An Innovative Helical Yankee Hood Design for Improved Profiling

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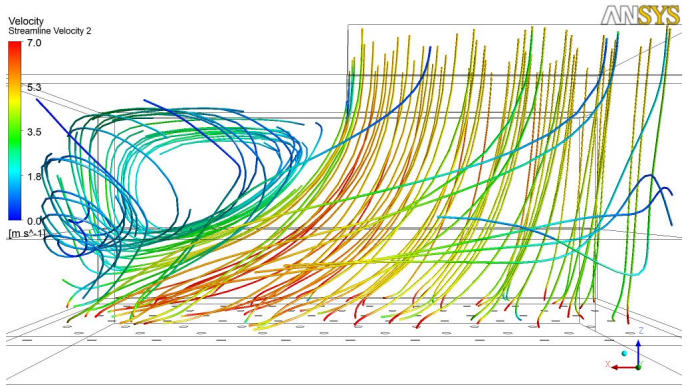
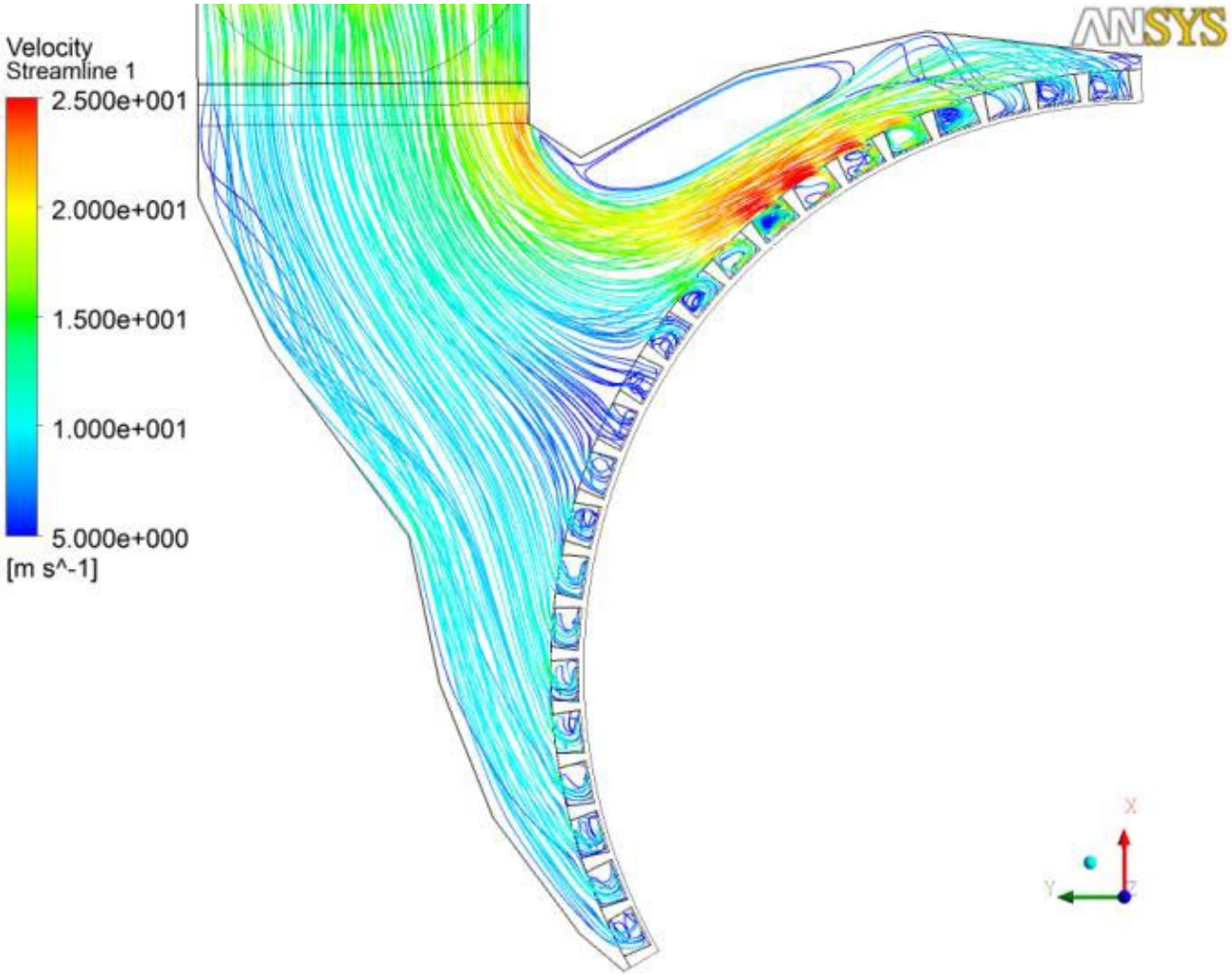
Valmet

Challenges in Cross Nozzle Box Design

Overall the impingement air speed distribution and temperature is even.

The drying contribution is slightly lower in some areas due to the internal turbulence and heat exchanged with return air.





Summary

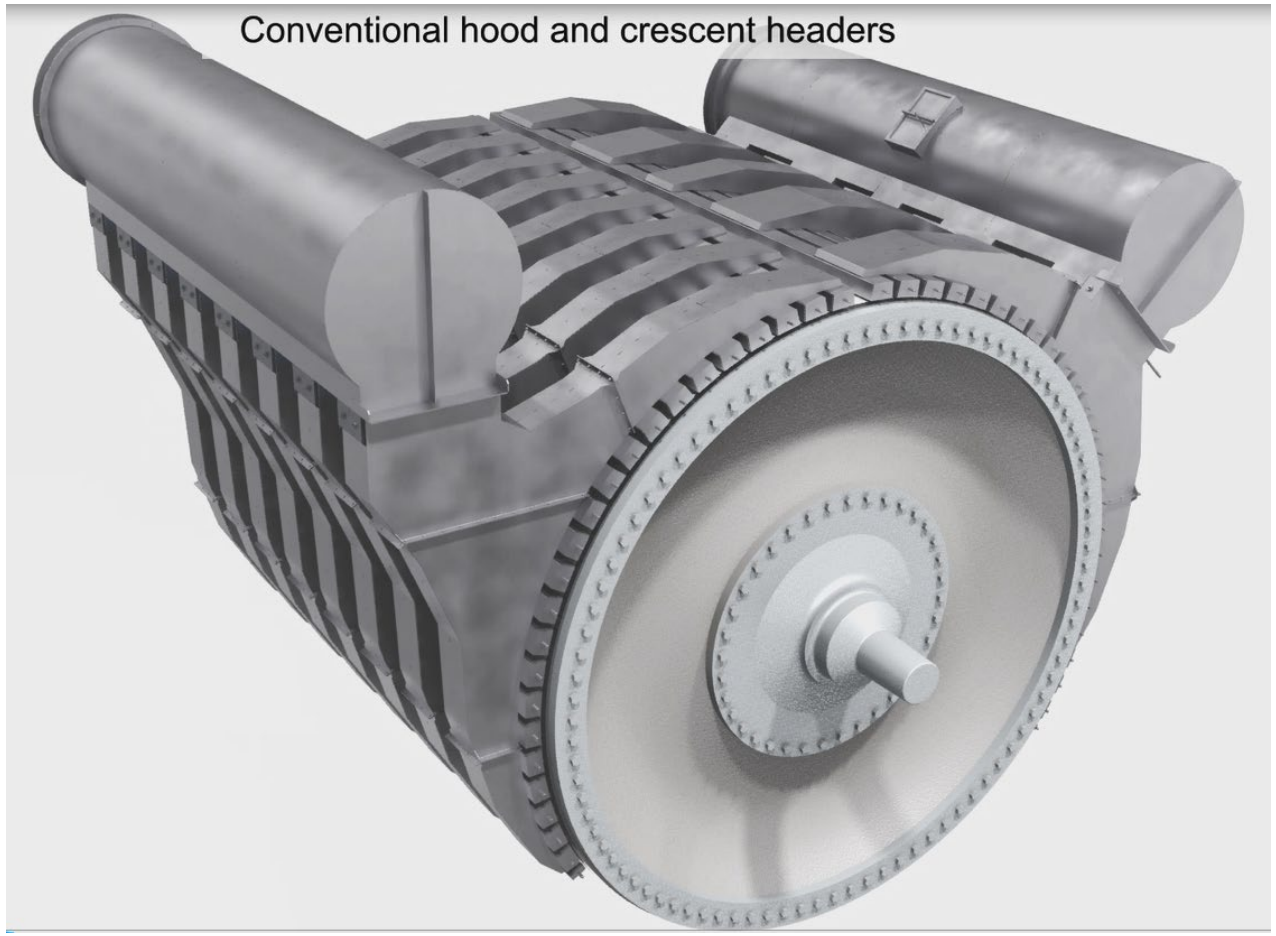
Problem

- Profiling issues inherent with traditional hood designs

Solution

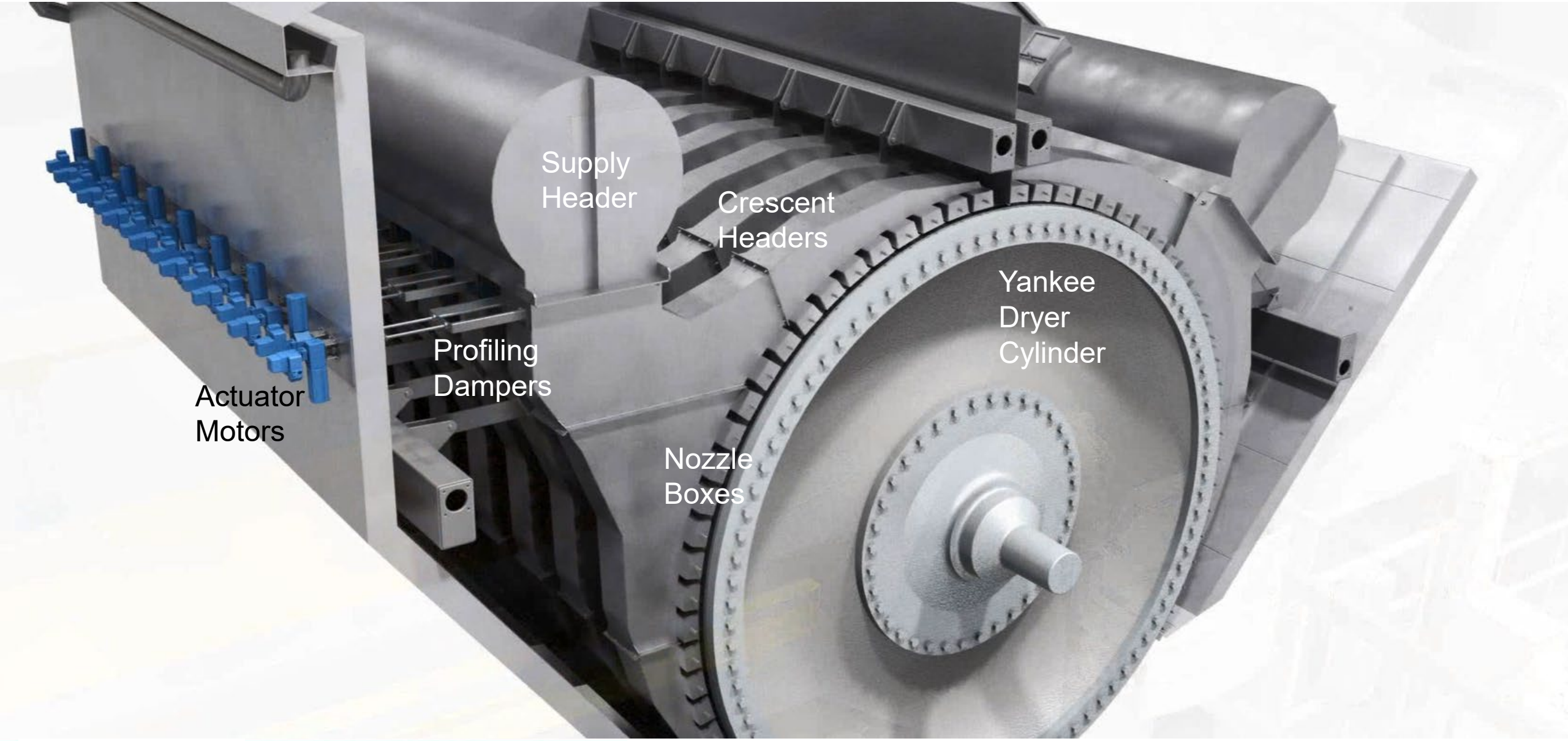
- A new Yankee hood design
- The nozzle geometry is in an innovative helical pattern
- Creates overlap in the impingement jets blowing on the sheet surface

