



MISG 2021

Recycle in a Sugarcane Diffuser

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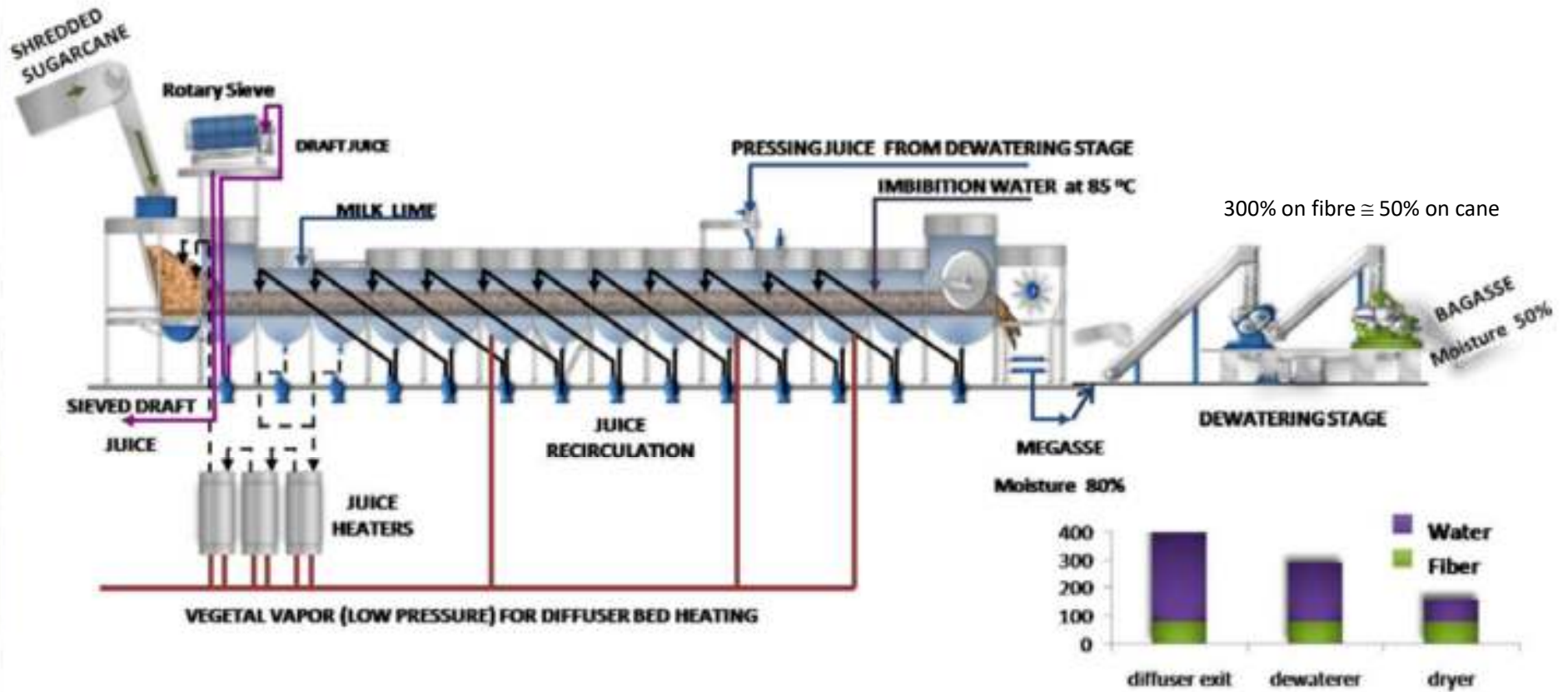


Sugar Milling Research Institute NPC SMRI



Based in Durban
Research in support of the southern African sugar processing industry
Analytical services (SANAS accredited laboratory)

How a diffuser works





Typical values

- Cane
 - 15% Fibre
 - 15% Sugar
 - 70% Water
- Imbibition
 - ~300% on fibre \cong 50% on cane
- Chain speed
 - ~1 m/min
- Percolation rate
 - Q/A (Volumetric flow/Area)
 - ~0.1 m/min in diffuser
 - ~0.6 m/min in flooded column
- Bed height
 - ~1.5-2 m
- Stage length
 - ~4.5 – 6m





Perfect process

- Counter current extraction
- Plug flow – i.e. no mixing
- Total wetting of cane
 - 100% saturation
 - maximum mass transfer
- Minimise imbitition





