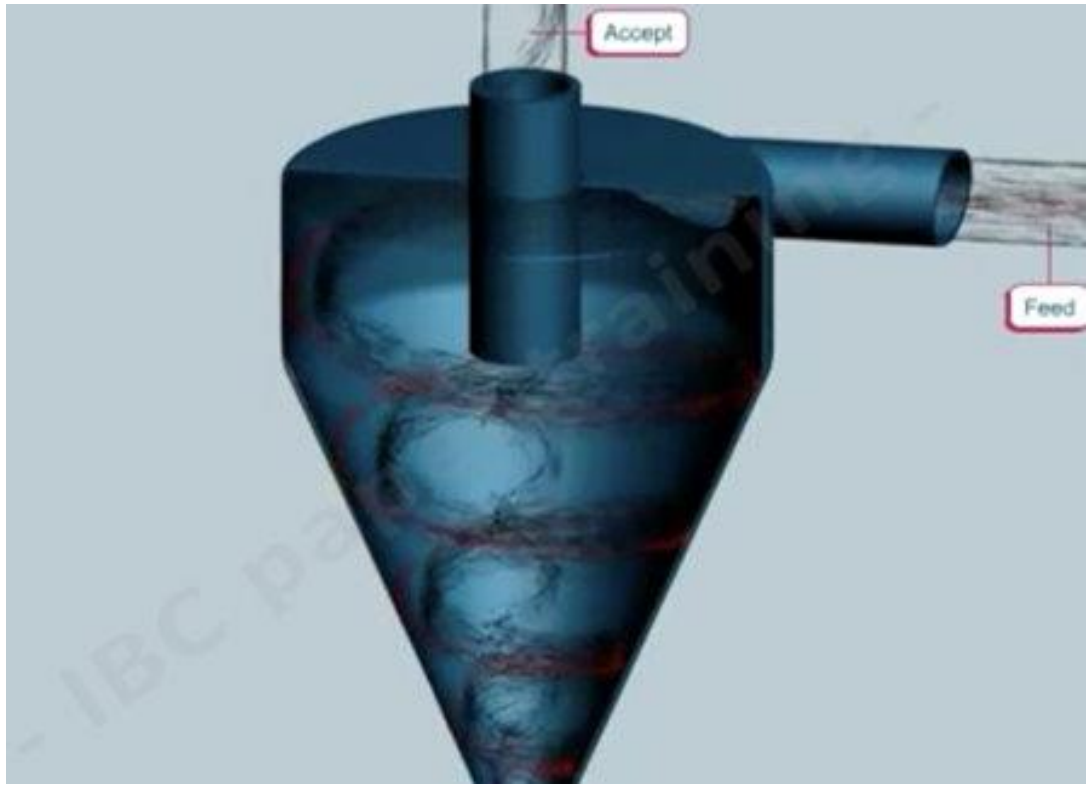
Cleaner bank (centrifugal cleaning)

- Remove heavier contaminants than pulp (e.g., sand)
- Centrifugal force separates contaminants from the fiber through the varying **density**
- Centrifugal force pushes contaminants against the equipment wall where they fall to the bottom
- Fibers are pulled into the center
- Heavy contaminates are removed to avoid machine damage



