solution in spirals
Württembergische
Spiralsiebfabrik GmbH

STFI

Sächsisches Textilforschungsinstitut

(Saxonian Textile Research Institute)

Spiral fabrics in Spunbond operation

Targets

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Part 1 : Test of spiral fabric as deposition belt

The first test of a spiral fabric as deposition belt in the Spunbond machine (Reicofil), producing standard PP nonwovens in varying grammages. Production was to be started at low speed, targeting further increase to maximum operating speed.

All settings and measurement parameters were recorded.

Part 2 : Test of spiral fabric as transfer belt

Also in this position the first test of a spiral fabric; two methods for web stabilisation are available:

- Thermobonding with heated rolls (not trial objective, no sketch)
- Highpressure water jet needling with Aquajet (see following sketch)

All settings and measurement parameters were recorded in this test also.

Sketch Spunbond & Aquajet

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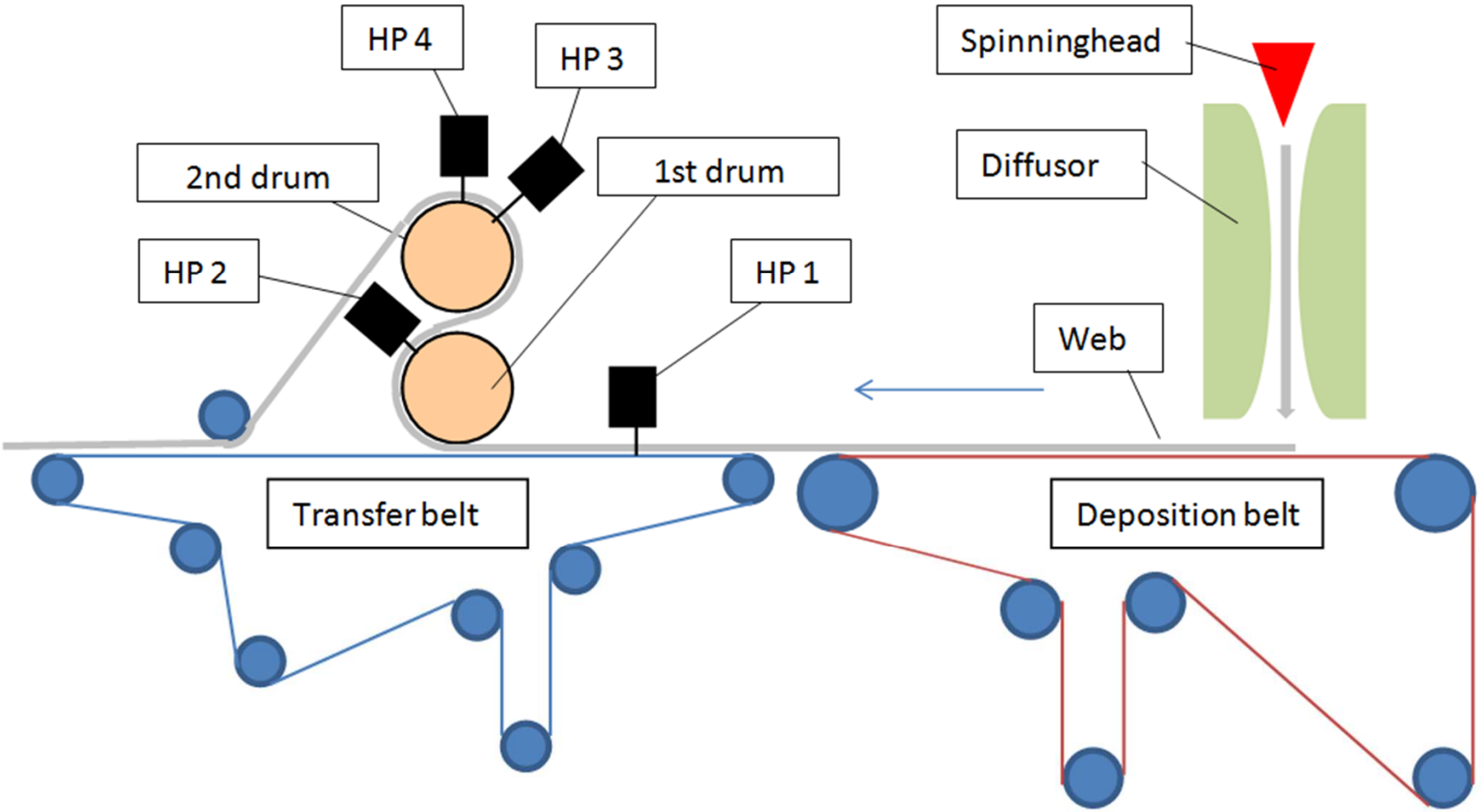

