

SYSTEMATIC STUDIES ON CIGARETTE PAPER:

The influence of filler, fibre and natural permeability on paper properties and mainstream ISO yields

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(1) BAT, R&D Centre, Southampton, UK.

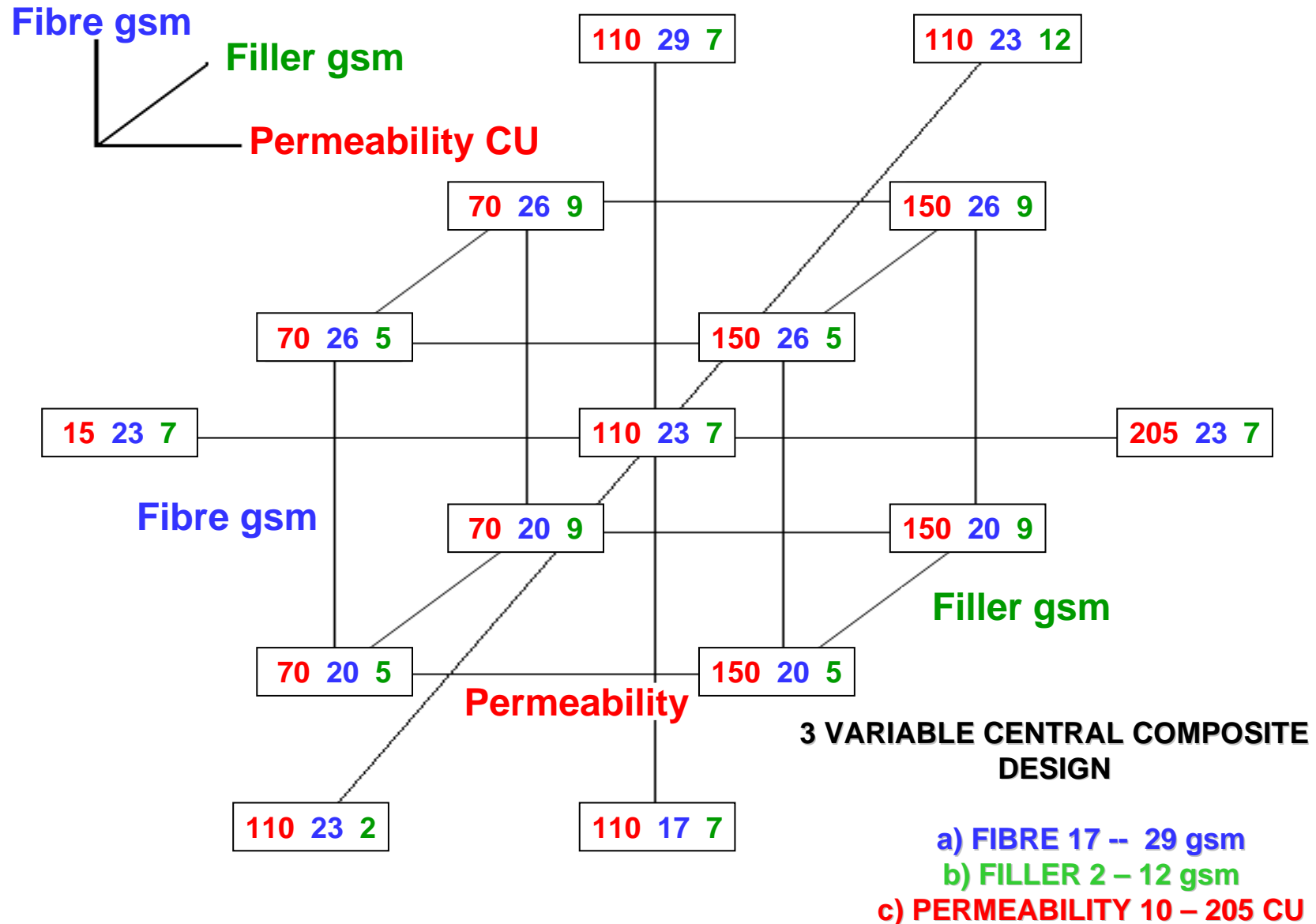
(2) WFT Research, Wattens, Austria.



