



Next Generation Equipment for the Precision Coating of Performance Film, Foil and Paper

Author

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OLBRICH GmbH**

Next Generation Equipment for the Precision Coating of Performance Film, Foil and Paper

1) Next Generation Equipment

- Vision and Competence
- Expertise in single process technology
- How to put process technology to work

2) Case Studies

- selected coating methods and their boundary conditions
- evaluation quality and quantity

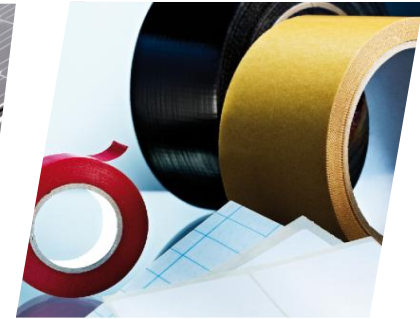
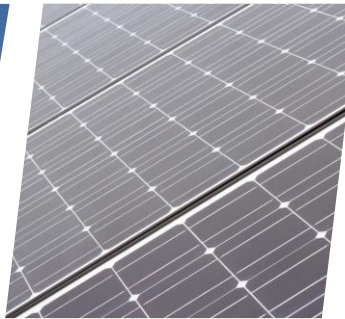
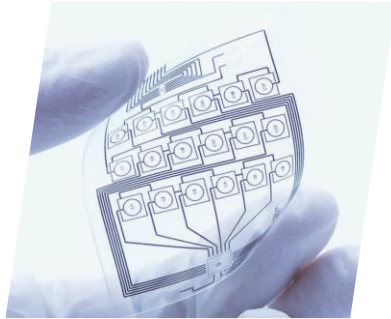
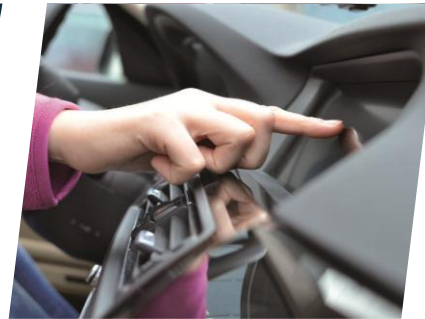
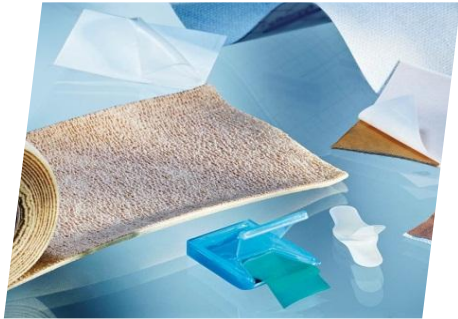
3) Conclusion

Next Generation Equipment - Vision and Competence



... leads to Solutions

SOLUTION needed for High-End Products



Industrial and Automotive

Medical

Electronics

Label stock and tapes

Battery

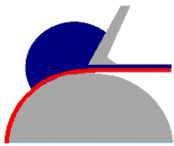
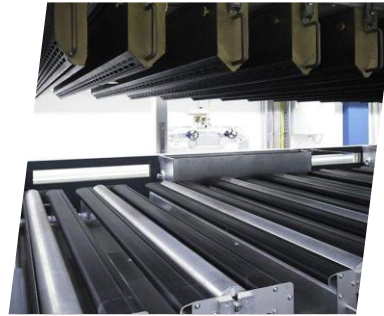
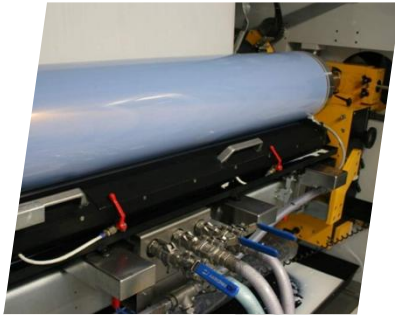
Optical

Packaging

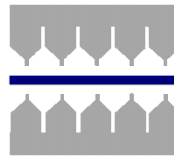
Release paper and films

Graphics

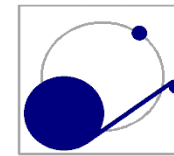
Vision and Competence



Coating



Drying



Winding



Drives & Controls

...pre-condition to allow for customized processes

Next Generation Equipment – Innovation put to work I



BA-1

Multi-purpose Coating and Laminating Line

- web width up to 500 mm
- line speed up to 150 m/min

PLA-1

State-of-the-art Laminating and Embossing Line

- material width up to 1000 mm
- line speed up to 100 m/min

Innovation put to work II - BA-2 Sophisticated Coating Line for Functional Applications



Technical Data: Web width_{max} = 1040 mm / v_{mech} = 2 – 500 m/min

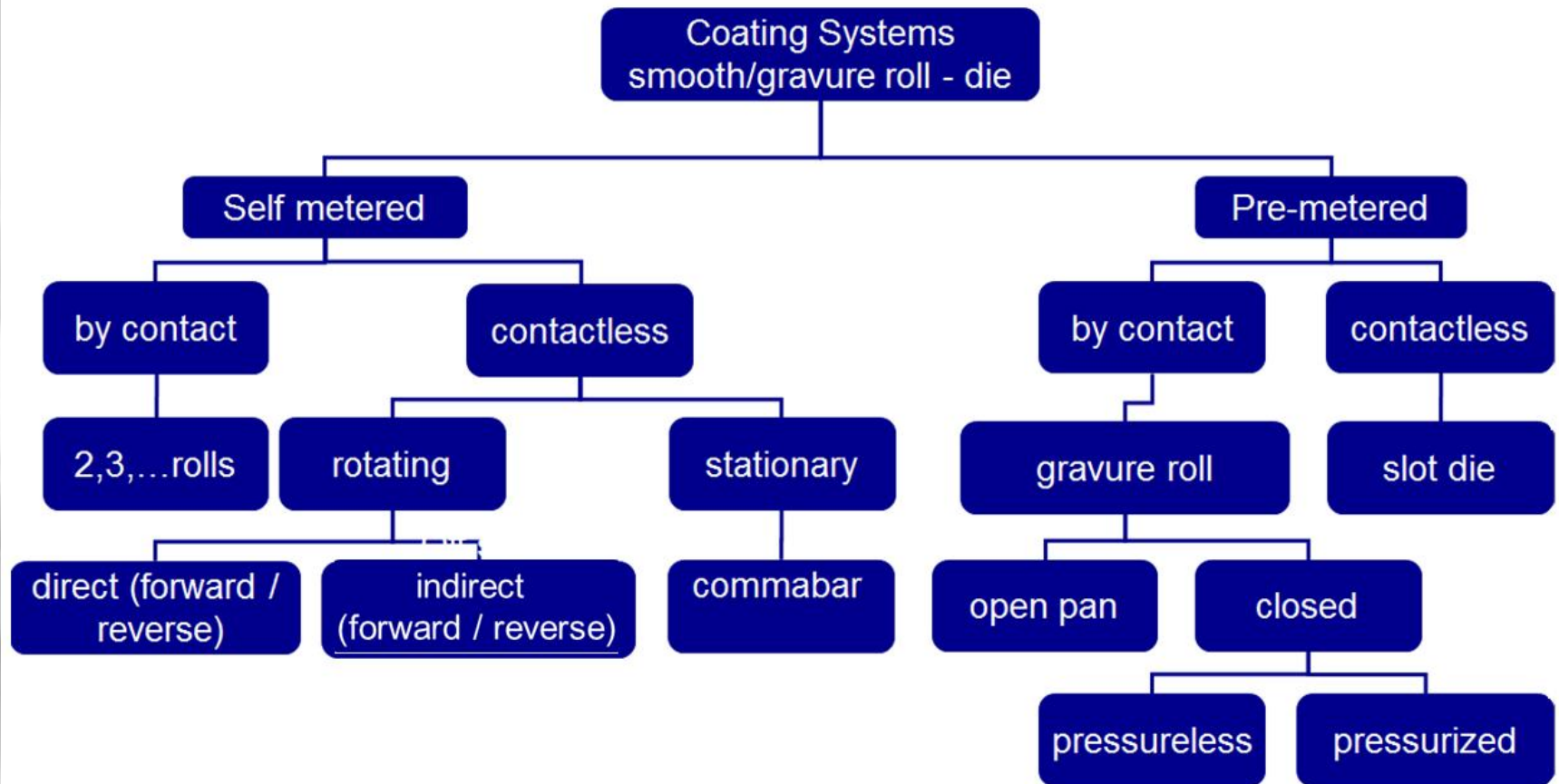
Technical specification

- Single-roll unwind system
- Cassette-type coating head change-over system
- IR / UV systems
- 4x drying section / 1x tempering section
- Steam moisturizer HUMICON
- Laminating station
- Contact and orbital type turret rewinder



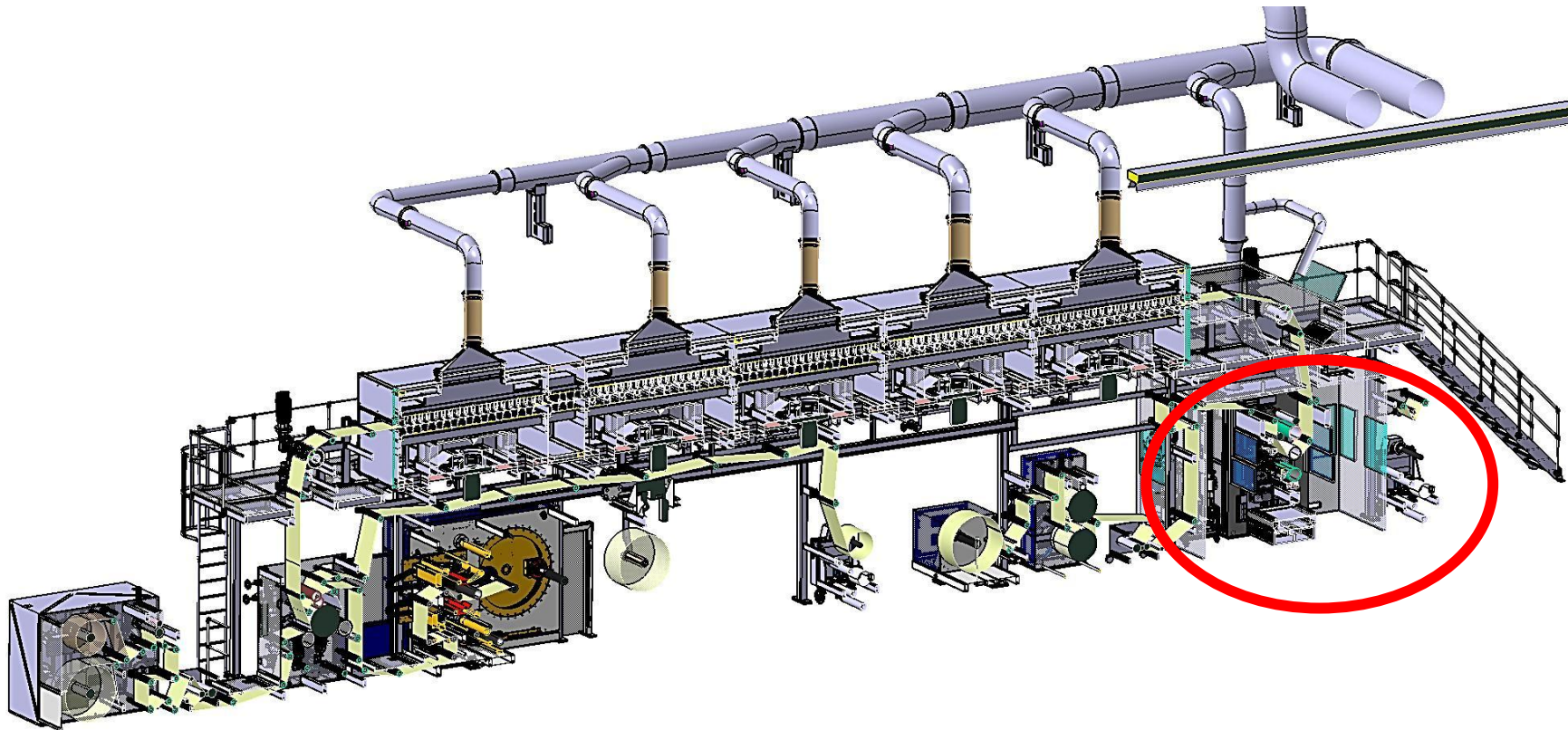
Innovation put to work – coating technologies