Details

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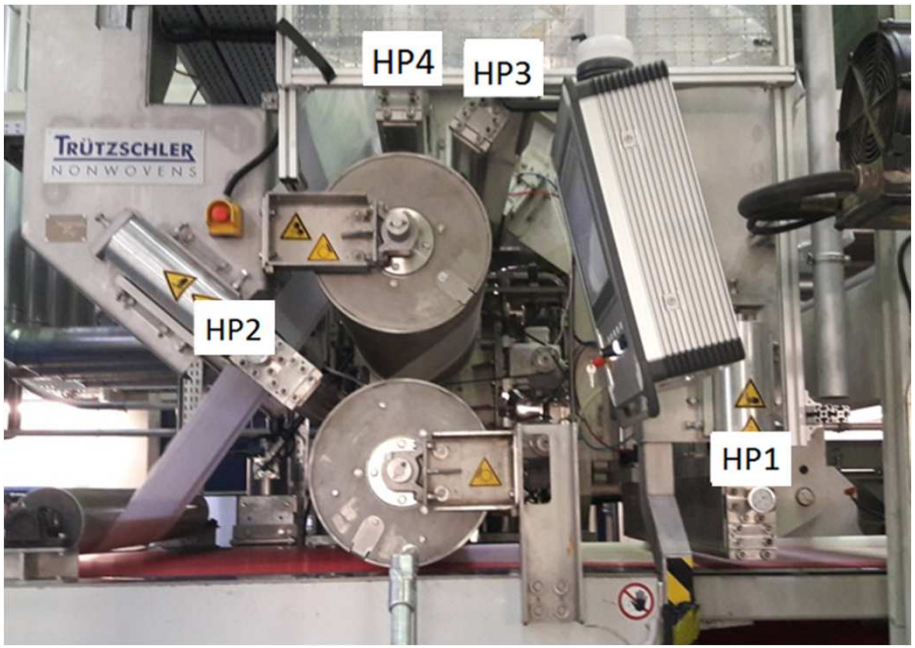
Spinninghead (prior to process start)

Aquajet section with transfer belt



Fabrics / materials

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Deposition belt :		
(L20,30 x W1,40m)	Standard	Woven, conductive, approx. 550 cfm
	Trial	**Spiralsolution 55000 A, conductive, 900 cfm**
Transfer belt :		
(L11,60 x W1,40m)	Standard	Woven, conductive, approx. 600 cfm
	Trial	**Spiralsolution 38000 FS, 900 cfm**
Trial material :		
Polypropylene (PP)	Type HP 561R	

