This presentation premiered at WaterSmart Innovations

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Plumbing Efficiency Research Coalition

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2011 STATUS REPORT:
Reduced Flows in Building Drains

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Review: The Need for Research on Drainline Transport

- The Good News: New water efficient fixtures and appliances are reducing demand on potable water
- The Not-So-Good News: We have some concerns
  - Health and Safety
  - Systemic Efficacy
- Drainline transport concerns are inhibiting the use of High Efficiency Toilets
- The US EPA is delaying the development of WaterSense™ specification for commercial HETs pending research

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PERC Update

- ASPE joins PERC in 2011!
- Funding for drainline research has yet to be received
- Scope of proposed research reduced in 2010 to lower cost
- Focus of revised scope:
  1. Evaluation of intermittent high volume “flush” to avoid drainline blockage occurrences
  2. Determination of the importance of the design of the toilet in drainline transport relative to other plumbing system design considerations

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PERC Update

Lab based testing

- 200 – 300 foot drainline apparatus, location TBD
- 4 inch diameter pipe (most common, worst case)
- System variables: pitch and flush volume
- Toilet design variables: percent flush water training solids and flow rate
- Analysis of data will rank significance of these variables and determine interactions
- Intermittent “clearing flush” at 1% and 2% frequency
- Cost using revised scope of work – $170K
- Yes, we still need funding!

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Memorandum of Understanding

- December 2010: ASFlow and PERC Sign MoU at EPA HQ
  - First ever international MoU focusing on plumbing research
  - Objective – "…research collaboration…for studying the sanitary flow and addressing any consequences of reduced water usage from water conservation measures, reduction in water usage by plumbing fixtures, and other drivers to reduce household and commercial water usage."

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Memorandum of Understanding

- Goals of MoU
  - Investigate current Australian, US and overseas research activities to avoid duplication of research
  - Review current knowledge on impacts of reduced flows on sanitary plumbing and drainage systems
  - Identify and quantify knowledge gaps
  - Compare installation and design practices
  - Communicate with overseas research groups on research methodologies