Coating Technology „The MUST-HAVE“ incorporated coating technologies - Overview



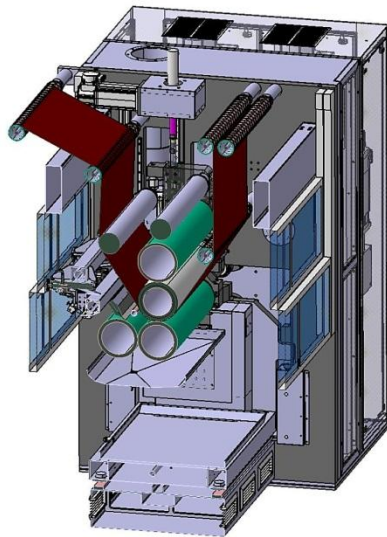
Innovation put to work – example of suitable layout, flexibility coating station

Pilot Line – BA-2 for the Precision Coating of Performance Film, Foil and Paper



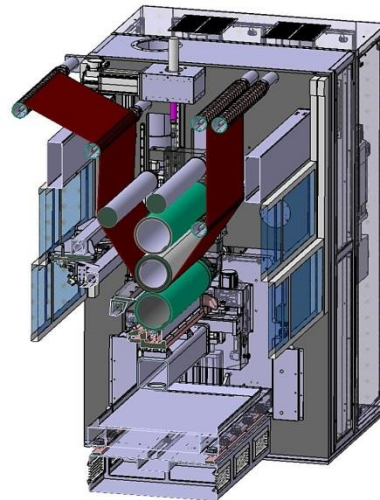
Innovation put to work – example of suitable layout, flexibility coating station

Coating Section - Coating Station / Cassette Type

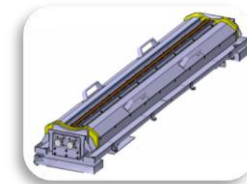


3-roll reverse indirect

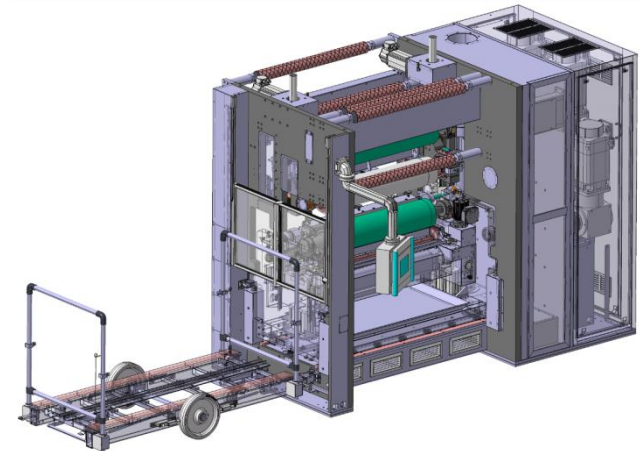
Coating Station w/ exhaust cabin



Gravure roll /
Pressured Chamber
Doctor Blade



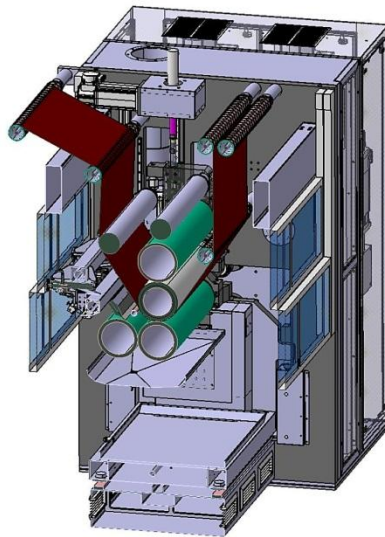
e.g. Pressure Chamber Coating Head



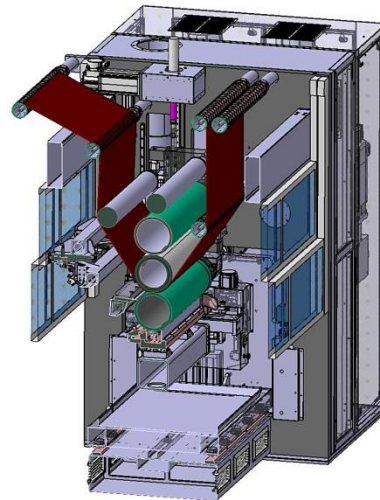
Cassette Change ...in

Innovation put to work – example of suitable layout, flexibility coating station

Coating Section - Coating Station / Cassette Type

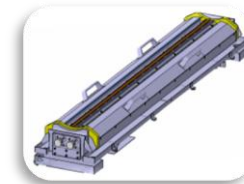


3-roll reverse indirect

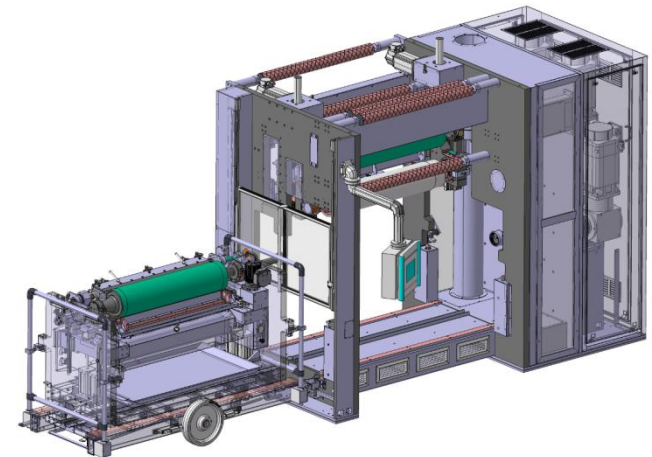


Gravure roll /
Pressured Chamber
Doctor Blade

Coating Station w/ exhaust cabin



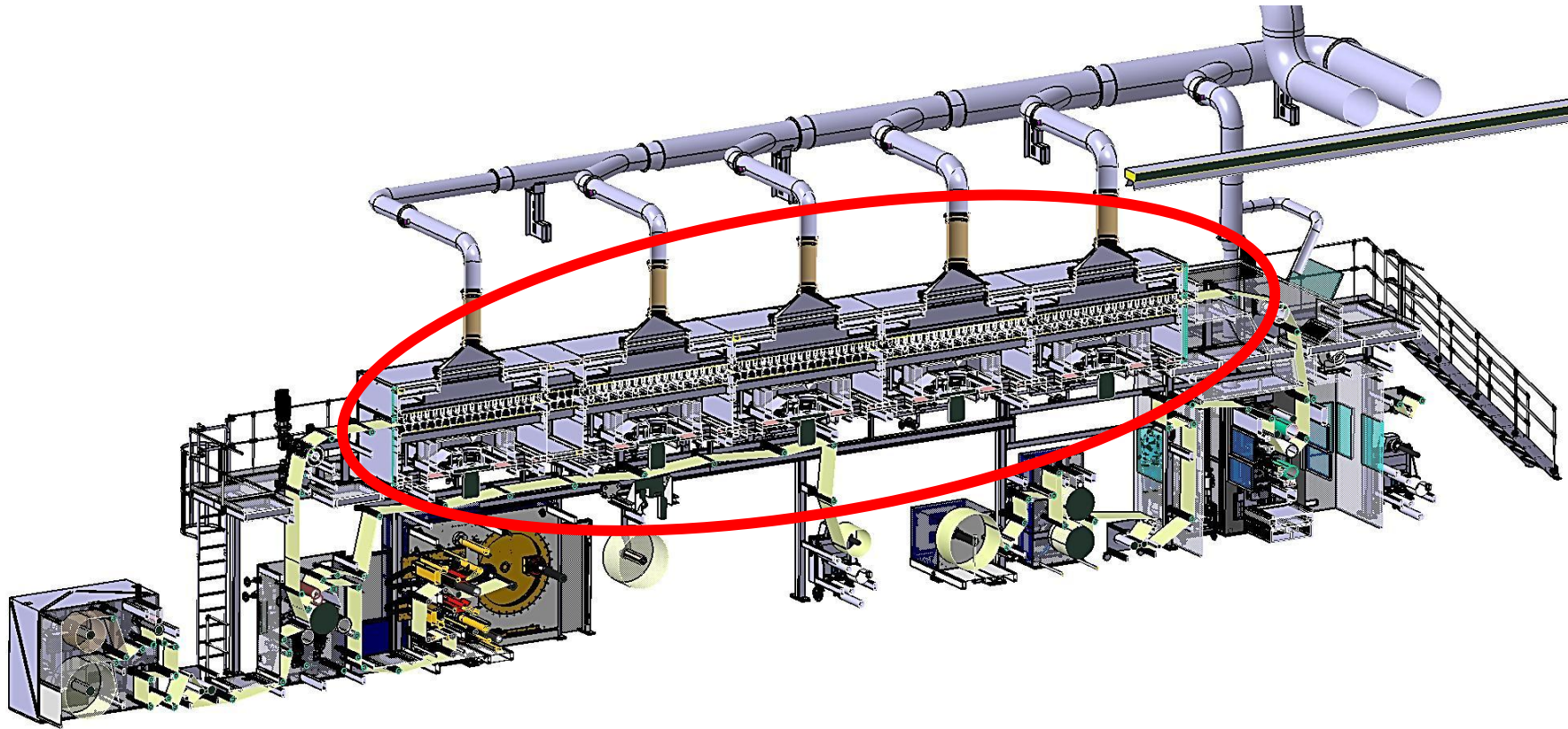
e.g. Pressure Chamber Coating Head



and ...out

Innovation put to work – drying technology

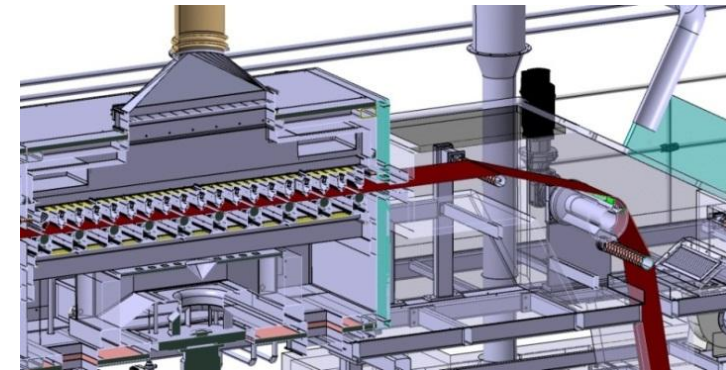
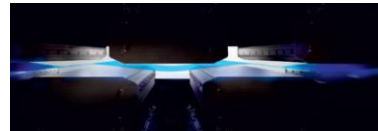
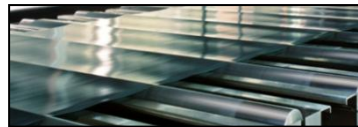
Pilot Line – BA-2 for the Precision Coating of Performance Film, Foil and Paper



