Paper Components for Heated Tobacco Products (HTPs)

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ST 04

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General – HTP vs Combustibles

Combustibles

Paper supporting

- combustion of tobacco
- smokeability
- dilution / ventilation
- ash and optical appearance
- filtration

Heated Tobacco Products HTPs

Paper supporting

- heating of tobacco
- temperature management
- non-smokeability
- tube stability, stiffness
- optical appearance

General – HTP vs Combustibles

HTP
- Sophisticated construction
- Heating device requested

Combustibles
- 2 Component system
- no device

devices



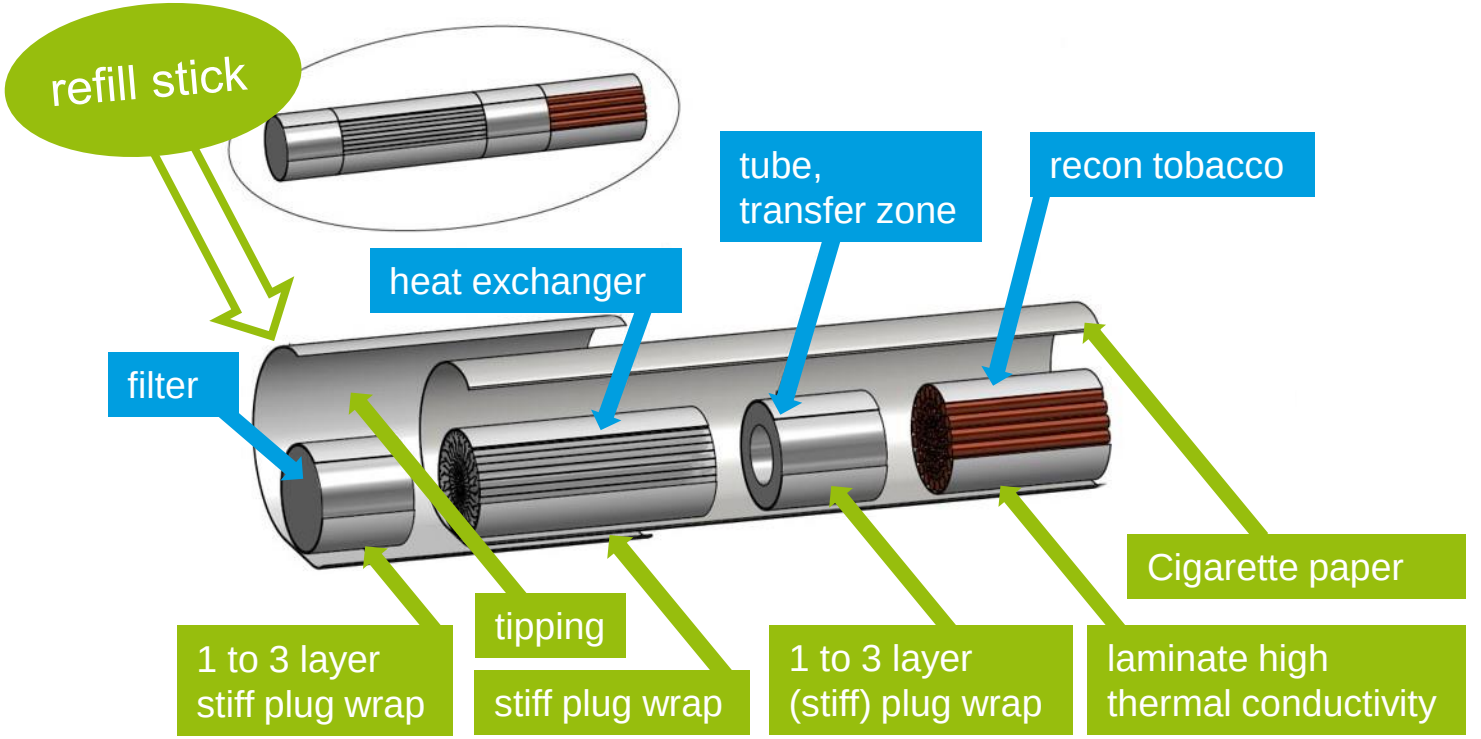


refills





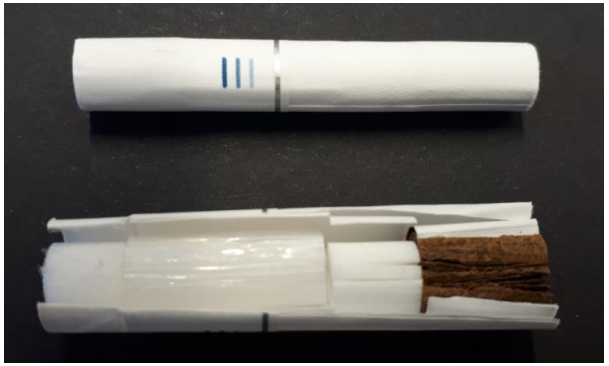
Papers for HTPs – Sophisticated construction