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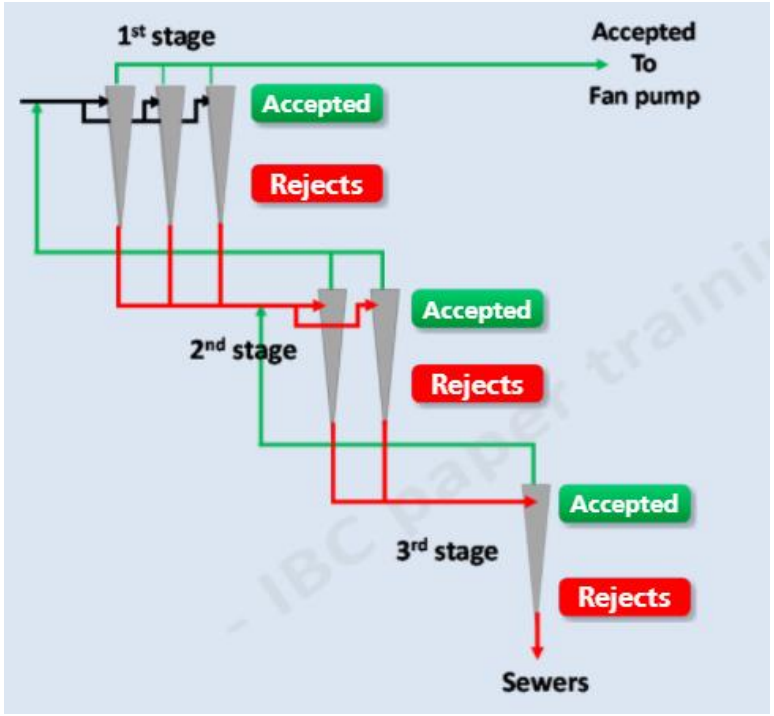
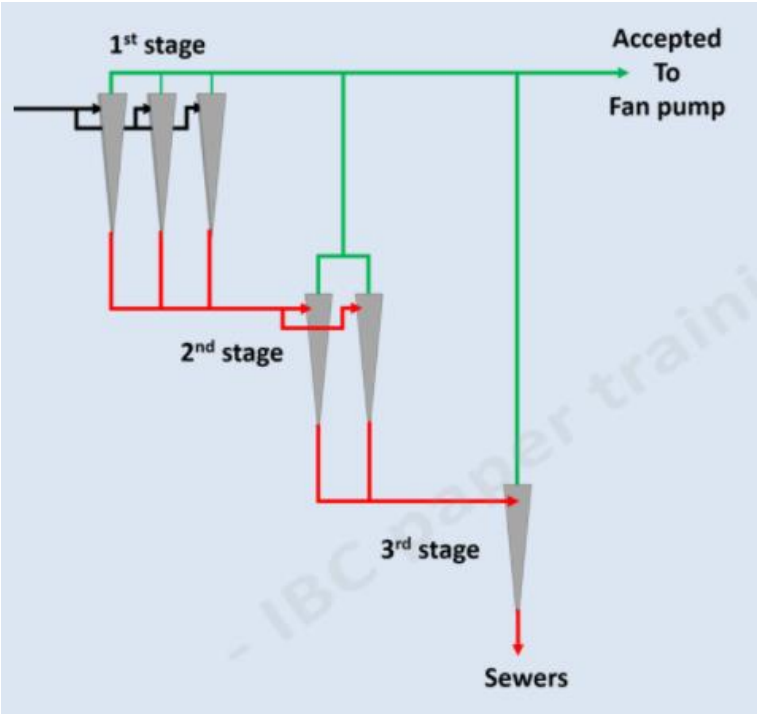
Cascade setup of cleaners



Cascade setup:

+ Good quality of accepted stream
- Limited volume capacity



Modified cascade setup:

+ Increased capacity compared to regular cascade setup
- Decreased quality of accepted stream

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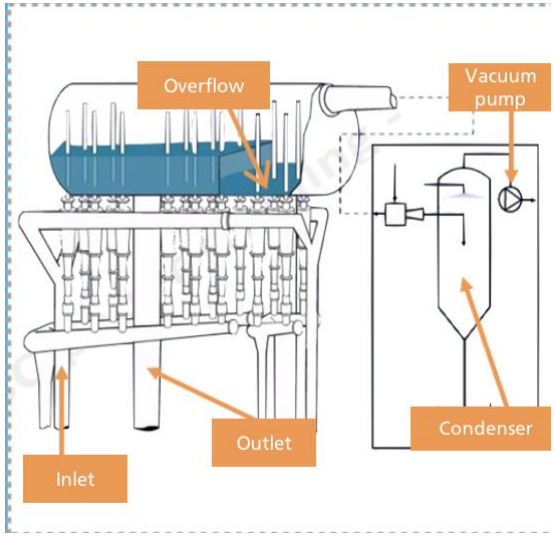
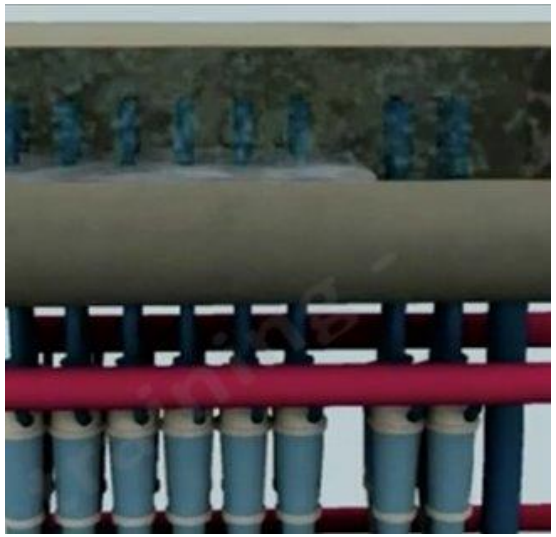
Deculator