Benefits

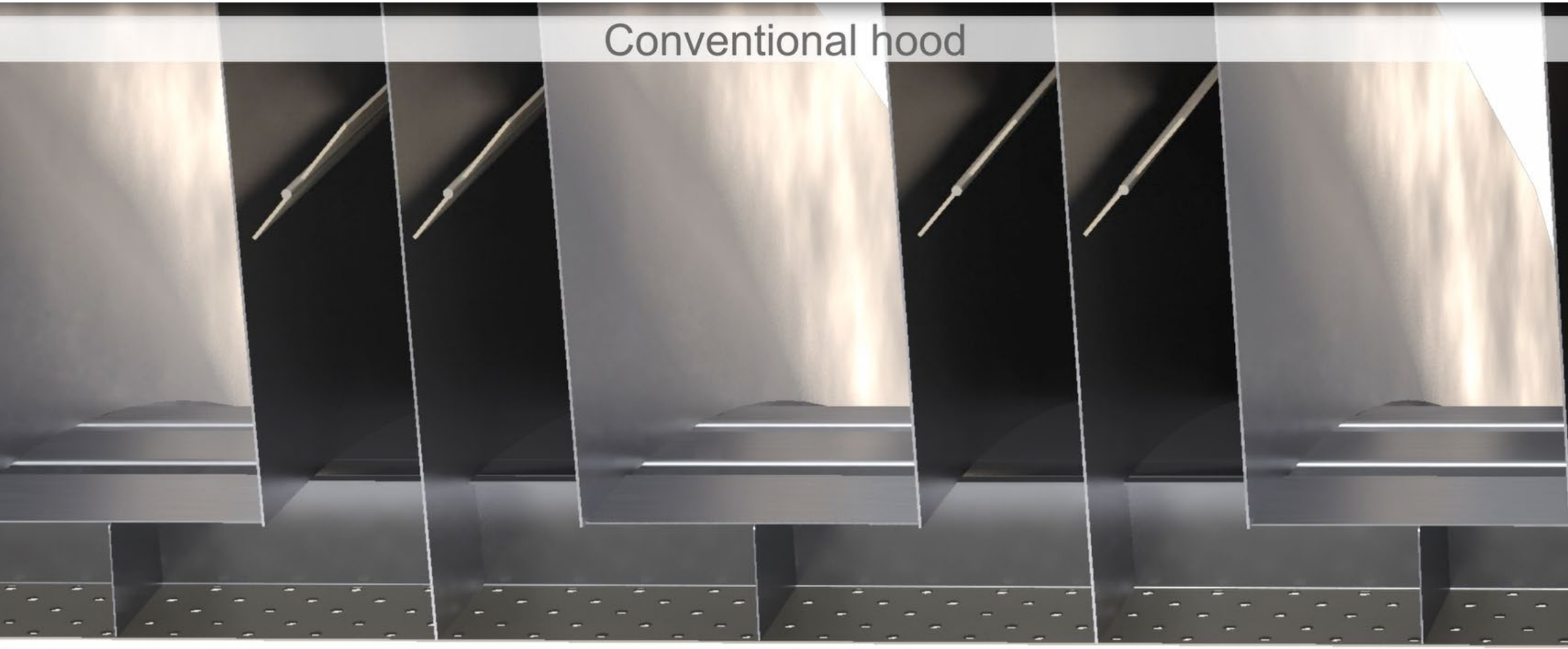


- Improved humidity profile
- Increased drying volume
- Reduced energy consumption
- Uniformity in CD drying
- Prevent overdrying
- Improved runnability
- Improved Quality
- Converting

Conventional Yankee Dryer Hood



Profiling dampers inside crescent headers

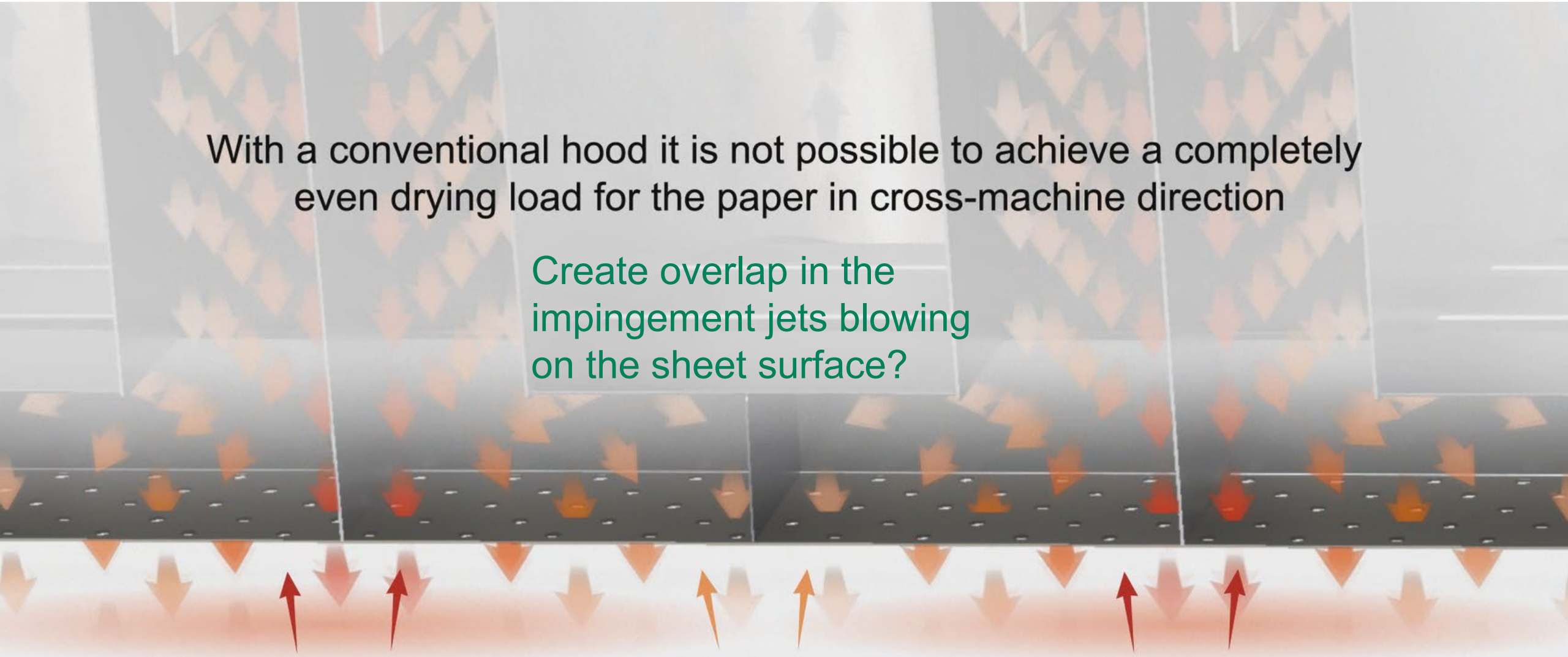


Air Speed and Temperature Variation

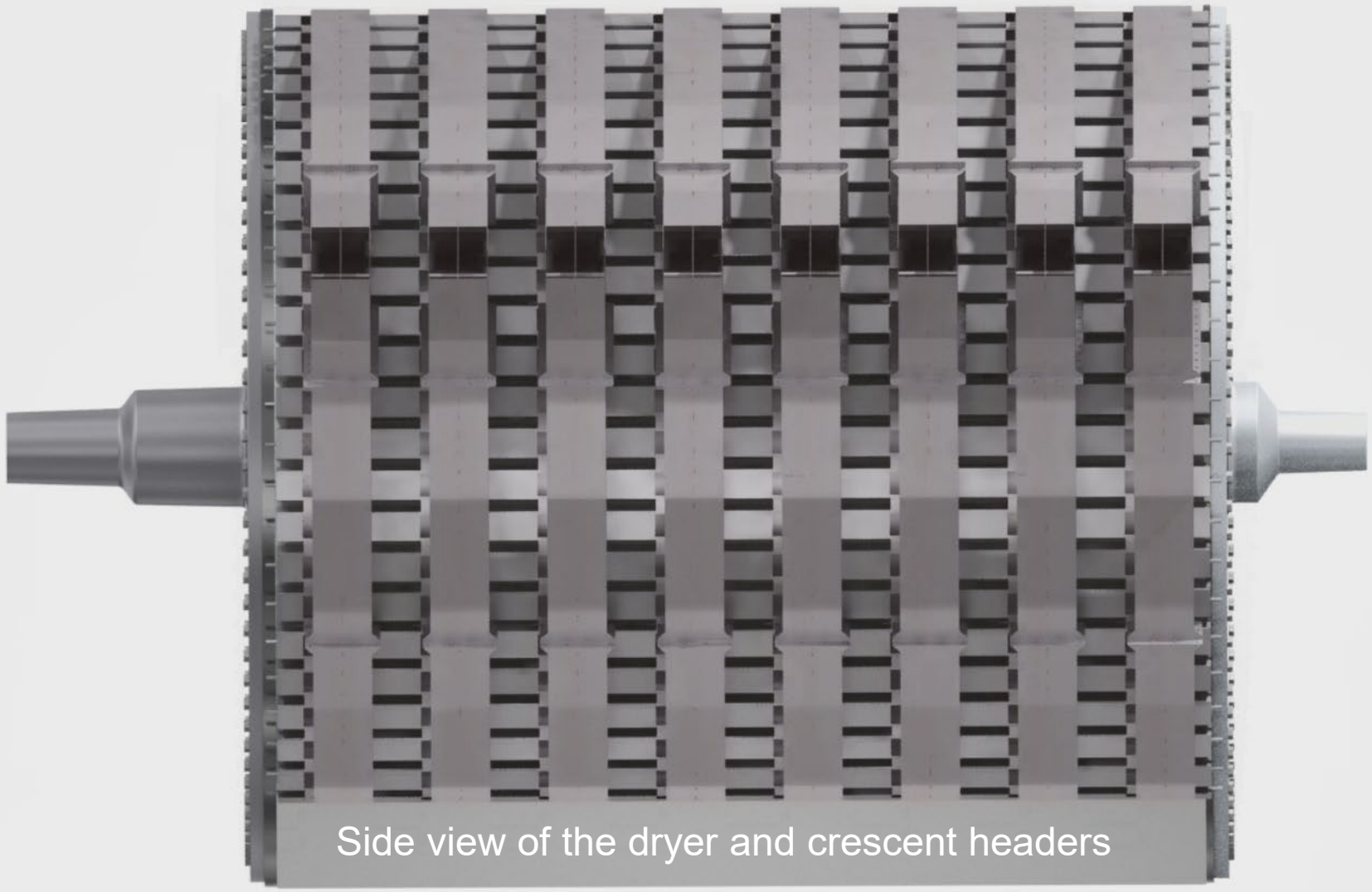
Air Speed and Temperature Variation

With a conventional hood it is not possible to achieve a completely even drying load for the paper in cross-machine direction

Create overlap in the impingement jets blowing on the sheet surface?