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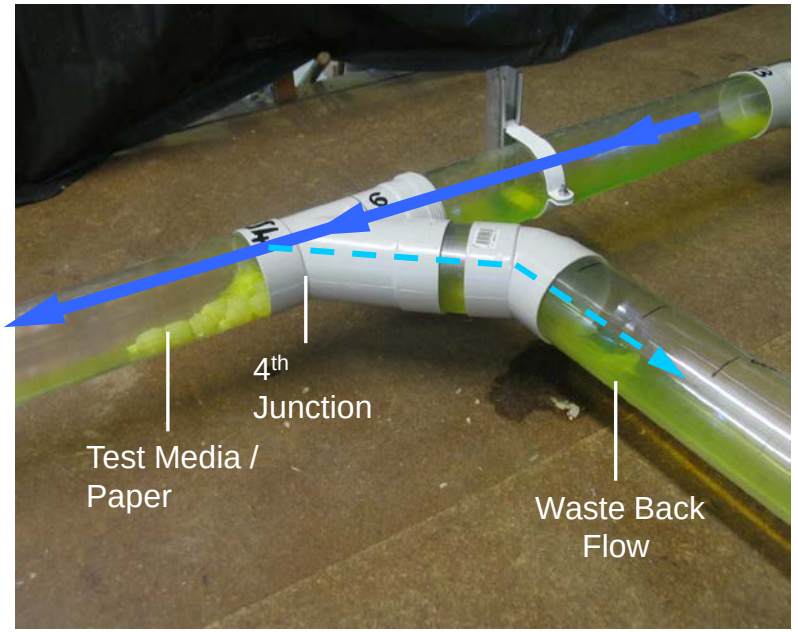
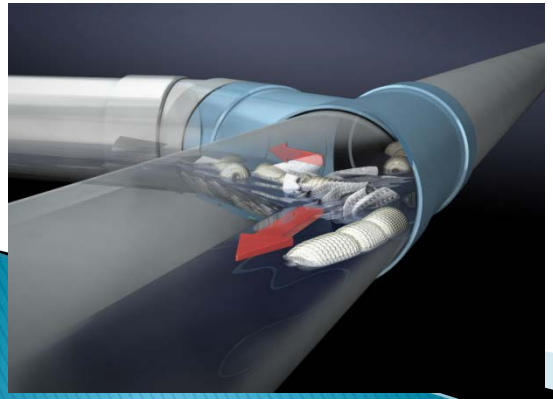
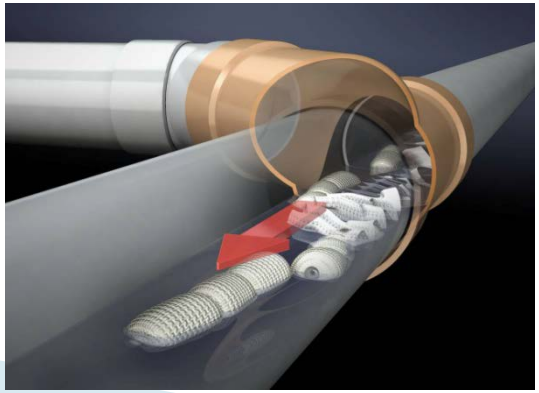
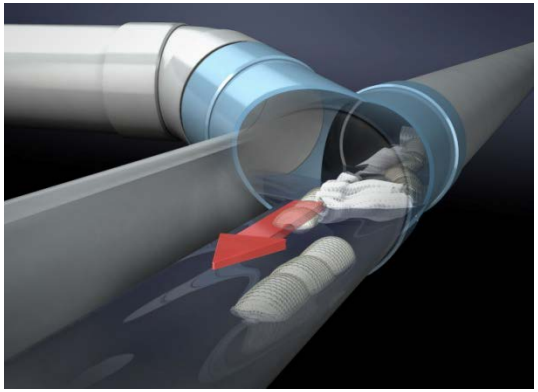
ASFlow Update

- Excellent work continues Down Under
  - Study on horizontal junctions completed in 2010 (presented at 2010 WSI)
  - Results will be basis of plumbing code revisions





