Frank Dick, P.E.
City of Vancouver, Department of Public Works
Frank’s Reason
Claims / Disclaims

Travel
My time my dime
NACWA

Work
Off Time
City of Vancouver

Interpretations, Opinions are Mine
NACWA - WEF - APWA
International Organizations
Manufacturers
Characteristics of Wipes

Working with Manufacturers

Disintegration and the Reynolds Number

U.S. and world efforts
What We Find in Clogs
(Paper / fiber products)

- Paper: 40%
- Nonwoven wipes: 42%
- Feminine hygiene products: 18%
What Wipes are Made of and Their Properties

Cellulose / pulp fibers

Rayon or Lyocell – regenerated cellulose fibers

Typically put together using spunlace or hydroentanglement
Wet Inside Package

Water based solutions to stabilize structure / strength

Lotions and additives
Dry & Wet Strength

Tensile strength (N/m)

<table>
<thead>
<tr>
<th>Material</th>
<th>Dry</th>
<th>Wet/Moist</th>
</tr>
</thead>
<tbody>
<tr>
<td>LQ TP</td>
<td>248</td>
<td></td>
</tr>
<tr>
<td>HQ TP</td>
<td>371</td>
<td></td>
</tr>
<tr>
<td>HT</td>
<td>503</td>
<td></td>
</tr>
<tr>
<td>MTP</td>
<td>265</td>
<td>149</td>
</tr>
<tr>
<td>TW</td>
<td>494</td>
<td>212</td>
</tr>
<tr>
<td>BW</td>
<td>266</td>
<td>257</td>
</tr>
</tbody>
</table>
Disintegration & The Reynolds Number
When and Wear a Wipe Breaks Apart

Hits water – chemical / ion trigger

Toilet – mechanical forces

Flow through sewers – hydraulic/mechanical forces

Pumps – mechanical forces (too late)

Screens – mechanical forces

Never
Slosh Box – Reynold’s Number Correlation for TURBULENCE in a Pipe

\[ \text{Re} = R_h \frac{V \rho}{\mu} \]

Ratio of inertia force, and viscous (friction) force
Reynold’s Number

\[ \frac{R_h \cdot V}{\rho / \mu} \]

Hydraulic Radius  Flow Velocity  Kinematic Viscosity

< 2,100  Laminar

> 4,000  Turbulent
Re Number

20,000
8” sewer main, 0.004 slope, concrete
Velocity 2 feet per sec

12” sewer main
Re 25,000 to 75,000

42” or larger sewer interceptors
Re 100,000 to 400,000
Re Number

Sensitive to . . . .

Water Temperature
Higher temp increases Re Number

Flow Velocity
More velocity increases Re Number

Pipe Slope
More slope lowers Re Number

Pipe Type
PVC lower Re Number
Flow3D Modeling

Estimated Parameters

Mean Kinetic Energy:

\[ KE_{\text{mean}} = \frac{\sum m_i v_i^2}{M} \]

Average velocity:

\[ V_{\text{ave}} = \sqrt{KE_{\text{mean}}} \]

Reynold's Number:

\[ Re = \frac{V_{\text{ave}} \cdot d \cdot \rho}{\mu} \]
Dr. Karadagli Re Number – Slosh Box

Length = 18” = 0.46 m
Width = 12” = 0.305 m

Water depth when slosh box is not rocking = 0.75 cm per liter of water
Dr. Karadagli Re Number – Slosh Box

Representative water movement

Ω = Rocking Angle = 11°

Maximum vertical elevation during rocking = 4'' = 0.1 m
South Interceptor 1.7 fps 31 min (2,816 ft)
Dealing with Manufacturers

Costco Meeting - 2013

No Way!

Agree to improve DNF
Dealing with Manufacturers

GD4
Guidance Document
rev 4 – 2015 to 2016

# Dealing with Manufacturers

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Addresses products labeled “flushable”</td>
<td>• Addresses primarily non-flushable products</td>
</tr>
<tr>
<td>• Updating GD3 tests and criteria</td>
<td>• Product labeling</td>
</tr>
<tr>
<td>• Proposing/validating new tests</td>
<td>• Consumer education</td>
</tr>
<tr>
<td></td>
<td>• Product design</td>
</tr>
</tbody>
</table>
GD4 Focus - 2015

01 Toilet and Drainline
02 Slosh Box Disintegration
03 Household Pump
04 Settling
05 Aerobic Bio-Disintegration
06 Anaerobic Bio-Disintegration
07 Municipal Pump
How to Fold Toilet Paper

Folding of toilet tissue into an “unit dose”
## INDA GD3 vs WW Proposal

<table>
<thead>
<tr>
<th></th>
<th>GD3</th>
<th>WW Proposal</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pump Test</strong></td>
<td>Flygt 3hp pump</td>
<td>No change</td>
</tr>
<tr>
<td></td>
<td>Pre-soak 1 hour</td>
<td>Average power increase max 1% with no spike point over 5%</td>
</tr>
<tr>
<td></td>
<td>10-sec intervals; 6 min</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Average percent power increase</td>
<td></td>
</tr>
<tr>
<td></td>
<td>NTE 15%</td>
<td></td>
</tr>
<tr>
<td><strong>Slosh Box</strong></td>
<td>2L 26 RPM</td>
<td>4L 13 RPM</td>
</tr>
<tr>
<td></td>
<td>180 minutes slosh time</td>
<td>30 minutes slosh time</td>
</tr>
<tr>
<td></td>
<td>&gt; 25% of mass pass through 12.5 mm sieve</td>
<td>No pieces &gt; 1” in any direction</td>
</tr>
</tbody>
</table>
## INDA GD3 vs INDA GD4