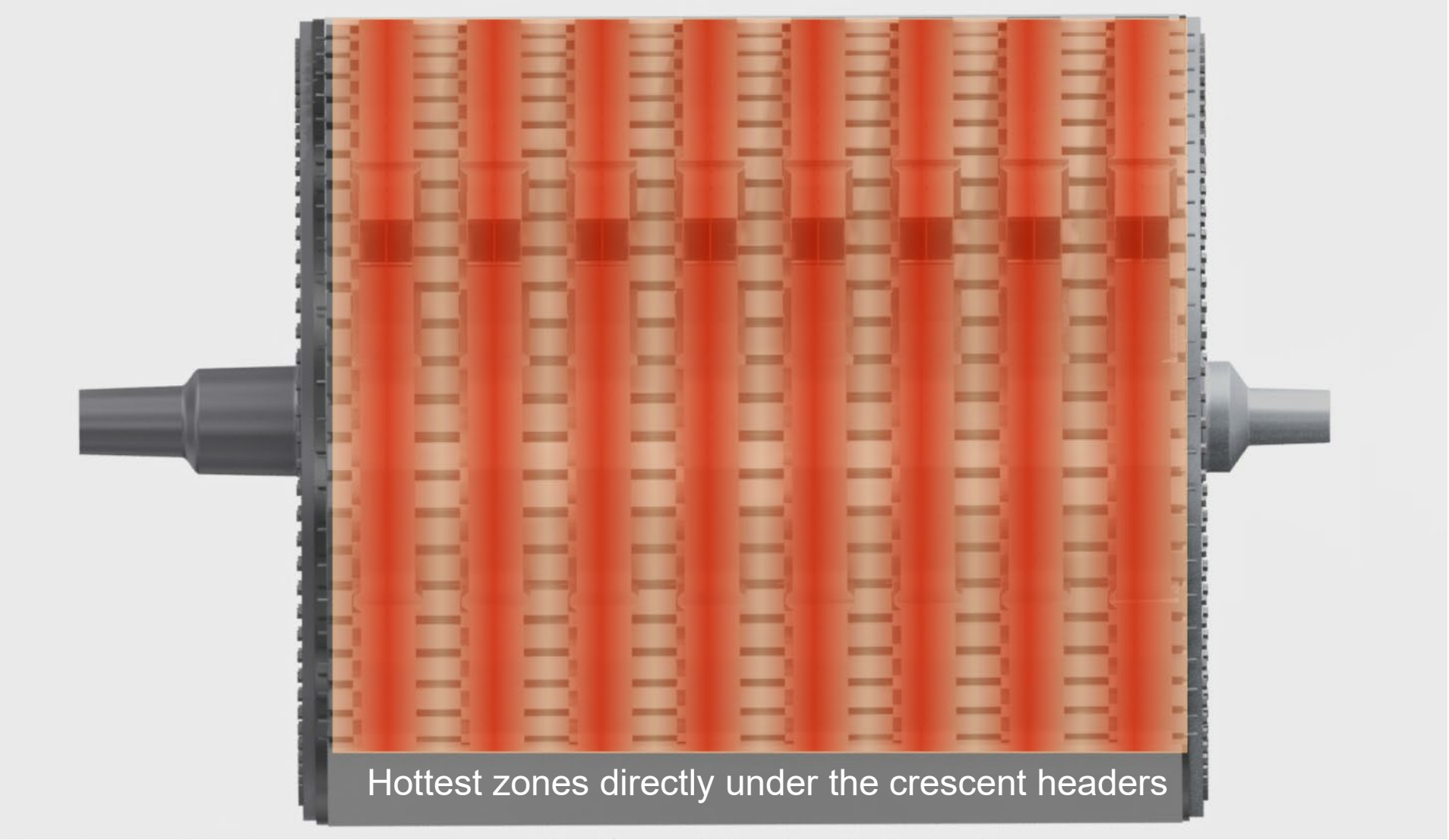


Design Considerations

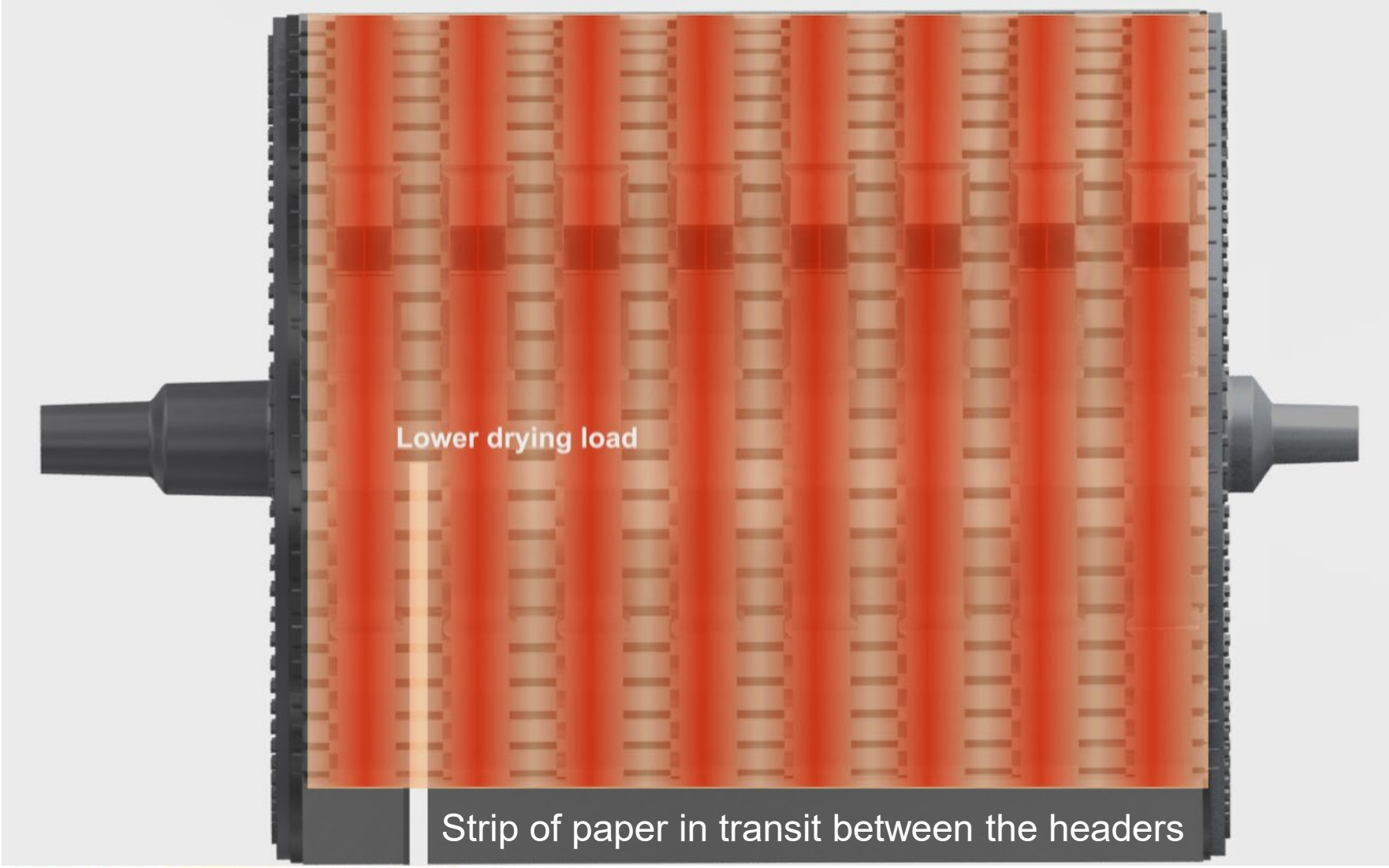


Side view of the dryer and crescent headers

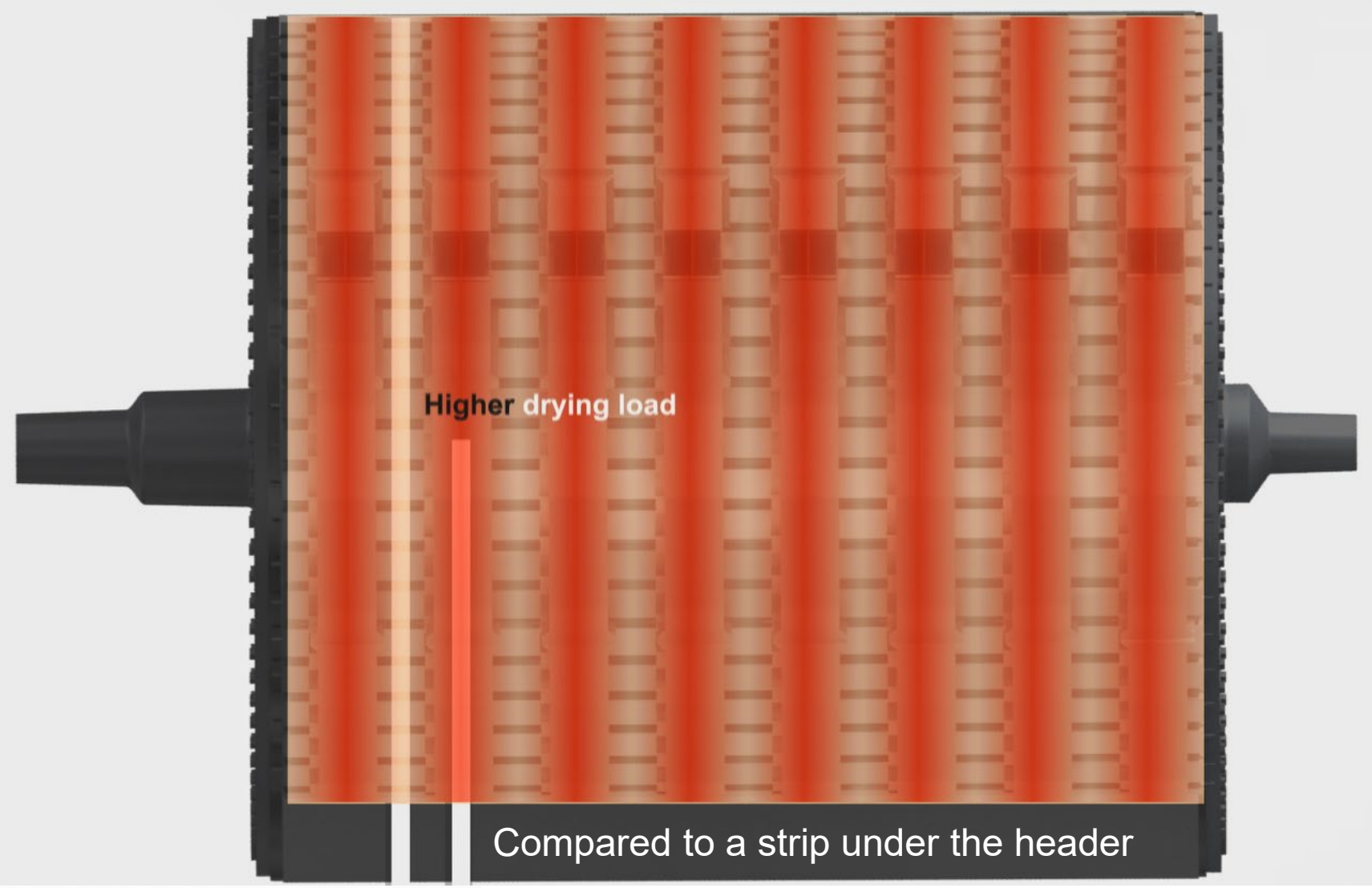
Hot Operating Conditions



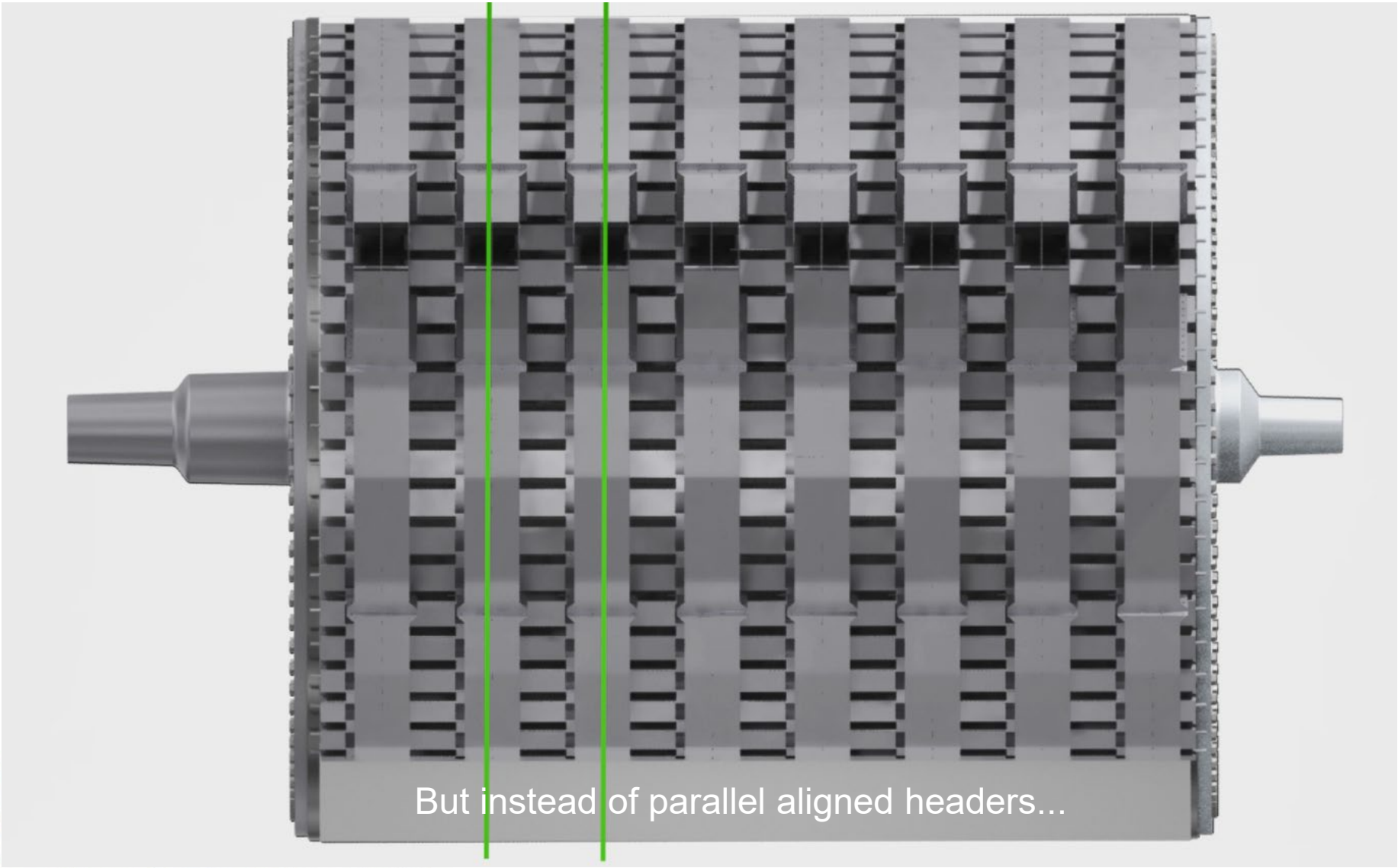
Lower Drying Load Zones



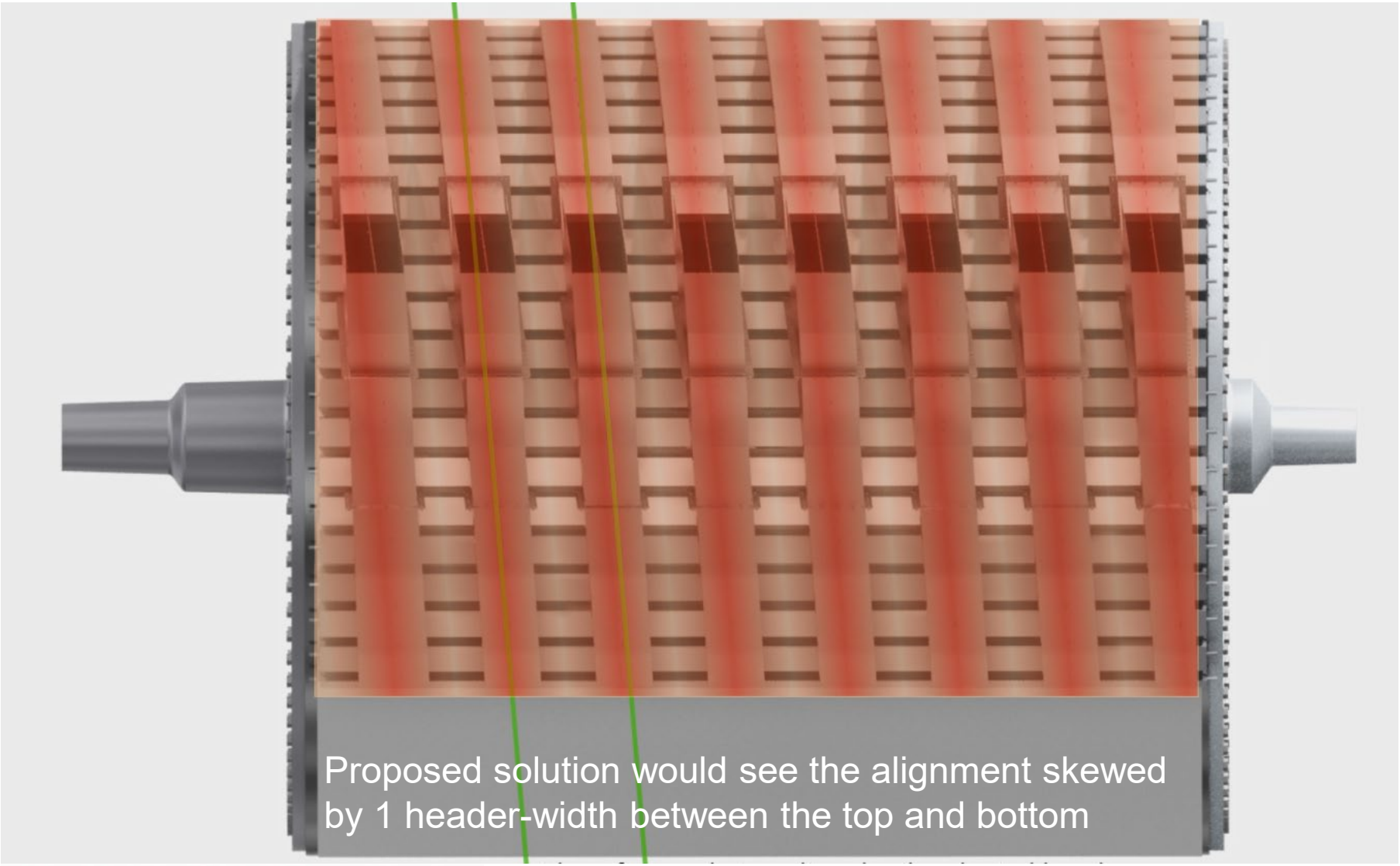