Innovation put to work – flexible drying system

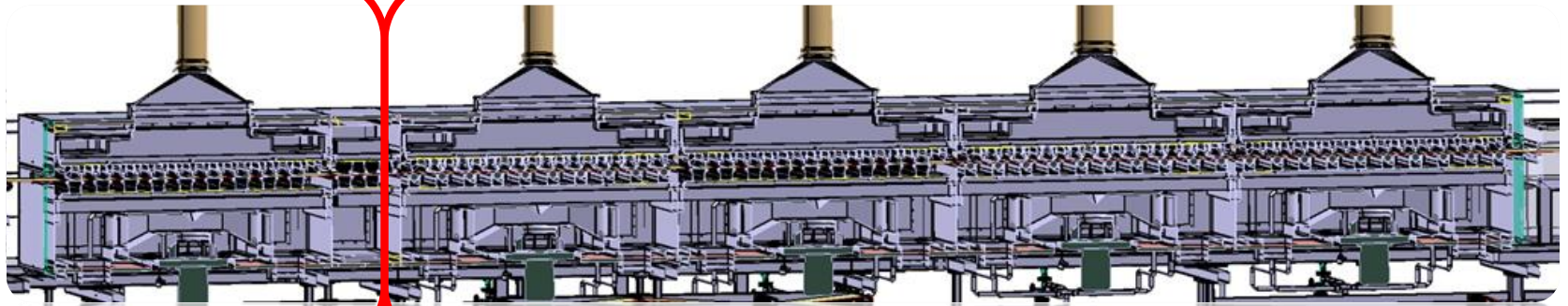
Drying Technology:

- 4x sections of dryers (upper and lower air circulation)
- 1x tempering section
- CTS, TP nozzle technology
- HiCon „VacRoll“ nozzle technology
- HiCon „AirFlotation“ nozzle technology
- Slot / hole nozzle design
- Ex-operating conditions
- State-of-the-art process control system



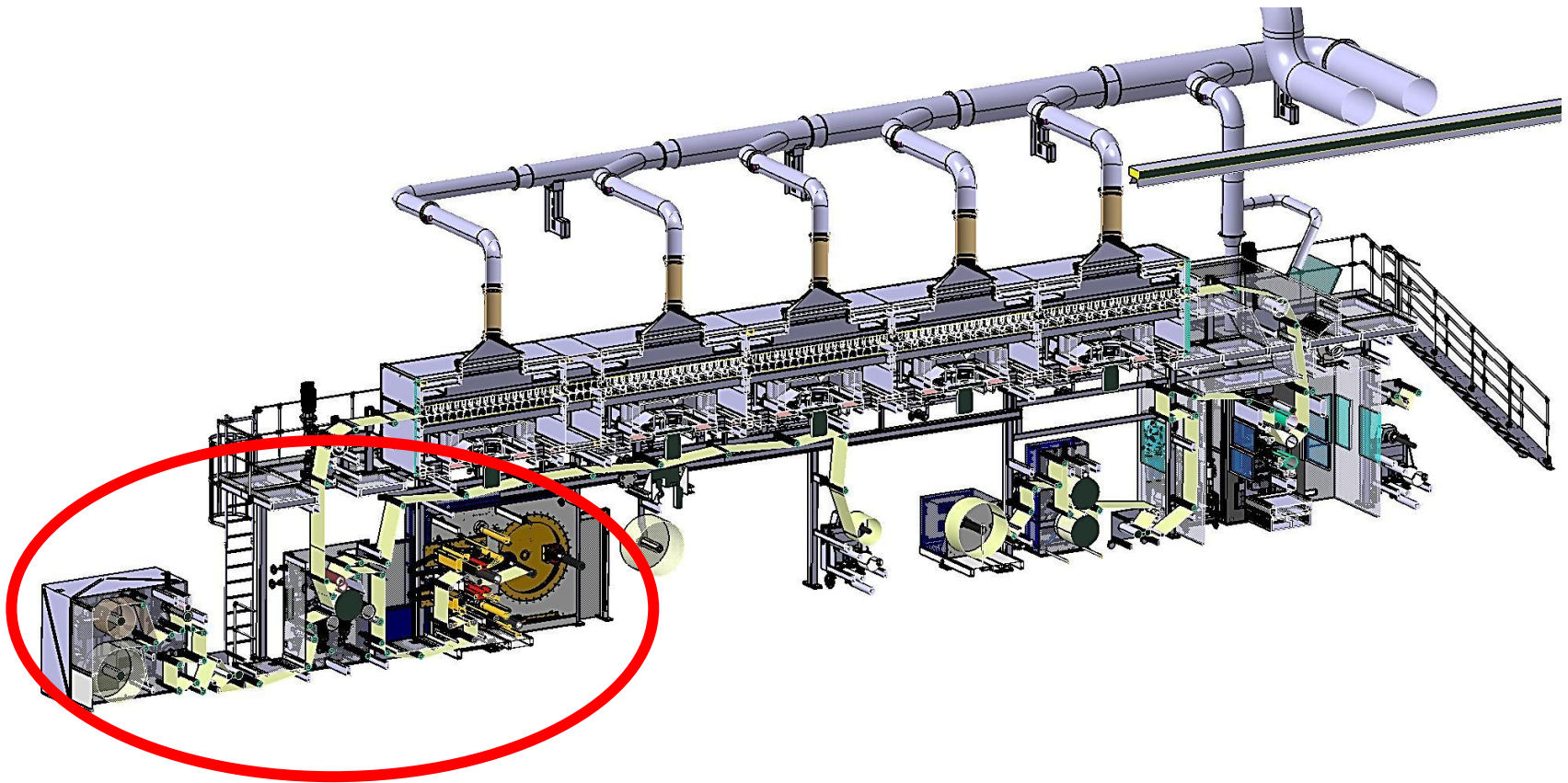
Detail: Web infeed from coating station into 1st drying section

← web direction



Innovation put to work – flexible laminating and winding area

Pilot Line – BA-2 for the Precision Coating of Performance Film, Foil and Paper



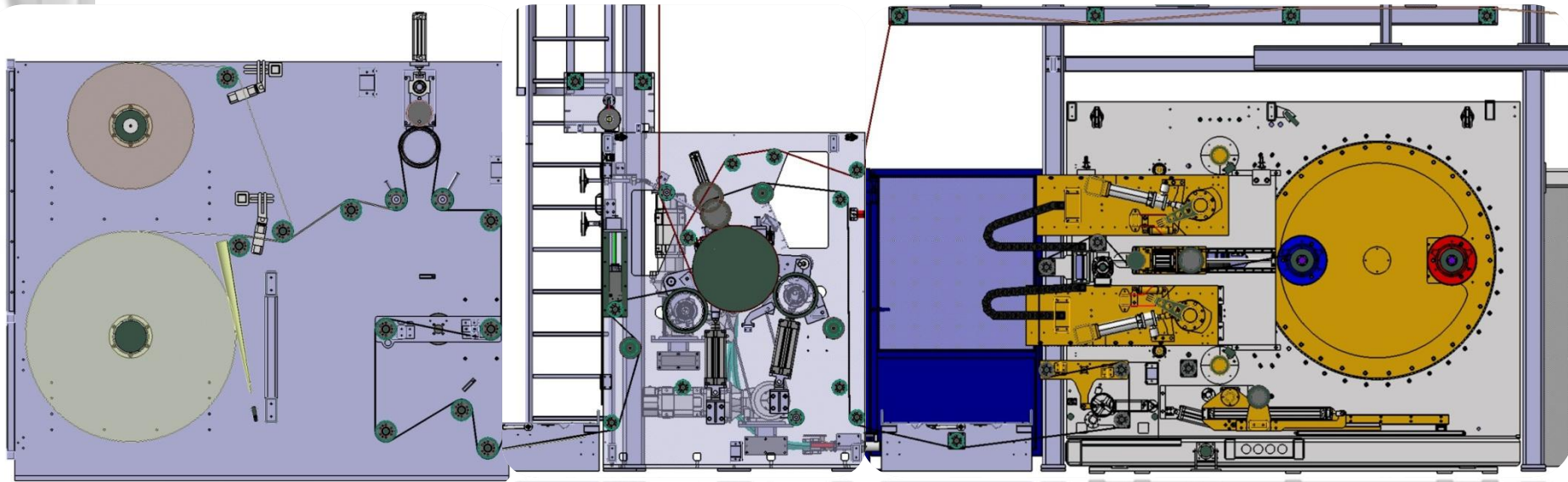
Innovation put to work – flexible laminating and winding area

Laminating Unwind Section

Re-winding Section

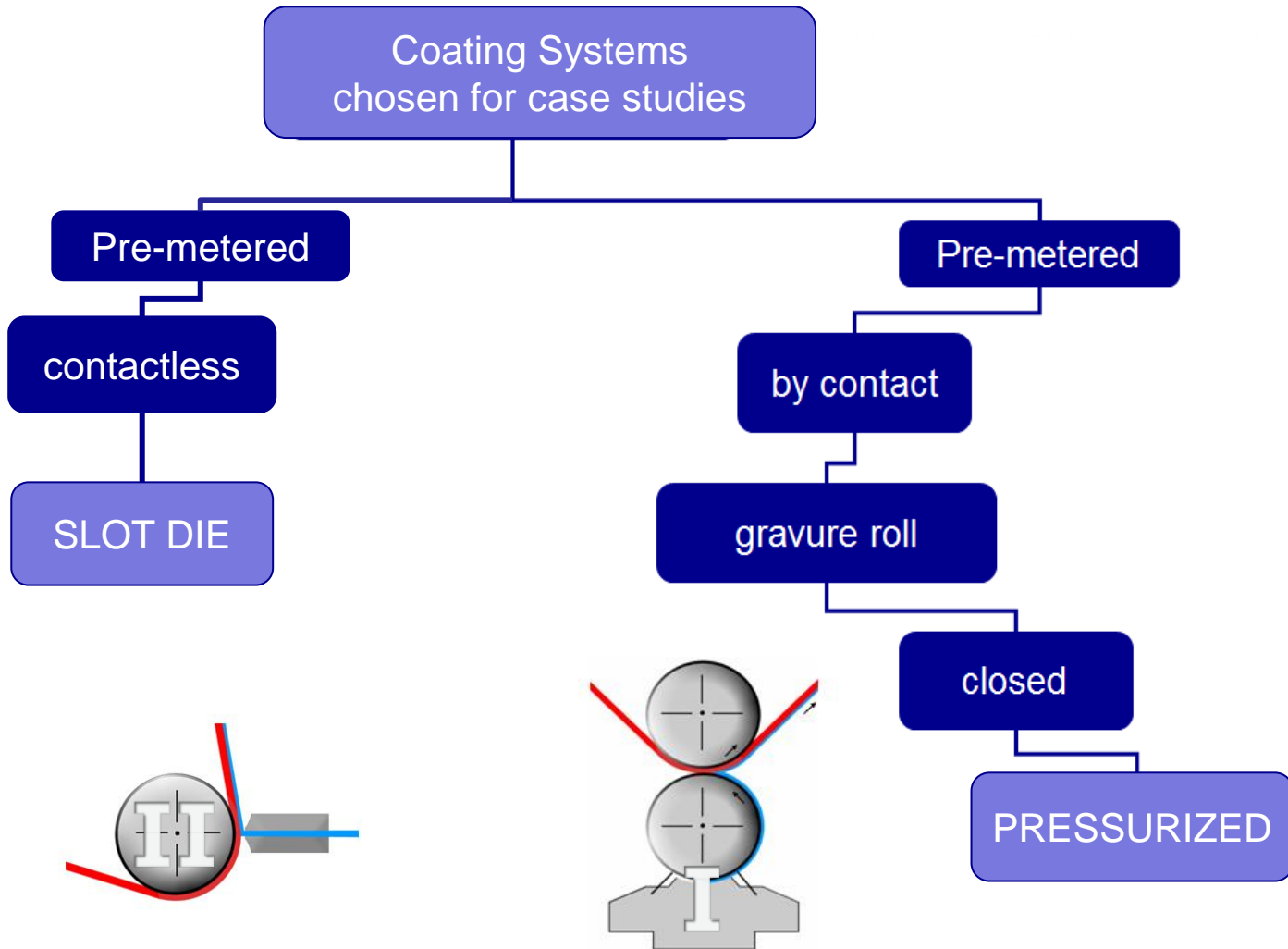
Laminating Unwind/Secondary Film Rewind

Turret Rewind (orbital type)



