Surface Topography Contribution to Coated Board Surface before and after Calendering

A correlation study:
Verity IA Topography,
Emveco Profilometer, and
Parker Print Surf

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Paper Presented by: Roy Rosenberger

Foreword

The correlation data presented in this paper were obtained as part of a wider study of RFID print on coated Solid Bleached Board which will be presented by Mario Cruz at the TAPPI Coating conference. The objectives of that study were to determine if the roughness of the substrate before coating influenced the resistivity of the RFID inks printed on the coated surface.

Overview

- Project
  - SBS Board
  - Coating
- Methodology
- Results
- Conclusions
- Acknowledgement

Project

- **Objectives**:

  Understand the effect of substrate topography on subsequent coating and calendering.

  To perform a comparative study of a new Verity IA Topography measurement device to other surface topography devices.

Project cont…

- **Substrate**: Solid Bleached Sulfate board (SBS)
- **Coating**: Commercial Formulation (Clay, Calcium Carbonate, etc…)

Solid Bleached Sulfate Board (SBS)

- High quality board
- Used in high quality packaging, such as perfume boxes.
- Requirements: Brightness, gloss and good surface properties, that allow high quality printing.

Coating

- Commercial formulation:

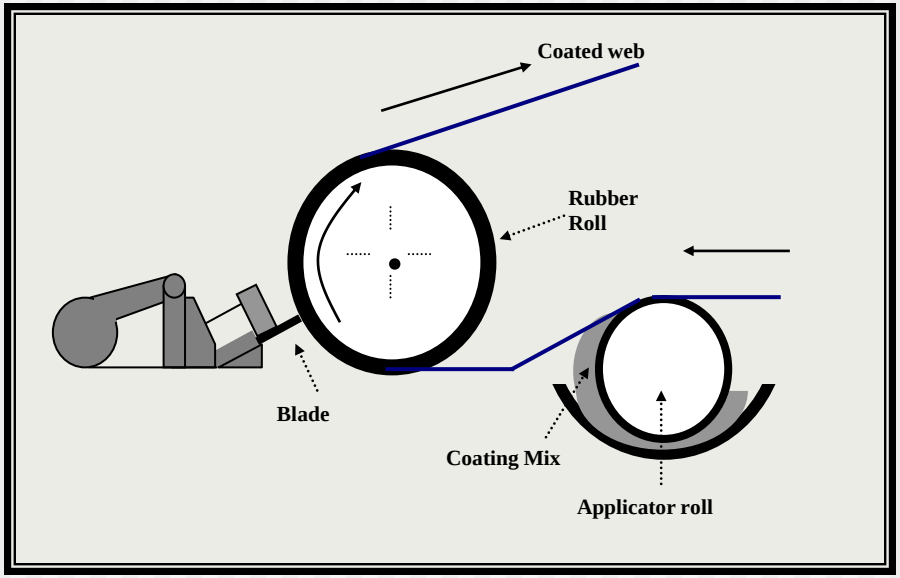
Ingredients	PPH
Ultrawhite 90 (Clay)	50
Hydrocarb 90 (Calcium Carbonate)	50
Dow PB6620 (Binder)	16
Alco Gum (Thickener)	0.05
Dispex (Dispersant)	0.25

Coating cont…

- Ultrawhite 90: Optimize brightness, opacity and coverage in paper and board.
- Hydrocarb 90: Provides high brightness, reduces binder demand.
- Dow PB6620: Binder
- Dispex: Dispersant used for calcium carbonate and TiO_2.

Blade Coaters

Used in high quality printing and packaging papers and boards. It provides the smoothest and most uniform coated surface





Air Knife

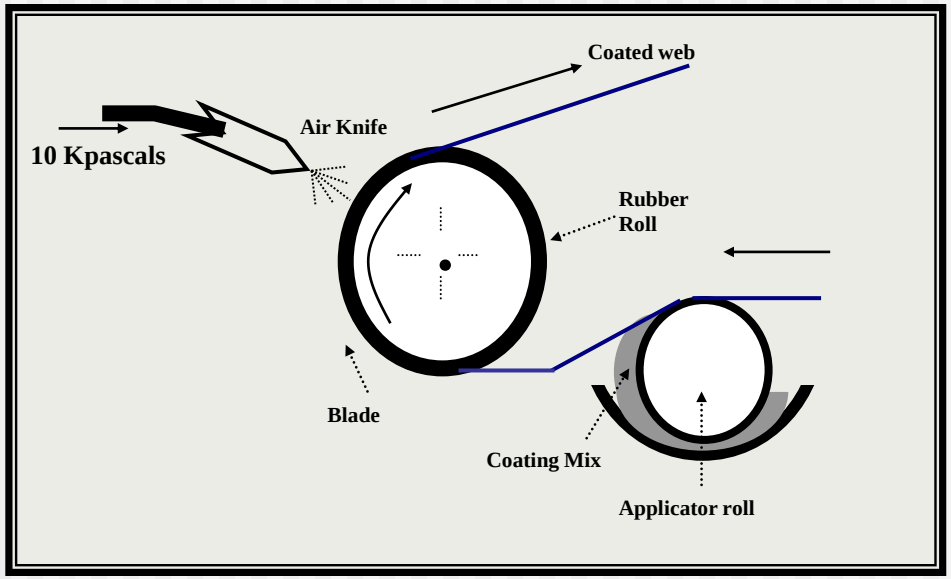
Jet of air is used to meter the amount of coating of the substrate

Commonly used in high coat weight boards

Contour Coating



Uniform coating layer on peaks and valleys.



Coating & Calendering

Air Knife		Blade	
Coat Weight (gr/m^2)	Calendering (pli)	Coat Weight (gr/m^2)	Calendering (pli)
10.86	600	9.61	600
14.42	1200	13.87	1200
23.92	UnCal	22.54	UnCal

Topography Devices

- Emveco Stylus Profilometer
- Verity IA Topography system
- Parker Print Surf (PPS)