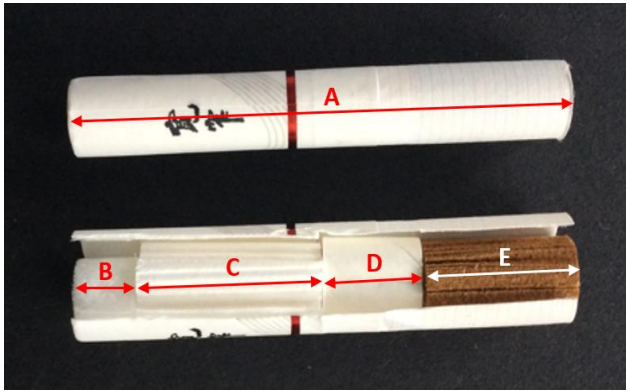
4 elements

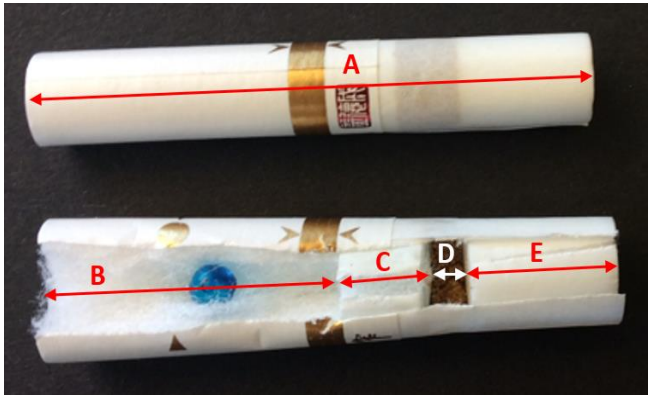
**min.
10 paper
components**

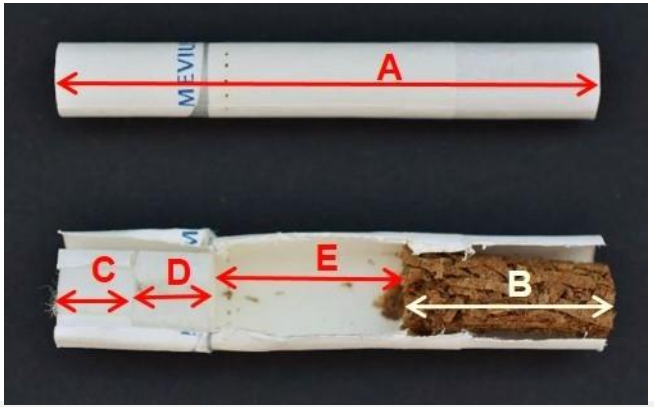
Papers at HTPs – Sophisticated construction