TOPICS TO BE COVERED

- **PAPER: EXPERIMENTAL DESIGN / PHILOSOPHY**
 - **CIGARETTE DESIGN / ANALYSES**
 - **PAPER PROPERTIES**
 - **INTER LABORATORY COMPARISON**
 - **CIGARETTE YIELD PROPERTIES**
 - **MECHANISTIC EXPLANATION**
- **DIFFERENT WAYS OF SPECIFYING CIGARETTE PAPER**
 - **CONCLUSIONS**
 - **ACKNOWLEDGEMENTS**

PAPER: EXPERIMENTAL DESIGN / PHILOSOPHY



CIGARETTE DESIGN / ANALYSES

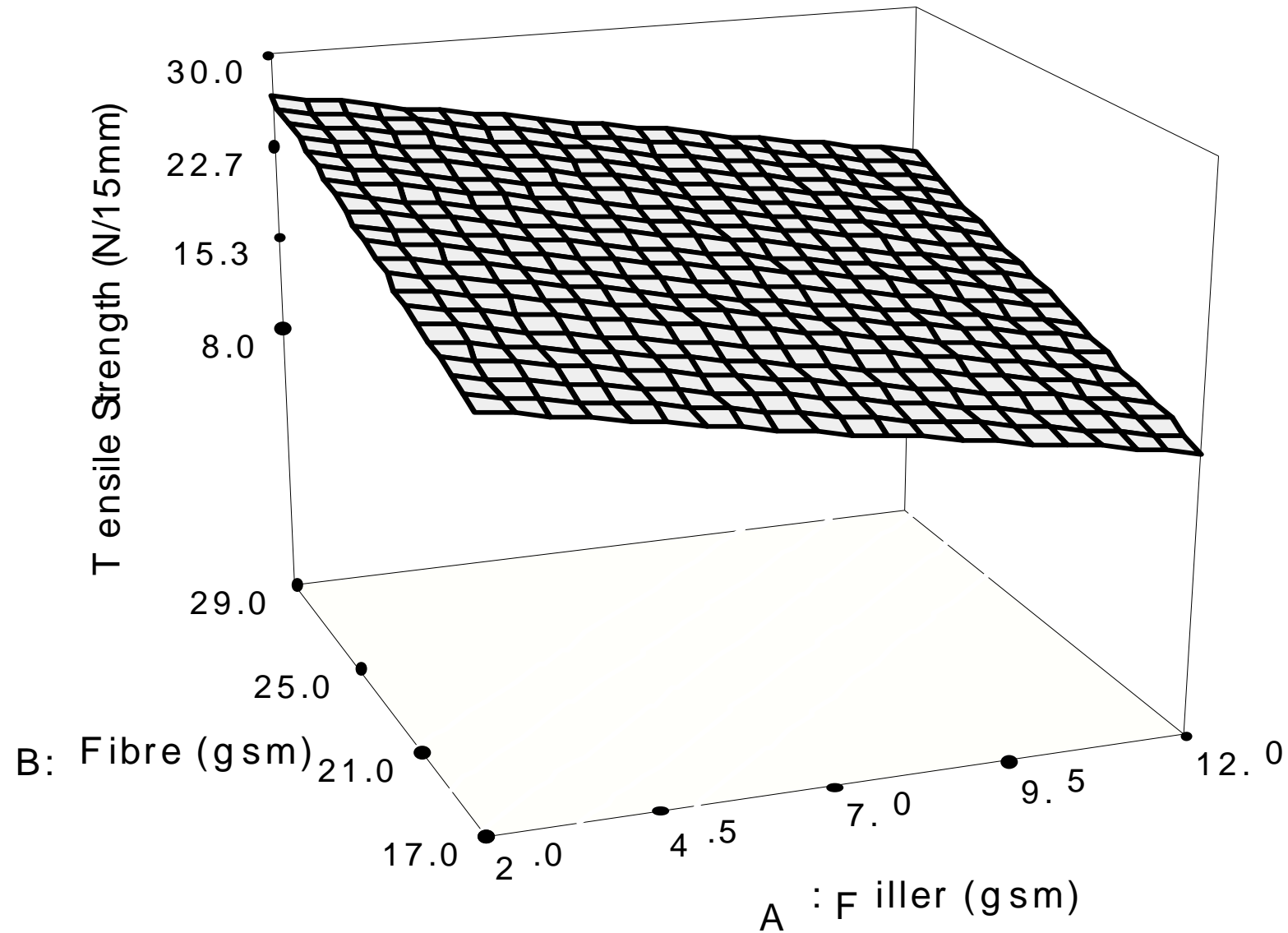
- **CIGARETTE CONSTRUCTION**