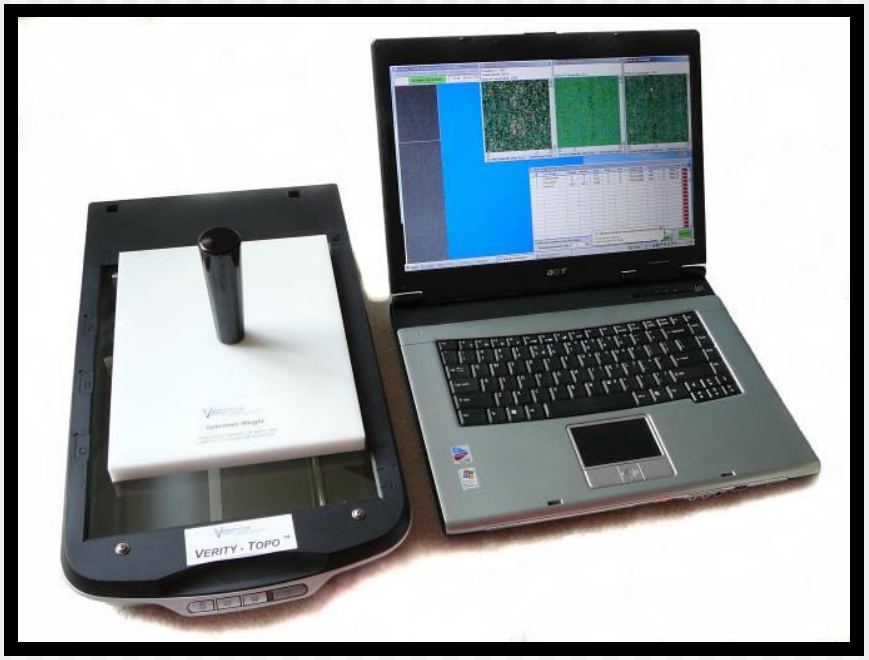
Emveco Stylus Profilometer

- Model 210
- Cone shaped stylus
- Stylus Radius of 25 μm
- 500 readings per sample
- 0.1 mm reading space



Verity-Topo ®

- Topography Software is used to numerically rank the surface topography
- Special Modified Verity IA Scanner with Verity IA Specimen Weight and standard PC
- Area scanned 8” x 8” at Resolution of 600 ppi



Parker Print Surf (PPS)

- PPS is designed to measure the surface roughness of sheet materials under conditions similar to those during printing process
- The sample is clamped between a head and a specifically designed backing.
- Clamping pressure 1000 kPa
- Area: 10 cm^2