Laminator

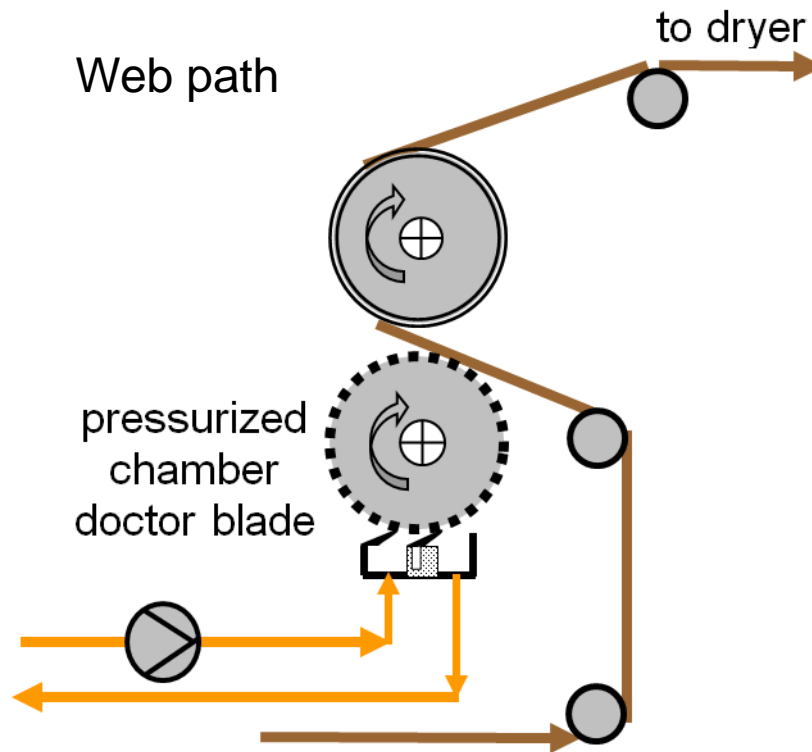
Innovation put to work – Case Studies



Case Study I

Coating and precise measuring of thin films

Kiss-Coating using Pressurized Chamber Gravure Coating System



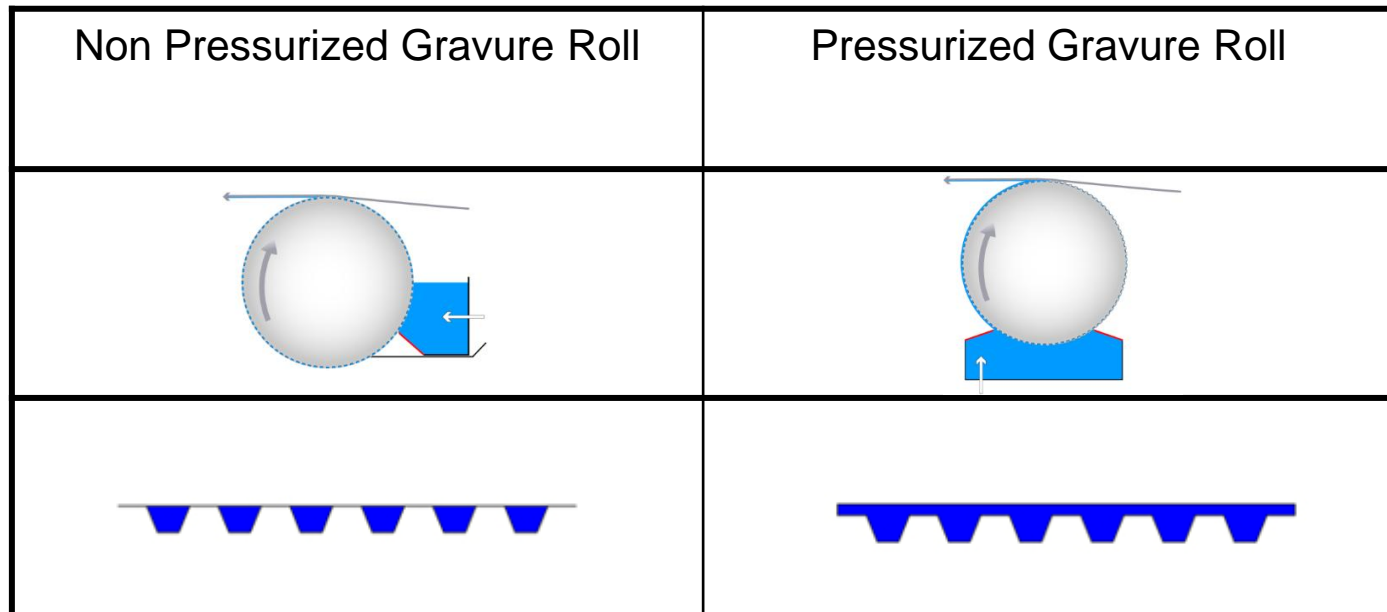
COATING HEAD PGS 250/1/6

Case Study I

advantage of pressurized gravure roll

Kiss-Coating using Pressurized Chamber Gravure Coating System

- Pressurized coating system is able to overfill the gravure roll (depends on gravure design)
- enables a wide operating range whilst reducing foaming
- Kiss-Coating minimizes possible scratches on the surface of the substrate

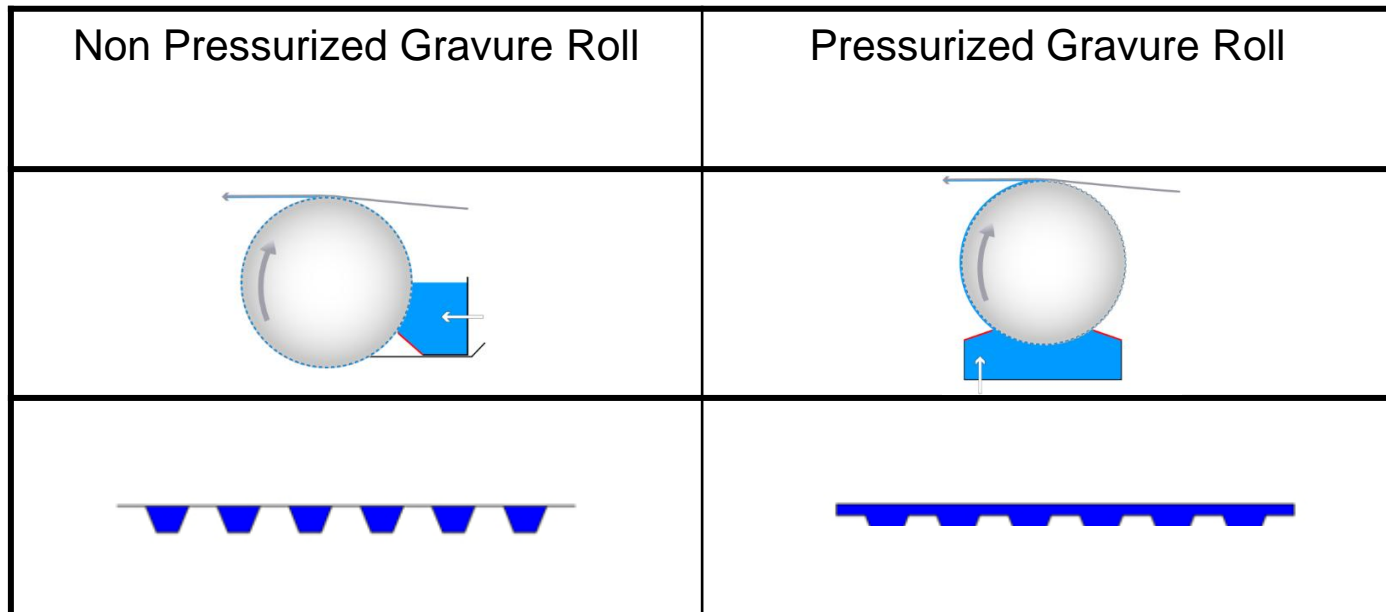


Case Study I

advantage of pressurized gravure roll

Kiss-Coating using Pressurized Chamber Gravure Coating System

- enables finer gravure roll for the same coating weight (because of overfilling)