- a) **CONSTANT 64 mm TOBACCO COLUMN**
- b) **CONSTANT 20 mm FILTER**
- c) **NON FILTER VENTILATED**

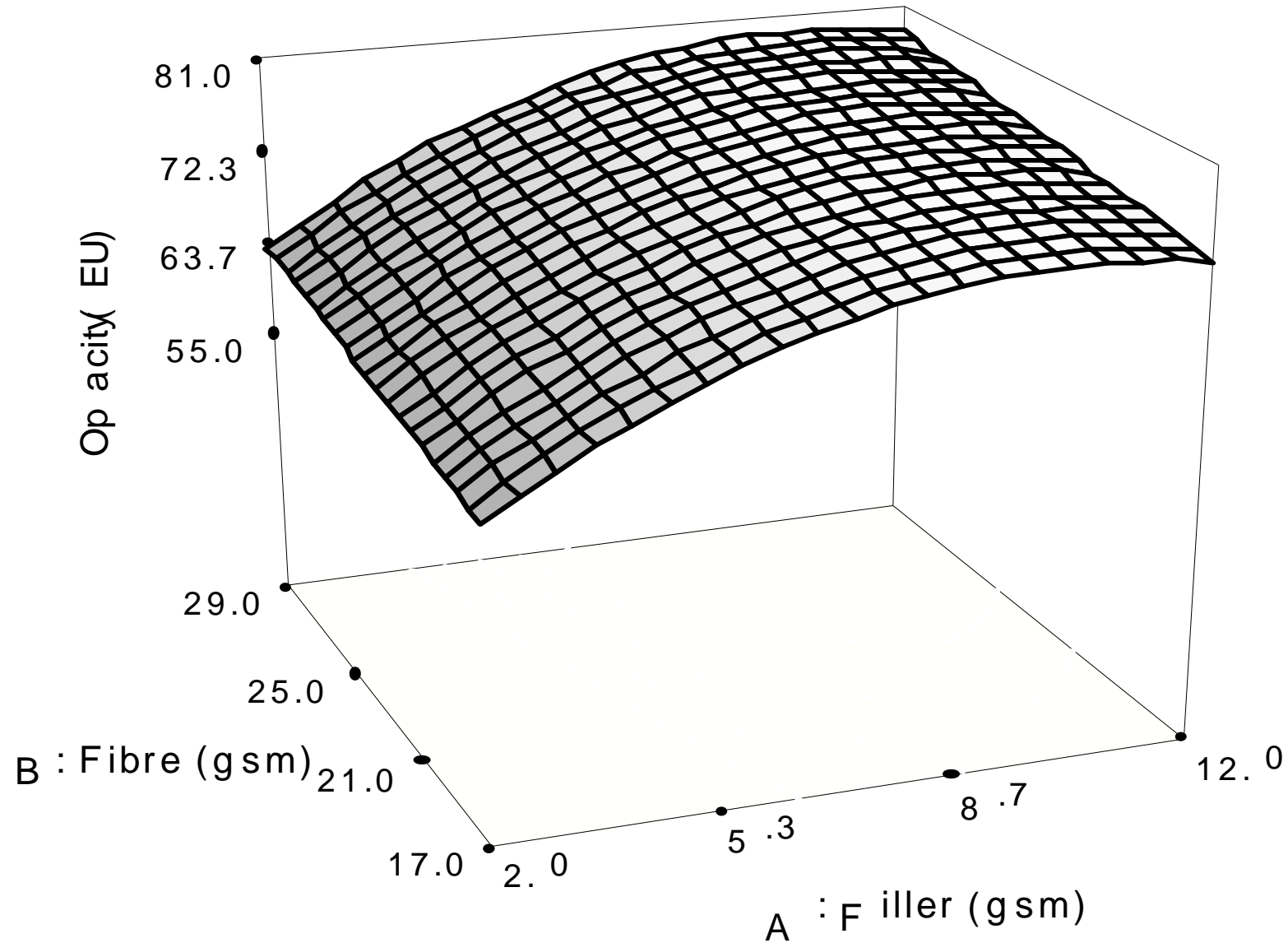
- **ANALYSES**

- a) **PAPER: CaCO_3 , BASIS WEIGHT, PERMEABILITY, TENSILE, STRETCH, OPACITY, WHITENESS.**
- b) **MAINSTREAM YIELDS: NFDPM, NICOTINE, CO, PUFF NUMBER, STATIC BURN RATE**
- c) **METHODOLOGIES: ISO FOR BOTH PAPER AND YIELDS**
- d) **MULTIPLE REGRESSION: FOR PREDICTIVE EQUATIONS**