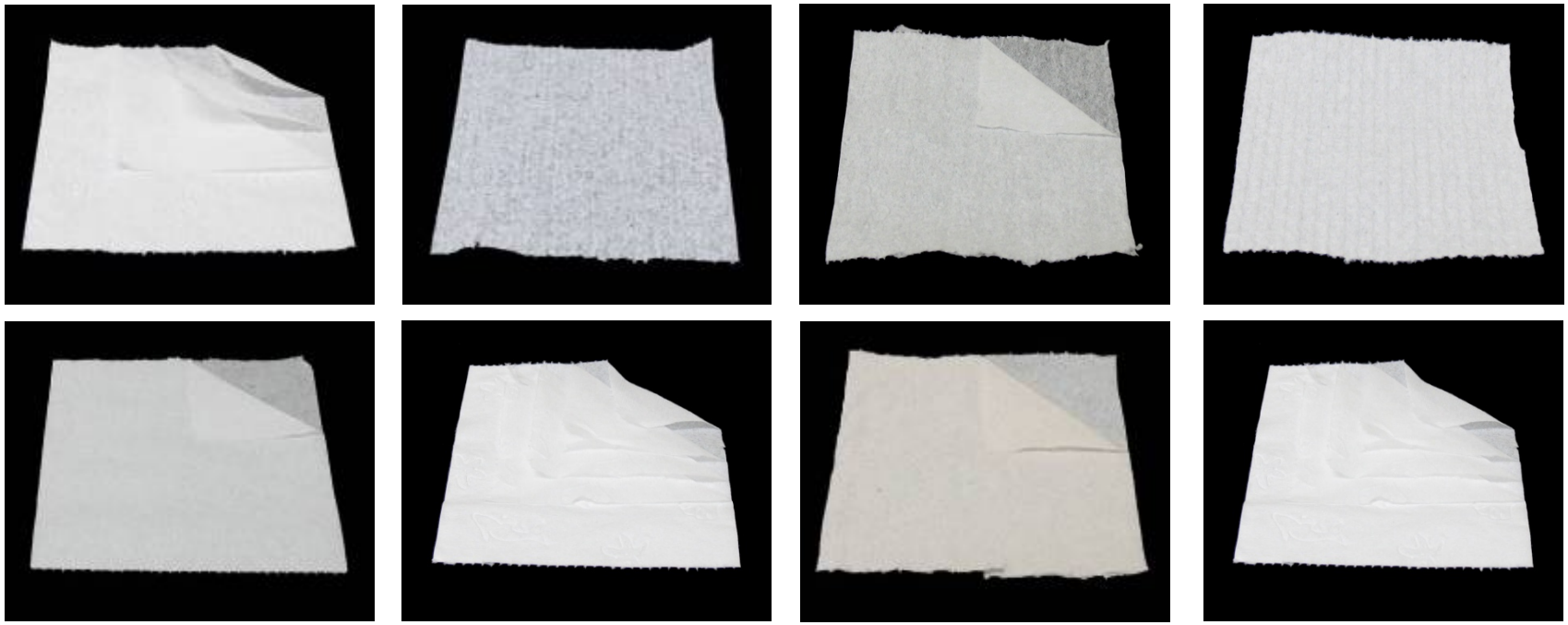




ASFlow Update

- Excellent work continues Down Under
  - Toilet paper testing
    - 22 brands of commercially available brands tested

Toilet paper characteristics varied by # of ply, texture, weight



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- Excellent work continues Down Under
  - 60 meter (~200 ft.) drainline test apparatus

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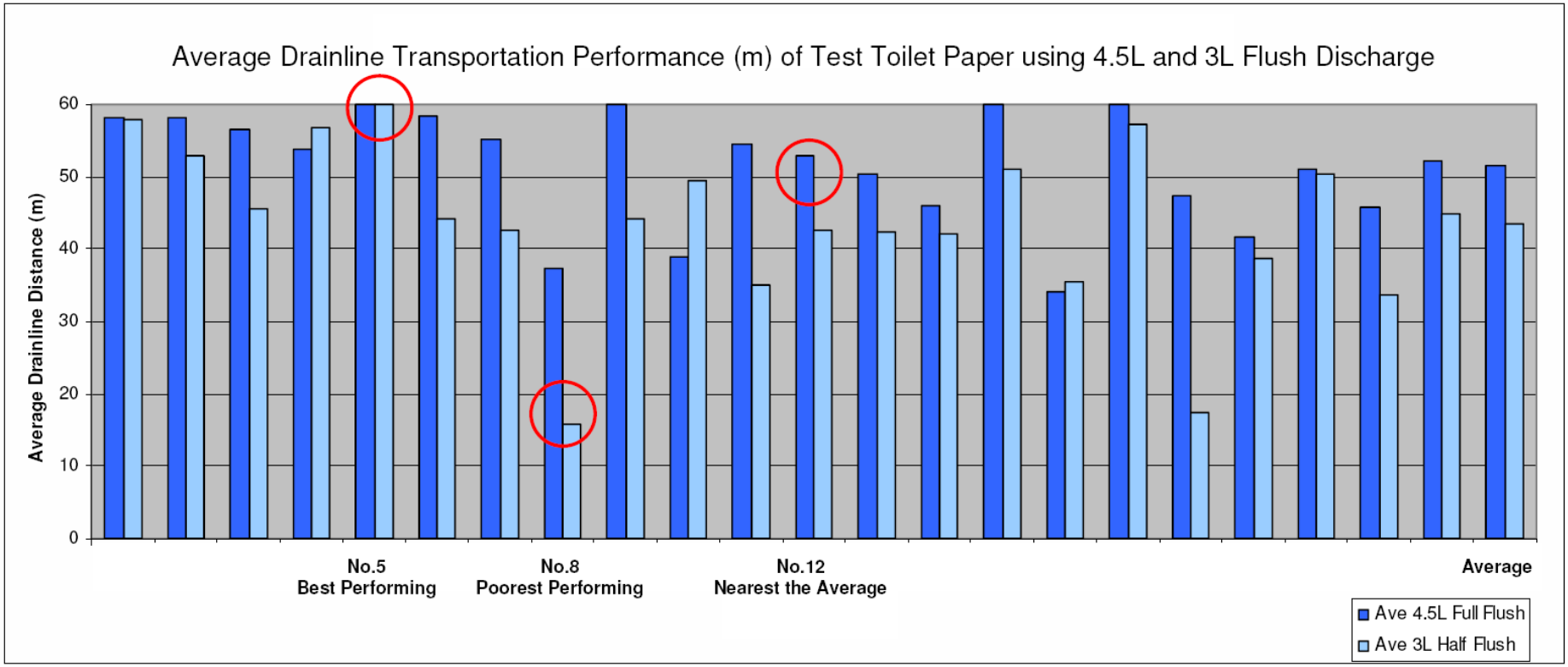

