Reusable v. Single-Use Wrap
Dispelling Myths

Reusables vs. Single-Use: Clinical Performance Differences & Environmental Burdens and Impacts – A Comparison of Evidenced Based Data

June 21, 2013
Goals of this presentation

- What are the clinical benefits of single-use Sterilization Wrap v. Reusable Textiles? The environmental impacts of each?
- Our customers’ needs drive the activity of Kimberly-Clark activity regarding sustainability.
- How do single-use products address sustainable concerns?
- There is a balance between delivering the best clinical performance and minimizing sustainability impacts.
Critical Traits of Quality Barrier Fabrics

- **Must:**
  - GDS: Allow sterilant to penetrate
  - GDS: Allow air to pass through
  - GD: Be ignition/fire resistant
  - GDS: Be static dissipative
  - GDS: Be low linting
  - GDS: Resist abrasion
  - GDS: Resist microbial pass through
  - GDS: Resist fluid penetration
  - G: Maintain initial temp/comfort
  - GDS: Be comfortable/drapable
  - DS: Not have excessive memory

(G: Gown) (D: Drape) (S: Sterilization Wrap)
Clinical Performance Needs – Sterilization Wrap

Barrier to Liquids/Microbes
- Hydrohead Repellency
- Bacterial Filtration Efficiency
- Resistance to Tearing

Low in Linting/Particulates
- Gelbo Lint
- Abrasion Resistance
Hydrostatic Head Test

AATCC – 127

Measures fabric resistance to water under pressure
Resistance to Linting - Gelbo

INDA Standard Test Method 160.1-92

“It is also generally accepted that the more lint that is generated in the operating room, the greater the possibility of a postoperative wound infection caused by either a microorganism transfer or by a foreign body reaction. “

— - Scheinberg et al.,

Annual Conference
September 8-10, 2013
Spunbond-Meltblown-Spunbond (SMS) 100% Polypropylene

- **Spunbond**
  - strength
  - durability

- **Meltblown**
  - Microbial capture

- **Spunbond**
  - strength
  - durability
Maintenance of Re-Usable Barrier Materials

- Reprocessing instructions from manufacturer
- Determine when properties unacceptable
- Record times reprocessed
Barrier Properties Degrade with Washing

280-Count Poly/Cotton Fabric: New

280-Count Poly/Cotton Fabric - Washed
AORN on Packaging Systems

Multiple processings eventually diminish the protective barrier of the material. A method should be established to monitor, control, and determine useful life when reprocessing woven materials.”

Burden is on the user, NOT the manufacturer

100% Woven Polyester Wrap
Study of Canadian Reusable 100% Polyester Wrap

57 Wraps, Random Selection, 90% 1-5 reprocessings, 10% > 5 reprocessings

<table>
<thead>
<tr>
<th>BFE</th>
<th>HydroHead</th>
<th>Weight</th>
<th>Grab Tensile Strength</th>
<th>Air Permeability</th>
<th>Martindale Abrasion Resistance</th>
<th>Static Dissipation (5000 volts)</th>
<th>Gelbo Lint # &gt; 10 µ</th>
<th>Trapezoidal Tear Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>70.1 %</td>
<td>21.9 cm</td>
<td>8.23 osy</td>
<td>&gt; 180 lbs</td>
<td>12.2 scfm</td>
<td>5</td>
<td>0.17 sec</td>
<td>25</td>
<td>21 lb 18</td>
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</table>

Comparable KC SMS weight Single Use Kimguard Wrap

<table>
<thead>
<tr>
<th>BFE</th>
<th>HydroHead</th>
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<th>Trapezoidal Tear Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>99.9 %</td>
<td>120.4cm</td>
<td>5.18 osy</td>
<td>86 lbs 82</td>
<td>12 scfm</td>
<td>5</td>
<td>0.19 sec</td>
<td>3</td>
<td>12 lb 16</td>
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</table>
Bacterial Filtration Efficiency – Staph Aureus

Reusable Wrap
BFE 70.1%

Kimguard One-Step KC600
BFE 99.9%
# BFE in Staph Aureus Organisms Penetrating Wrap

<table>
<thead>
<tr>
<th>% Filtration Efficiency</th>
<th># Bacteria pass through fabric</th>
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<tbody>
<tr>
<td>50.0%</td>
<td>1,100</td>
</tr>
<tr>
<td>70.0%</td>
<td>660</td>
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<tr>
<td>90.0%</td>
<td>220</td>
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<tr>
<td>95.0%</td>
<td>110</td>
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<td>97.0%</td>
<td>66</td>
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<tr>
<td>98.0%</td>
<td>44</td>
</tr>
<tr>
<td>99.0%</td>
<td>22</td>
</tr>
<tr>
<td>99.9%</td>
<td>2</td>
</tr>
</tbody>
</table>

1Number of *Staphylococcus aureus* used to challenge barrier fabrics tested per ASTM F2101.
Single Use vs. Multiple Use – Environmental Impacts
What is Life Cycle Assessment (LCA)?

Taken from Keoleian and Spitzley in *Sustainability Science and Engineering* (2006)
Similar Tradeoffs Seen For Wrap as with Surgical Gowns (McIlvain Study)

- Single-use gowns-wrap offer significant reductions in freshwater consumption
- Multi-use gowns-wrap offer reductions in on-site waste management
- Most other environmental impact categories will depend on key system variables:
  - Number of reuse cycles (Wrap 33, Gowns claim 75)
  - Single use gown weight (Heaviest Single-Use Wrap is 5.2 osy v 8.2 Reusable)
  - Sterilization and treatment process (energy use and associated emissions)
  - Chemicals used in laundry process (water pollution)
  - Heat and electricity supporting washing cycles (greenhouse gas emissions and regulated air pollutant emissions)
Environmental Burden – McIlvaine Study of Surgical Gowns and Drapes (2009)

- The Environmental burden is lower for single-use products than for reusable products.
- Reusable garments consume approximately 4.5 times as many resources as single-use garments. Laundering is a substantial environmental burden for reusable textiles due to the intensive use of water.