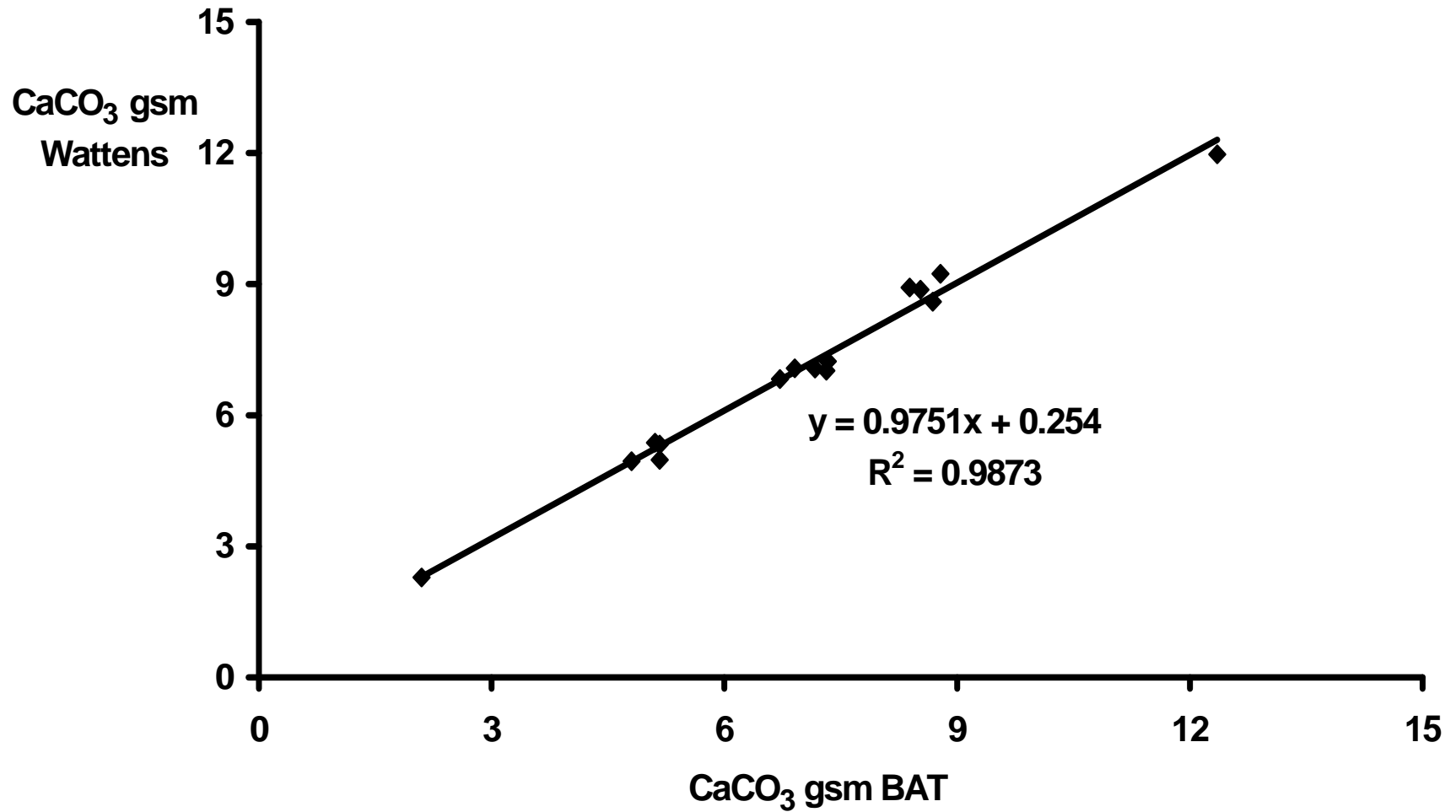
PAPER PROPERTIES: TENSILE STRENGTH