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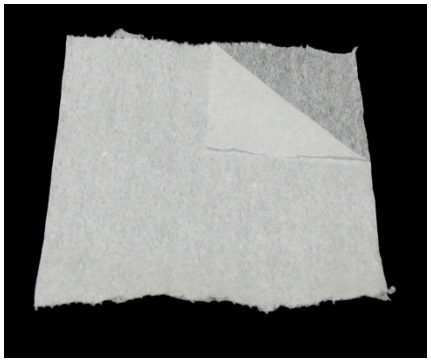
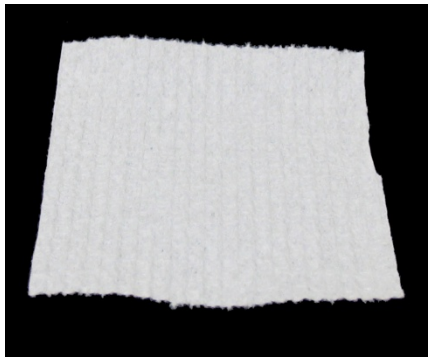
ASFlow Update

Toilet Paper Media Study – Determination of performance characteristics

No.5 Test Paper Characteristics	No.8 Test Paper Characteristics	No.12 Test Paper Characteristics
Sheet Size: 11x10cm Ply: **2** Weight (g) of 10 sheets: **3.8g**	Sheet Size: 11x10cm Ply: **1** Weight (g) of 10 sheets: **3.6g**	Sheet Size: 11x10cm Ply: **2** Weight (g) of 10 sheets: **5.1g**
		