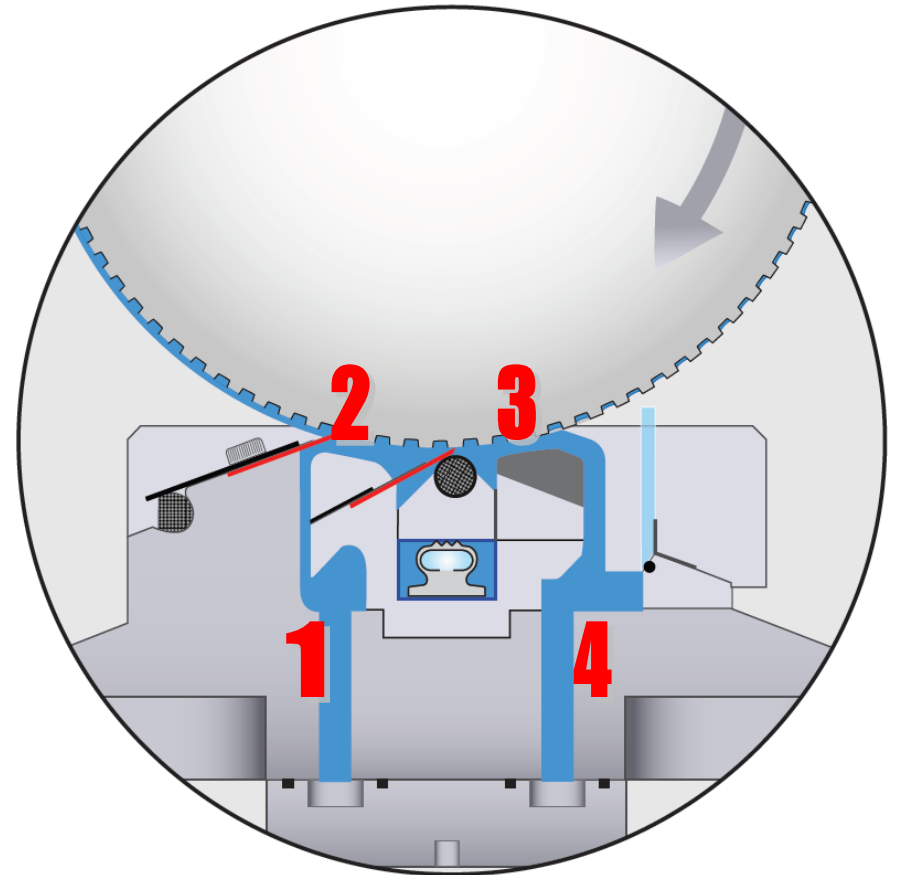


Case Study I

function of the PGS

Type PGS

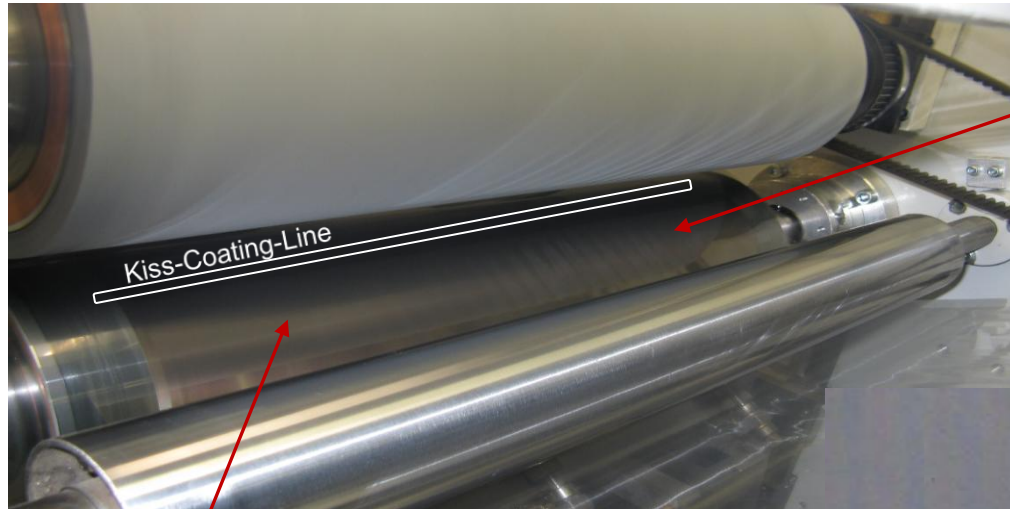
- **ZONE 1**
Coating Inlet and working width distribution
- **ZONE 2**
Main dosing of coating liquid
- **ZONE 3**
Pre-filling
- **ZONE 4**
Backflow with Air Contamination



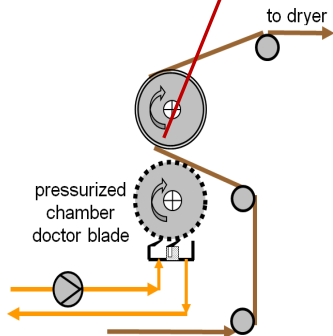
Case Study I

first settings and results

Kiss-Coating using the PGS



Wrinkles due to lack of tension control downstream from the kiss coating line



resulting in coating non-uniformity in the sub-micron region (rainbow-effect, kiss-coating stripes)

Case Study I

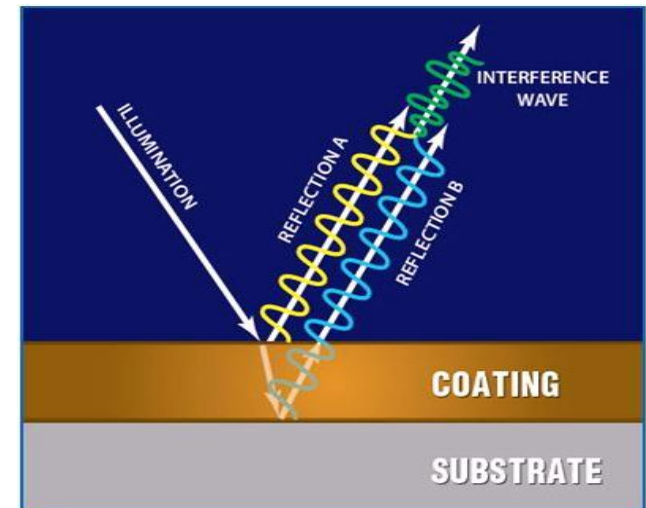
Excursion: Measuring device

How can we prove the QUALITY of PRECISION COATING on Film ?

With respect to:

- ✓ ... the required or “of choice” coating method
- ✓ ...the type of coating (properties)
- ✓ ...the coat weight
- ✓ ...the “final” coating layer characteristics (quality overall)
- ✓ ...and In-line operation

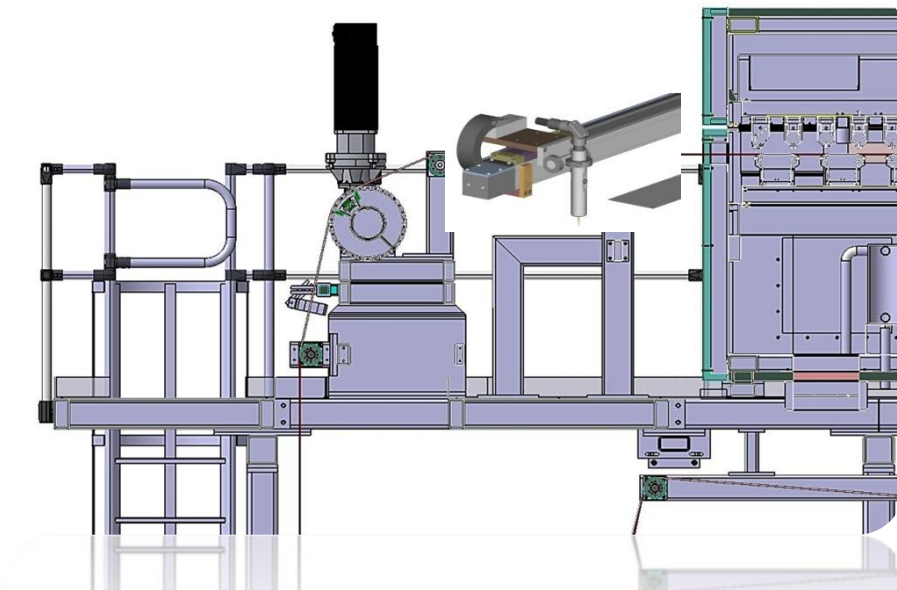
➤ Decision/ Consequence: Optical Interference Technology



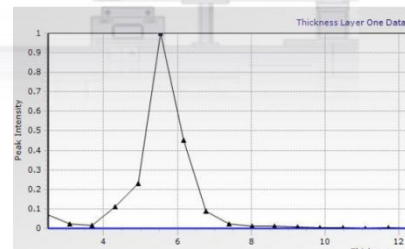
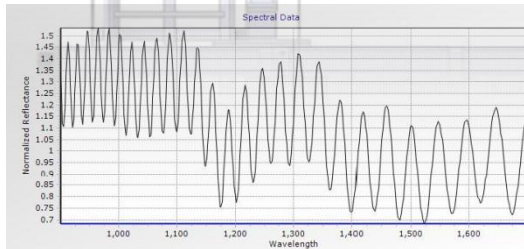
Case Study I

Excursion: Measuring device - function

Principle: Spectral Reflectance + analysis of optical interference wave



- non-contact
- non-destructive
- real time data capable
- in-line compatible, thickness measurement system of wet or dry coatings



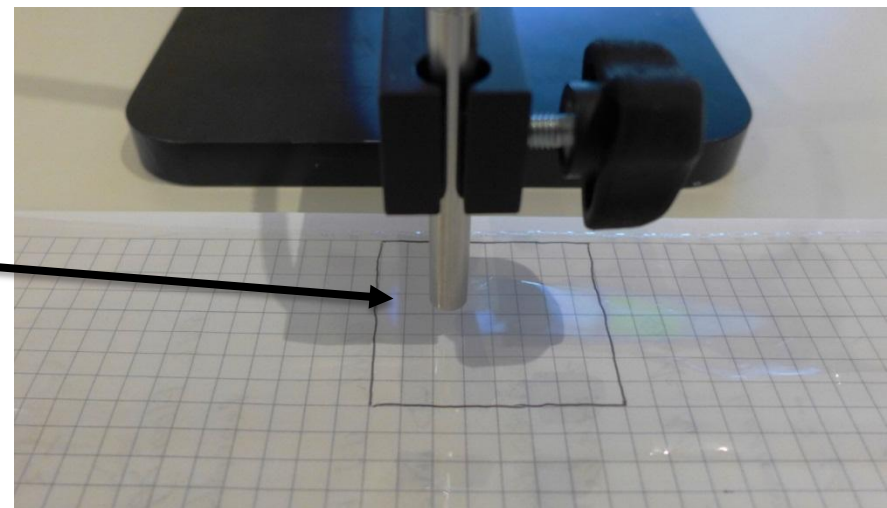
Source: Sensory Analytics

Case Study I

Kiss-Coating using Pressurized Chamber Gravure Coating System

- **Kiss-Coating Stripes**

8 x 8 Matrix Measurement (Xenon / UV)

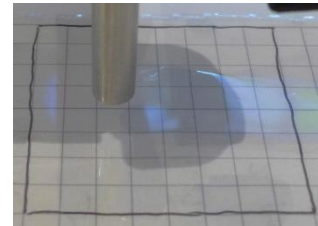
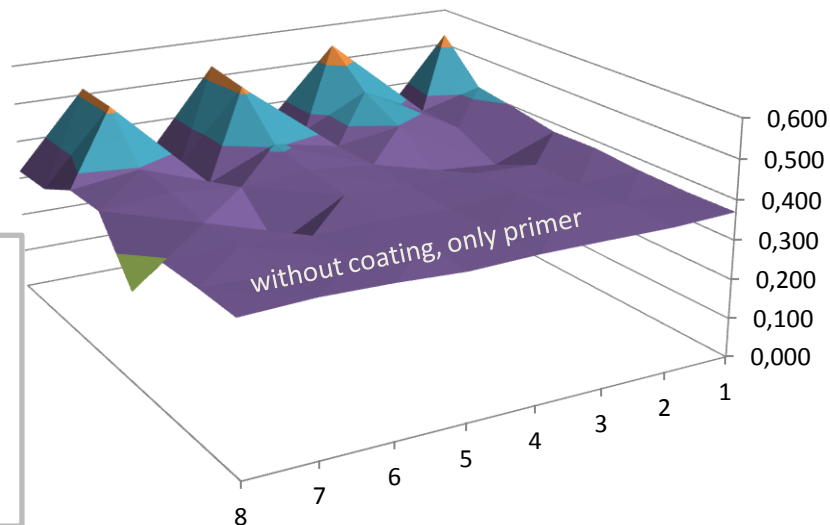
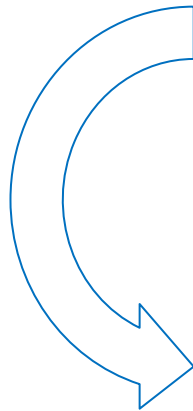