Part 1:
Spiral deposition belt

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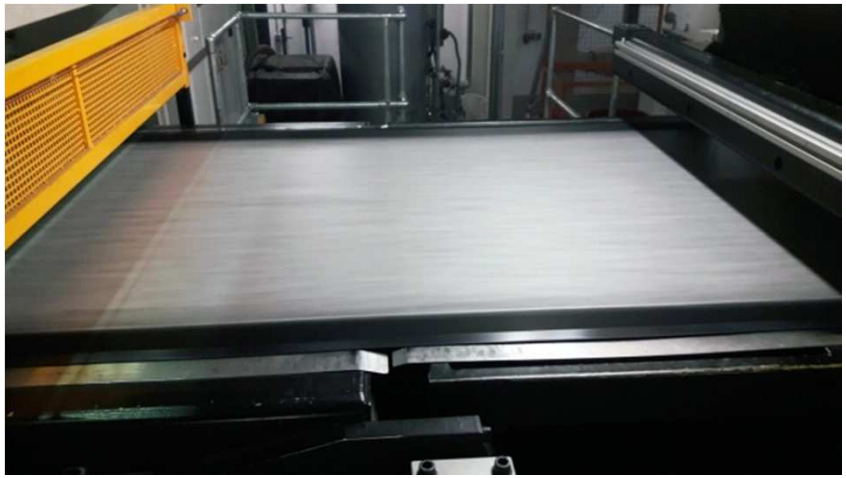
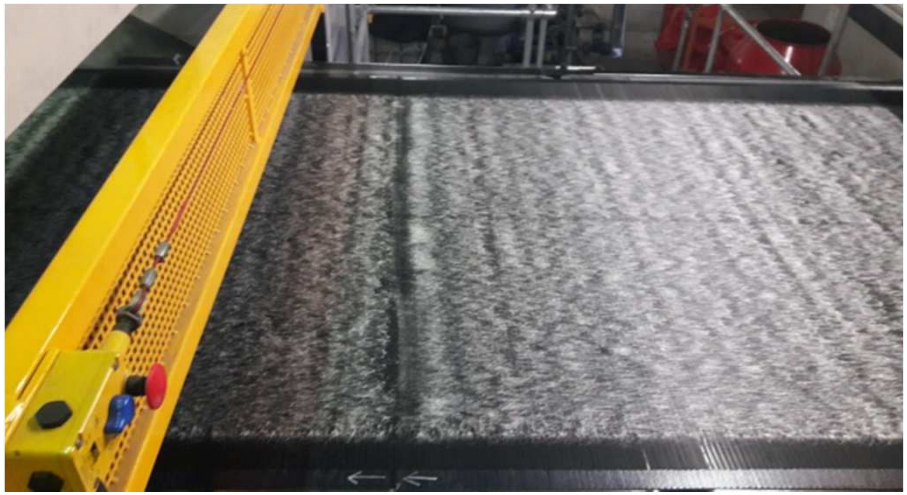
Fibre web on Spiralsolution 55000 A





After completion of trials, spiral fabric covered with fibres. Seam area visible due to use of oil spray for seaming.