<table>
<thead>
<tr>
<th></th>
<th>GD3</th>
<th>GD4</th>
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<tbody>
<tr>
<td><strong>Pump Test</strong></td>
<td>Average power increase NTE</td>
<td>Average power increase NTE</td>
</tr>
<tr>
<td></td>
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<td>&gt; 25% of mass pass must pass</td>
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<td></td>
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## INDA GD3 vs INDA GD4 vs WW

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<th>GD4</th>
<th>WW</th>
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<tbody>
<tr>
<td><strong>Pump Test</strong></td>
<td>15%</td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td><strong>Slosh Box</strong></td>
<td>2L 26 RPM 180 minutes</td>
<td>2L 26 RPM 60 minutes</td>
<td>4L 18 RPM 30 minutes</td>
</tr>
<tr>
<td></td>
<td>&gt; 25% of mass must pass through 12.5 mm sieve</td>
<td>&gt; 60% of mass must pass through 12.5 mm sieve</td>
<td>&gt; 95% of mass must pass through 25 mm sieve</td>
</tr>
</tbody>
</table>
Product Stewardship
Code of Practice

Reduce consumer confusion
Encourage mfr and retailer participation
Encourage proper disposal

Labeling – sizing & location
Decision Tree for Labeling (& claim of flushability)
All baby wipes to be labeled Do NOT Flush (logo) regardless of flushable
ISO TC 224 WG10
International Organization for Standardization

TC 224 – Service activities relating to drinking water supply systems and wastewater systems

WG 10 - Flushable products

Stakeholders including WW and Manufacturers

Set out to develop flushable standards . . . No consensus / ruling to cease . . . . . . Therefore . . .

Technical report
The criteria for flushability and test methods are a global consensus of the members and reflect the hydraulic, mechanical and environmental conditions of drain lines, onsite treatment systems, wastewater collection and treatment systems, and the receiving waters for treatment plant effluents.
International water industry position statement on non-flushable and ‘flushable’ labelled products

To prevent problems with sewers, pipe and toilet blockages plus the human and environmental cost of sewer flooding and pollution, the organisations signing this statement below agree that:

- Only the 3Ps – Pee, Poo and toilet Paper – should be flushed.
- Currently, all wipes and personal hygiene products should be clearly marked as “Do Not Flush” and be disposed of in the bin or trashcan.
- Wipes labelled “Flushable” based on passing a manufacturers’ trade association guidance document should be labelled “Do Not Flush” until there is a standard agreed by the water and wastewater industry.
- Manufacturers of wipes and personal hygiene products should give consumers clear and unambiguous information about appropriate disposal methods.
- Looking to the future, new innovations in materials might make things easier. If they pass a technical standard which has been agreed by the water and wastewater industry*. Preferably this standard would be from an International Standards Organisation (ISO).
- Key requirements for any standard include that the product:
  a) breaks into small pieces quickly;
  b) must not be buoyant;
  c) does not contain plastic or regenerated cellulose and only contains materials which will readily degrade in a range of natural environments.

*and in compliance with local legislative requirements

3Ps – Pee Poo TP

- Break up quickly
- Doesn’t float
- No plastics / RC
GLOBAL SUPPORTERS:
IWSFG
International Water Services Flushability Guidelines

Toilet Clearance – 3 flushes, no plunger
Drain Line Flow Clearance – 5 flushes to clear
Settling – 20 min to settle; no buoyancy
Anaerobic Biodisintegration – Absence of persistent metabolites; residue pass through 1000 um sieve

ADDED:
Fiber Analysis – no intentional plastic fibers

DID NOT INCLUDE:
Municipal Pump Test
Aerobic Biodisintegration Test
Slosh Box Disintegration

Oscillating Box – 18” x 12” x 12” 11° angle
4 Liters Water @ 15°C
18 rpm
30 minutes

95% pass through 25 mm perforated sieve
UK Ventured on Its Own – Water Industry Standards “WIS”

Water Industry Specifications / Information + Guidance Notes

Current Water Industry Specifications (WISs) and Information and Guidance Notes (IGNs) are managed by Water UK and available here.

Documents for public comment

Water Industry Specifications (WISs) are prepared by the UK water industry for the specification and purchase of products used in the industry. They generally cover products for which there is no suitable European or British standard.

Information & Guidance Notes (IGNs) are used to provide additional guidance to a WIS or provide interpretation and additional information to European or British standards. All WISs and IGNs are listed as one of the following:

- General
- Clay and concrete
- Metals
- Plastics and rubbers
UK WIS

Shaker & Flash
2.8 L Fernbach Flask / Orbital Shake Table
1 Liter 100 rpm
90 minutes

Pass through 6.3 mm perforated sieve
(2 min rinse)
Labeling & Code of Practice

On the Face of Sales Packaging:

Clear & visible statement:
“This product is not flushable and should be disposed of by alternative means”

DNF Label 2cm x 2cm
Germany is Now Embarking – Similar to U.S. Track

DWA AG ES-7.8
Störstoffe in Entwässerungssystemen
Non-sewer items in sewer systems
DANKESCHÖN - THANK YOU