



WELCOME! ARTA's 2nd Speaker Series will begin in just a few minutes.

“Reusable and Disposable Healthcare Incontinence Pad Textiles –
Comparative Analysis and Life Cycle Assessment”

By Michael Overcash, PhD
Environmental Clarity

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Reusable and Disposable Healthcare Incontinence Pad Textiles – Comparative Analysis and Life Cycle Assessment

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American Reusable Textiles Association

Speaker Series

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Background

The dialogue regarding single-use versus reusable textile products includes the following major factors:

- Cost
- Environmental sustainability
- Risk

The first two factors are widely accepted as the benefit of reusable technology.

The third factor is perceptual and is used to suggest substantial risk when decisions are made to adopt reusables.

Now results on risk are available and find no significant risk with reusables.

50-Year Analysis of Reusable HCT Safety for HAI

- Published record of HAI incidences attributed to aspect of reusable laundry systems
- 1970 – 2020 – U.S. and UK
- 69 patients
- Multiplied by 100 to account for underreporting = 6,900 HAI patients

- Over 50 years this is 0.37 HAI cases per day attributed to reusables
- The average annual HAI rate in 2019 for U.S plus UK = about 1.4 million total = 3,800 HAI cases per day
- Risk of HAI reusable causation (conservative) is then 1 in 10,300
- Risk of person in UK and U.S. of being hit by a meteor in their life is 1 in 9,000
- Recent study with doctors and nurses of HAI factors for gowns showed disposables as 5-fold greater attributed adverse impact

Overview

- Life cycle analysis and a new economic assessment of annual health care costs are the important tools that provide substantial data on these reusable benefits versus equivalent disposable alternatives.
- Next generation life cycle tools we are using also provide technology details, transparency, and factors that can lead to improvement.
- A new study of the incontinence underpads has been completed