- The role is to remove air from stock before headbox
- Air is removed from stock mechanically by boiling pulp at low pressure
- Free air, Residual air, and dissolved air
- Vacuum is achieved through **vacuum pump** and **Condenser**
- Vacuum level value is usually between 70 and 90 mbar
- Condenser maintain a constant vacuum in the deculator
- Vacuum pump is required to vacuum the air
- The role of the overflow is to ensure constant level in the deculator to avoid any pressure variation





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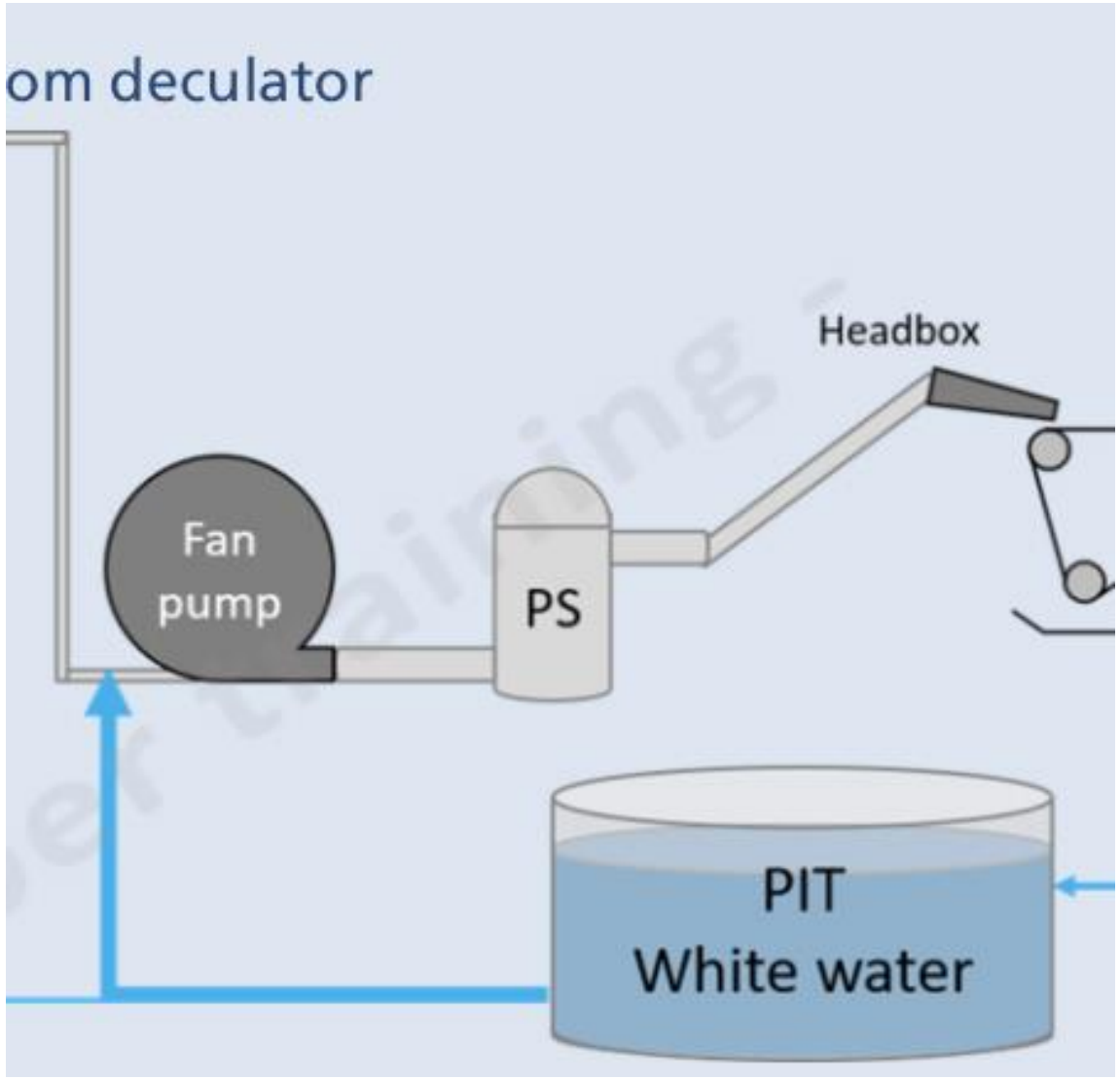
Effect of air on papermaking