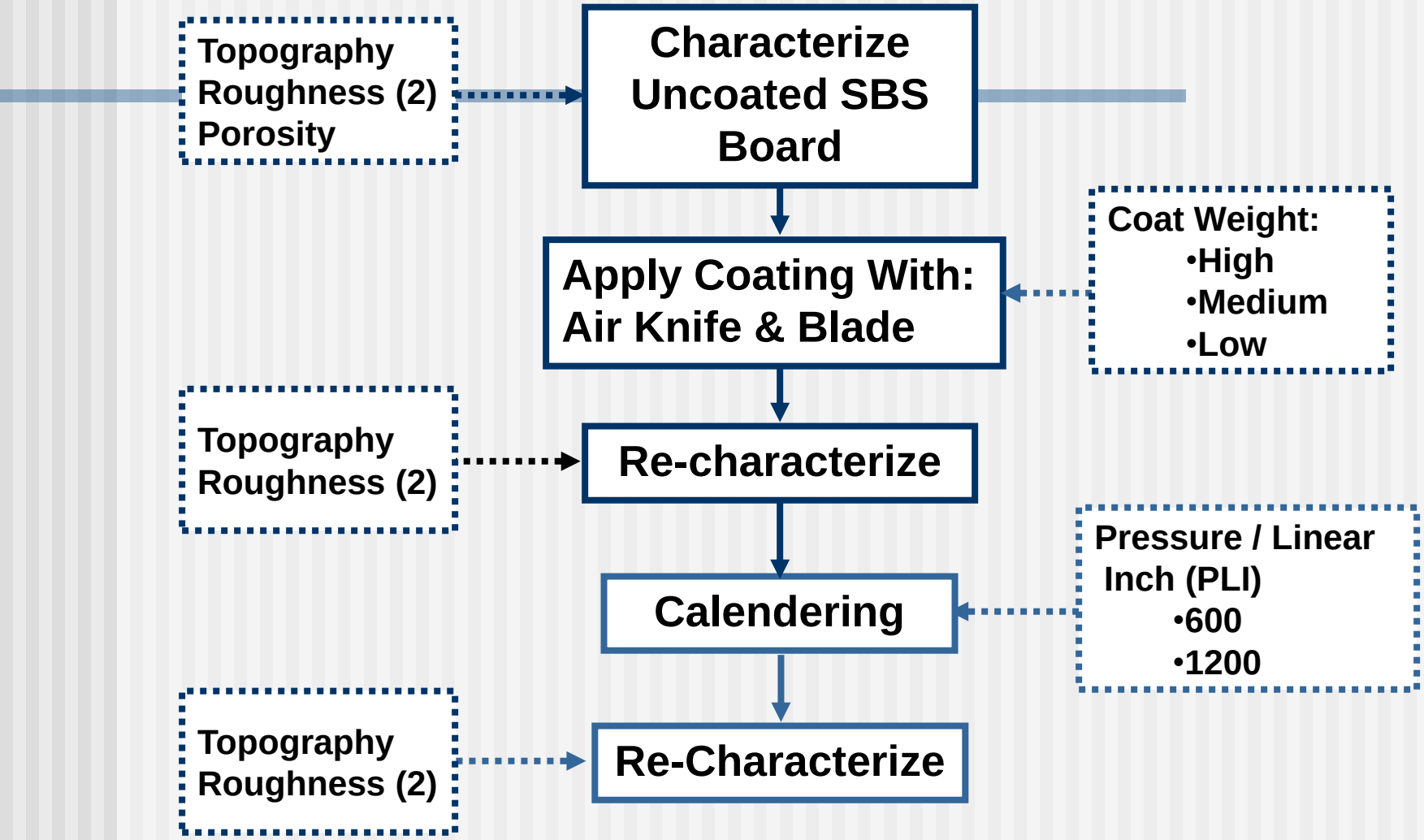


Methodology

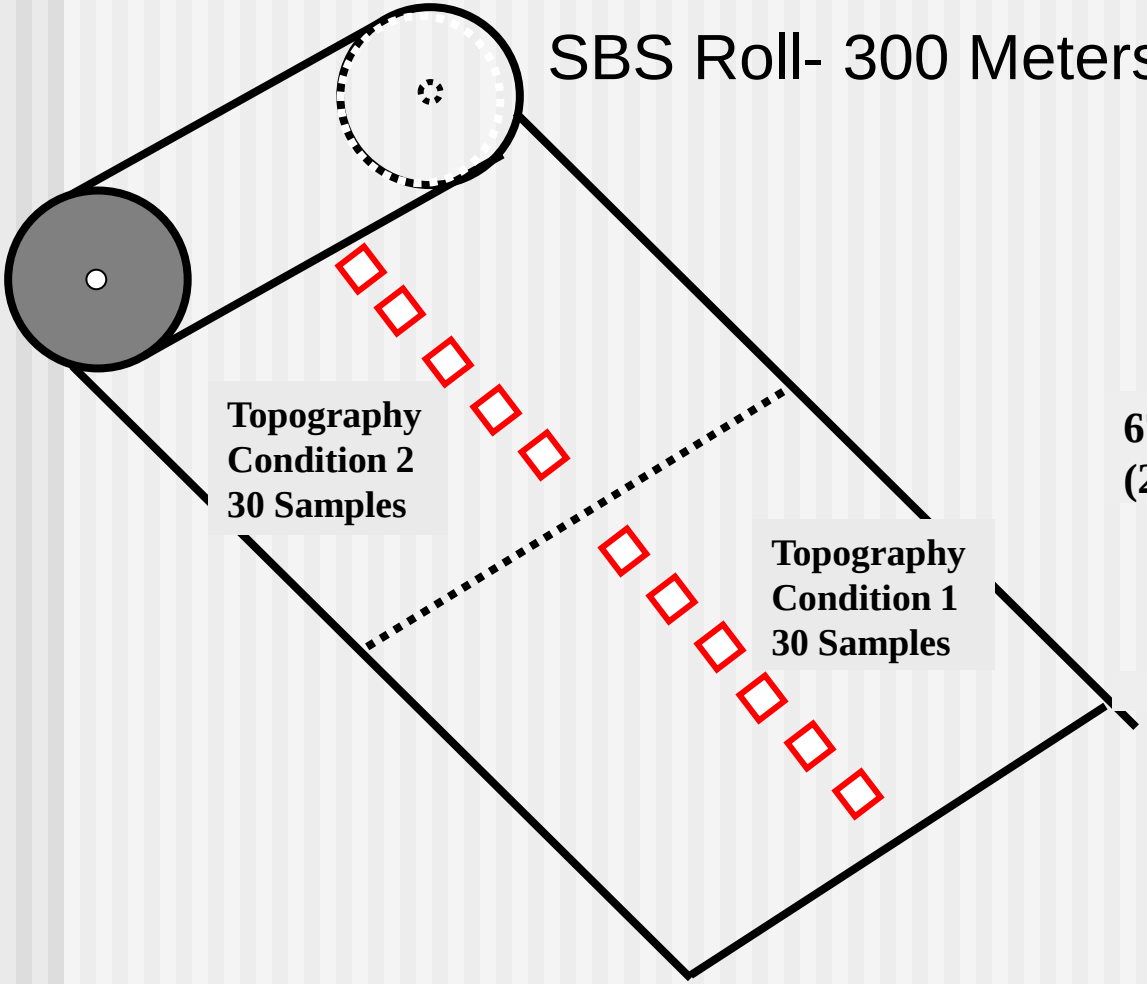
- Analysis
  - Topography (Verity-Topo)
  - Roughness (Emveco Profilometer)
  - Roughness (PPS)
  - Porosity (PPS)
  - Thickness

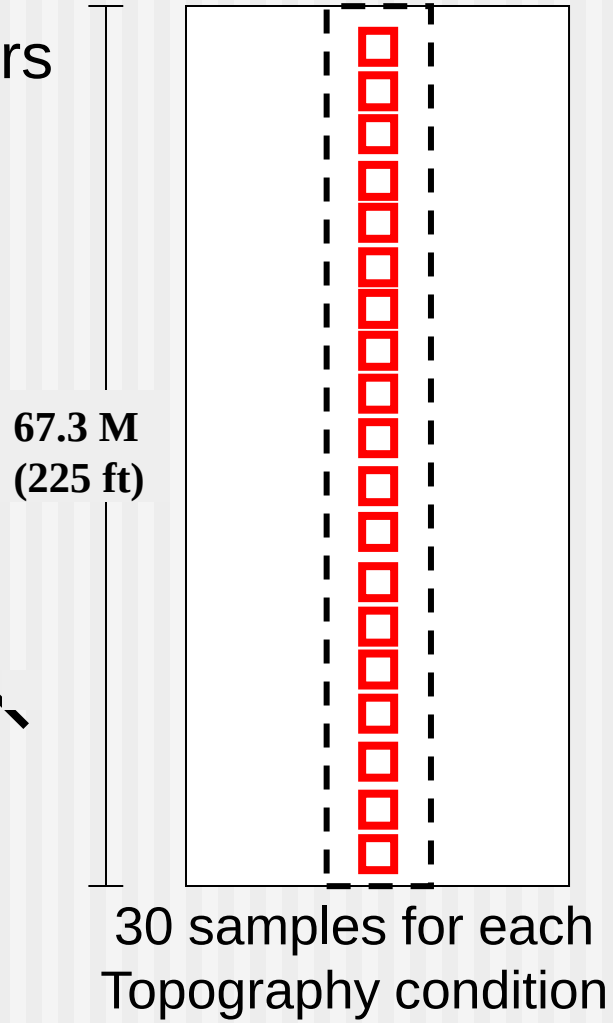
4 Topography conditions
30 samples at each condition
9 measurement points for each sample
Total = 1080 measurements