Papers at HTPs – Sophisticated construction





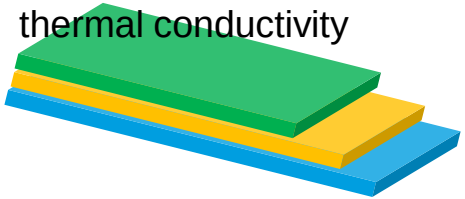


Paper properties – function

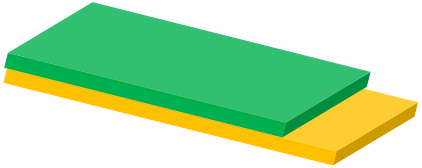
Temperature management

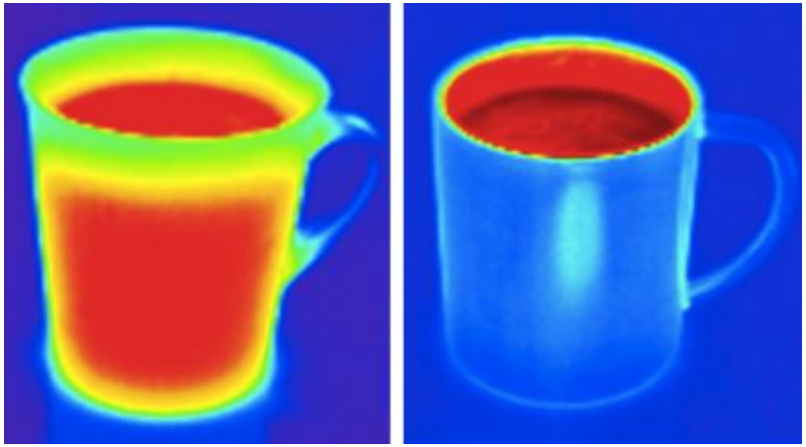
Wrapper with high or low thermal conductivity

Laminated paper with additives to control the thermal conductivity

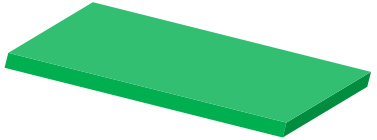


Laminated paper with aluminum foil





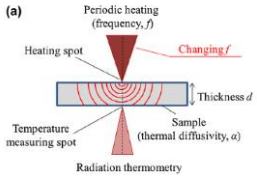
Low density paper, functional additives



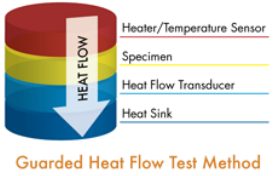
Paper properties – function
Thermal conductivity

Methods for measurement of thermal conductivity

Laser Flash Method

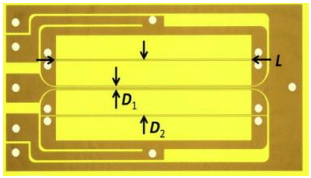


Heat Flow Meter (HFM)



Guarded Heat Flow Test Method

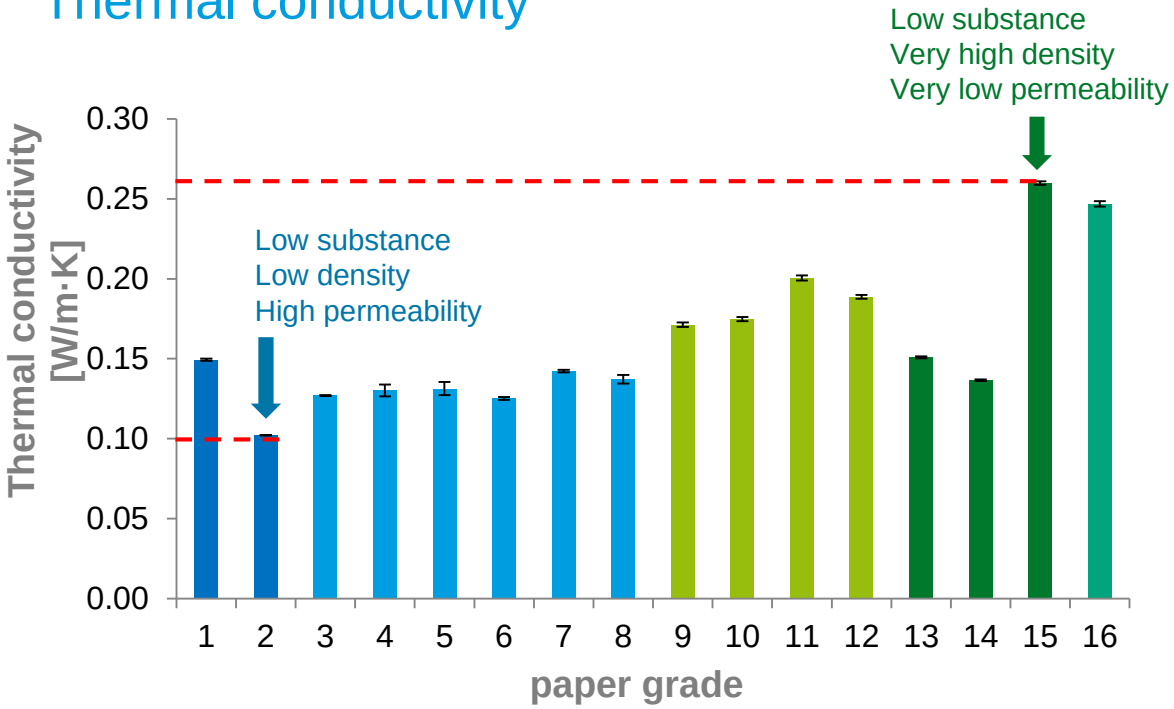
Transient Hot Bridge (THB)



THB was chosen for measurement of paper thermal conductivity.