Case Study I results

Kiss-Coating using Pressurized Chamber Gravure Coating System

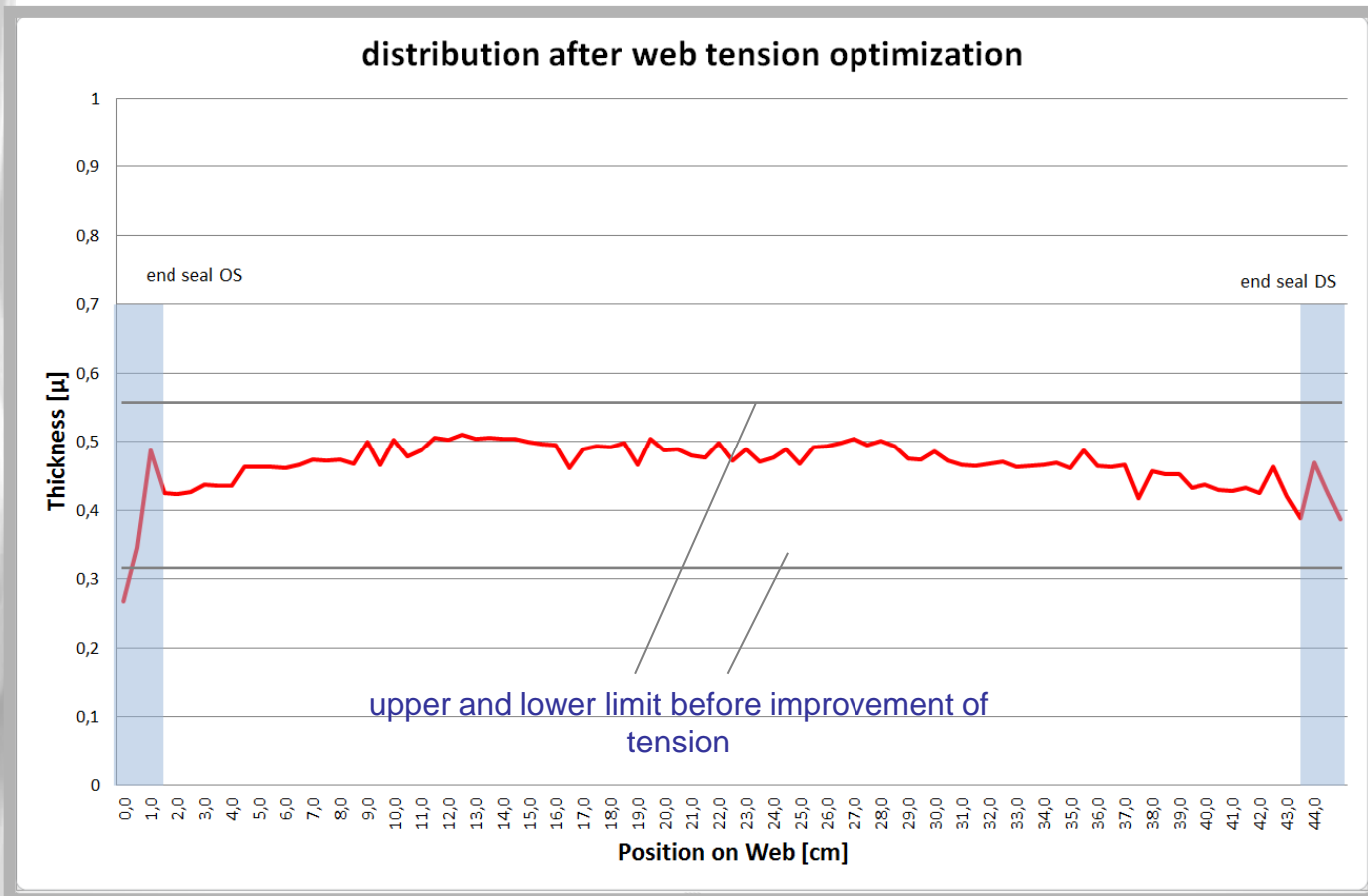
- Kiss-Coating Stripes**

	Column 1	Column 2	Column 3	Column 4	Column 5	Column 6	Column 7	Column 8
Row 1	0,527	0,335	0,541	0,367	0,529	0,321	0,516	0,319
Row 2	0,414	0,370	0,450	0,368	0,513	0,327	0,513	0,323
Row 3	0,397	0,368	0,399	0,372	0,406	0,331	0,397	0,373
Row 4	0,377	0,314	0,327	0,372	0,386	0,373	0,390	0,375
Row 5	0,380	0,364	0,371	0,368	0,375	0,280	0,369	0,234
Row 6	0,371	0,365	0,374	0,363	0,367	0,362	0,371	0,366
Row 7	0,368	0,370	0,375	0,367	0,369	0,368	0,365	0,369
Row 8	0,370	0,364	0,366	0,367	0,362	0,371	0,375	0,368

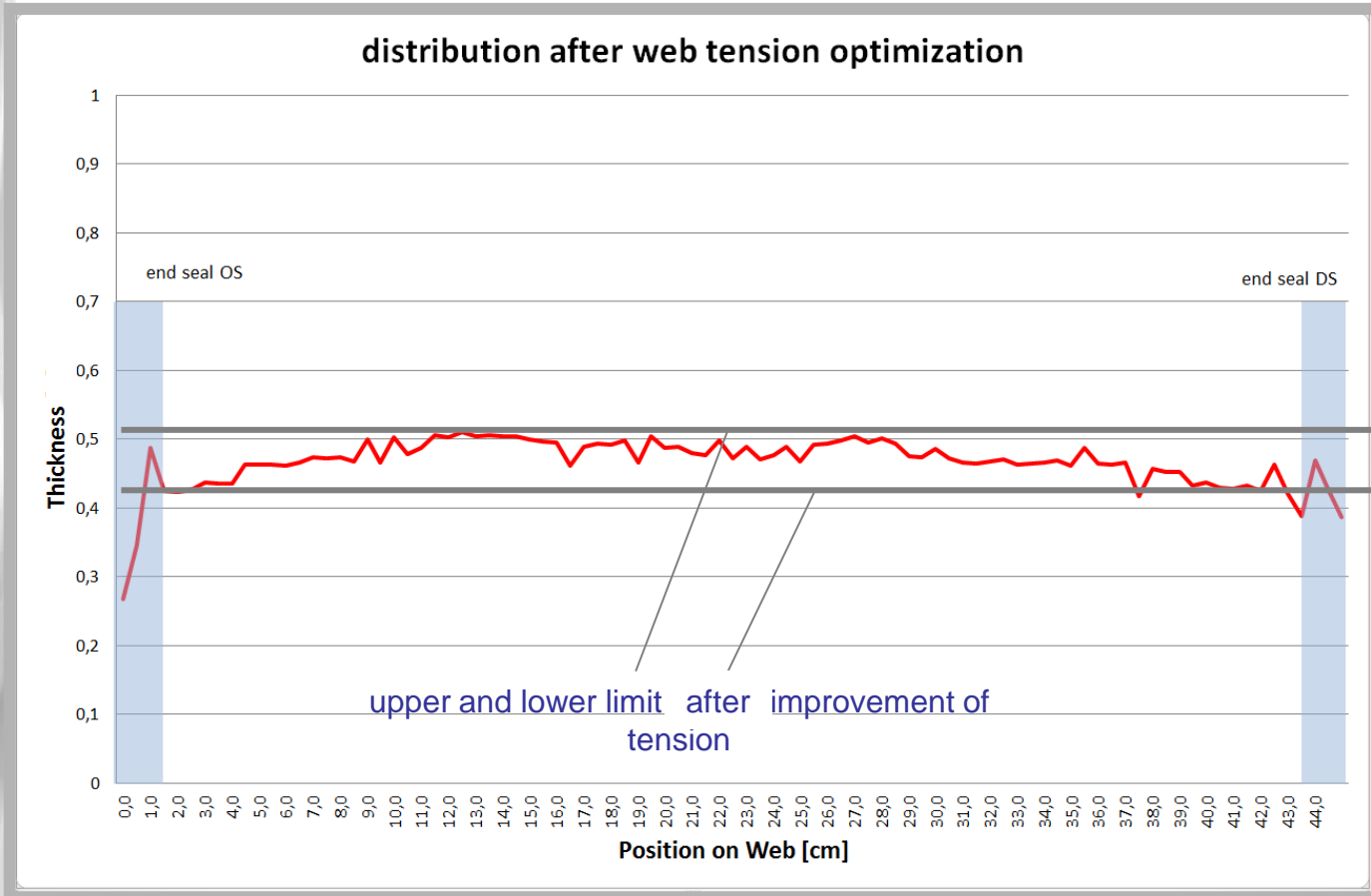


The columns 1-3-5-7 correspond to the green stripes (high coat wt.)
 The columns 2-4-6-8 correspond to the red stripes (low coat wt.)
 ⇒ The stripes are differences in coat weight of ca. 150–200nm

Case Study I results



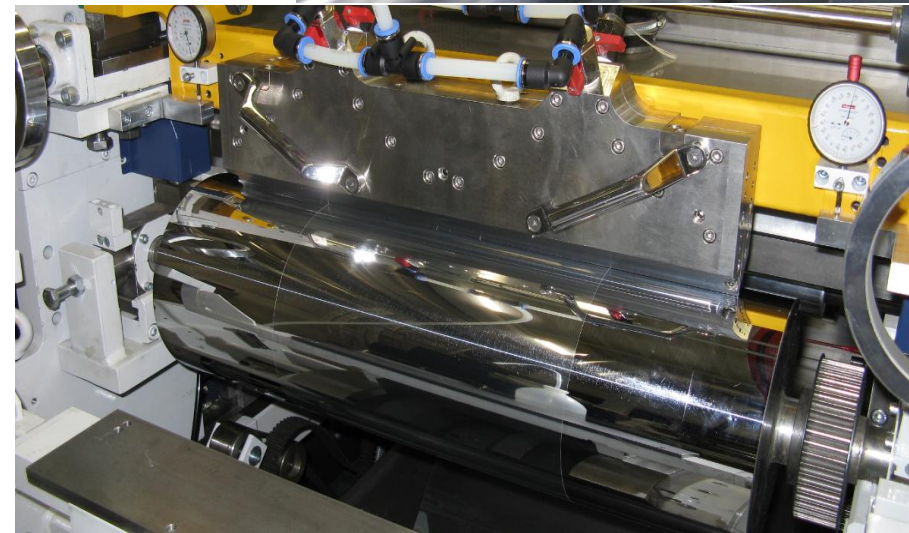
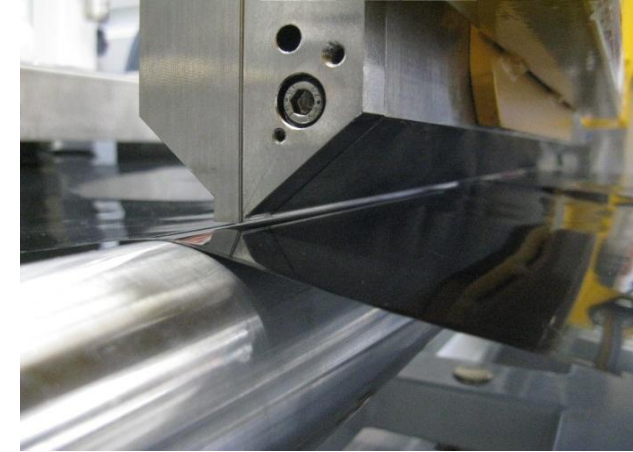
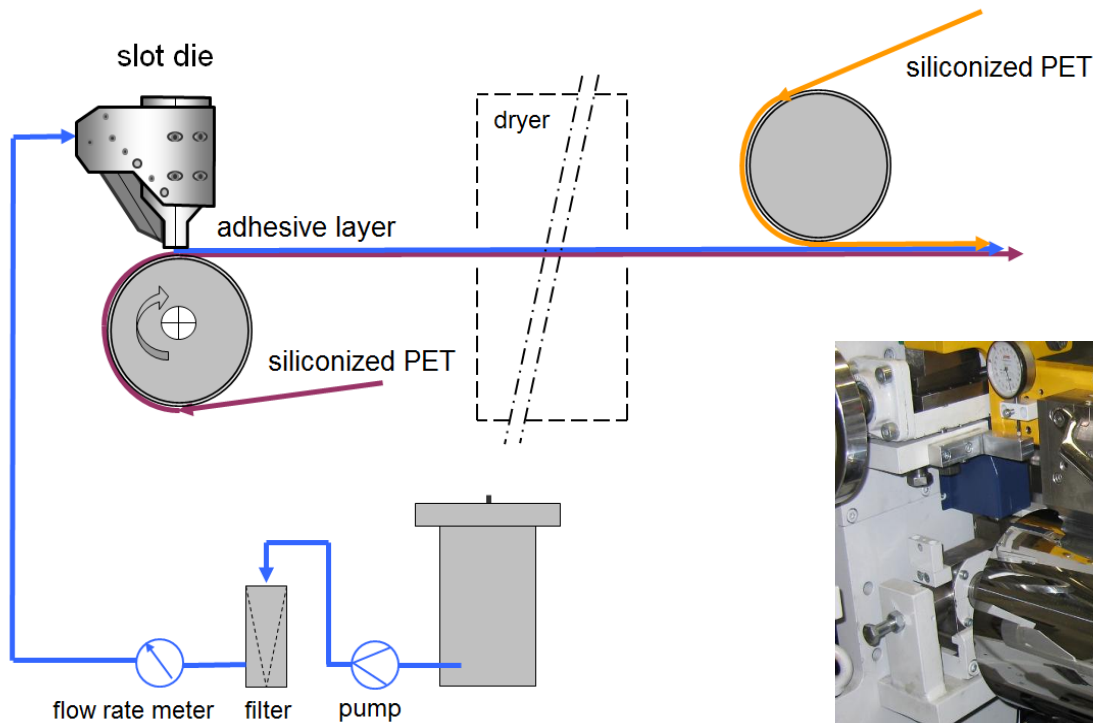
Case Study I results