Higher Drying Load Zones



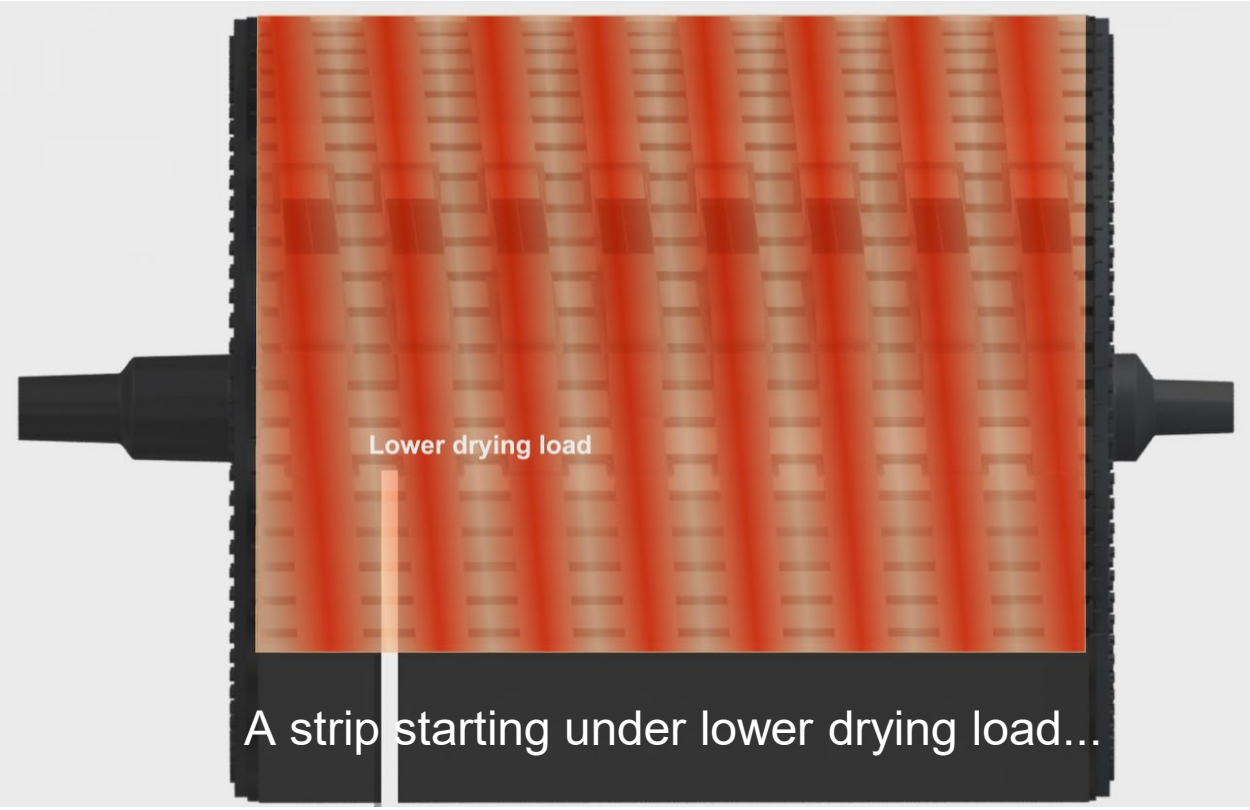
Parallel Alignment of Crescent Headers

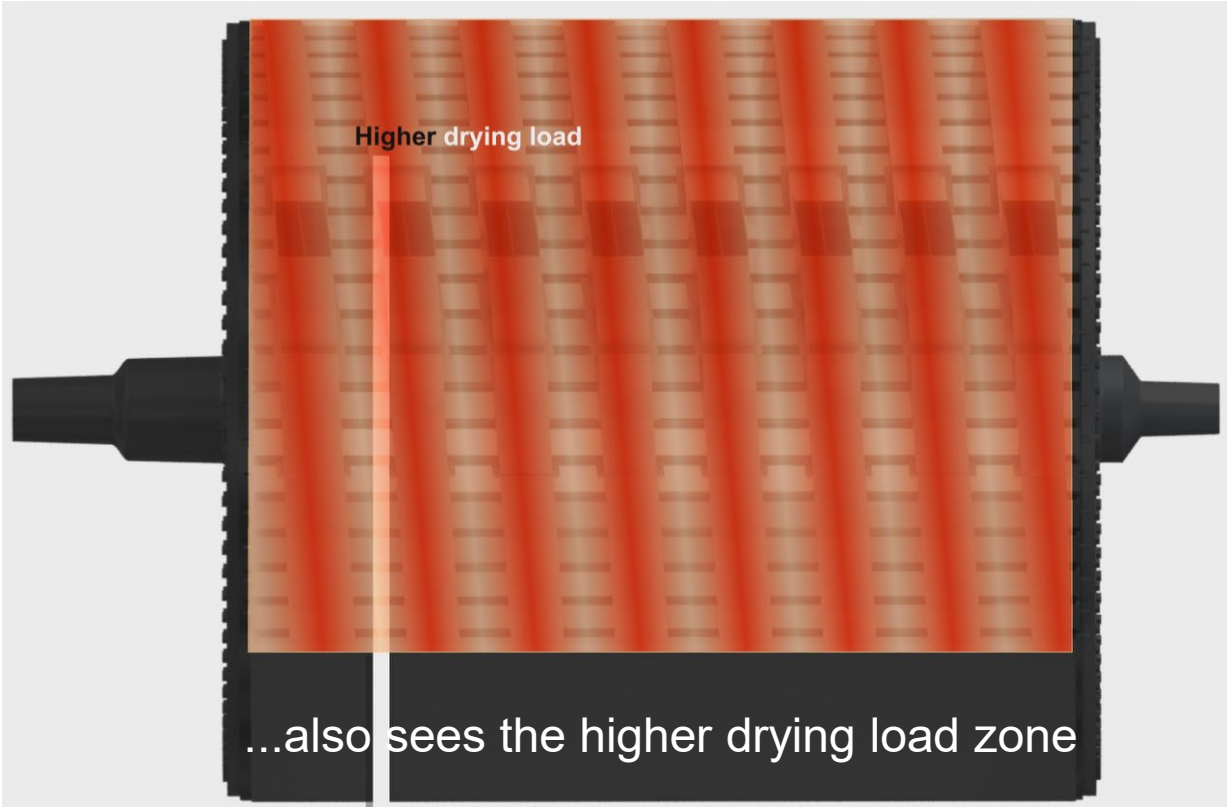


Slanted Alignment of Crescent Headers

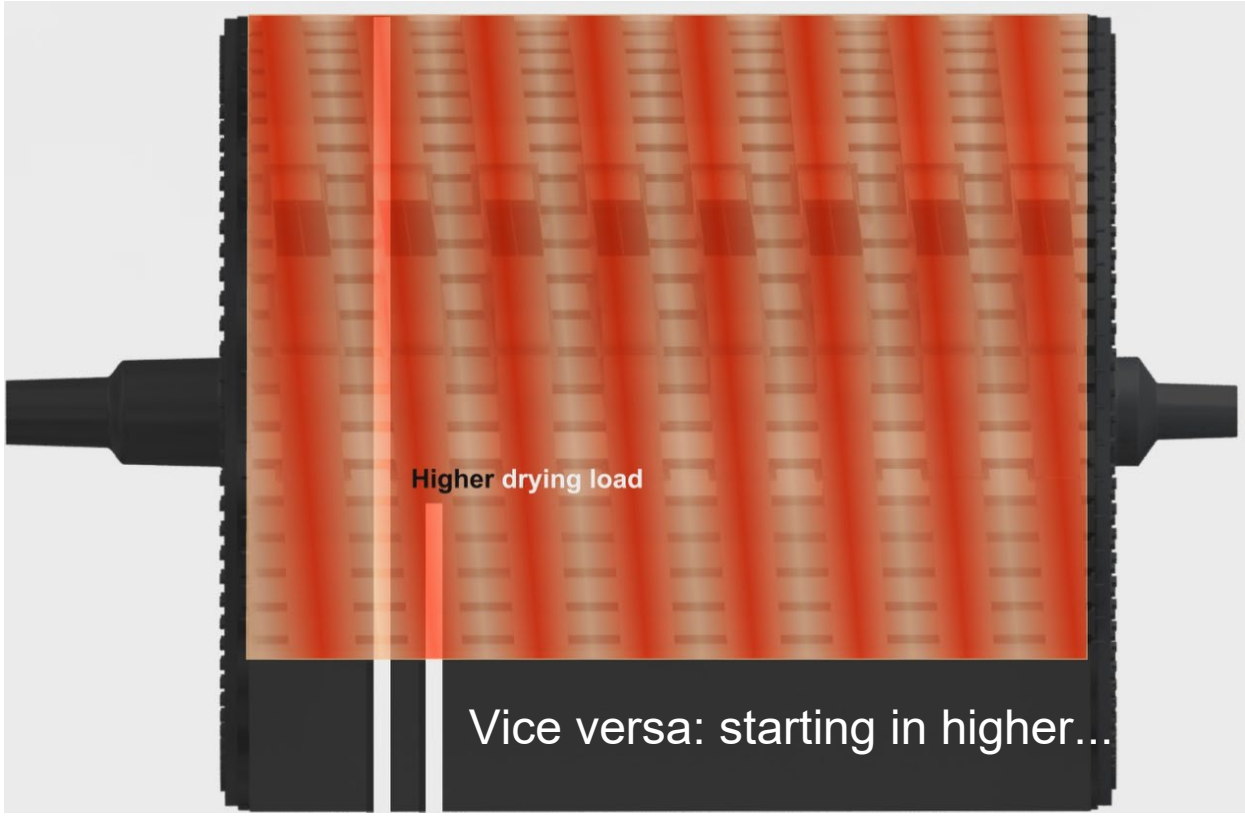


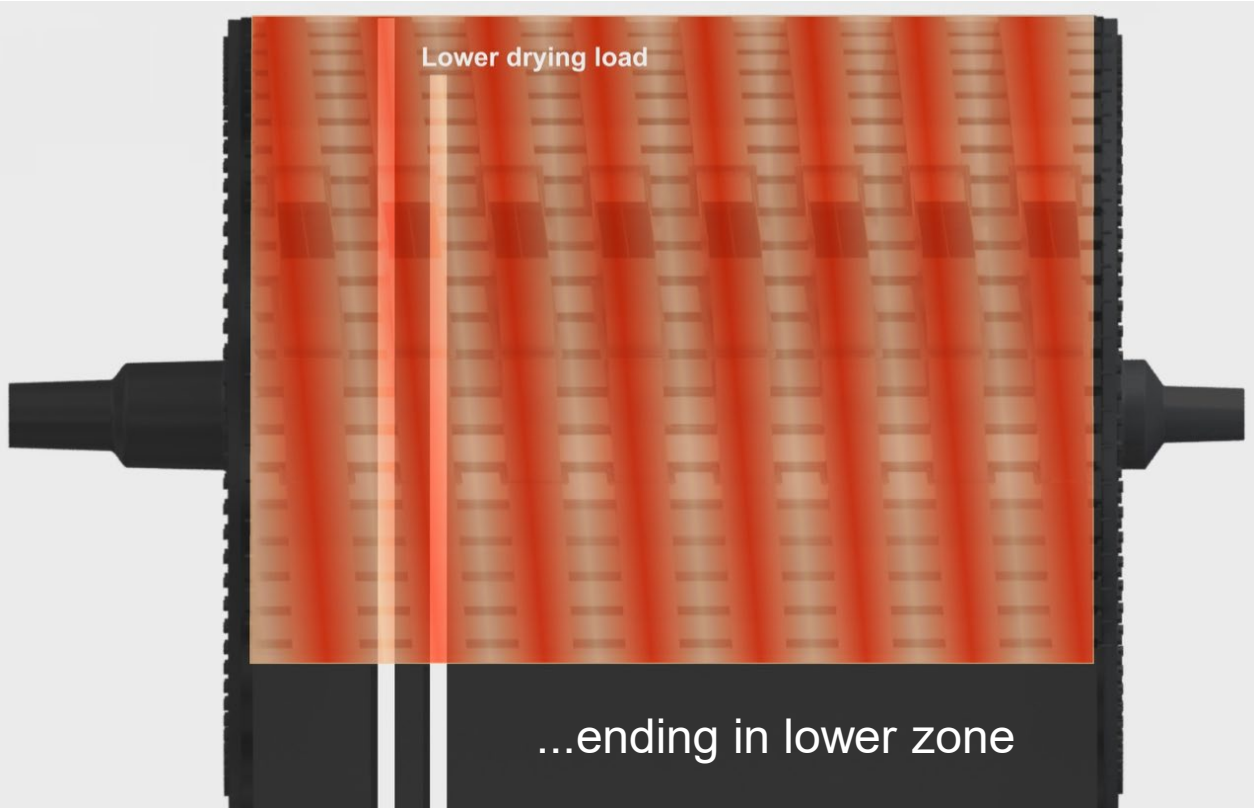
Drying Load Zones in a Helical Alignment