Freshwater Use Associated with Surgical Gowns

Average Gallons of Water Used Per Pound of Laundry Processed (gal/lb)

Total Gallons of Water Per Gown Use (gal/lb)

- 2.5 additional gallons per gown
- 10 Uses
- 50 Uses
- 100 Uses
- Single Use

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Not just more water use, but also...

The chemicals used in all this water, such as:

- Alkaline Solutions
- Detergents
- Water Conditioner
- Antichlor
- Bleach
- Enzymes
- Stain Treatment
- Bactericides

...Lead to pollutants, such as...

- Conventional Pollutants (BOD, TSS, etc.)
- Zinc
- Copper
- Lead
- Ethylbenzene
- Toluene
- Other Hydrocarbons

That are ultimately discharged to public treatment works

USEPA, Technical Development Document for Proposed Pretreatment Standards for Existing and New Sources for the Industrial Laundries Point Source Category, November 1997
Kimberly-Clark Sustainability Programs

- 58% of facilities **met goal of zero landfill** manufacturing waste. *All Kimberly-Clark Health Care manufacturing facilities have been 100% landfill-free for at least one full year.*

- **KC Sterilization Wrap** reclaims ALL trim and off-spec fabric back into the process through a repelletization system. *FDA traceability requirements (U.S.) are currently an obstacle to using post-hospital wrap back into fabric-making process, but plans being explored with the Agency.*

- 15% annual improvement in **energy efficiency**, which resulted in enough energy savings to power more than 300,000 houses for one year.

- 12% annual improvement in tissue manufacturing **water-use efficiency** — which saved enough water to flow over Niagara Falls for over three hours.

- Set a goal of 50% **reduction in wood-fiber use from natural forests** by 2025. *Exploratory programs in place with Bamboo, grass fiber – fast growing fiber sources.*
KC Sustainability Programs – Products, cont.

- 22% (approximately $4.6 billion) of the Company’s net sales derived from **environmentally innovative products**.
- 1.5 million pounds — the weight equivalent of more than 400 midsize cars — of sterile medical wraps diverted from landfills through the **BLUE RENEW* KIMGUARD* Sterilization Wrap Recycling Program**.
- Andrex, K-C Professional Kleenex and K-C Professional Scott towel and tissue products introduced with **bamboo and wheat straw fibers**.
Latest Global Study Results:
Importance of sustainability in healthcare

- **54%** of hospitals say *green attributes* are very important in their purchasing decisions
- **40%** of hospitals expect their *future RFPs* to include questions/criteria regarding green attributes of products
- **85%** of hospitals *rate being free* of heavy metals and latex, end of life solutions and energy efficiency as important attributes
- **35%** of hospitals *switched suppliers* due to additional green/sustainable product offerings.

# The Big Picture

*What it looks like – CSRhub\(^1\) ranking/interpretation*

<table>
<thead>
<tr>
<th>Localized Action</th>
<th>Undeveloped Plan</th>
<th>Established Direction</th>
<th>Super-leaders</th>
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<tbody>
<tr>
<td>n/a Medline</td>
<td>47 Stryker</td>
<td>57 Synergyhealth</td>
<td>67 Philips</td>
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<tr>
<td>n/a Mölnlycke</td>
<td>51 Zimmer</td>
<td>58 BD</td>
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<td></td>
<td>48 Cardinal Health</td>
<td>61 J&amp;J</td>
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<td></td>
<td>41 Synthes</td>
<td>64 Baxter</td>
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<td>48 Covidien</td>
<td>62 3M</td>
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<td></td>
<td>47 Boston Scientific</td>
<td>58 Siemens</td>
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1 CSRhub.com: World’s largest corporate social responsibility (CSR) and sustainability ratings and information database to compare activity that utilizes many databases to rank company performance based on GRI principles
A look to the Future—Today

Sterilization Wrap Recycling
2013 Blue ReNew Wrap Recycling Stats

- **243 hospitals currently engaged** in Blue ReNew (203 engaged in the first 6 months)
- **64 hospitals currently recycling** (June 2013) Estimated 2.45MM lbs. diverted annually.
- Once the infrastructure is in place, we **estimate 3-4 times** the number of hospitals (generally smaller ones) are recycling their own wrap through the recycler that is in place in the area.
- Estimate **10+% of all hospitals** in the US are recycling wrap – including those independent of the Blue ReNew program.
- Set up system with Turtle Island for 2 **Canadian Hospital programs** *(New York General, Chatham Kent)*
K-C Healthcare Commitment: Infection Prevention

- Fabric Technology
- Manufacturing Practices
- Product Innovation
- Customized Programs

Infection Prevention
A Delicate Balance

Protecting Healthcare Workers and Patients

- Protecting the Environment
What is Sustainability 2015?

PEOPLE
- Zero workplace fatalities
- Socially focused programs in all K-C communities
- 100% compliance to K-C social standards

PLANET
- 25% reduction in water use + maintain quality of discharge
- 100% fiber from certified suppliers
- 5% absolute reduction in GHG
- Zero manufacturing waste to landfill

PRODUCTS
- 250 million new consumers touched
- 25% of 2015 net sales from environmentally innovative products
- 20% reduction in packaging environmental impact