Case Study II

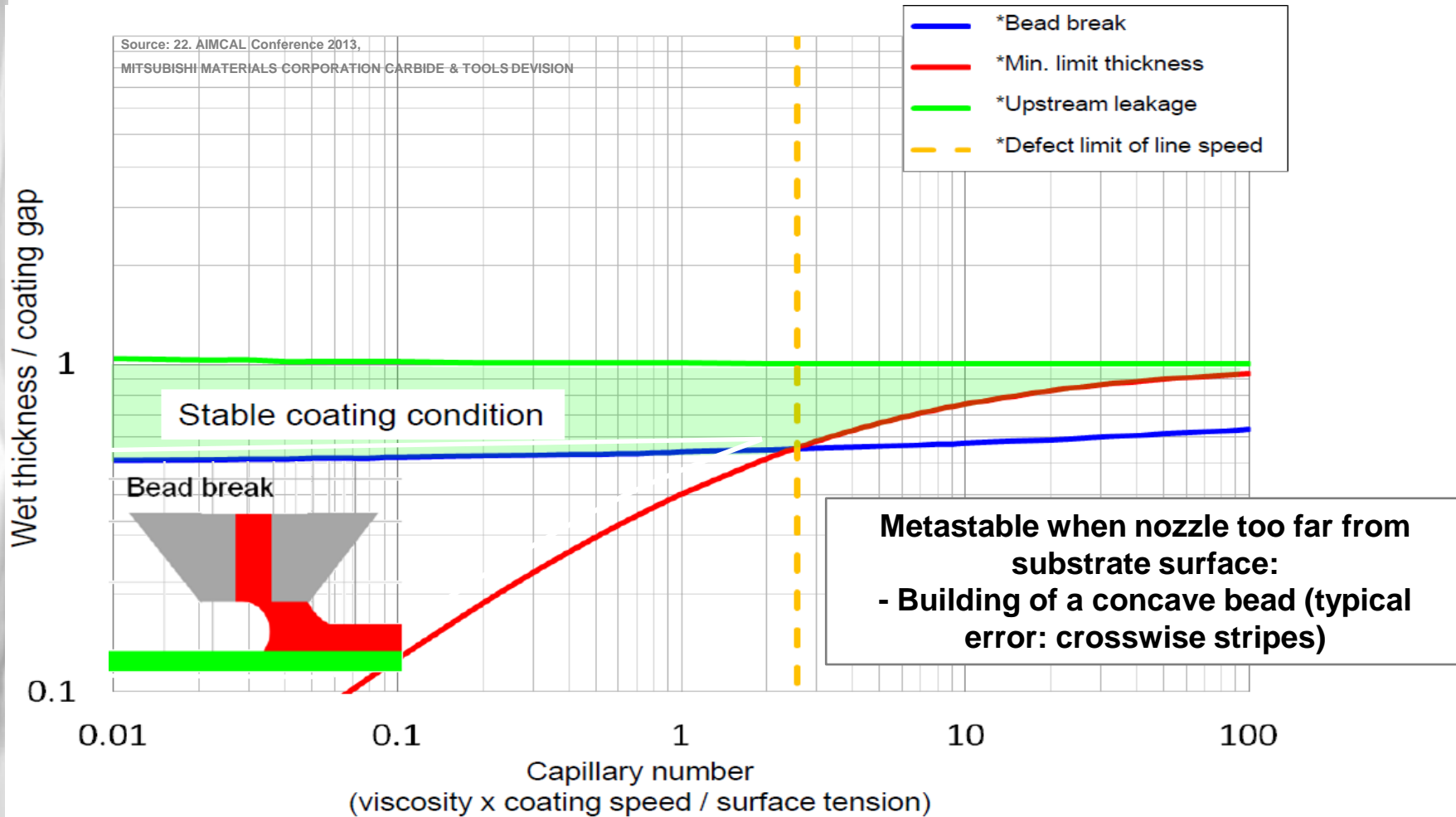
Coating adhesive transfer tape double lined with PET

Coating adhesive film by Slot Die Coating



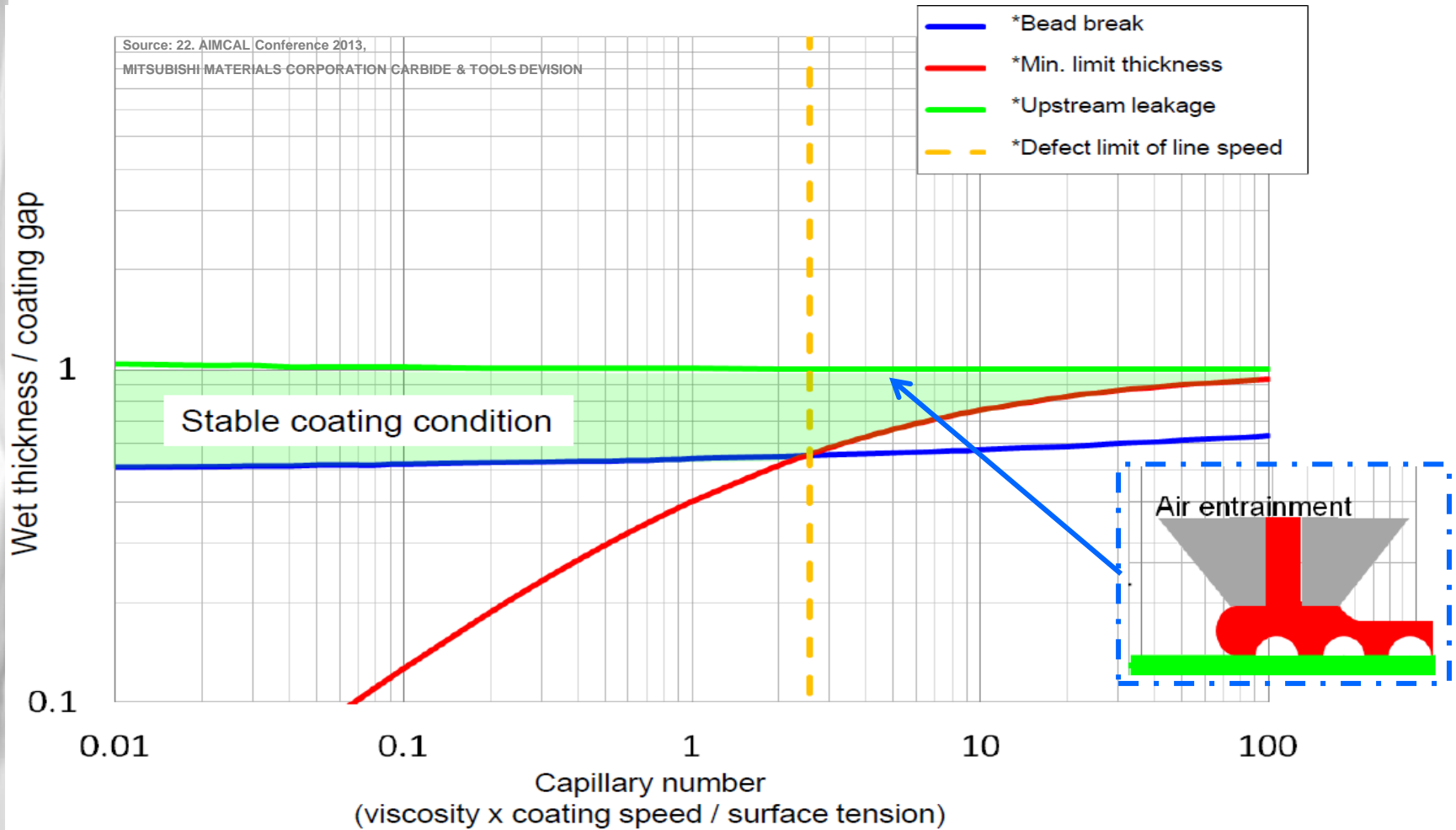
Case Study II

limitations of process window slot die coating I

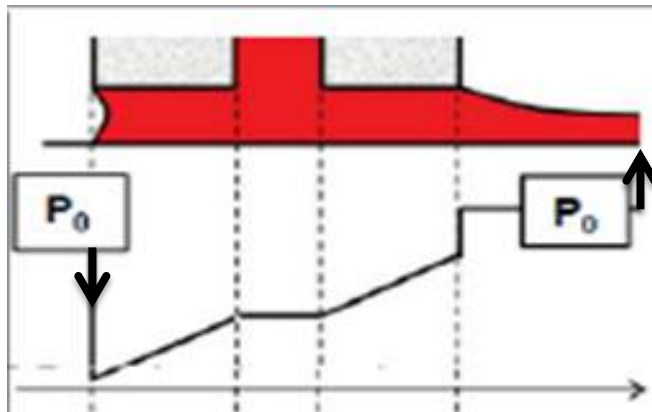


Case Study II

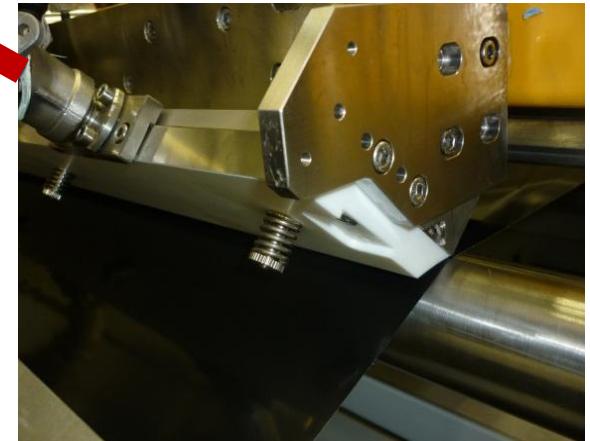
limitations of process window slot die coating I



Case Study II pushing the limits of process window slot die coating



Air suction outlet
[1.]