Part 1:
Spiral deposition belt

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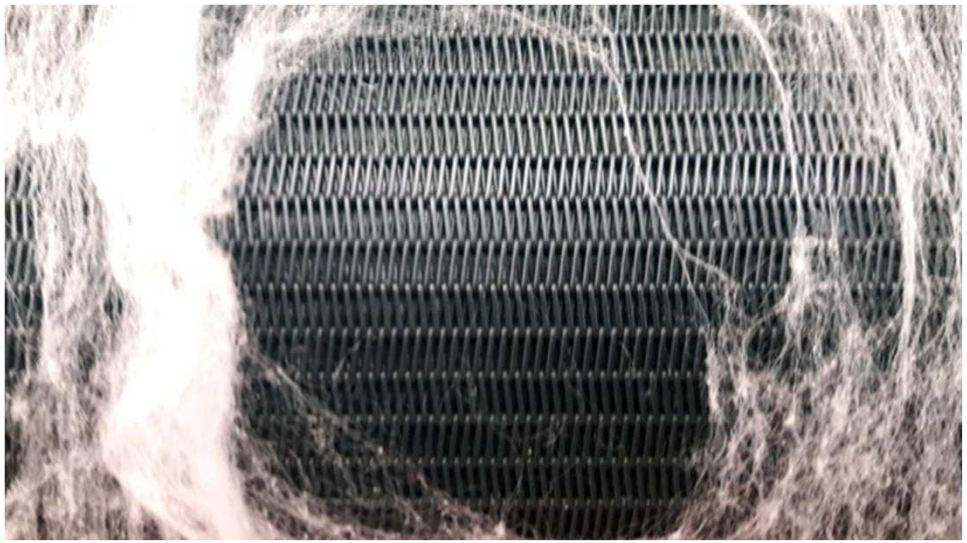
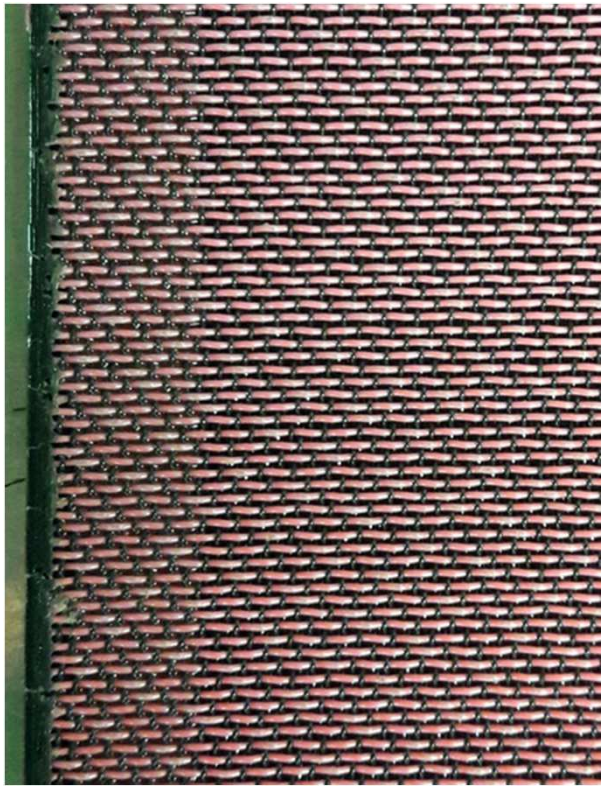
Web adhesion on Spiralsolution 55000 A



Fibres are easily removed, no penetration into body of spiral fabric

Comparison:
Standard fabric



Part 1:
Spiral deposition belt

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Fibre loss with Spiralsolution 55000 A

After completion of trials, perforated metal plate under spiral fabric covered with fibre - indication of a fabric too open.

Data, Part 1:
Spiral deposition belt

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No.	V [m/min]	GSM (set) [g/m²]	suction air [rpm]	Draw* [%]	F_{Max} MD [N]	F_{Max} CD [N]	Elongation MD [%]	Elongation CD [%]
924	36	100	1800	0	N	N	N	N
925	72	50	1800	0	111	58,9	73	73
926	120	30	1800	0	83,2	41,3	108,2	100,2
927	240	15	1800	6	33,8	16,1	80,4	87,8
928	240	15	1400	4	35,7	15,6	80,5	78,4
929	240	15	2000	7	29,7	15	68,8	80,9
930	300	12	1800	7	24,1	11,2	69,3	74
931	360	10	1800	9	18,4	9,1	59,8	78,9
932	400	10	1800	9	17,5	8,1	64,6	76,4