- Reduction in process stability
- Increased contamination in approach flow system
- Corrosion in pump
- Negative effect on certain paper characteristics (e.g. Poor sheet formation >> Low paper strength)
- Pinholes on the sheet
- Pressure screens will run less efficiently

2nd Fan pump (headbox fan pump)

- Create a uniform flow and pressure of stock flow in the headbox
- Dilutes stock down to headbox consistency which is 1%
- A diluted stock makes a more homogeneous paper
- Right amount of dilution is needed, otherwise dewatering capacity and drying will be affected
- Sizing agents are added once pulp is diluted



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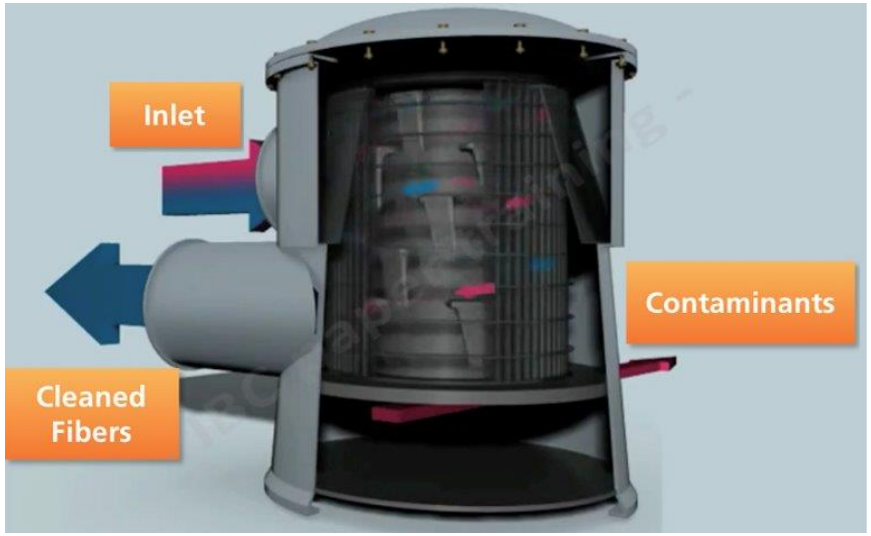
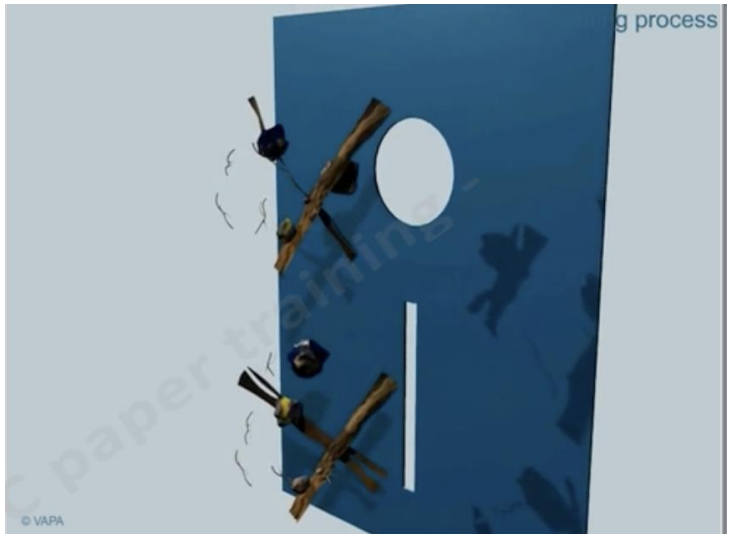
Headbox Screens (pressure screens)