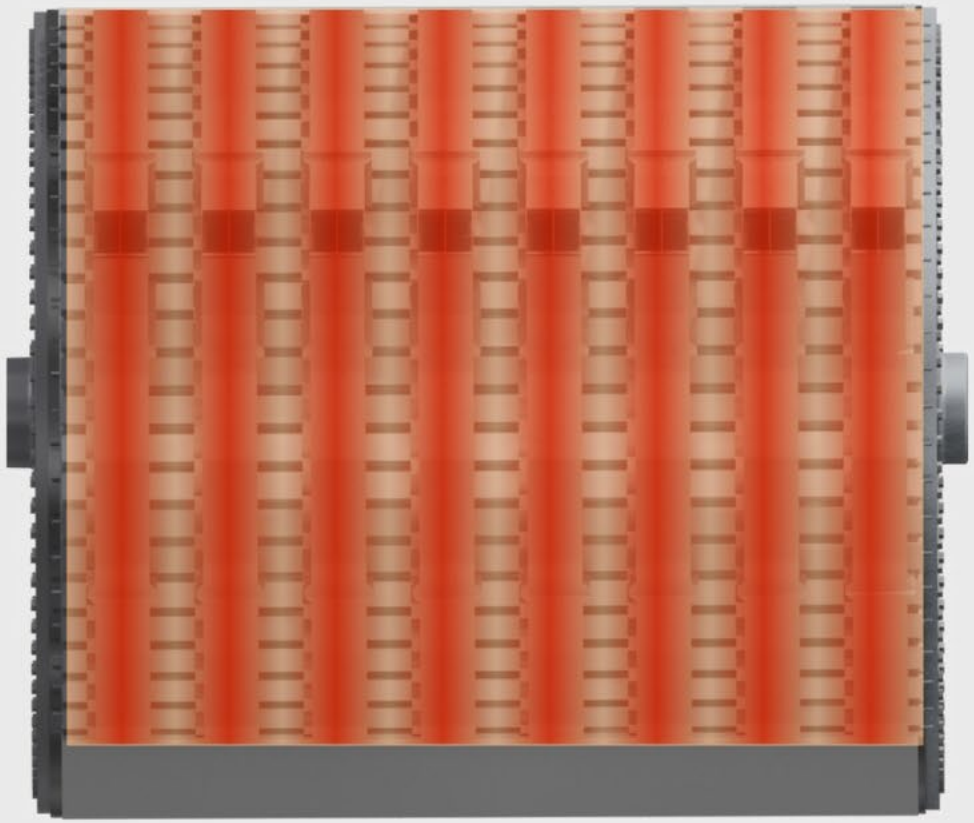
Similar Average Drying Load



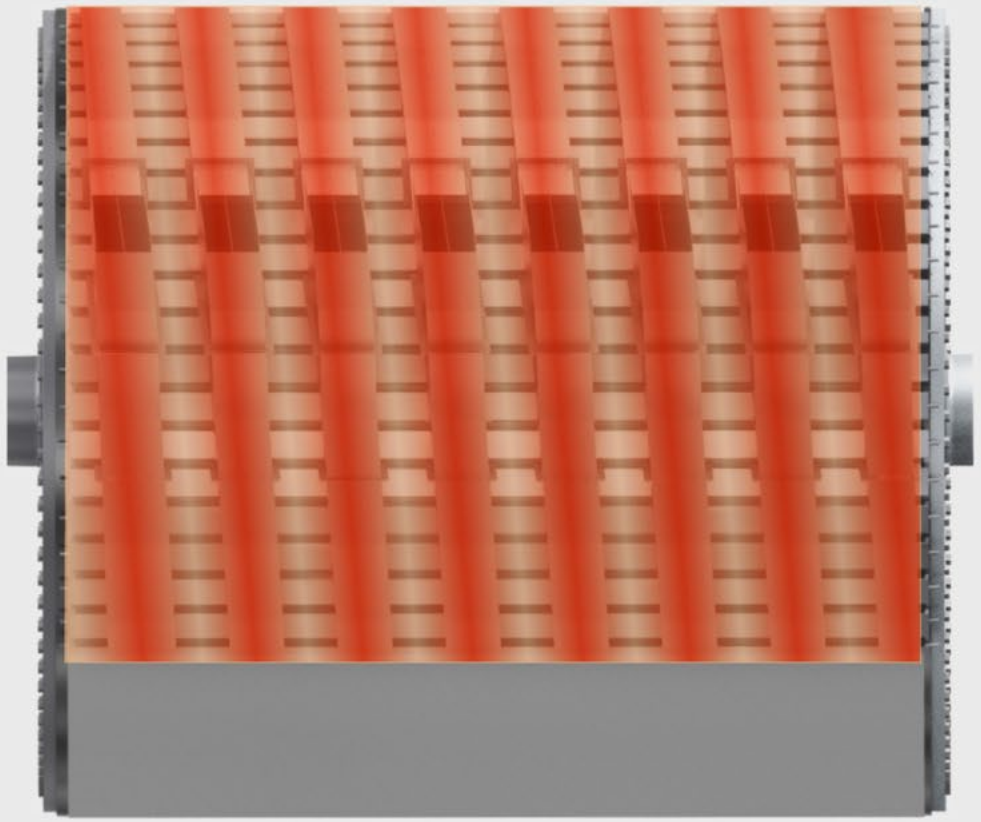


Regardless of the transverse position each strip of paper undergoes the same average drying load