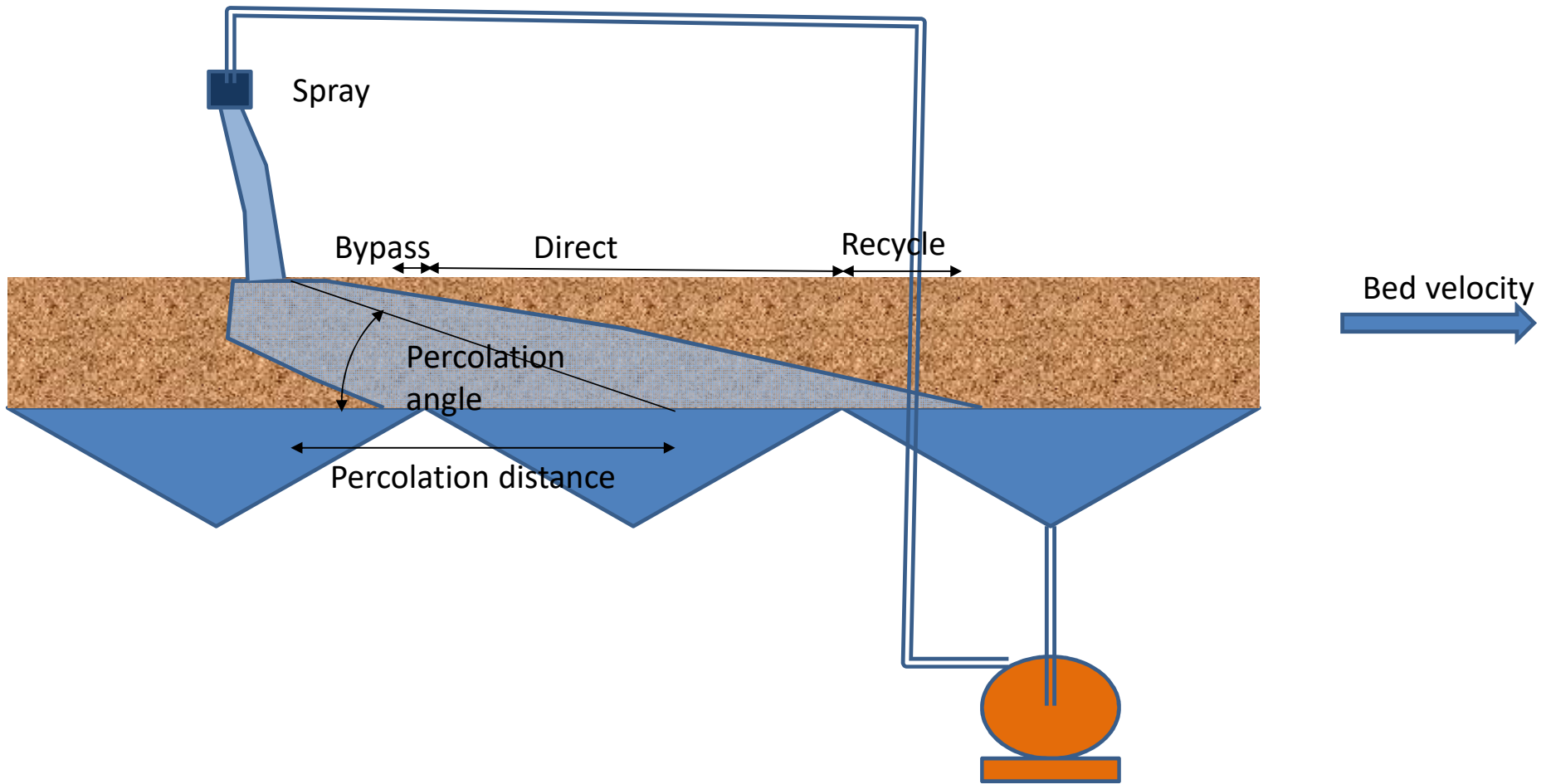
The reality

- Cane absorbs a substantial amount of water
- Diffuser operation is gravity driven
- Require saturation level achieved by
 - Multiple passes
 - Recycle
 - Mixing
- Diffuser operation is a balance between
 - too little wetting – low extraction
 - Flooding – uncontrolled mixing – low extraction
- Aim for ~95% saturation





Recycle





Factors influencing recycle

- Controllable influences
 - Chain speed
 - Bed height
 - A combination of throughput and chain speed
 - Position of sprays
- Non controllable
 - Permeability (percolation rate)
 - Length of stage
 - Imbibition
 - Minimisation reduces evaporation requirements





Questions to be explored

1. What is optimum recycle fraction that should be used as a target for setting and controlling a diffuser?
2. Can a relationship between the controllable variables and non-controllable variables be derived that will enable the factory to achieve the optimum recycle?



Discussion and clarification