Draw*: transition table N: no measurement

Data, Part 1:
Spiral deposition belt

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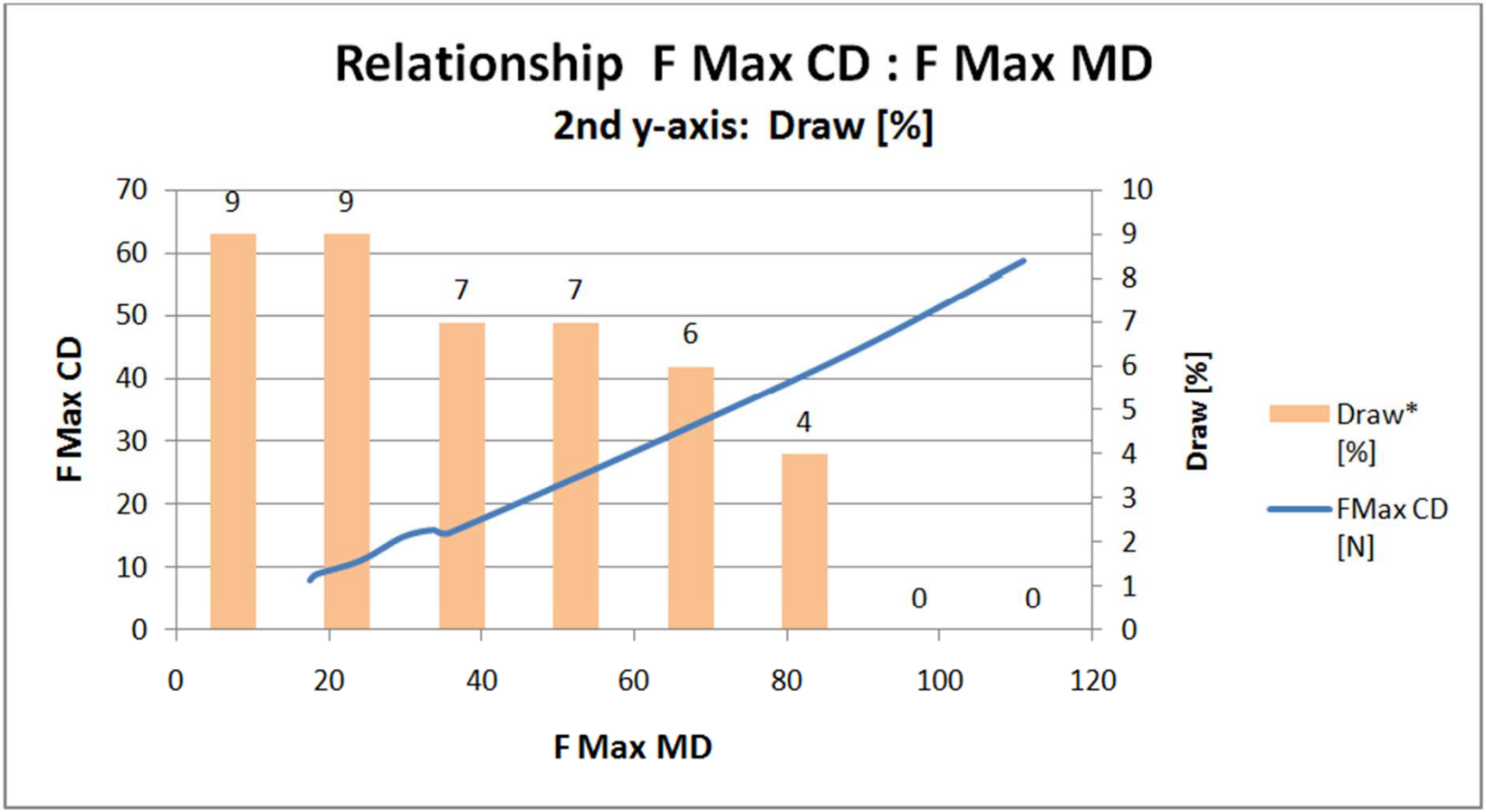

Comment: *Irrespective of changes in draw, the relationship of MD to CD max. tensile strength is almost linear.*

Conclusion, Part 1: Spiral deposition belt

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Spiralsolution 55000 A :

First ever spiral fabric tested in the deposition position.

Positive feedback was given on the „endless“ characteristics after seaming.

It was generally possible to run all tests with this spiral fabric, meaning also nonwovens with basis weights of $\leq$ 10 g/m² could be produced.

It was also possible to raise machine speed to maximum and to operate at this speed.

Based on these results, the trials are judged as promising first evaluations.