Best Performing	**Poorest Performing**	**Nearest the Average**

Size, Ply and Weight

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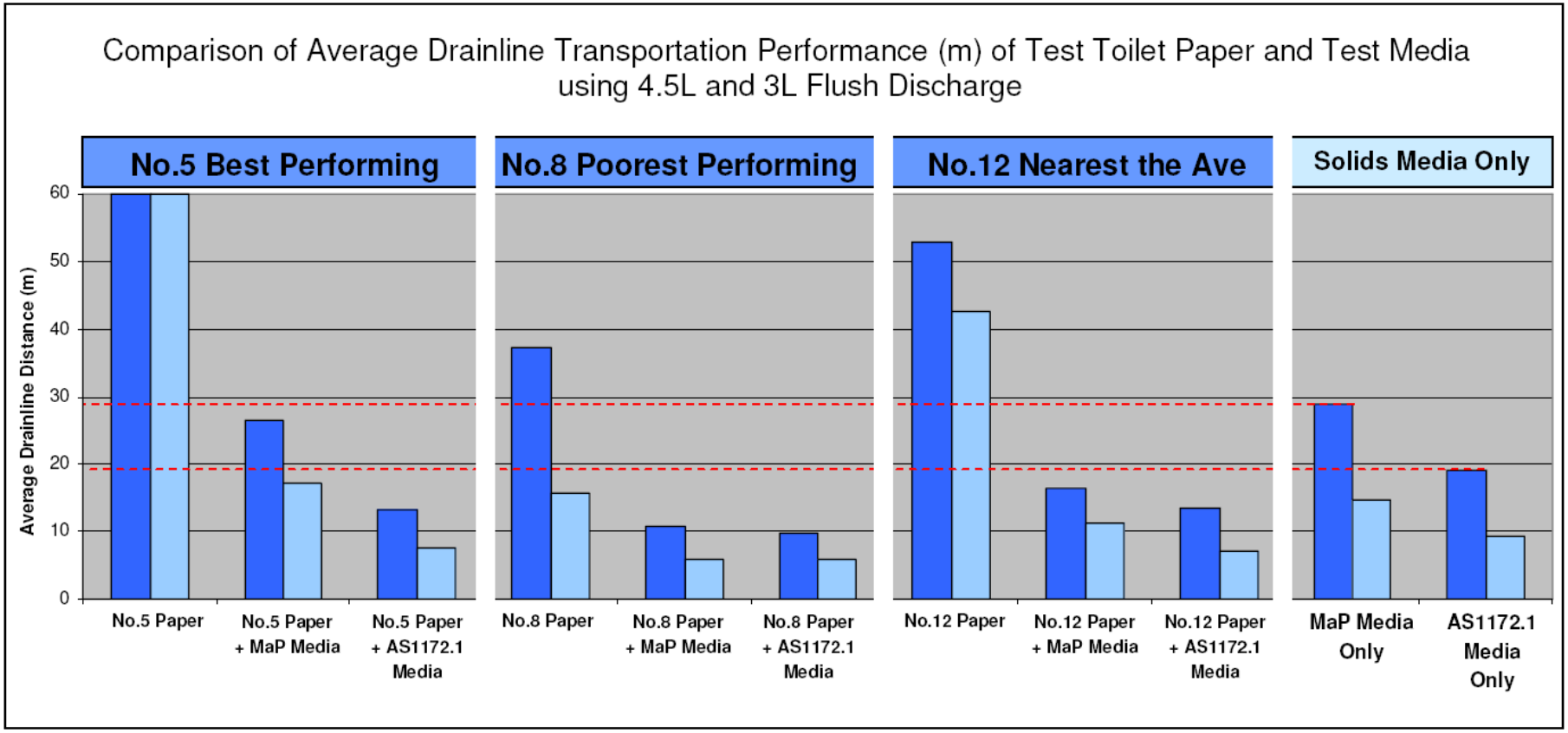
Toilet Paper Media Study – Results



Combination of solids and paper reduce drainline performance

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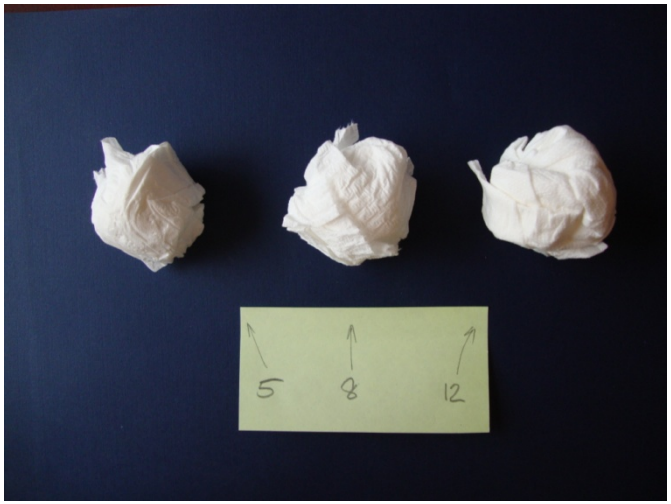
Toilet Paper Media Study – Low Cost Predictive Tests?