Paper properties – function

Thermal conductivity



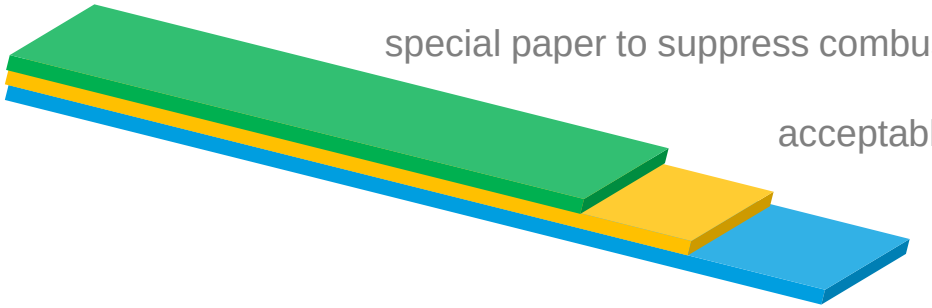
Paper property	Thermal conductivity is increased by …
substance	↓
density	↑ ↑
permeability	↓
filler	↑ ↓

Paper (0,10 – 0,26 W/m·K) is an insulator vs. alu-laminate (0,92 W/m·K)

Paper properties – function

HTP non-smokeability

3 layers, 3 functions, multi-functional paper web



special paper to suppress combustion of consumables

acceptable optical appearance

heat suppressor

Benefit: fulfills tax regimes and potentially regulatory requirements

Paper properties – function

HTP non-smokeability

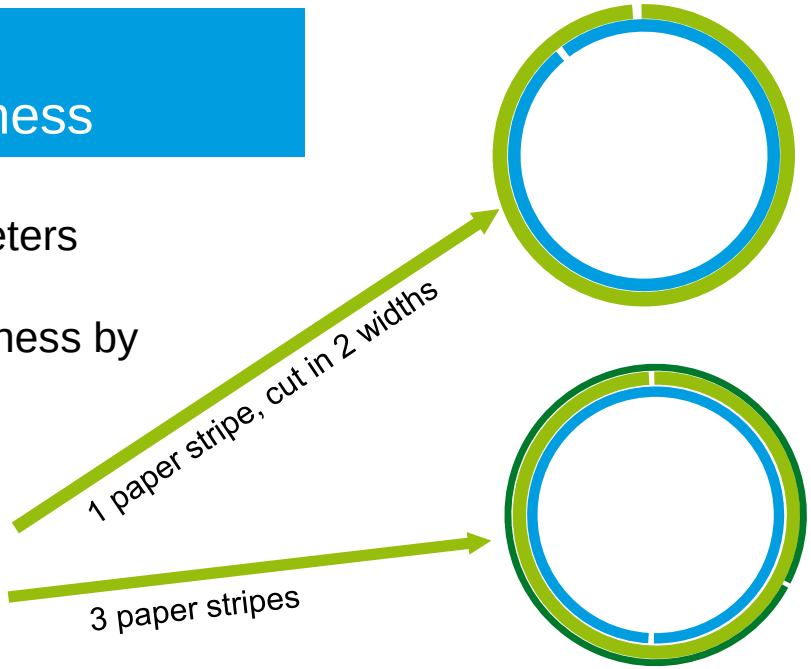
	1 layer Paper grade A	2 layer Paper grade A + B	2 layer laminated Paper grade A + B
non-smokeability	↑↑	↑	↑
complete extinction under ISO	1 puff	1-2 puffs	1-2 puffs
complete extinction under Canadian	2-3 puffs	max. 5 puffs	max. 5 puffs
opacity	↓	↑↑	↑↑
stability after heat treatment	↑	↑↑	↑↑↑

Non-smokeability of HTP is achieveable with special paper grade.