Conclusion, Part 1: Spiral deposition belt

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Draw between deposition and transfer belt had to be increased steadily from machine speed 200 m/min upwards, reaching the maximum possible value of 9% at a speed of $\geq$ 360 m/min.

Draw was therefore substantially higher with the spiral fabric than with the standard woven product, at comparable speeds.

It can further be noted that MD/CD tensile ratio clearly depends on the required suction air volume (low volume = MD/CD high … high volume = MD/CD low).

From these results it becomes apparent that the air permeability of the tested spiral fabric is too high. This could be the possible reason for fibre build-up on the fabric surface during the test. A further indication for too high a fabric permeability, is the perforated metal plate between fabric and suction compartment being covered with fibres.

Conclusion, Part 1: Spiral deposition belt

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Grip properties of the spiral fabric seem to be acceptable, possibly a little too high though. The web stayed in place after deposition and release was safe up to maximum speed.

However, in the high speed range, there was a clearly visible difference to be noted between release properties of spiral fabric and standard woven deposition belt.

Part 2:
Spiral transfer belt

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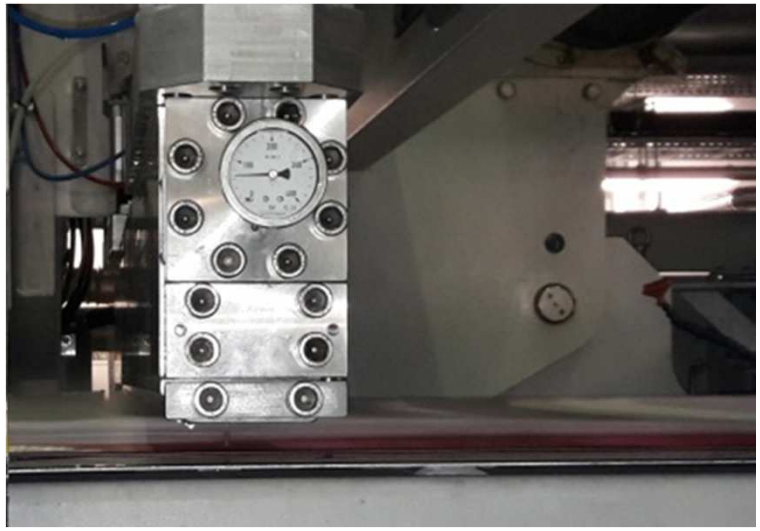
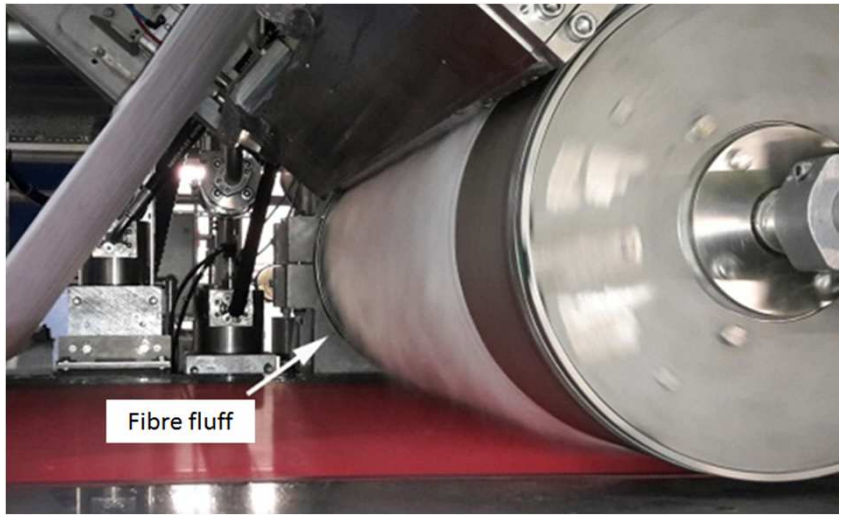
Hydro-entanglement (HP1)