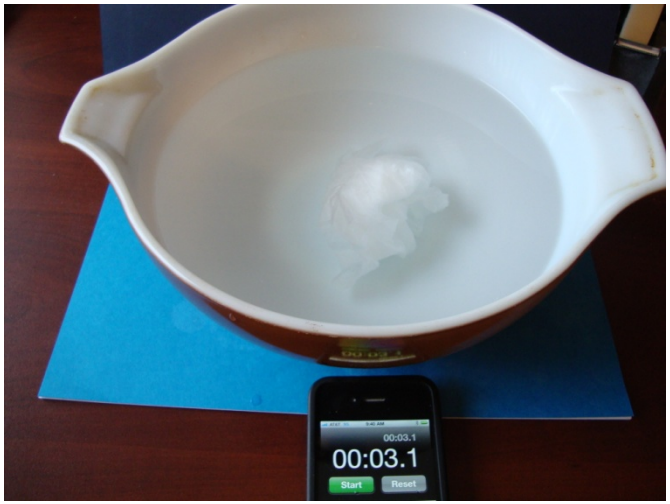
Water Absorption Test or Tensile Strength Test Correlation to Drain Line Transport Distance?

Water Absorption Test

Test samples:

6 Sheets TP Crumpled as in MaP test





Time until sample becomes saturated

Count # of washers at failure

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Toilet Paper Media Study – Low Cost Predictive Tests?

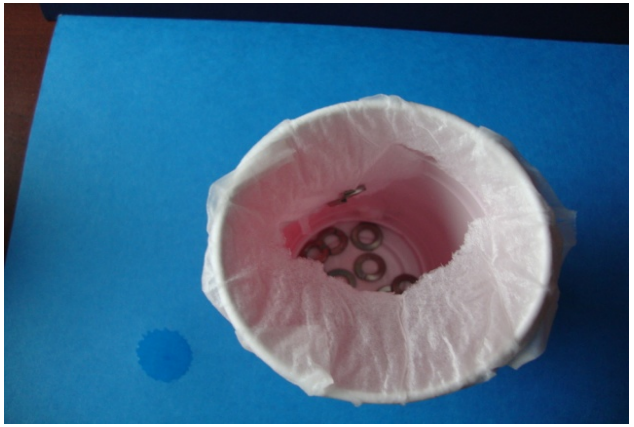
Water Absorption Test or Wet Tensile Strength Test Correlation to Drain Line Transport Distance?

Wet Tensile Strength Test

Test samples:
Plastic Cup
Rubber band
1 sheet TP

Soak for 60 seconds

Add washers 1 at a time



Count # of washers at failure

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Toilet Paper Sample #	Brand #5	Brand #8	Brand #12		Brand #5	Brand #8	Brand #12
Wet Tensile Strength (# washers)	9	39	22		11	26	22
Absorption Time (sec)	3	4	4		3	4	3
DLC w/ MaP (m)	27	11	16		27	11	16
DLC /w AS (m)	12	10	13		12	10	13
DLC w/ TP alone (m)	60	38	52		60	38	52
Correlation – Tensile Strength	**trial #1**				**trial #2**	**~ 4 seconds between adding washers**	
Wet tensile strength / DLC MaP	**-0.95823**				**-0.99875**		
Wet tensile strength / DLC AS	-0.71074				-0.43546		
Wet tensile strength / DLC alone	**-0.99685**				**-0.91335**		
Correlation – Water Absorption							
absorption time / DLC Map	-0.95222				-0.2116		
absorption time / DLC AS	-0.18898				0.755929		
absorption time / alone	-0.77771				0.155543		

Conclusion: Appears to be a very strong correlation (inverse) between DLC result w/ Map and Toilet Paper only media and Toilet Paper Tensile Strength Test

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Q & A

Questions?

THANK YOU!

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