Methodology

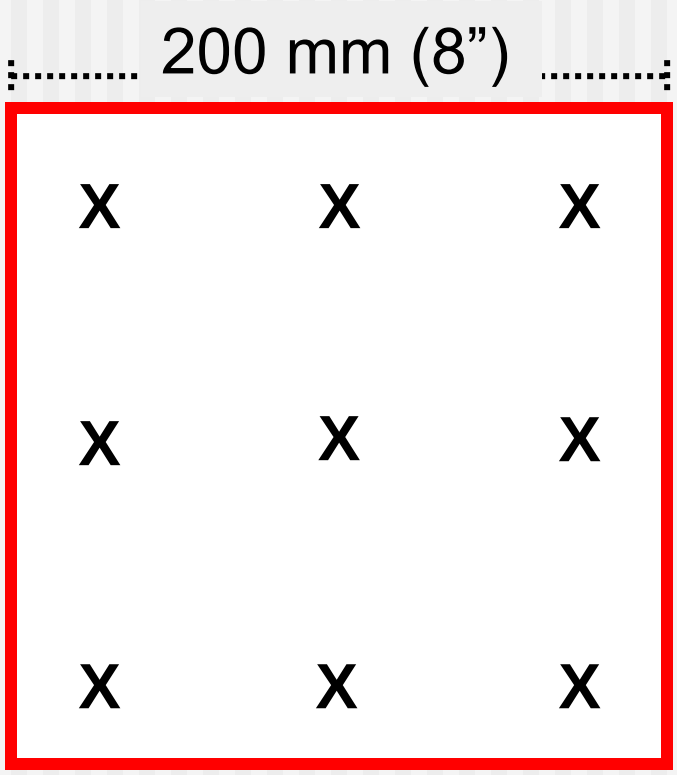


Substrate Analysis





Substrate Analysis cont…



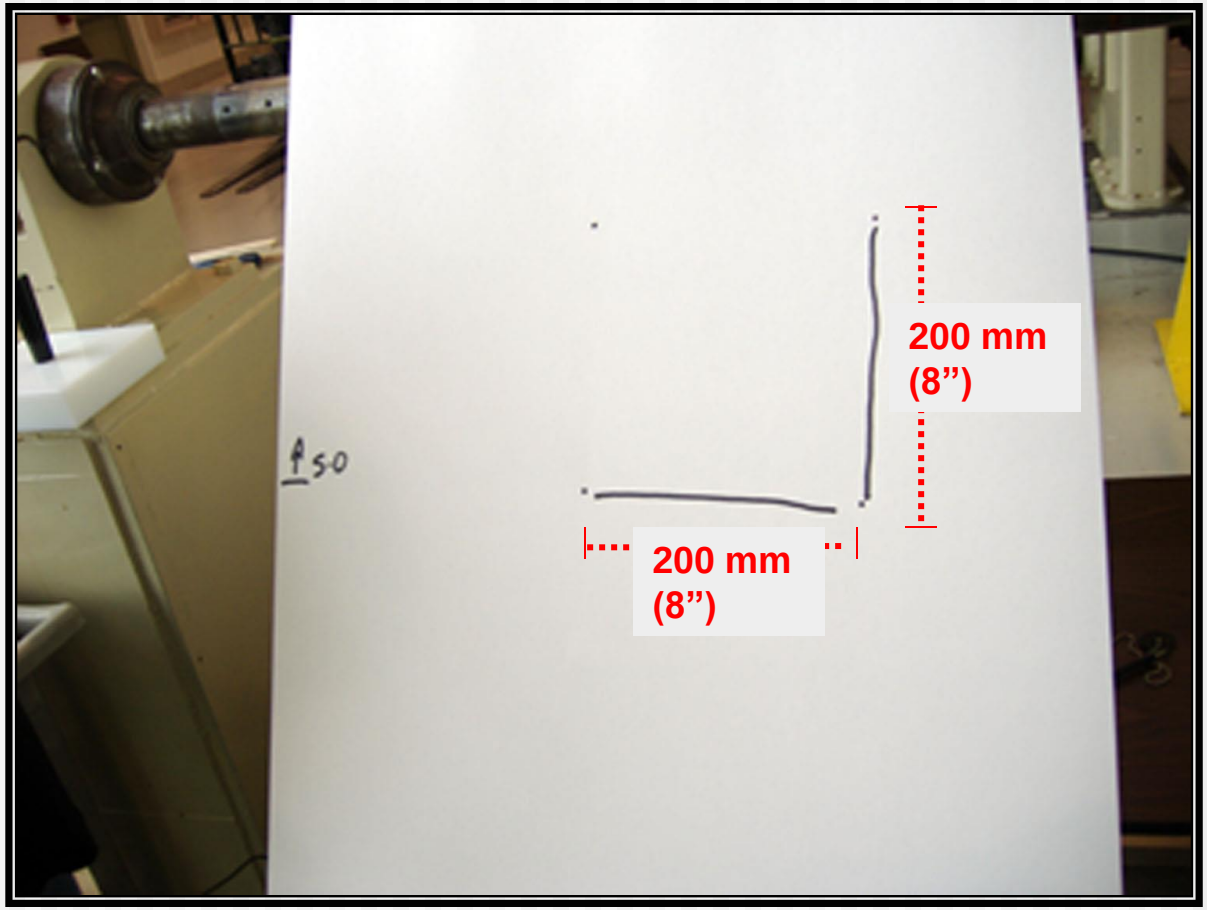
9 measurement at different points

- Verity IA Topography
- Emveco Roughness
- PPS Roughness
- Thickness

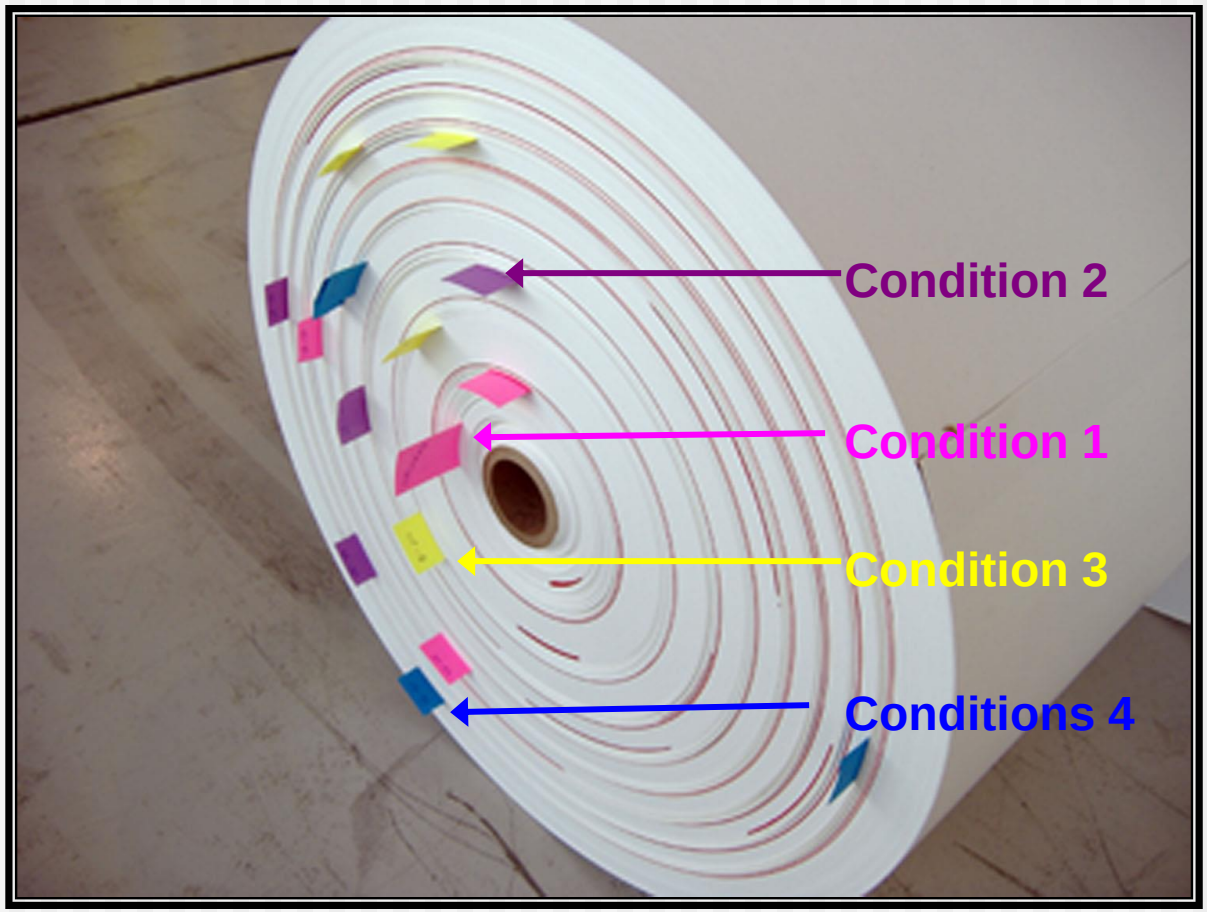
Substrate Analysis cont…