Paper properties – function
Tube stability, stiffness

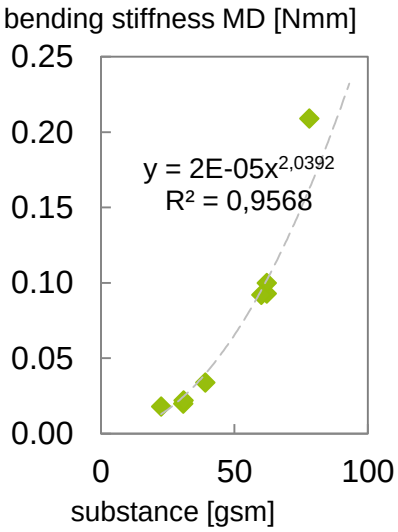
HTP products are designed for a high dimensional stability and stiffness

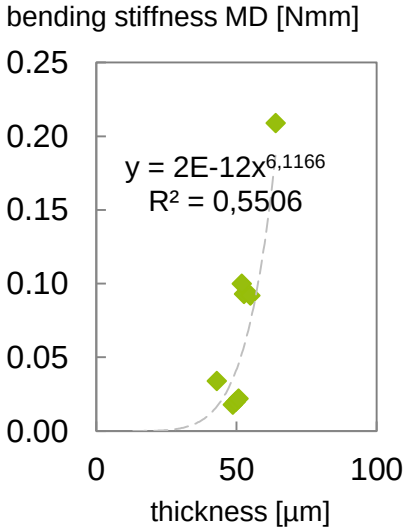
- high stiffness by optimized paper parameters
- highest stiffness at lowest weight & thickness by laminates
- laminate products are
  - double layer tubes / longitudinal seam
  - triple layer tubes / spirally twisted

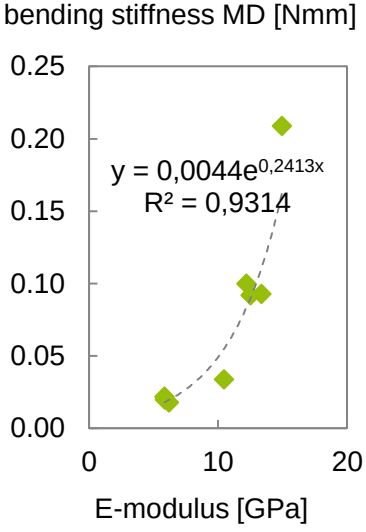


Paper properties – function

Tube stability, stiffness







Paper property	Stiffness is increased by …
substance	↑ ↑
density	↓
permeability	↓
filler	↓

fiber orientation MD/CD = 2 : 1 ➔ bending stiffness MD/CD = 2 : 1

Options for improvements

Paper element in HTP as heat exchanger / taste enhancer

Paper element in HTP ...

is biodegradable

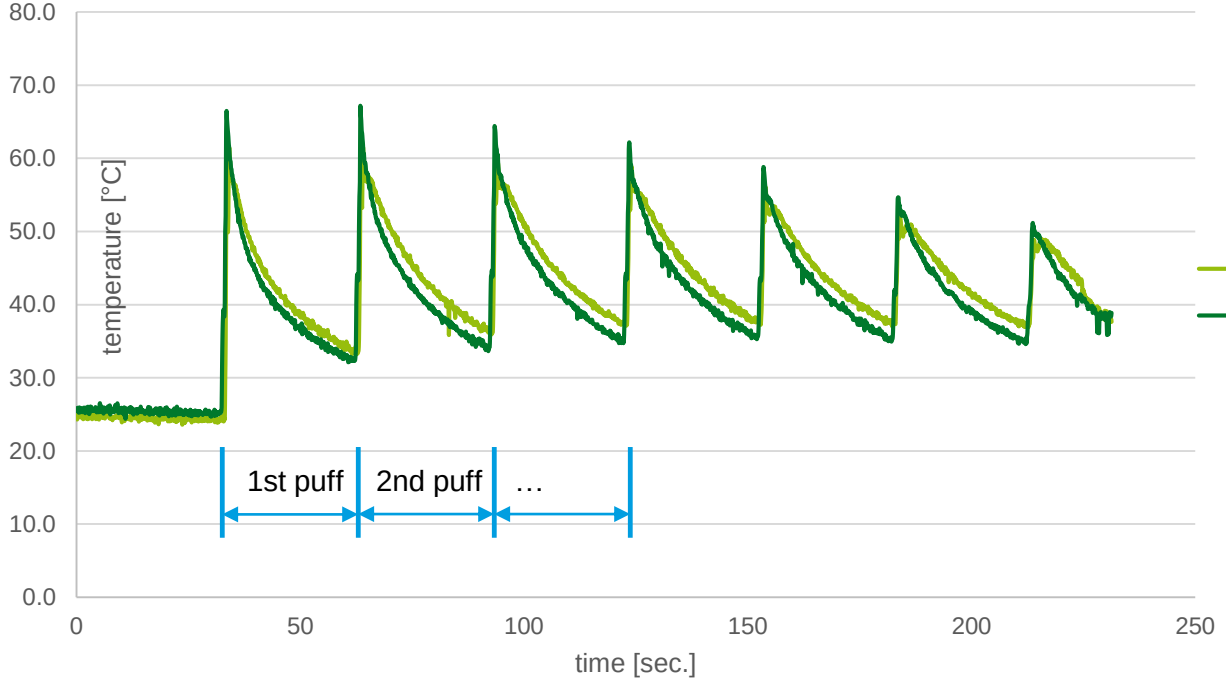
can carry flavors and humectants and can offer enhanced taste