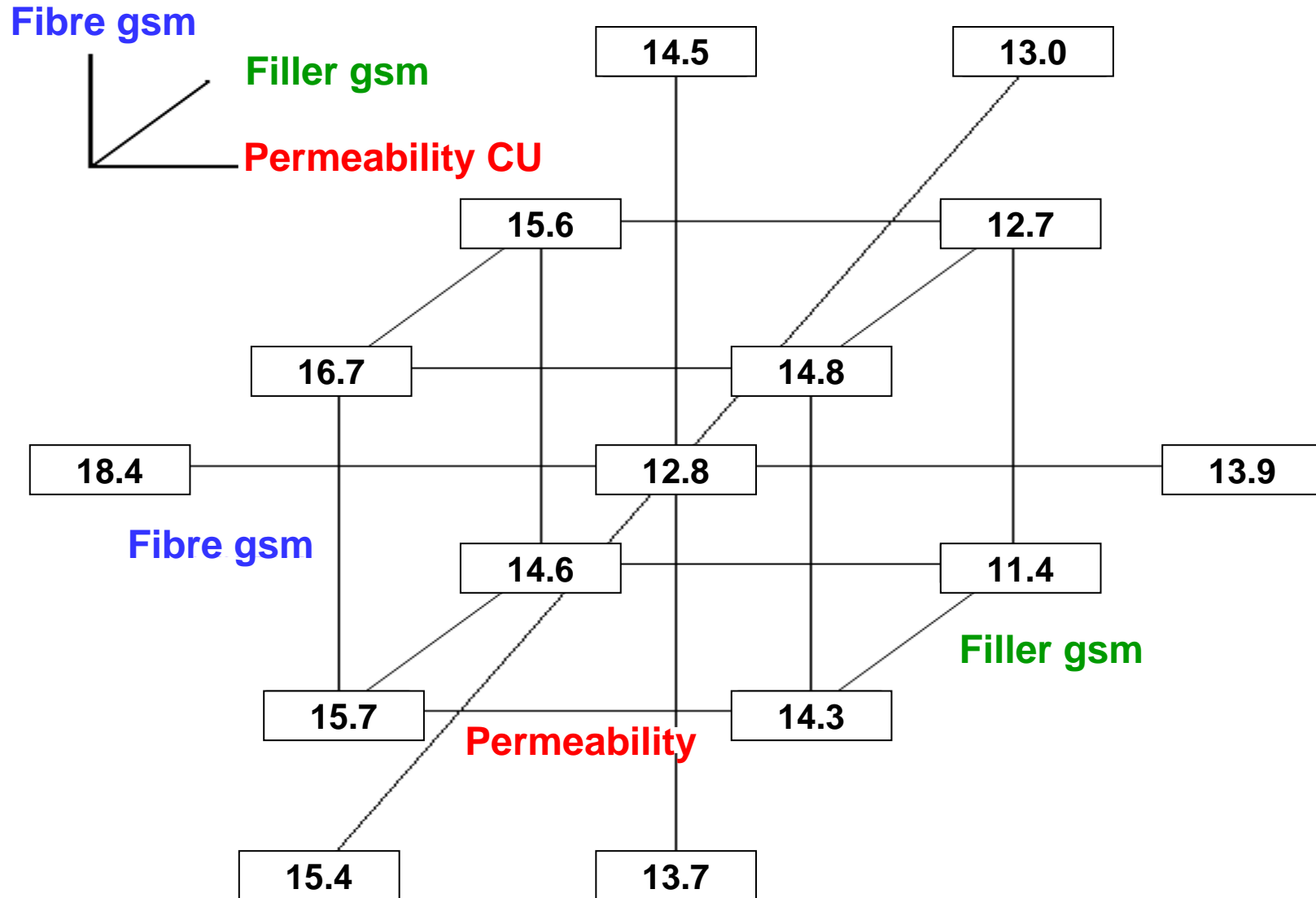
PAPER PROPERTIES: OPACITY



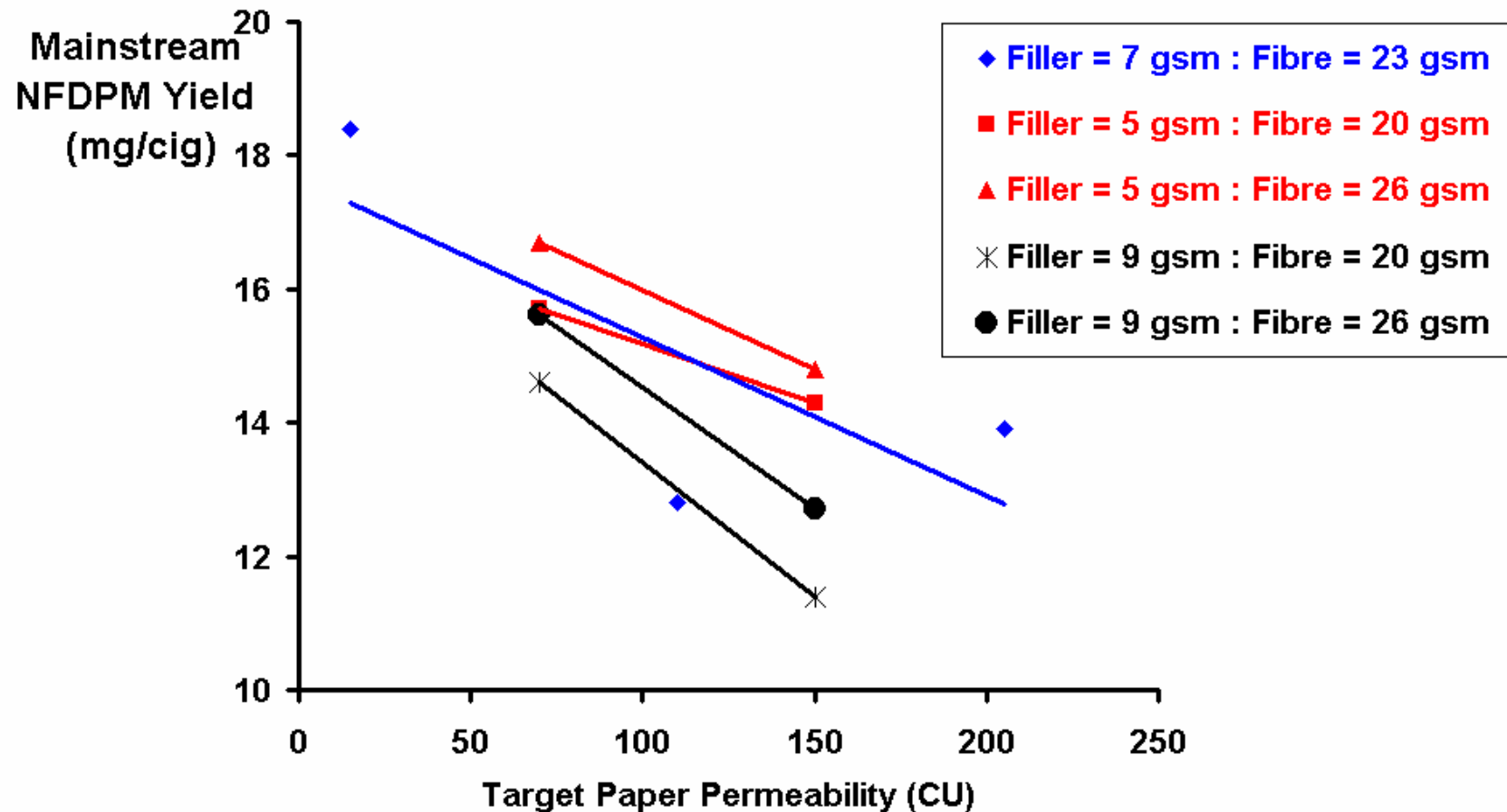