Substrate Analysis cont…



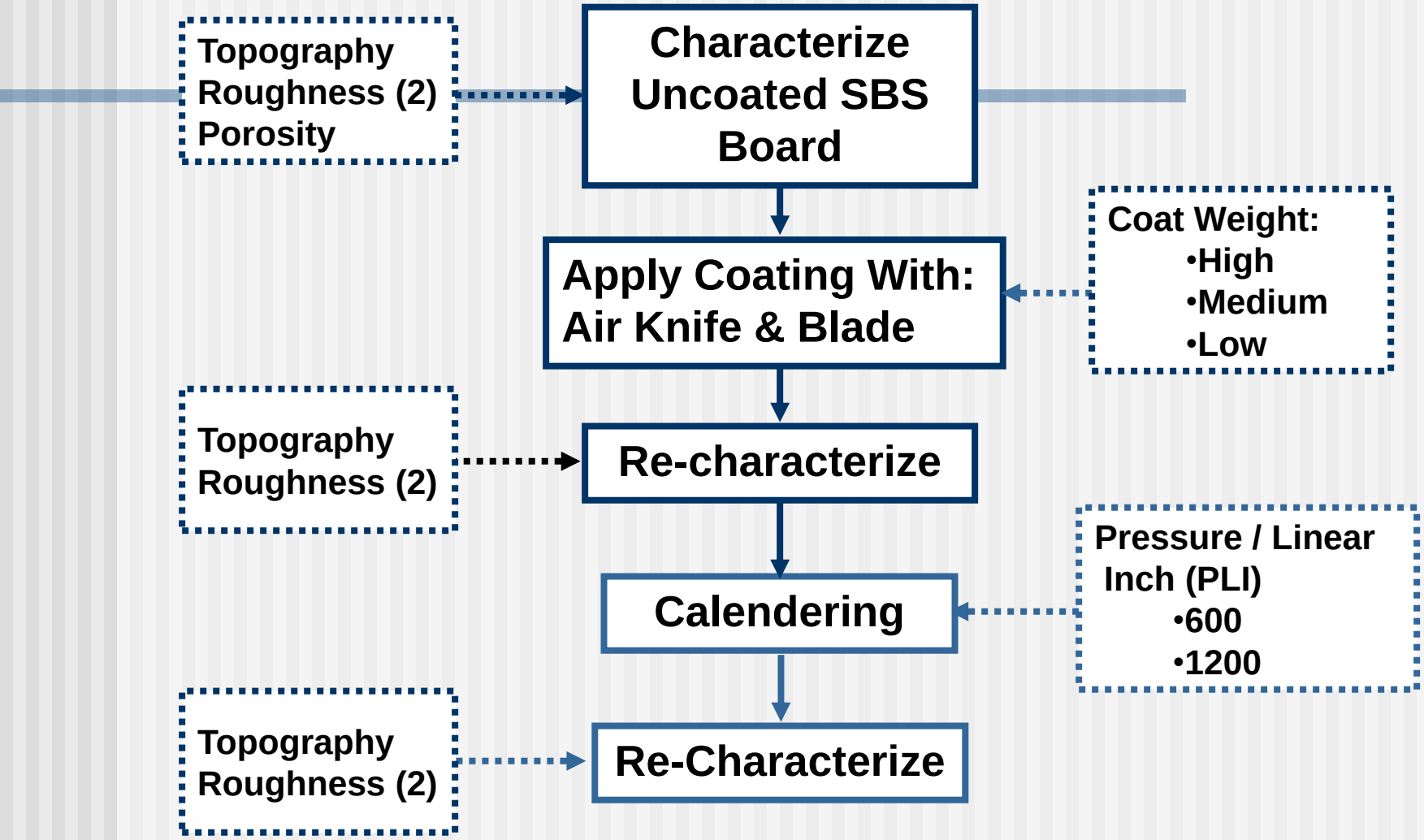
Substrate Analysis cont…



Uncoated Substrate Results

- Emveco Roughness (microns): Average 4.89
  StDev 0.28
- PPS Roughness (microns) Average 5.01
  StDev 0.15
- Verity IA Topo Average 3.49
  StDev 0.21
- Thickness 355 μm
- PPS Porosity Average 271.4 ml/min
  StDev 19.4