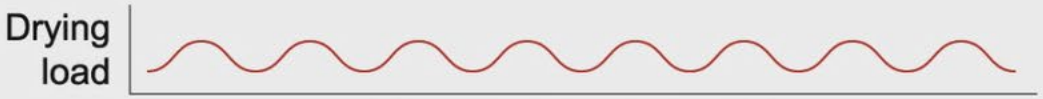
Hood Side Footprint Eliminated



Conventional Hood

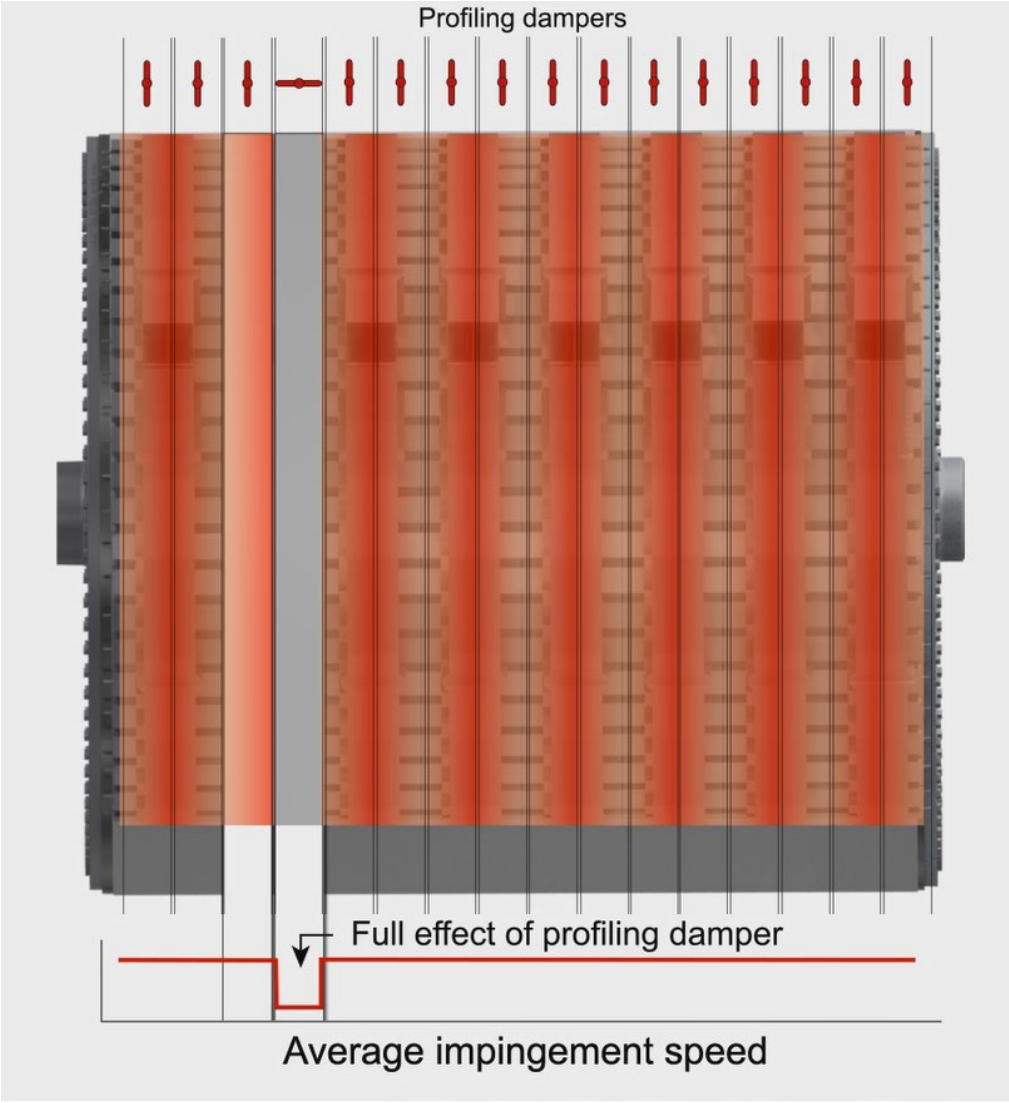


Helical Design Hood

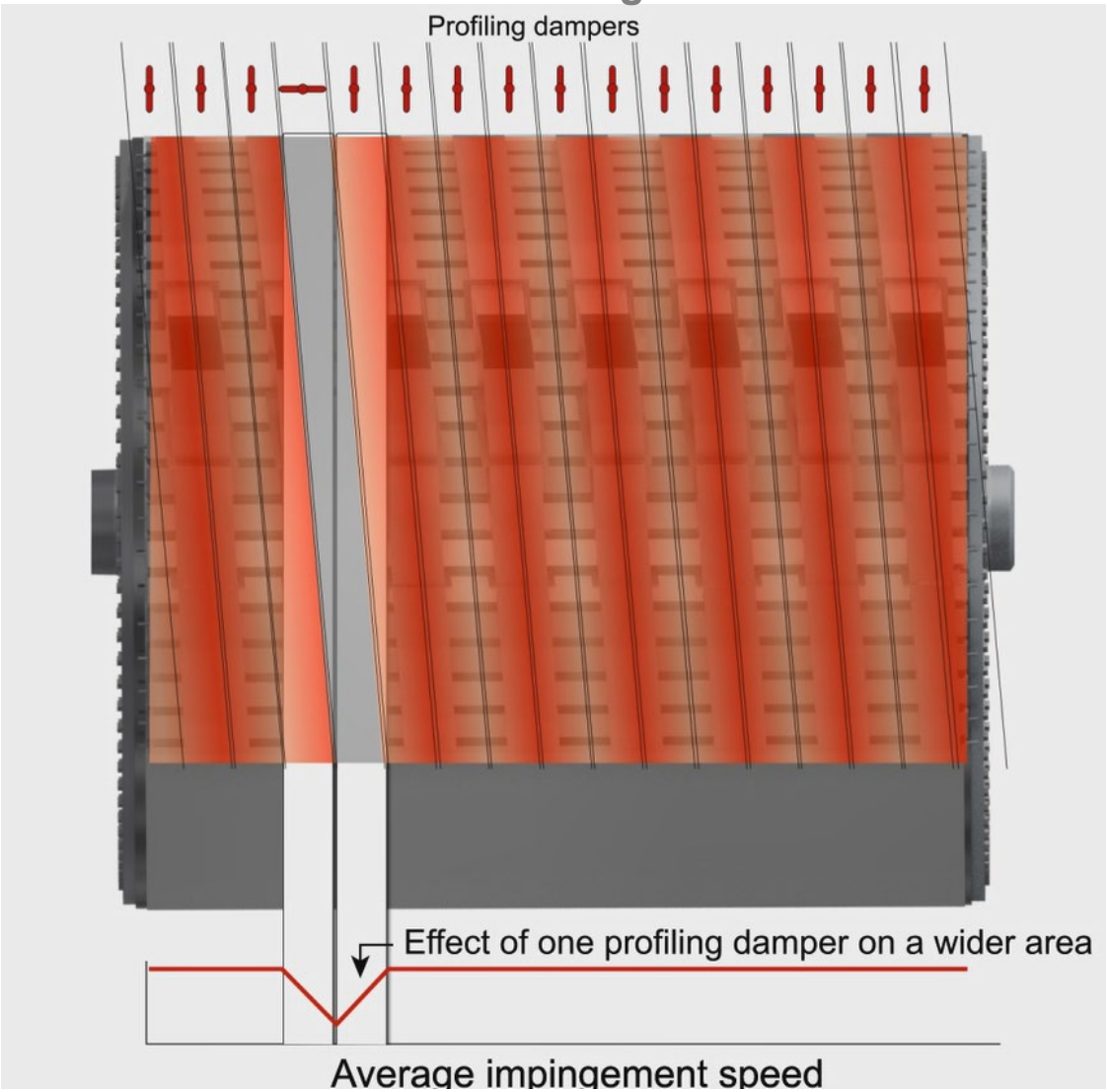


Profiling Capabilities

Conventional design

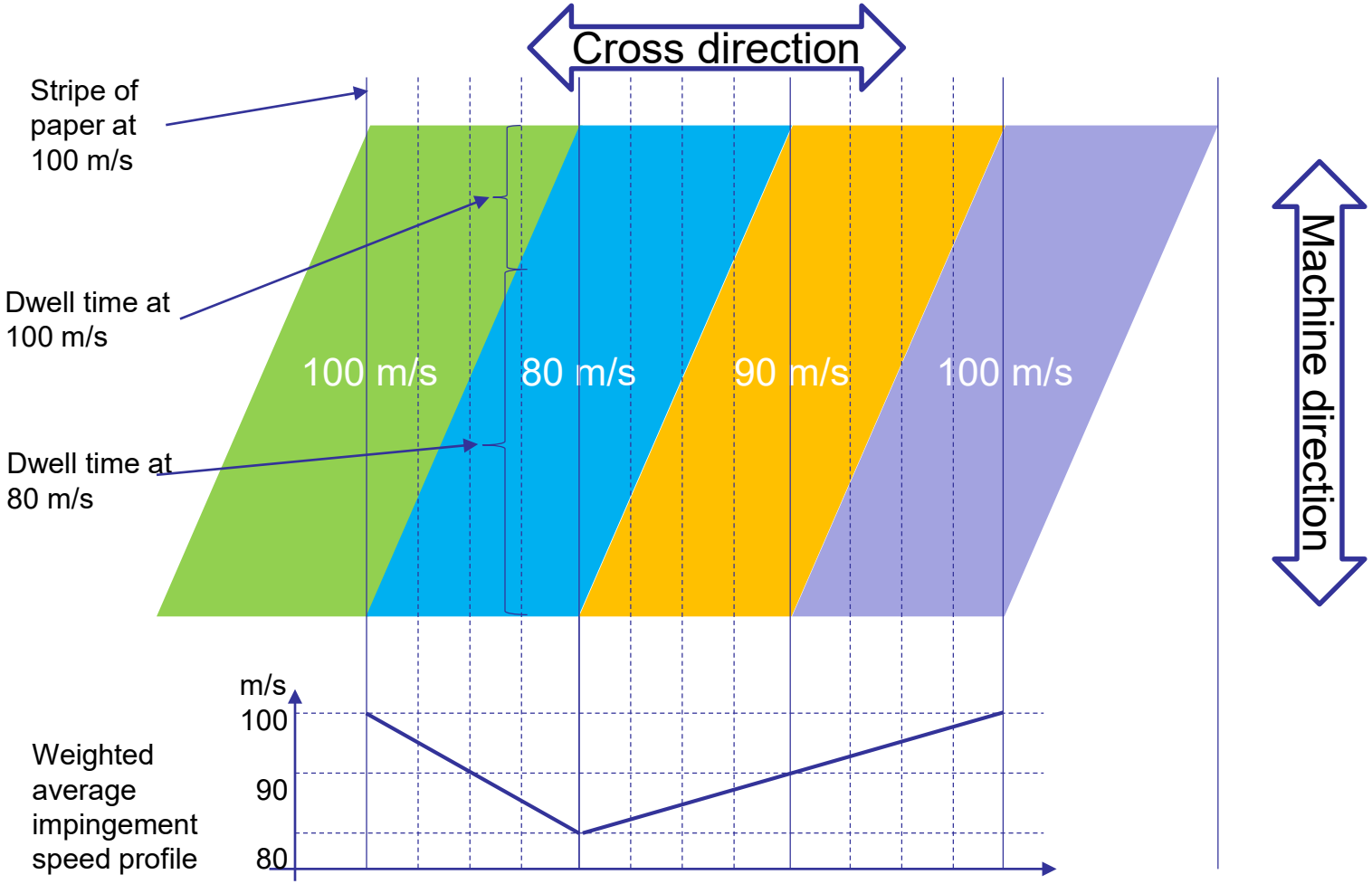


Helical design



Impingement Speed

- Gradual Impingement speed change
- Slope of impingement speed impacted by damper settings
- No step changes



Profiling Capability

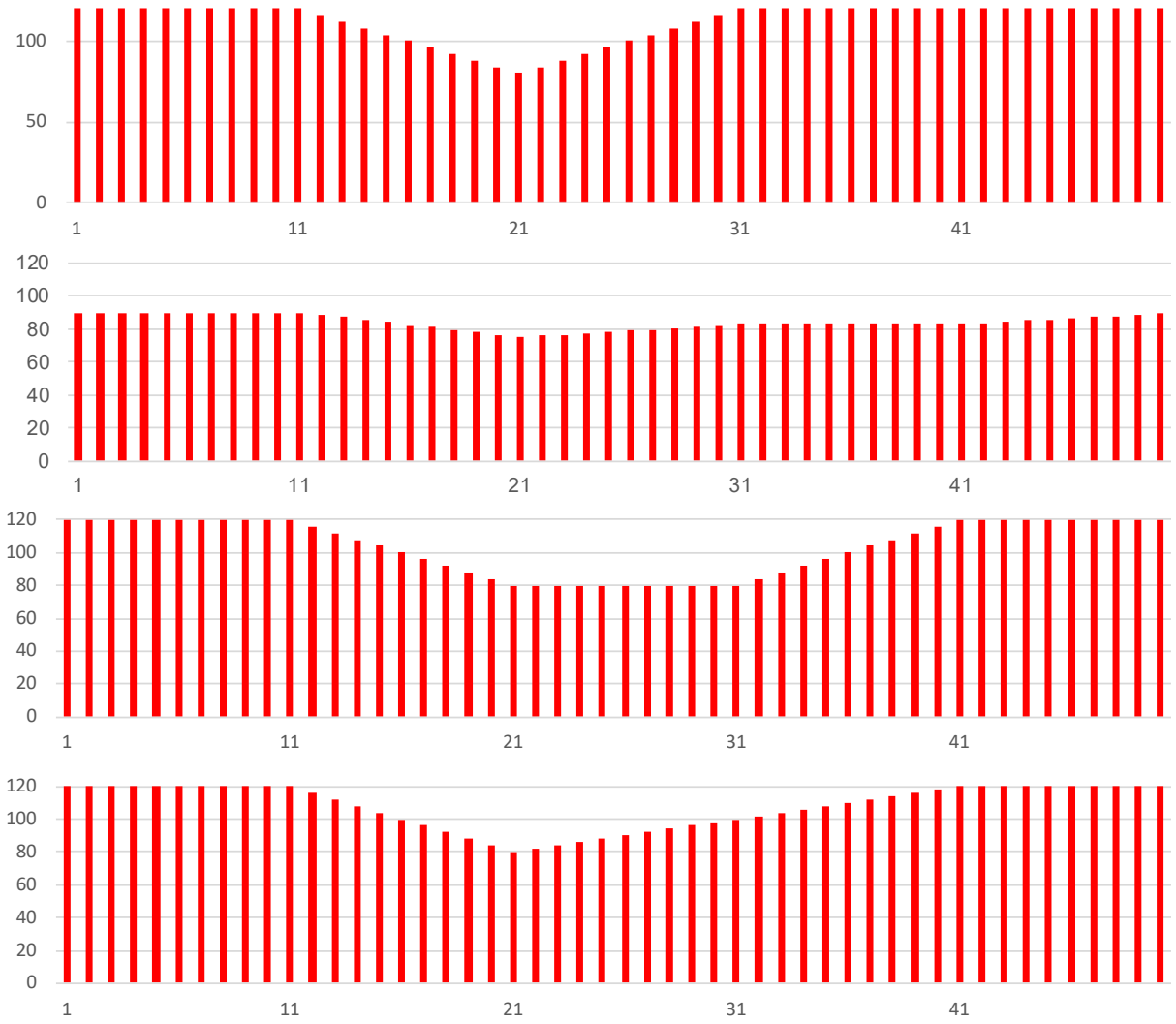
- Case with one damper closed
- Gradual Impingement speed change
- No step changes

Standard design

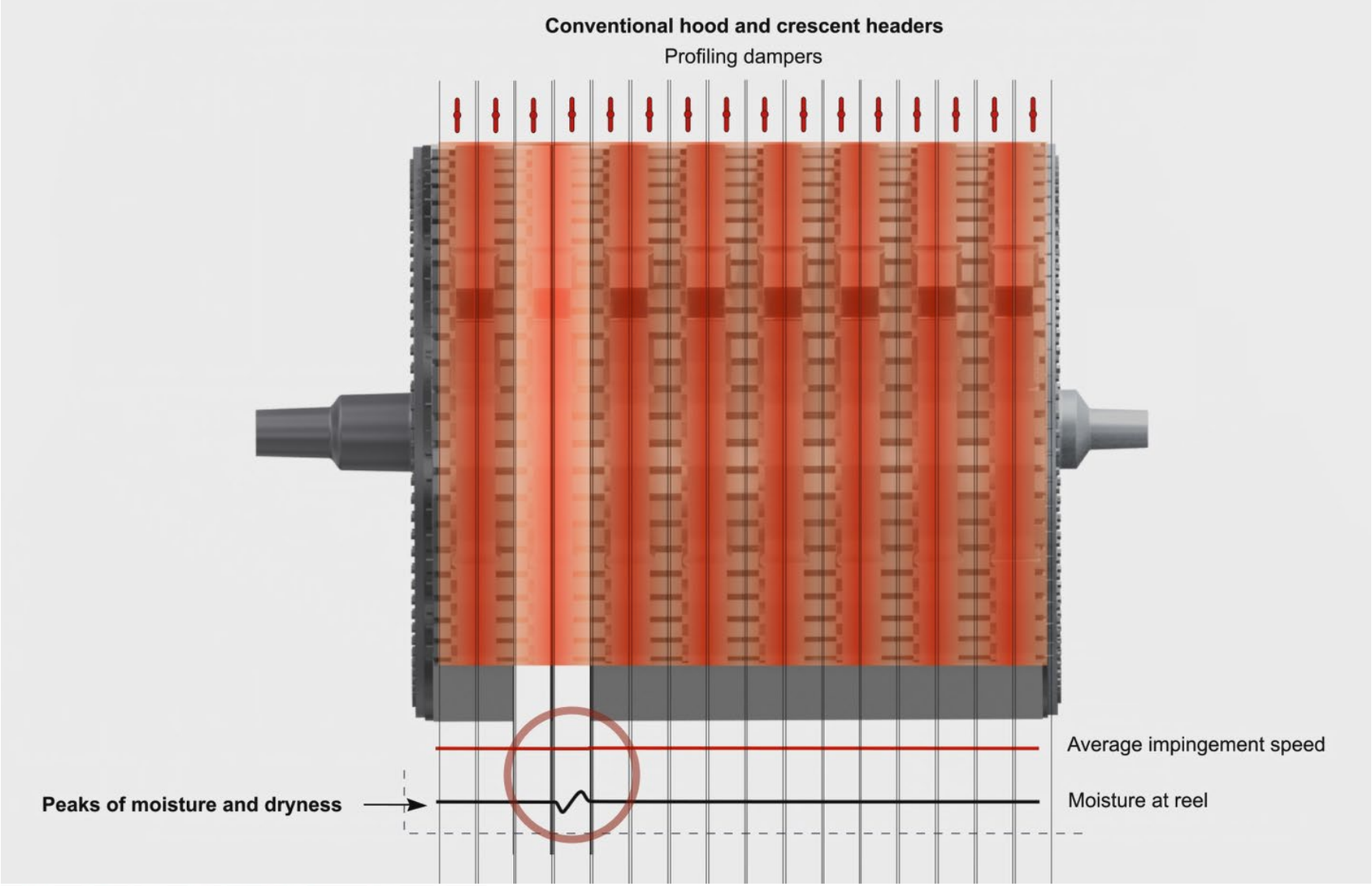
| | | |

Examples of Helical Profiling

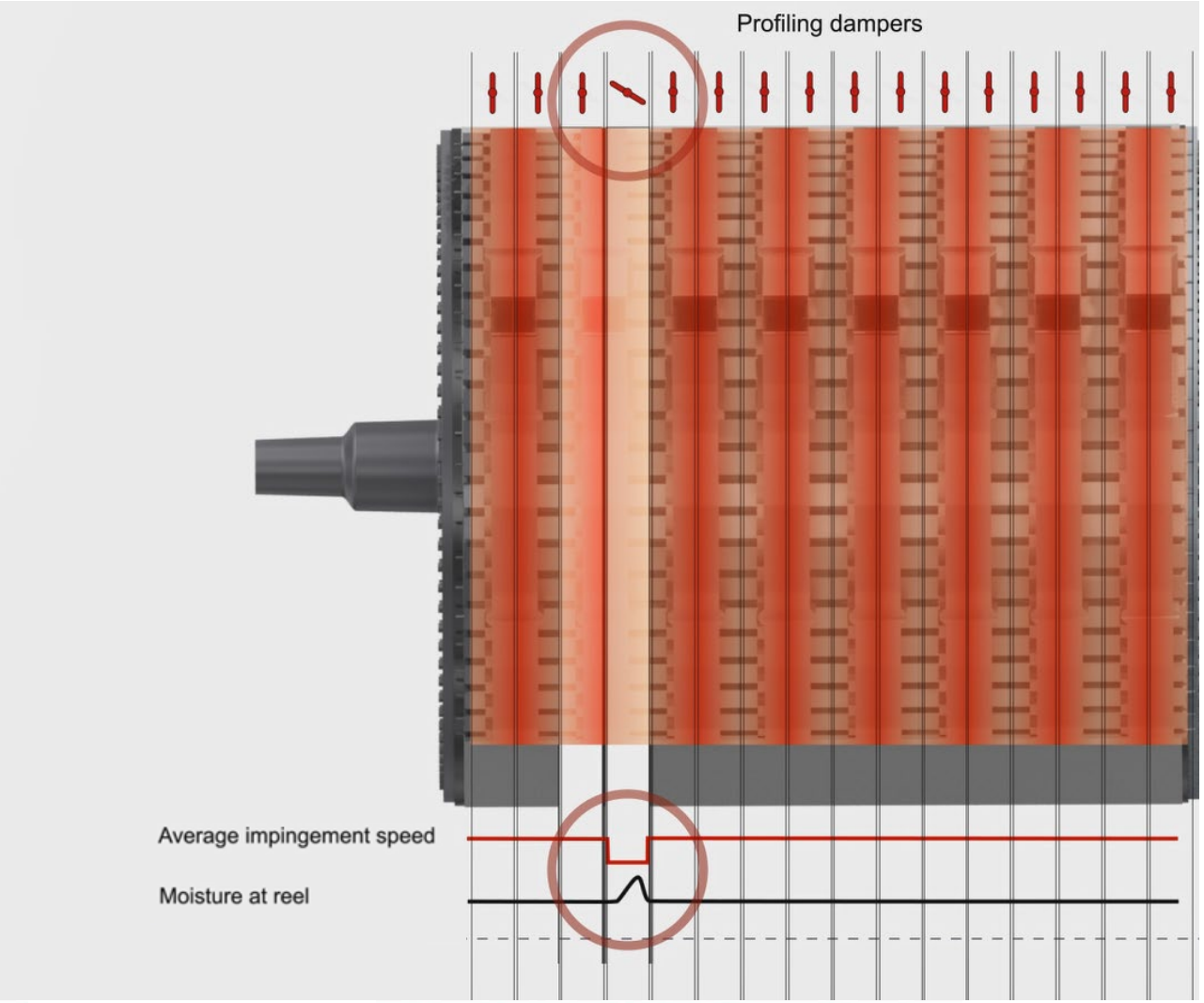
- Larger range of corrective actions become possible
- From very subtle corrections all the way to very important ones