INTER LABORATORY COMPARISON



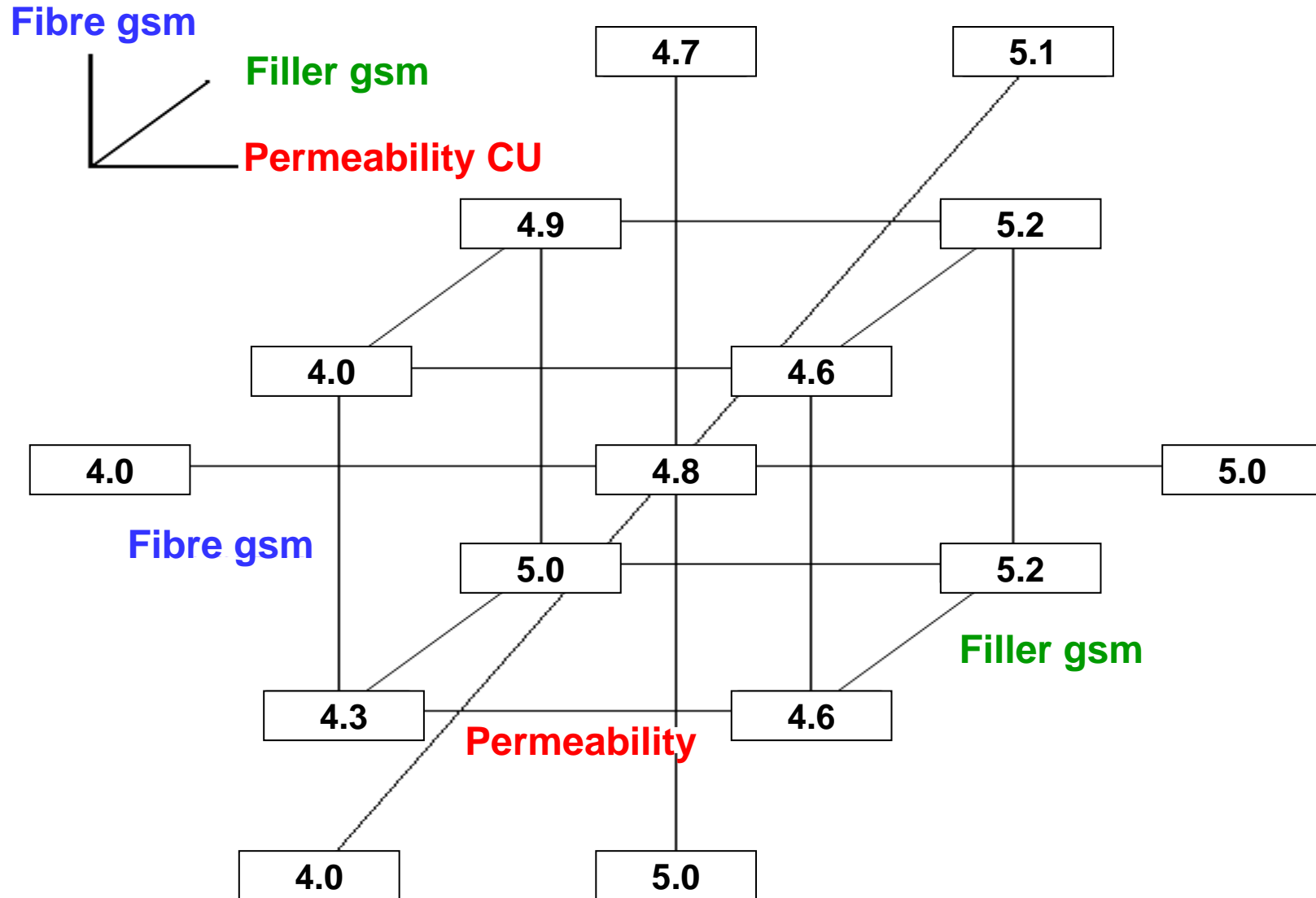
CIGARETTE NFDPM YIELD (mg/cig)