of fibre web on transfer belt





Fibre on 1st drum, before HP2

Part 2:
Spiral transfer belt

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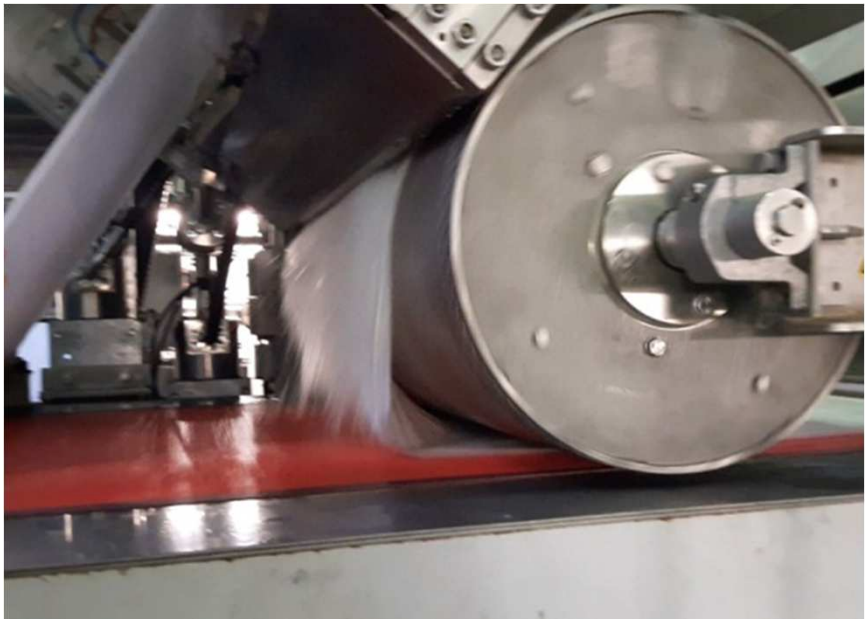
Heavier fibre fluff

Just before
emergency cut-out



Data, Part 2:
Spiral transfer belt

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No.	V [m/min]	GSM (set) [g/m²]	Draw* [%]	F_{Max} MD [N]	F_{Max} CD [N]	Elongation MD [%]	Elongation CD [%]	GSM (real) [g/m²]
933	62,0	60	3,0	199,8	124,9	158,4	213,9	58,2
934	100,0	40	3,0	124,2	72,6	139,5	214,3	38,6
935	130,0	30	3,0	94,3	48,7	114,7	208,3	31,5
936	200,0	20	5,0	58,8	25,0	112,7	197,8	21,0
937	45,0	80	3,0	277,5	174,6	158,6	201,5	79,2
938	37,0	100	3,0	333,3	212,4	150,7	197,5	96,3