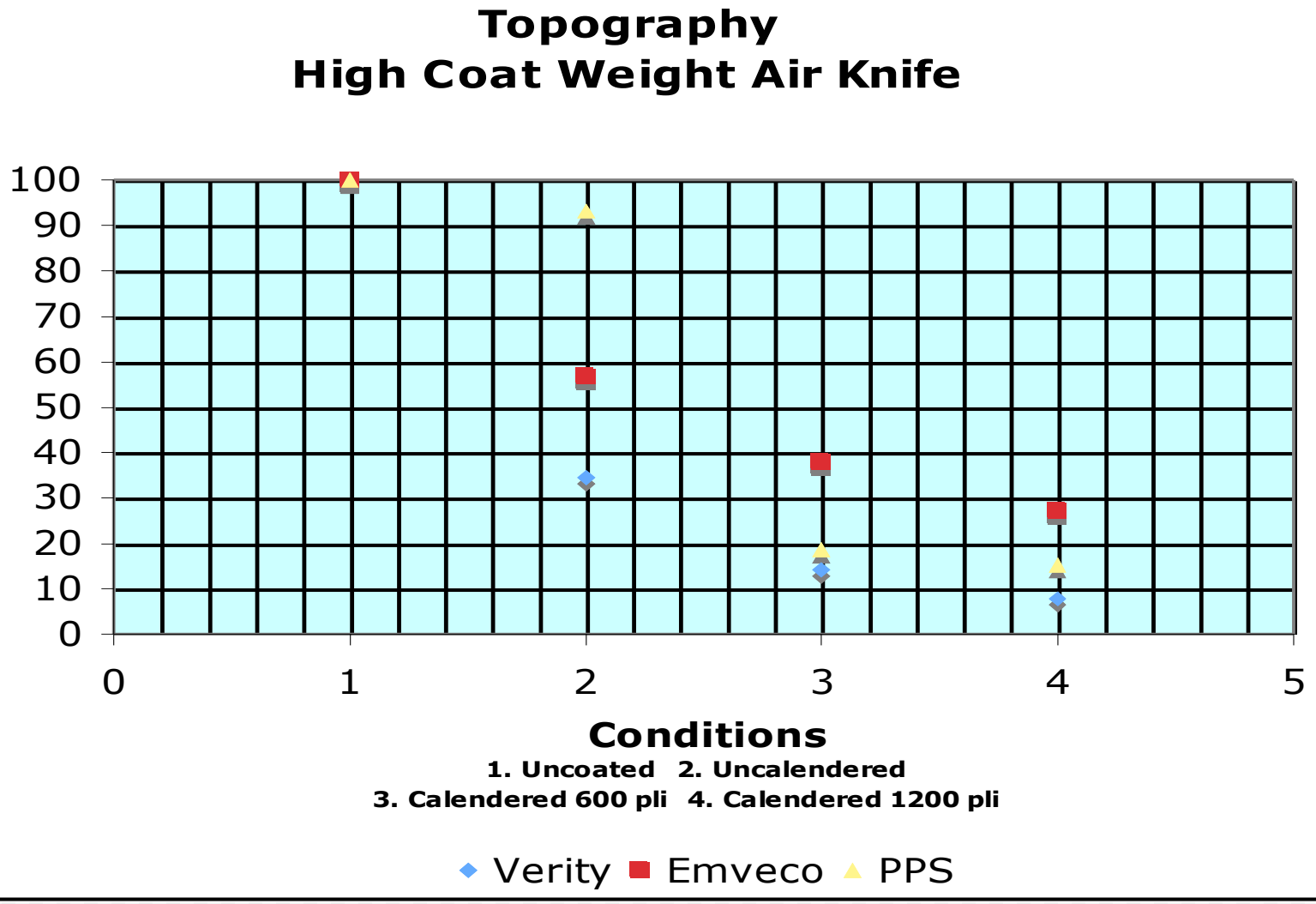
Methodology



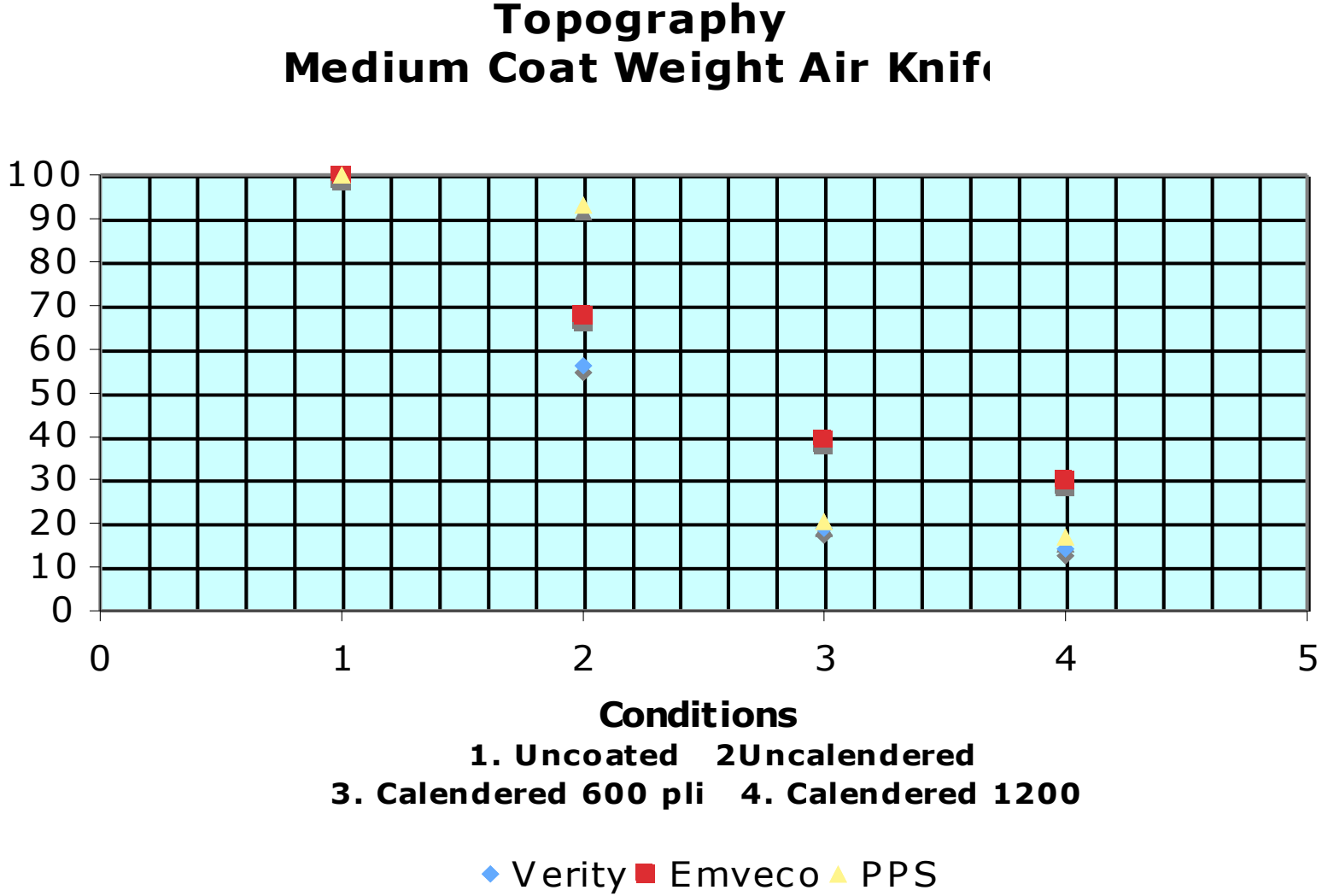
Coating & Calendering

Air Knife		Blade	
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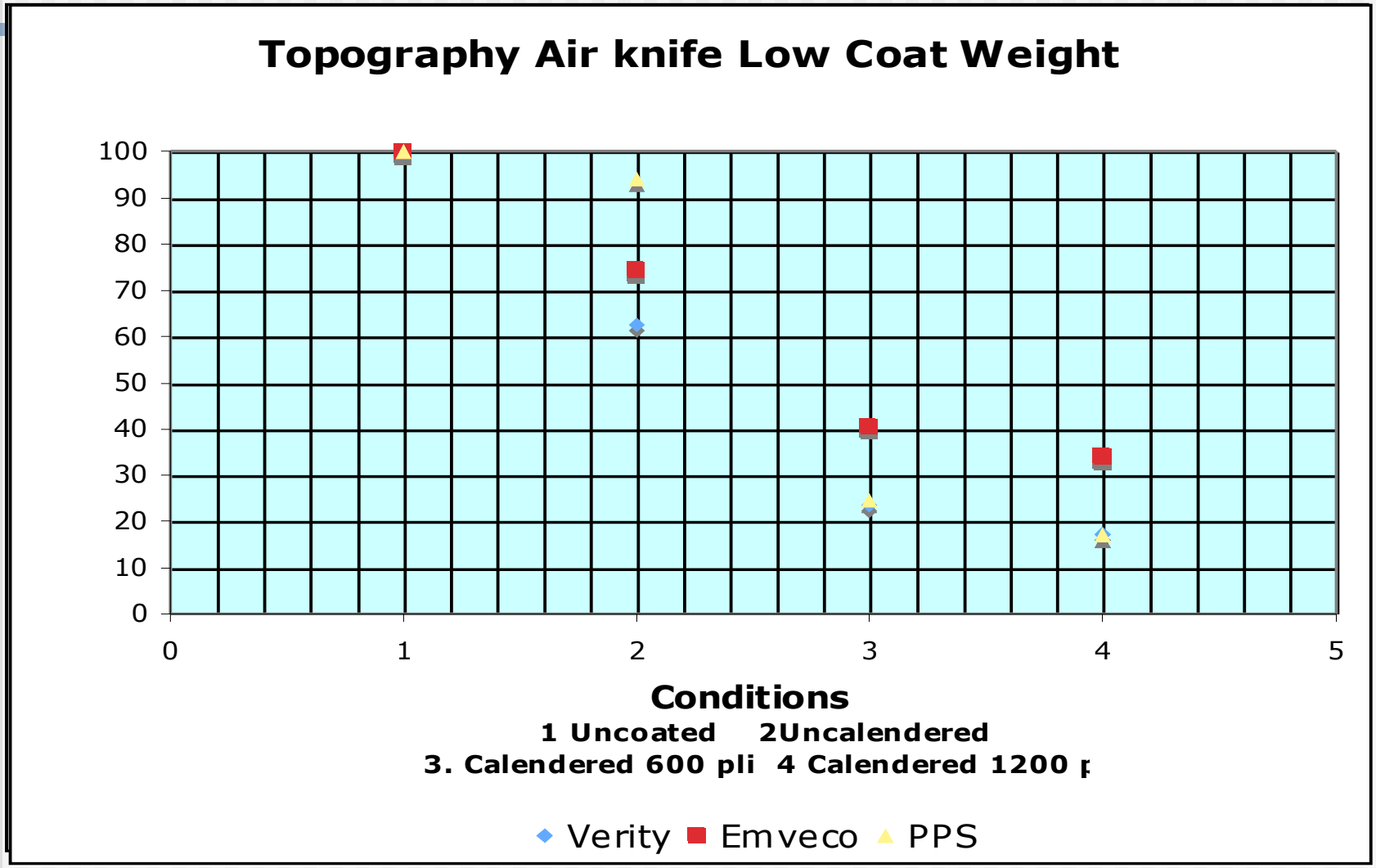
Topography Results
High Coat Weight