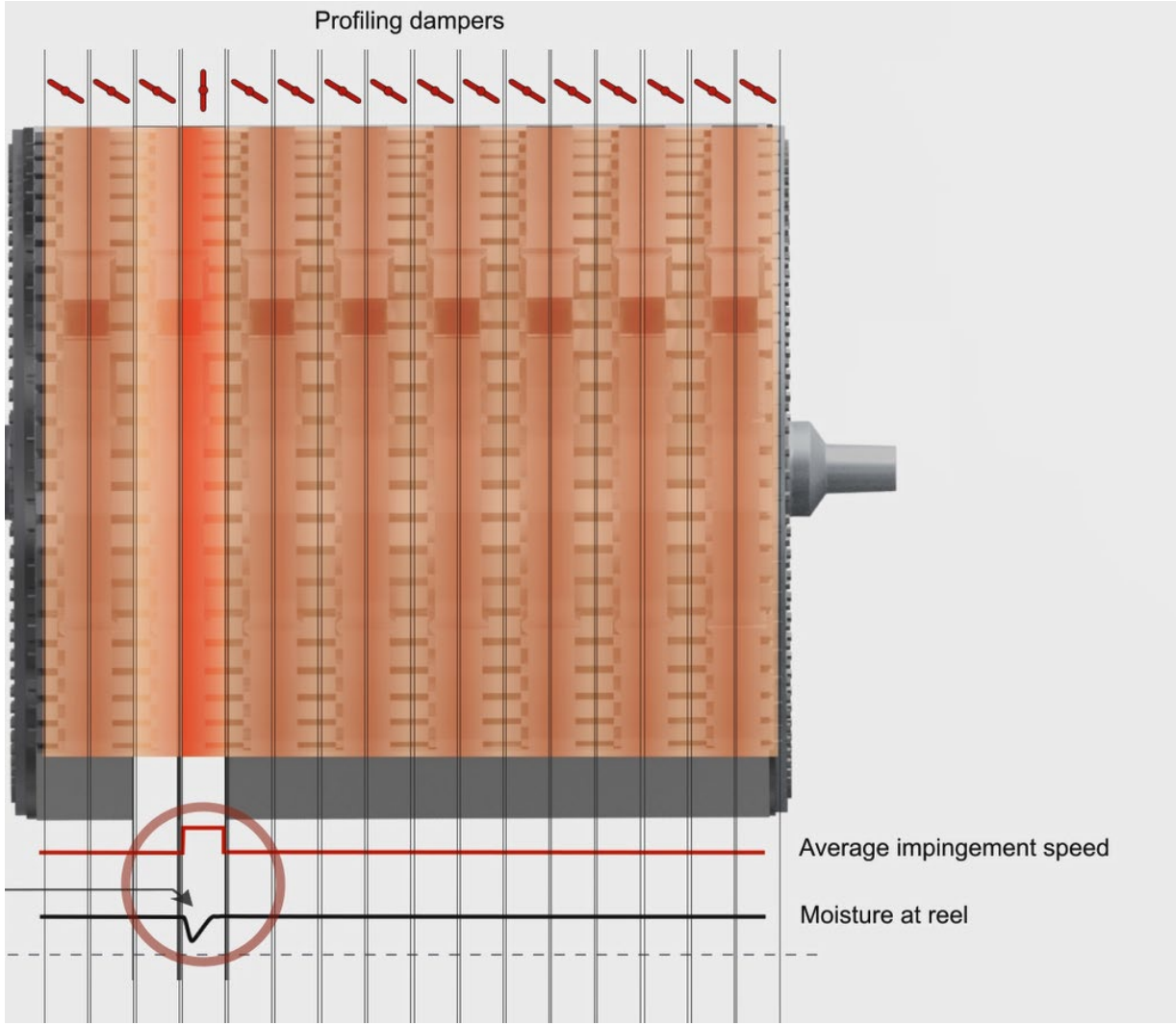


Peaks of Moisture and Dryness

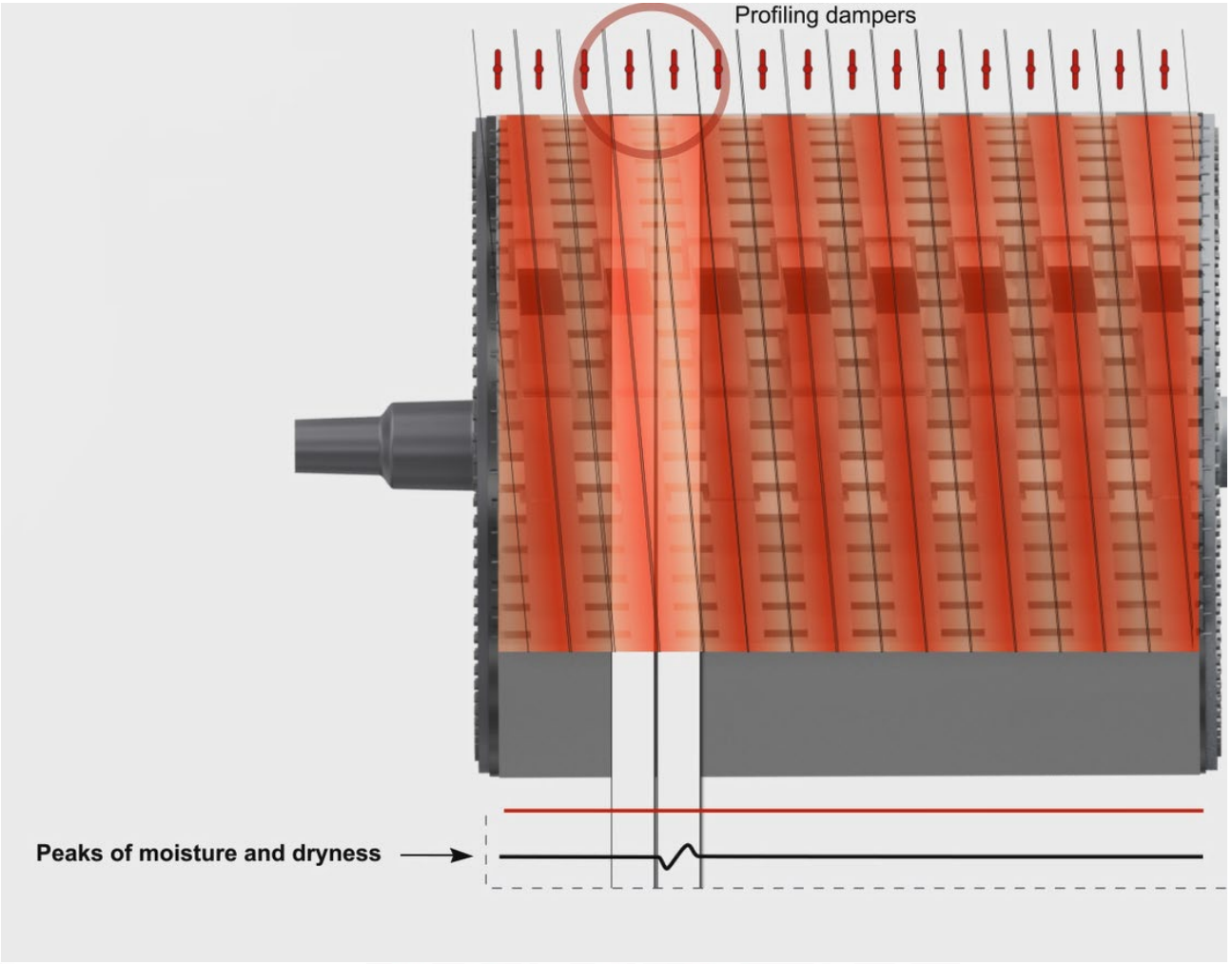


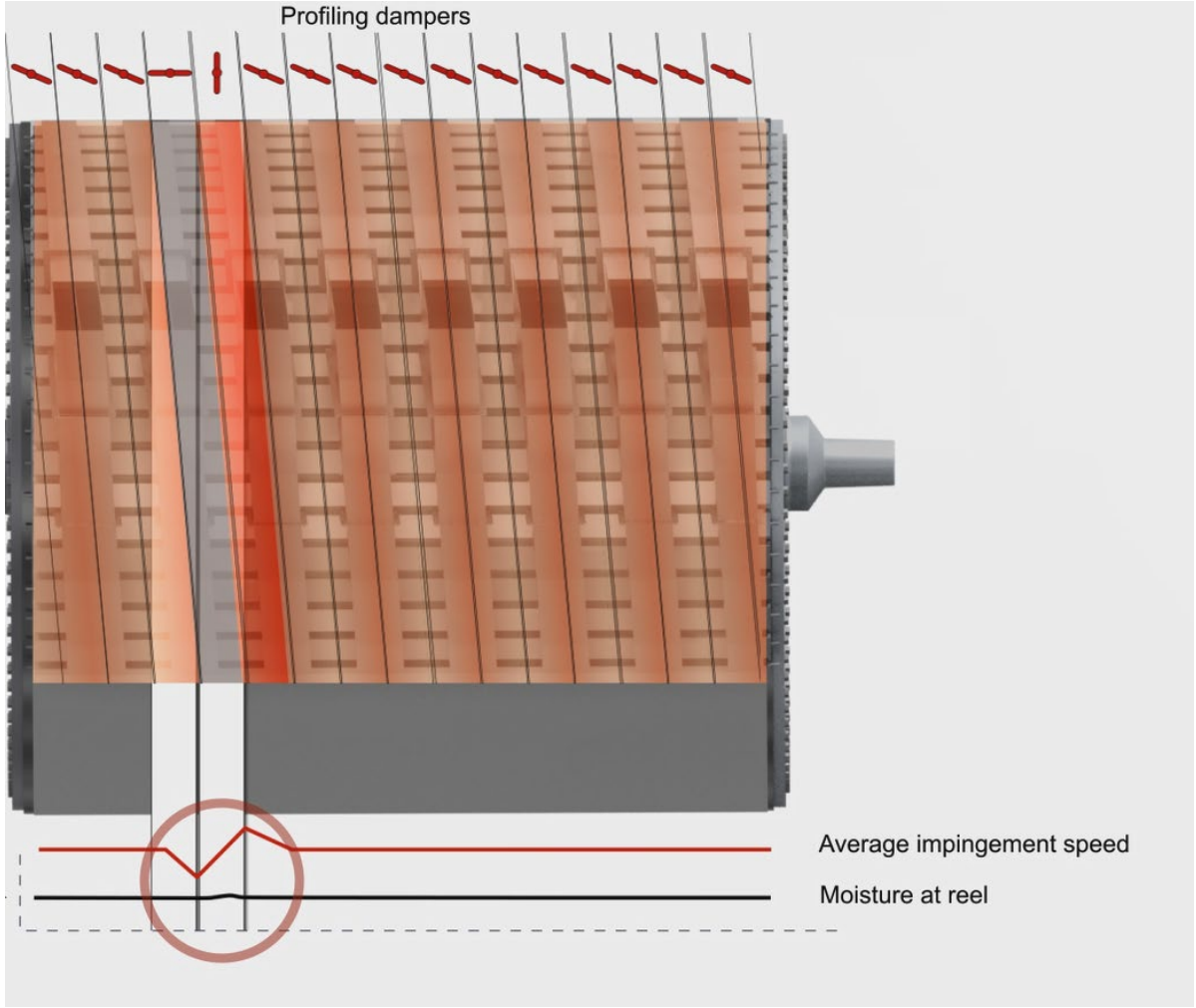
Peak Correction
Conventional Design





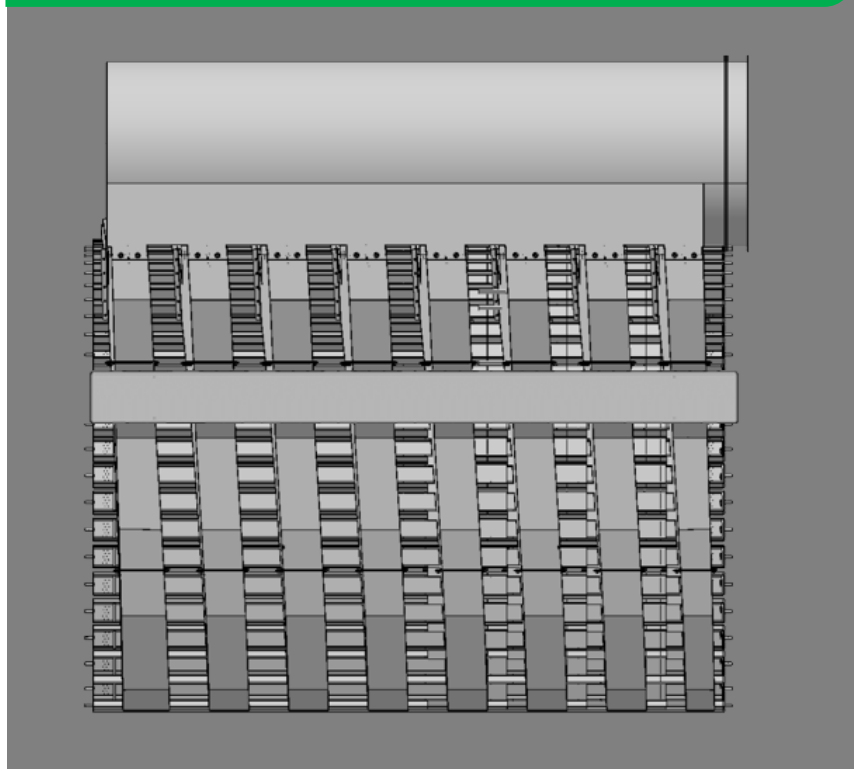
Peak Correction
Helical Design



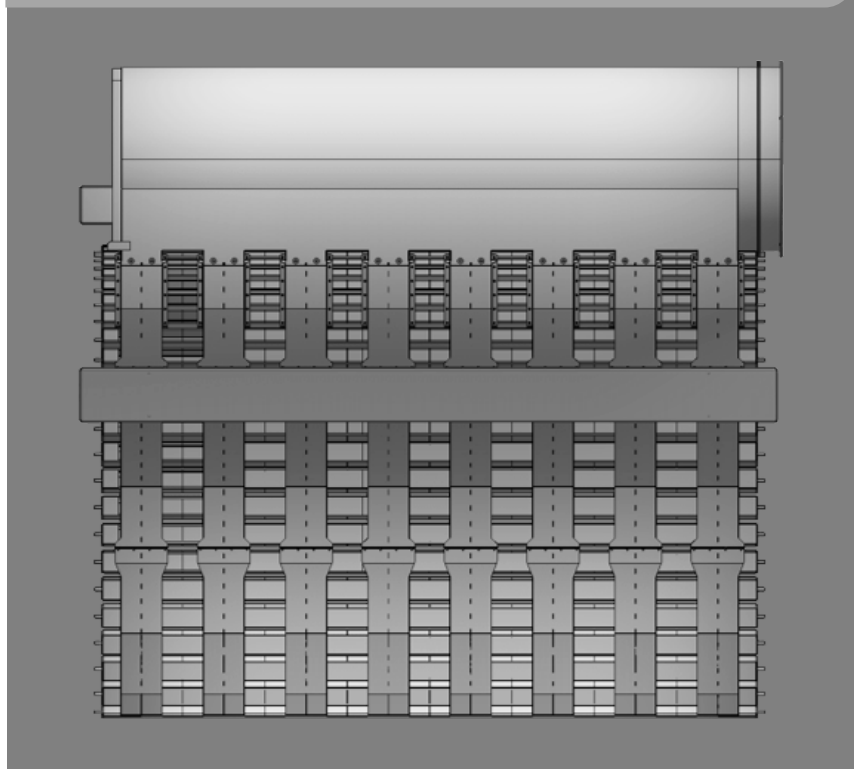


Case Study

W/E: helical design



D/E: conventional



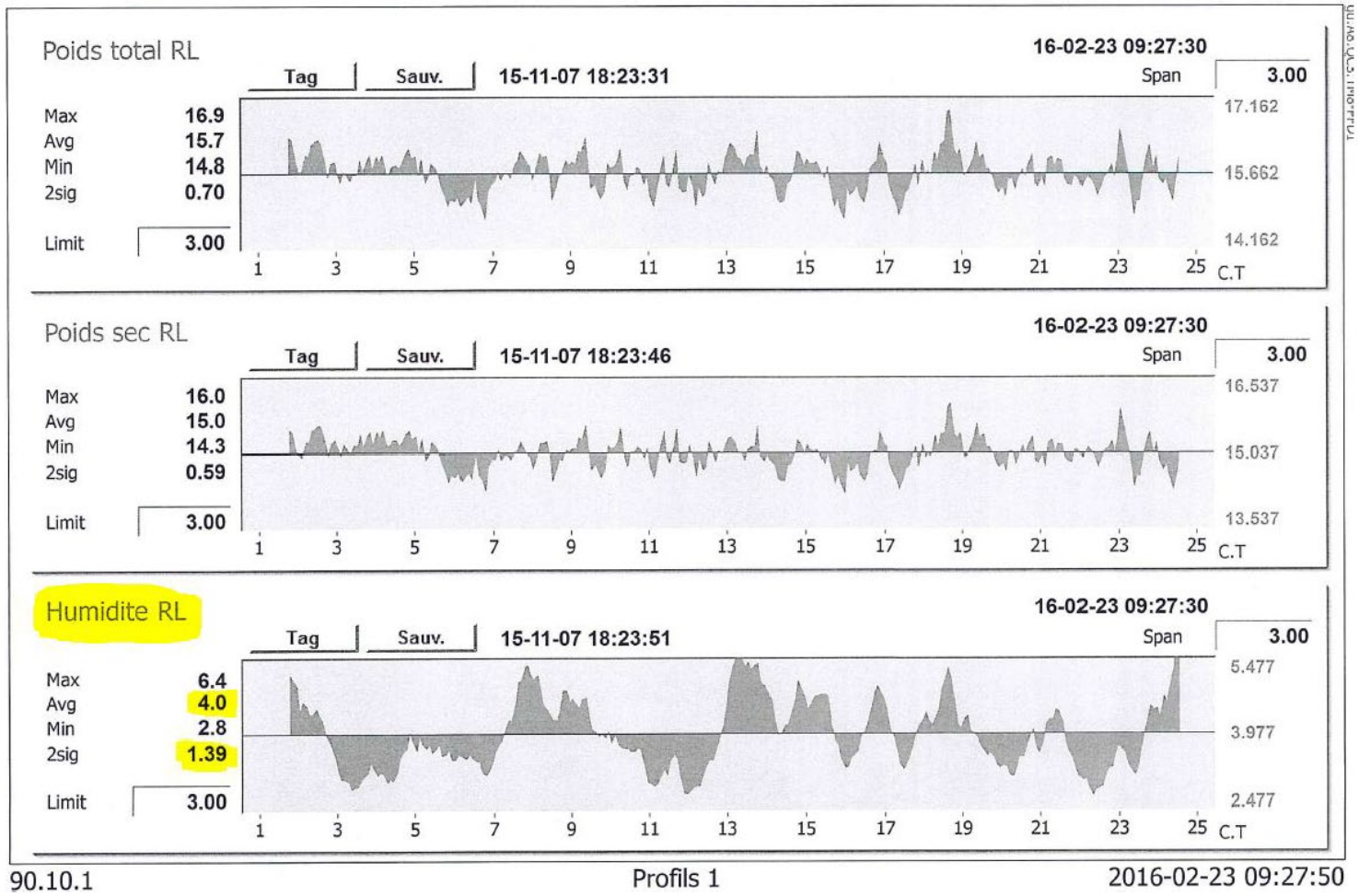
Case Study

- Mill
  - France, 2016
- Machine width
  - 2.8 m (110”)
- Rebuild
  - helical hood only on wet end

PRODUCTION VALUES DURING THE SURVEY		Feb 22-23, 2016
Yankee speed	[mpm]	1970
Reel speed	[mpm]	1586
Creping ratio ((Y speed - R speed) / Y speed)*100	[%]	19,5
BW at reel	[g/m^2]	15,7
Dryness after the press (PPRC)	[%]	38,1
Dryness at reel (RC)	[%]	96,3
Sheet width at Yankee Dryer	[m]	2,870
Sheet width at reel	[m]	2,820
Bone Dry (BD) production at Yankee	[kg_{BD}/s]	1,147
Evaporation at Yankee	[kg_{WATER}/s]	1,819
	[kg_{WATER}/h]	6550
Production at reel	[ton_{PAPER}/h]	4,21
	[ton_{PAPER}/24h]	101,1
Yankee dryer steam pressure	[barG]	8,5
Impingement temperature WE / DE	[°C]	475/476