- Last cleaning before headbox
- Removes contaminants bigger than a fiber
- Stock comes from the inside of the basket
- Accepted stock is collected on the outside of the basket
- Basket screens opening can be either holes or slits
- Delta P is crucial to force stock through the basket
- Retention agents are introduced after this and before the headbox
- If added before, fibers flocculate and big aggregates will form on paper web





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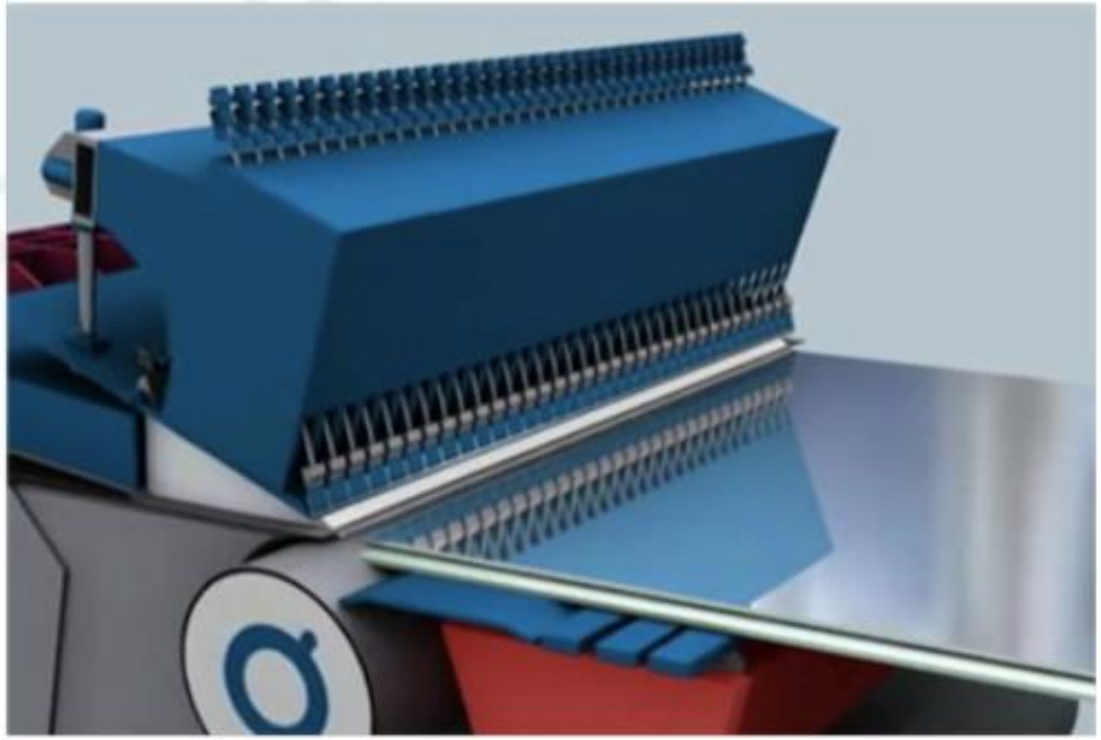
Headbox

- It is the last step before the paper machine
- Spreads stock evenly across the width of the paper machine (forming wire)
- Running suspension 1 % concentration