Draw*: Transfer table
- Drum 1

Data, Part 2:
Spiral transfer belt

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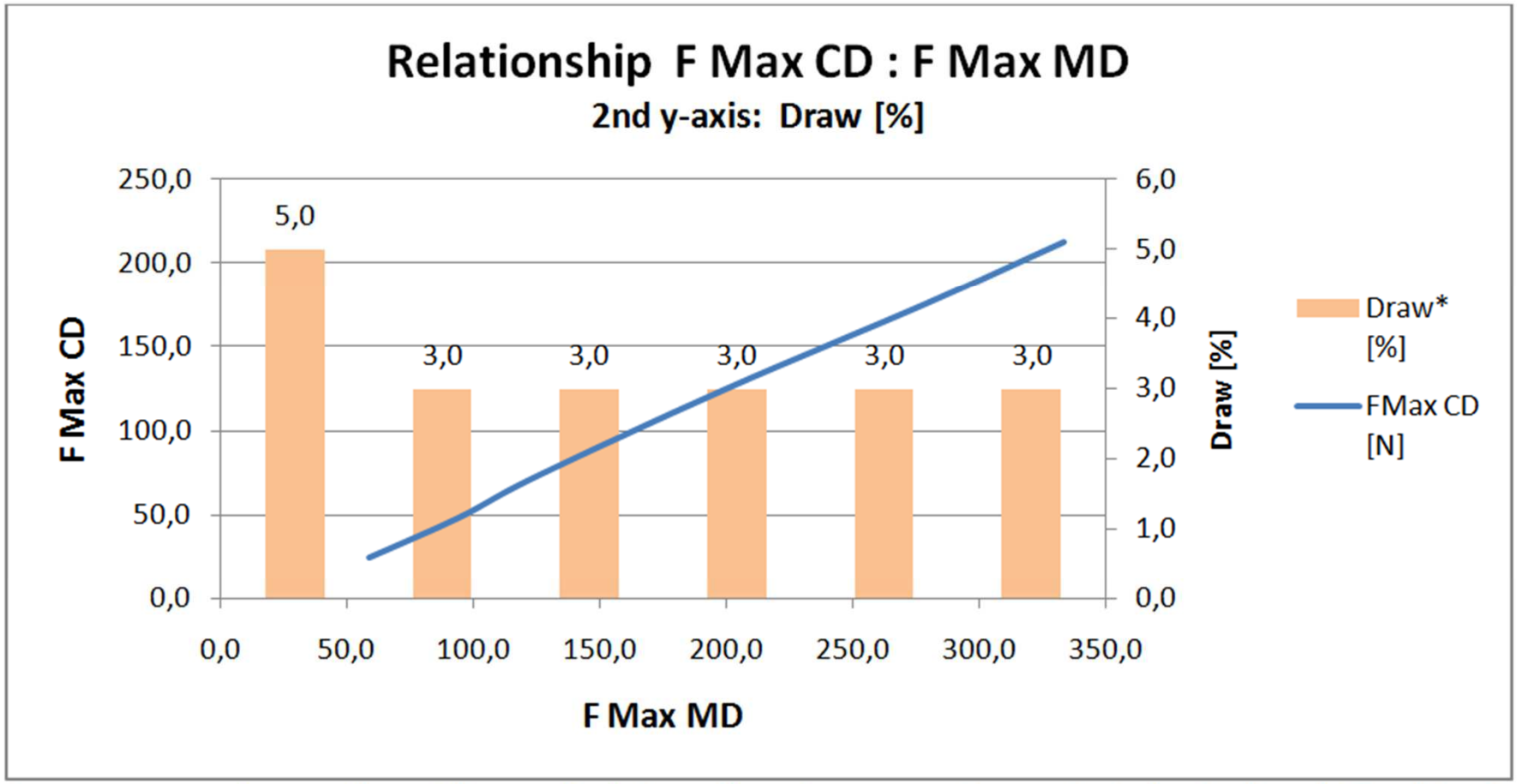

Comment: *Irrespective of the required draw, there is no conspicuous deviation in the relationship of MD to CD tensile strength.*

Conclusion, Part 2: Spiral transfer belt

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38000 FS :

First ever spiral fabric tested in the transfer position.

With specific settings, it was possible to produce 20 g/m² webs on the Aquajet unit.

For safety reasons during this trial, machine speed was limited to 200 m/min.

Noise increased dramatically above speeds of 100-150 m/min, caused by the first hydro-entanglement unit (HP1). At maximum machine speed of 200 m/min, the excessive operating noise called for use of ear protection.

Asssumption:
The high noise level may be caused by the open channels of the unfilled spiral fabric.

Conclusion, Part 2: Spiral transfer belt

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38000 FS :

It is further assumed that the influence of coarse spiral fabrics can be offset by spirals with lower air permeability.

The permeability of woven fabrics for this position lies between 600 and 700 cfm, i.e. spiral fabric permeability for additinal test runs should be approx. 500 - 600 cfm.

Finer spiral fabric structures with highest possible contact area could reduce marking of the nonwovens produced and influence release properties positively also.

For the above reasons, the filled spiral fabric design **45500 S-V** (or similar) shall be considered for further trials.

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Thank you for your interest!

Oliver Maier

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