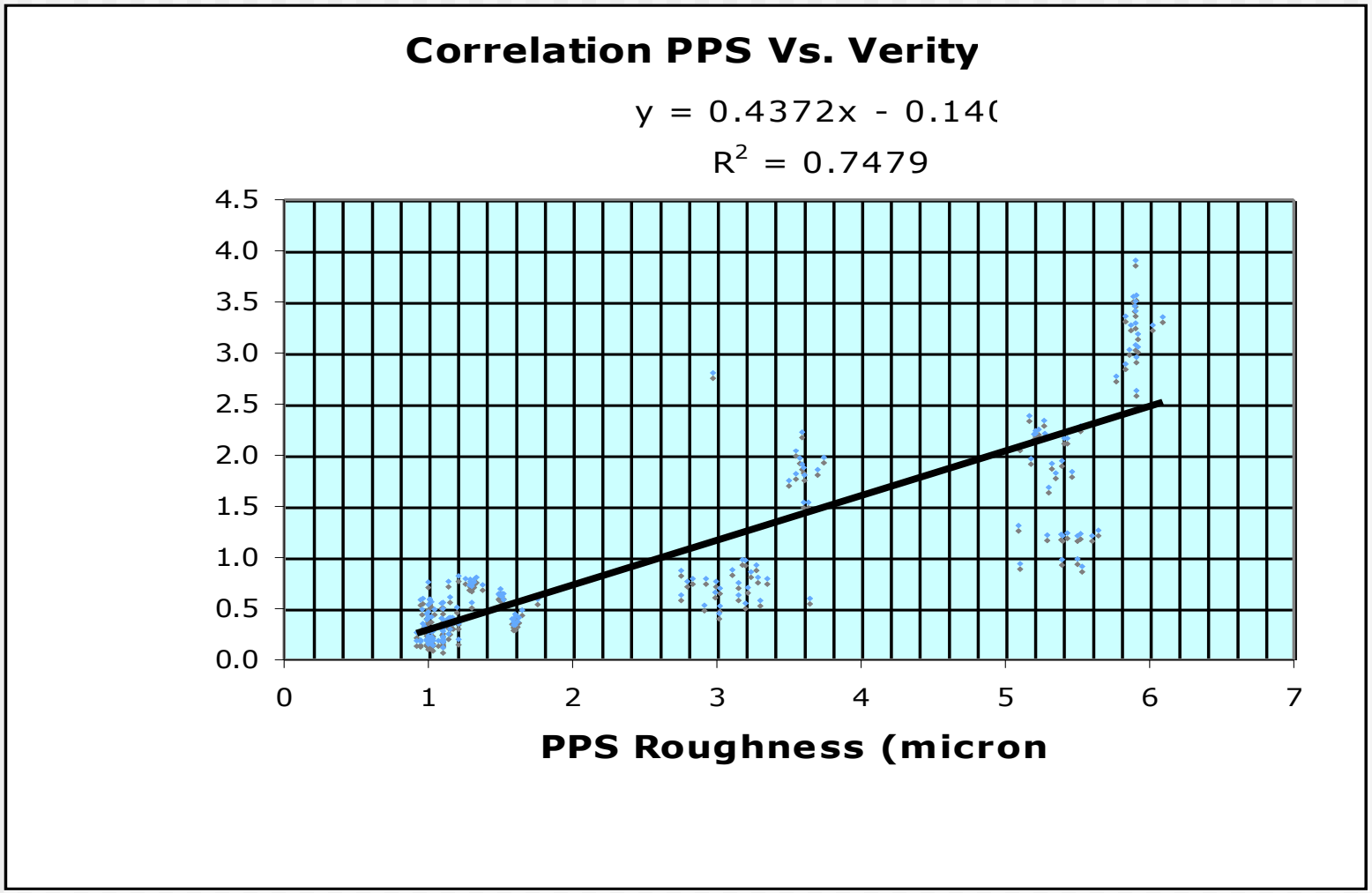
Topography Results
Medium Coat Weight



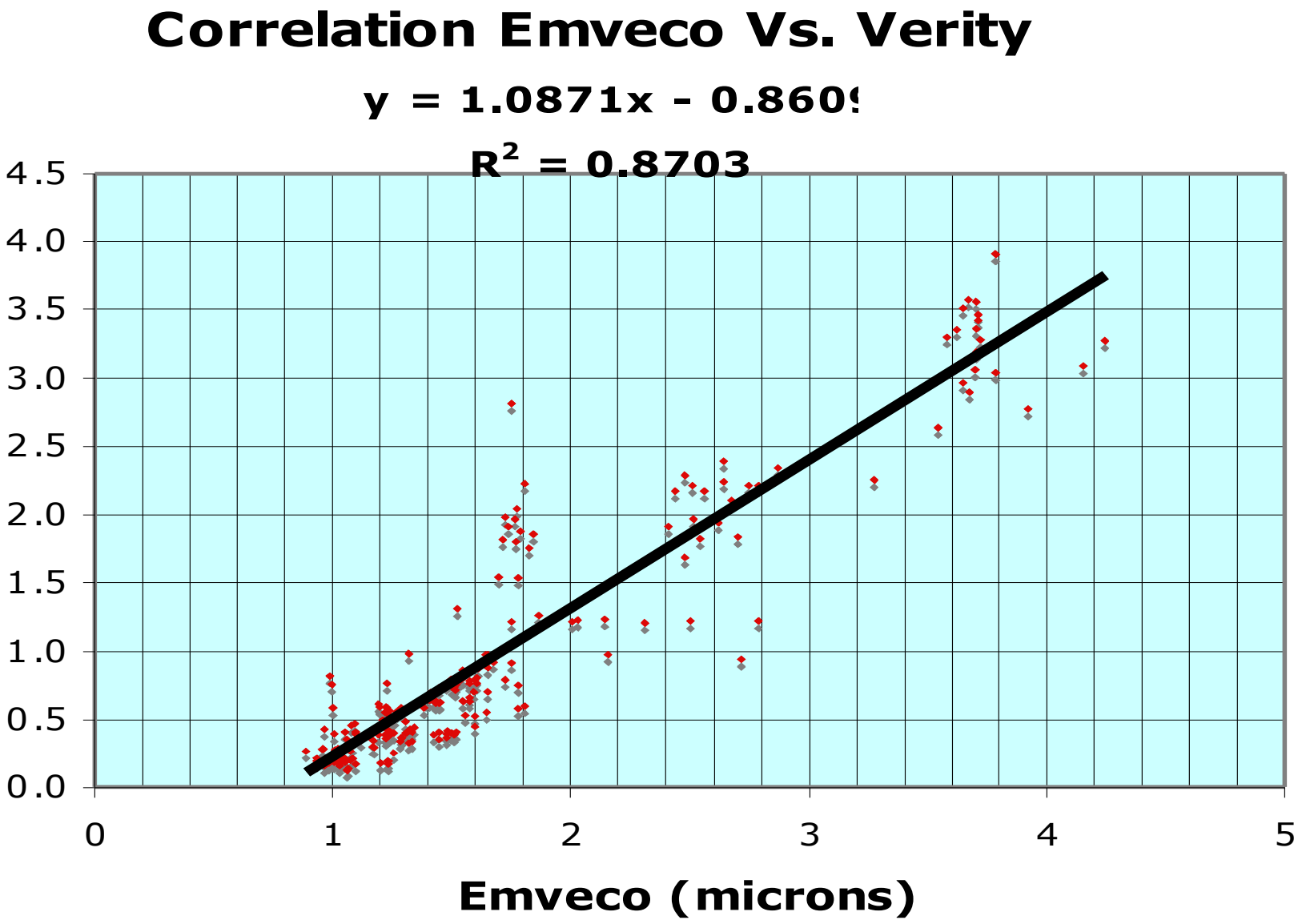
Topography Results
Low Coat Weight



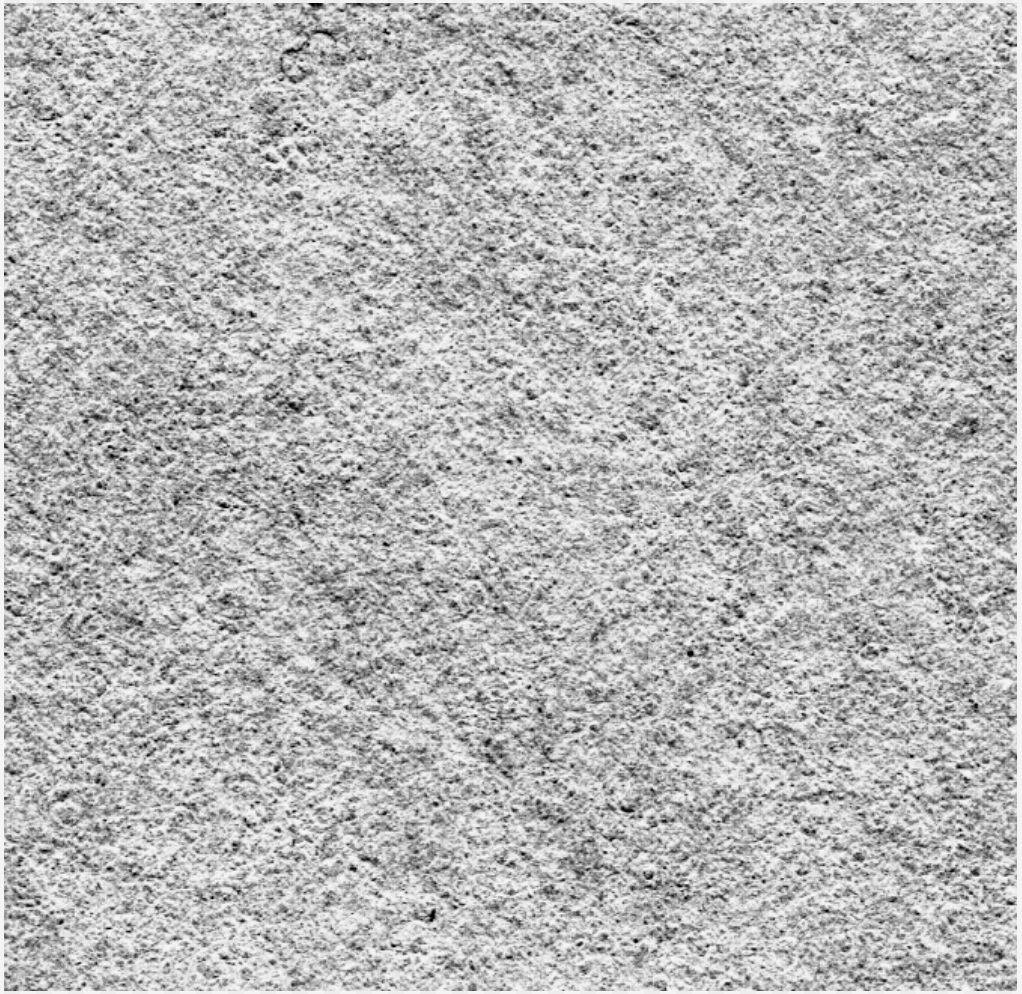
Correlation
PPS Vs. Verity



Correlation



Verity-Topo® Surface Display Image - SBS Before Coating



Conclusions

- Decreased coat weight caused a decrease in the topography number.
- Blade samples showed a better topography than Air knife.
- All instruments evaluated were able to predict coating topography with measurement of the substrate.

Conclusions

- Emveco Stylus Profilometer correlates better with the Verity. A better correlation was obtained than the one with Parker Print Surf and Verity.

- The visual image display obtained with the Verity Software is a big plus in the selection of a topography measuring device. Also, the measured area is more representative in comparison with the other two instruments.

Thank you !!!

Questions…



Verity-Topo ® Resistivity Study