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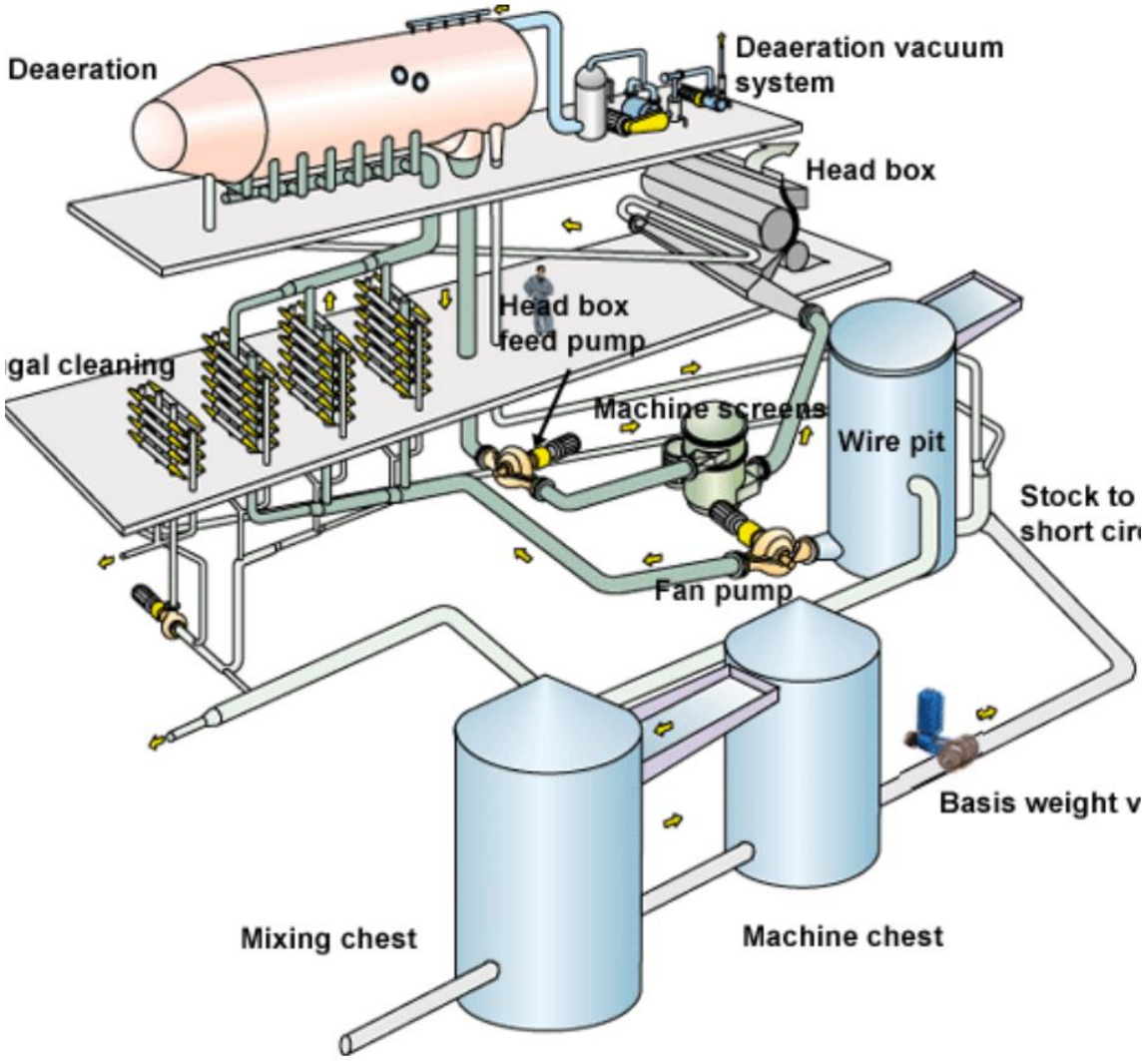
Summary

- In approach flow system pulp is diluted and cleaned.
- For dilution, white water coming from paper machine wire section is used.
- Contaminants rejected in the 1st stage of cleaners pass through 2nd and 3rd stage and finally to sewers.
- Process additives, product additives and fillers are added in this stage.
- The overall grammage is controlled by the flow from headbox.



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Reference

- IBC paper-training: available at: https://ibcpapertraining.riseup.ai/

- KnowPap: available at:

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