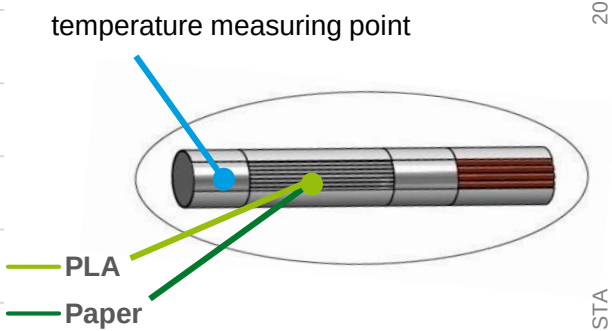
offers better pressure drop control and high hardness at given low filtration efficiency

shows similar or even better heat exchanger function

Options for improvements

Temperature profile at filter of HTP





Canadian Intense Regime

Refill in Borgwaldt LX1

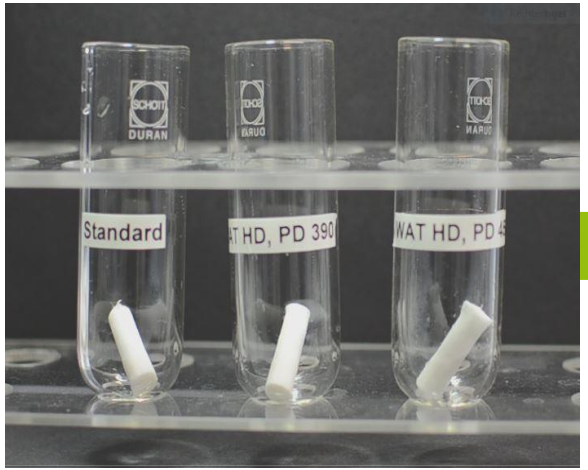
Commercially available temperature measurement

Options for improvements

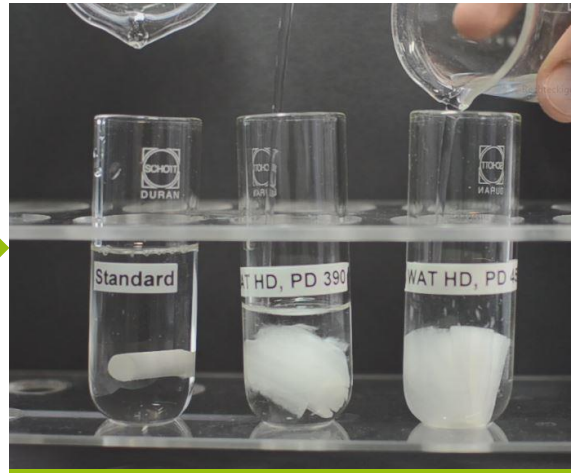
Paper based filter rod for mouth end and cooling section