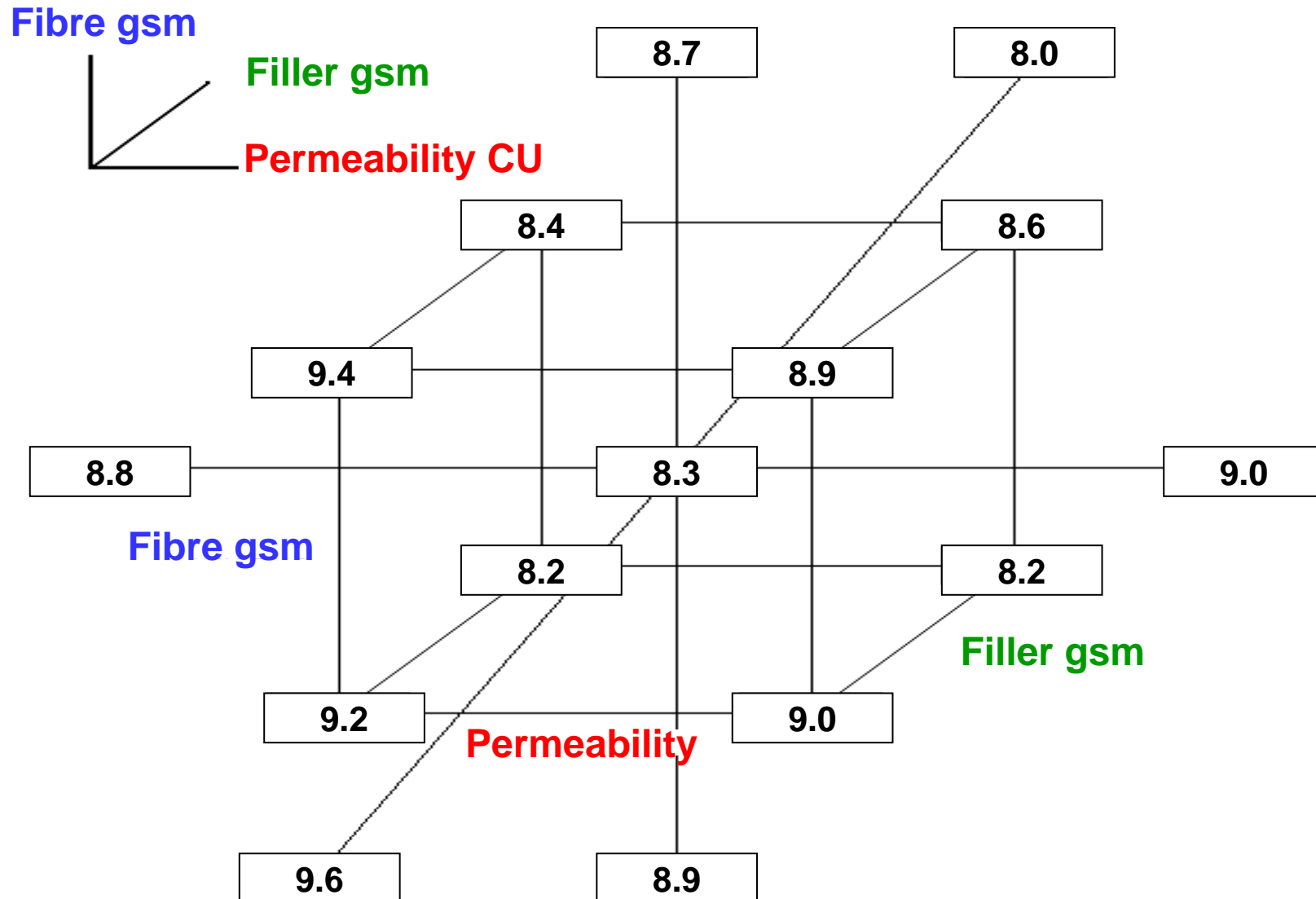
ALTERNATIVE VIEW OF NFDPM YIELD as a function of FILLER, FIBRE & PERMEABILITY