Impingement speed WE / DE	[m/s]	125/141
Circulation fans speed WE / DE	[rpm]	1660/1660

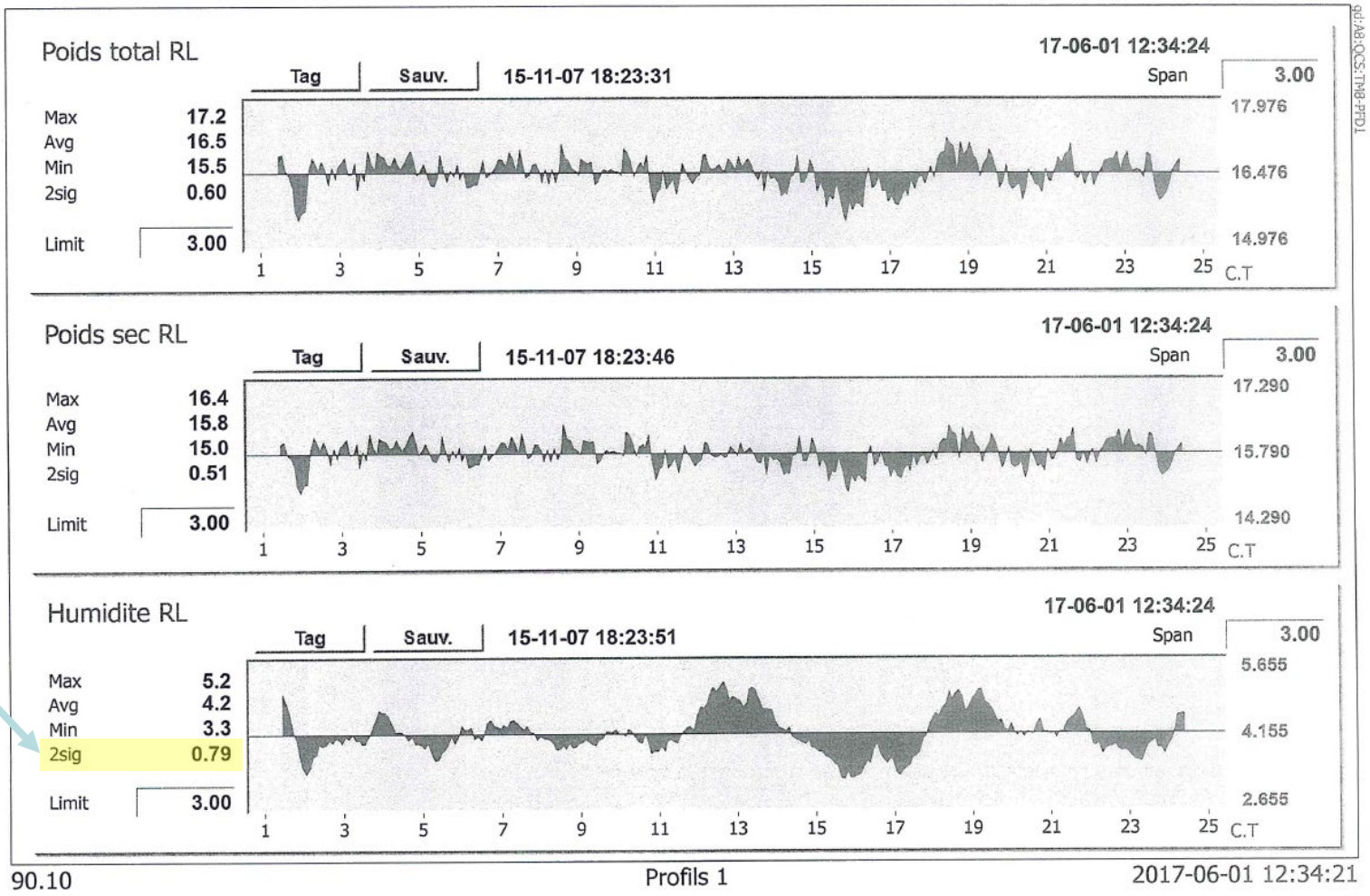
Case Study

- The moisture 2-sigma before the installation of the was 1.39 on the WE hood
- The guarantee was for a 2σ < 1.00 after the rebuild

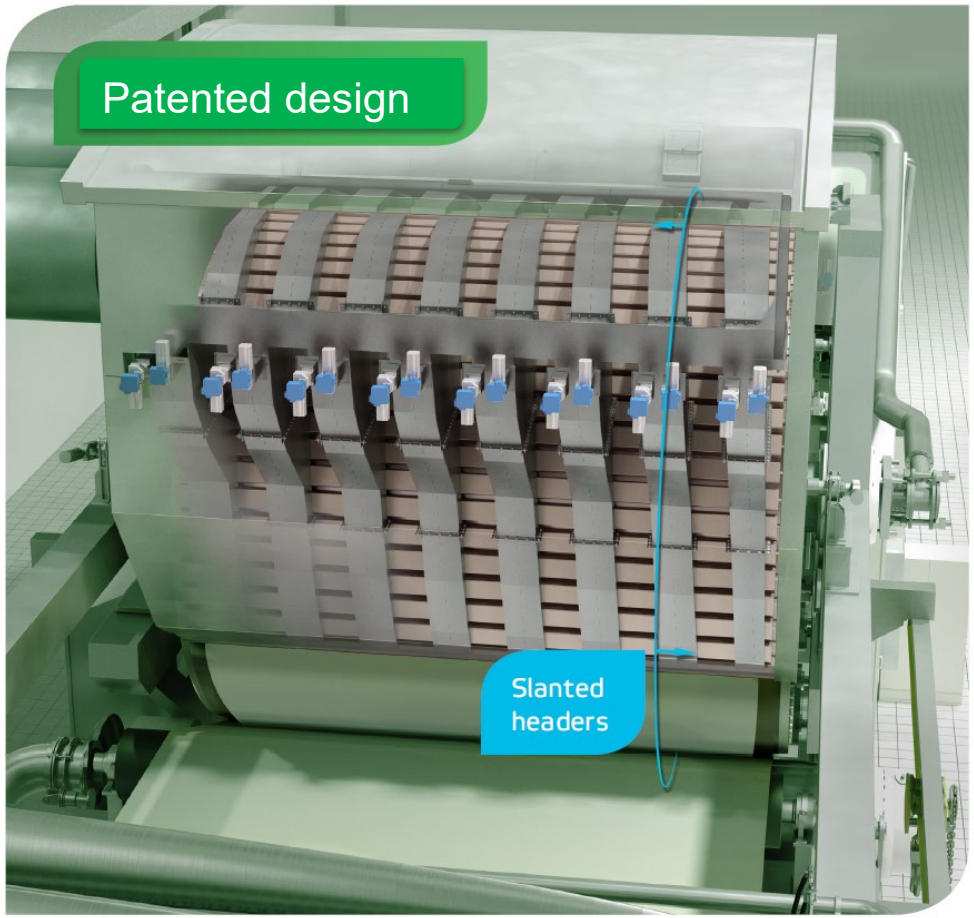


Case Study Results

- Final result exceeded the expectations and guaranteed values
- During the start up the measured value of moisture 2σ was 0.79



Conclusion



- Uniform CD temperature and CD blowing speed in wet end hood
- Uniform CD temperature and CD blowing speed in dry end hood
- Both hood sections can work independently with their own blowing temperature and blowing speed
- Uniform paper moisture profile with all blowing temperature and blowing speed combinations
- CD profiles after each hood section are uniform
- Drying capacity profile suited to the humidity profile to be corrected
- Improved 2-sigma moisture profile at reel
- Nine (9) helical hoods installed and successfully started up

Thank you

PRESENTED BY

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