degradeability

dispersibility



+ water

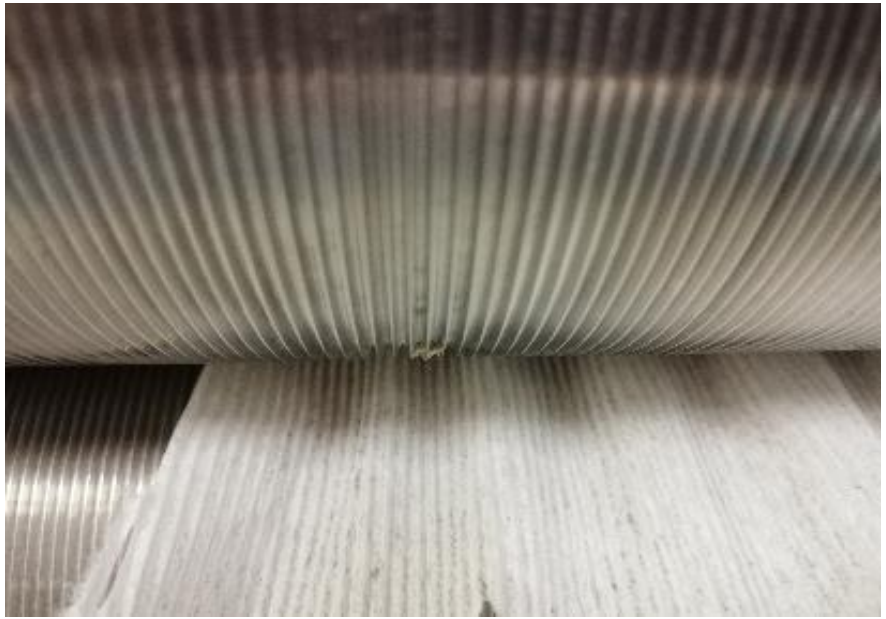


Dispersion after few sec

Options for improvements

Paper based filter rod for mouth end and cooling section

Embossing of special paper



Paper filter

- low pressure drop
- high pressure drop

Heat exchanger section

- low pressure drop
- high hardness
- temperature management
- low filtration efficiency

Summary

- Paper grades for HTPs compared to combustibles
  - are used in sophisticated constructions
  - fulfill other functions and thus have different properties.
- Paper grades for HTP generally have higher substance, lower permeability and focus more on mechanical properties as they are not burnt together with tobacco.
- Controlled thermal conductivity of papers is important to support the temperature management at HTP.
- Besides papermaking other technologies like embossing, lamination and coating can be used to modify the properties of paper components for HTPs.

Summary

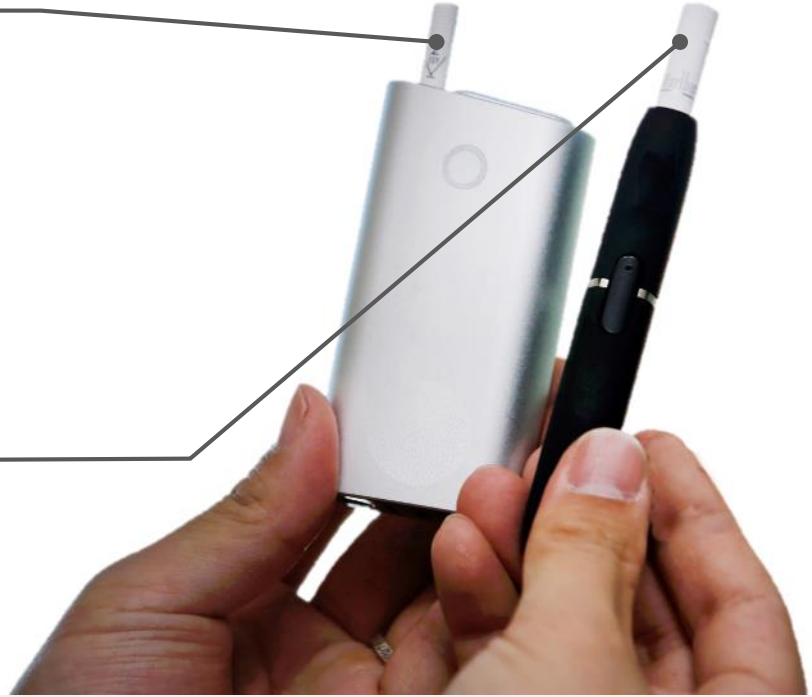
Supported functions of paper for HTP

functional aspects

- temperature management
- heat exchanger
- non-smokeability
- dimensional stability
- degradability
- water-repellent

visual aspects

- anti-staining / anti-spotting
- controlled color change
- optical features



Thank you