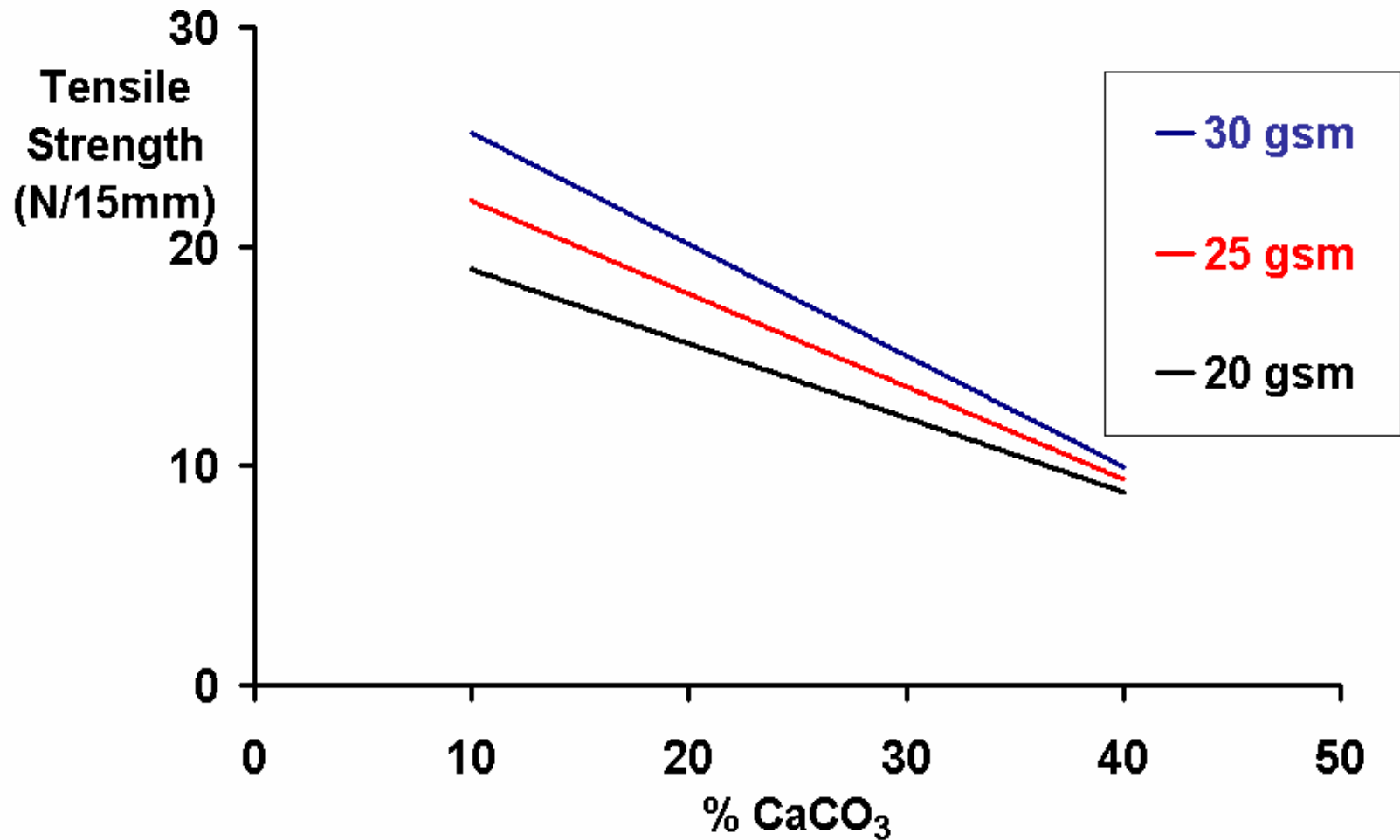
MECHANISTIC EXPLANATION OF NFDPM YIELD VIA USE OF STATIC BURN RATE (mm/min)



MECHANISTIC EXPLANATION OF NFDPM YIELD VIA USE OF PUFF NUMBER



DIFFERENT WAYS OF SPECIFYING CIGARETTE PAPER



CONCLUSIONS (1)

Measured Response	Effect of increasing the paper design variable		
	Permeability	Filler level	Fibre level
NFDPM	↓	↓	↑
Nicotine	↓	↓	↑
CO	↓	↓	↑
Puff number	↔	↓	↑
Static Burn Rate	↑	↑	↓
Tensile strength	↓	↓	↑
Opacity	↔	↑	↑

CONCLUSIONS (2)

- **STATISTICAL DESIGN CAN BE APPLIED TO CIGARETTE PAPER.**
- **PAPER PHYSICAL PROPERTIES AND MAINSTREAM YIELDS CAN BE PREDICTED.**
- **PERMEABILITY AND FILLER EFFECTS CAN BE EXPLAINED BY BY CONSIDERING S.B.R. AND PUFF NUMBER. FIBRE EFFECTS CANNOT BE EXPLAINED USING THE SAME APPROACH.**
- **PAPER PHYSICAL PROPERTIES AND MAINSTREAM YIELDS INVOLVE ADOPTING A BALANCED APPROACH.**
- **IT IS POSSIBLE TO SPECIFY CIGARETTE PAPER IN A NUMBER OF DIFFERENT WAYS.**

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