Solution:

1. decreasing P_0 inlet (air evacuation with suction chamber)
2. increasing P_0 outlet (overpressure device)

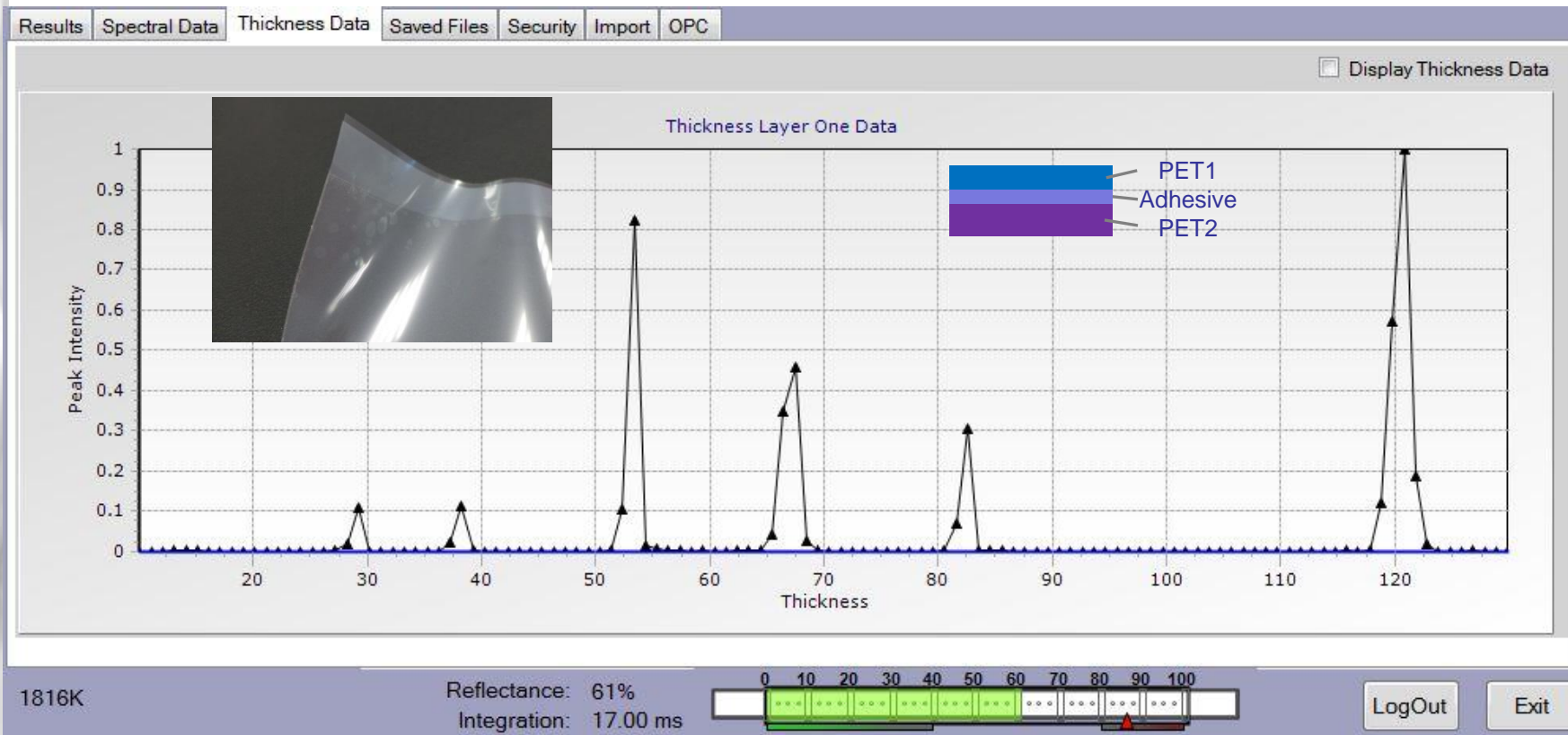
Case Study II

evaluation of coating thickness

Coating adhesive transfer tape double lined with PET

- Measurement of PET-Adhesive-PET

6 discrete peaks found



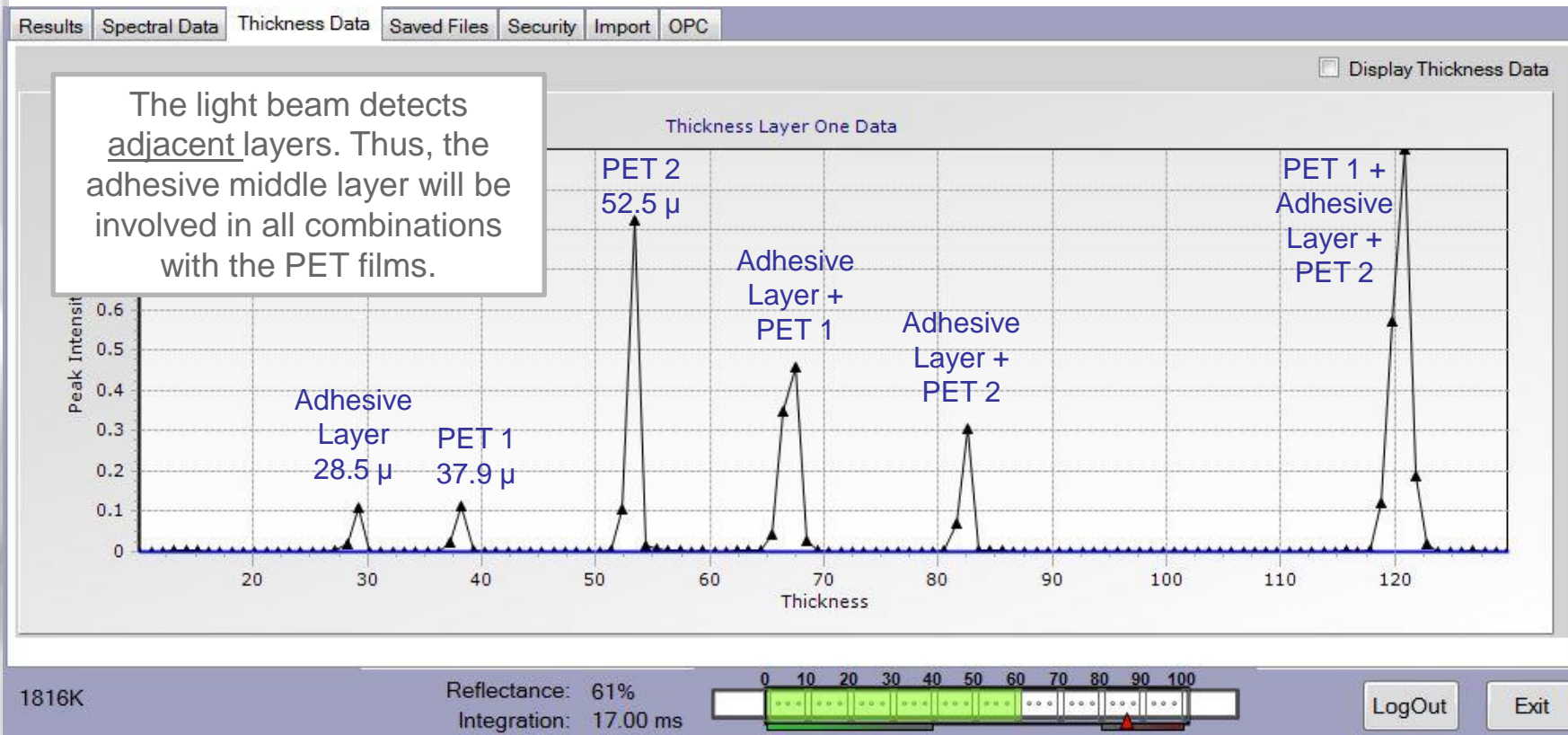
Case Study II

evaluation of coating thickness

Coating adhesive transfer tape double lined with PET

- Measurement of PET-Adhesive-PET

Assignment of peaks to layers



- The discrete values were measured by NIR after narrowing down the range

Case Study II

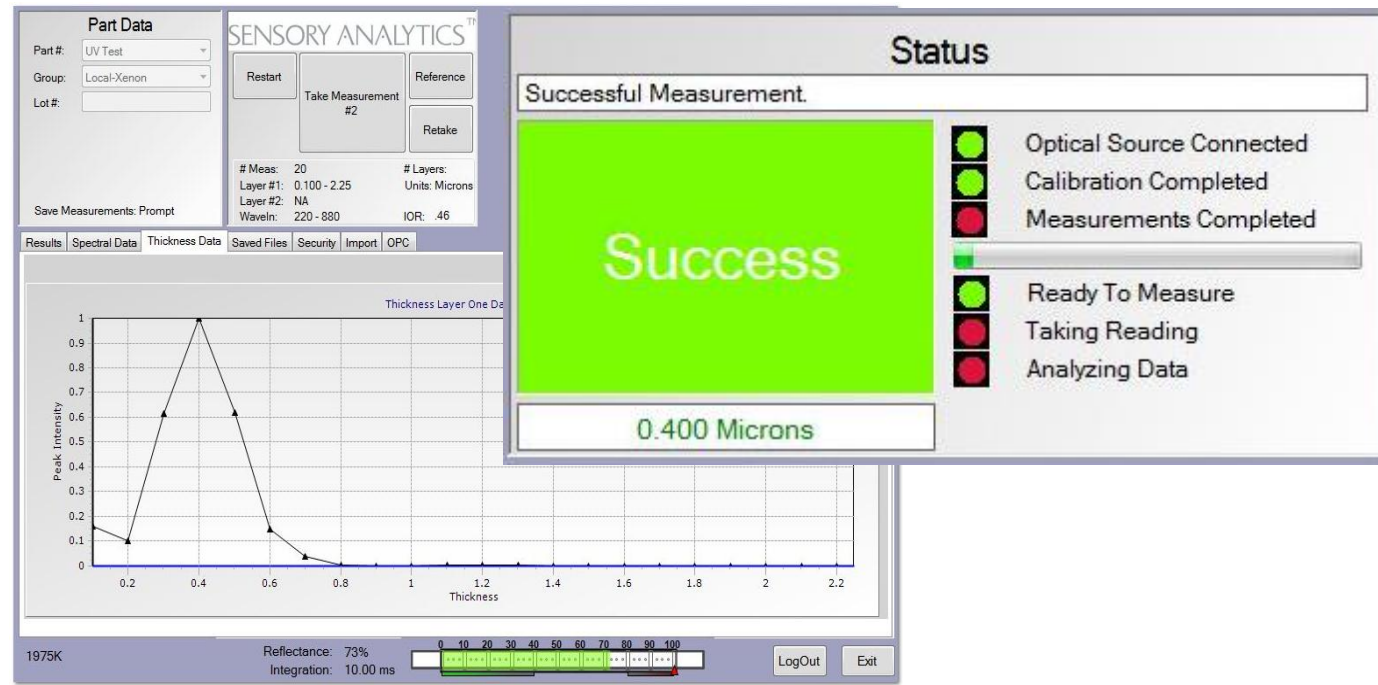
evaluation of coating thickness

Coating adhesive transfer tape double lined with PET

- Measurement of Silicon Layer of PET-Film (UV, broad scanning mode)



0.40
 μm



Conclusion

**CONCLUSION: Next Generation Equipment must provide 100% control of the
PRECISION COATING process**

... means controlling of:

- Possessing Know-why and Know-how
 - Process Technology Expertise required in order to determine “The Processes”
 - Design Engineering Expertise required in order to transform ideas into “Machinery Equipment”
- Measurement and evaluation of the product
 - Profile (MD/CD)
 - Web Inspection System





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**THANK YOU VERY MUCH FOR
YOUR ATTENTION!**