One Reusable Gown Replaces 57 Disposable Gowns

Disposable Gowns



Reusable Gown

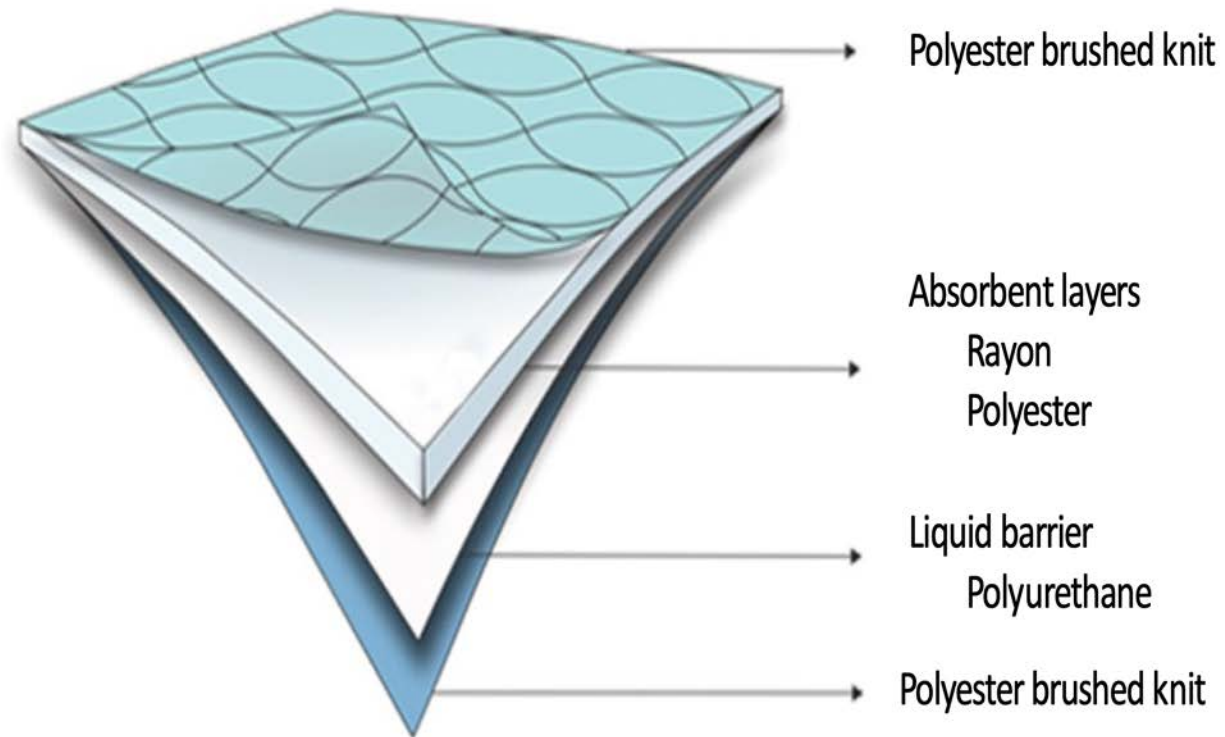


Because The Future Is Not Disposable

2021 Completed Environmental Assessments

1. Surgical gowns
2. Isolation gowns
3. Surgical drapes
4. Incontinence underpads
5. On the horizon, environmental services microfiber wipes and mops.
6. 20 complete life cycle analysis of reusable versus disposable products, not only in healthcare.

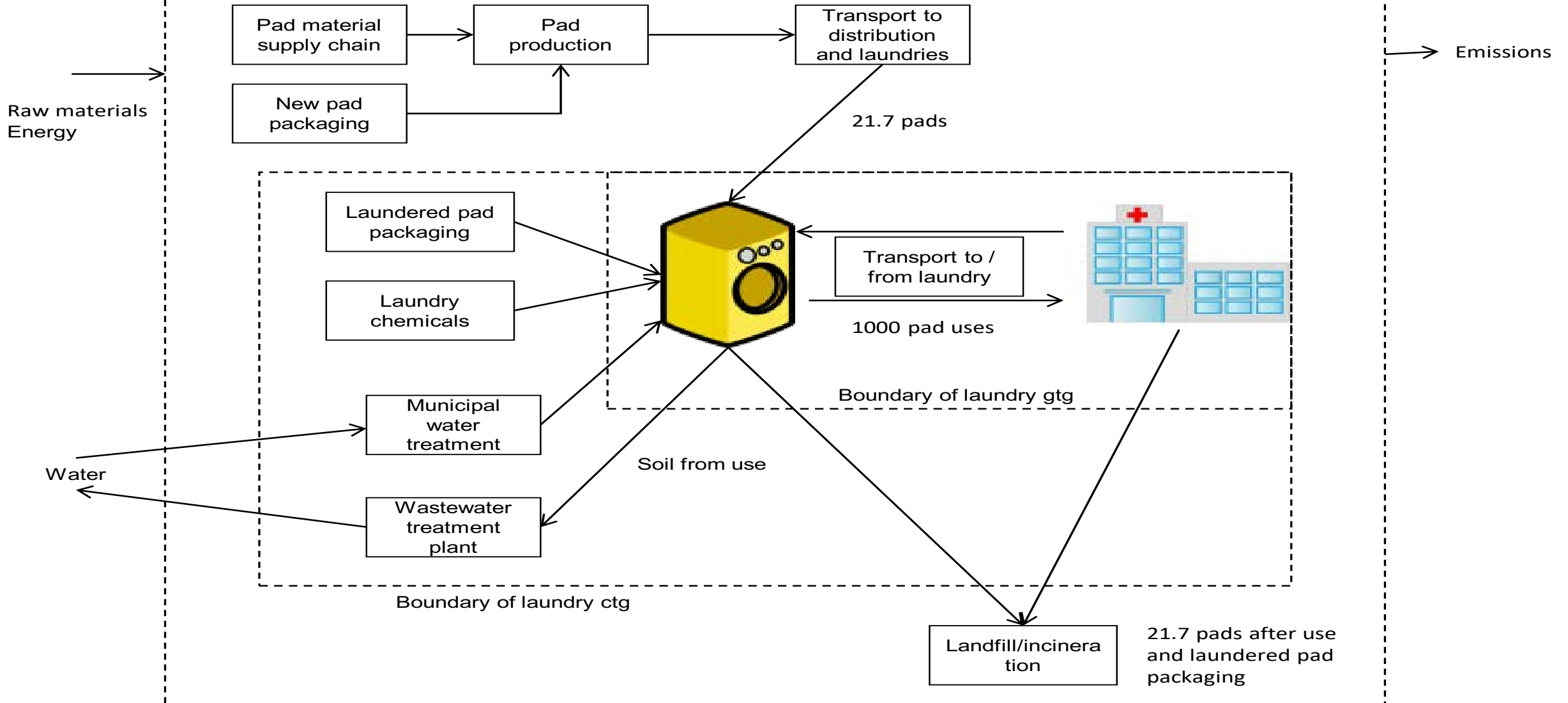
General Incontinence Underpad Structure



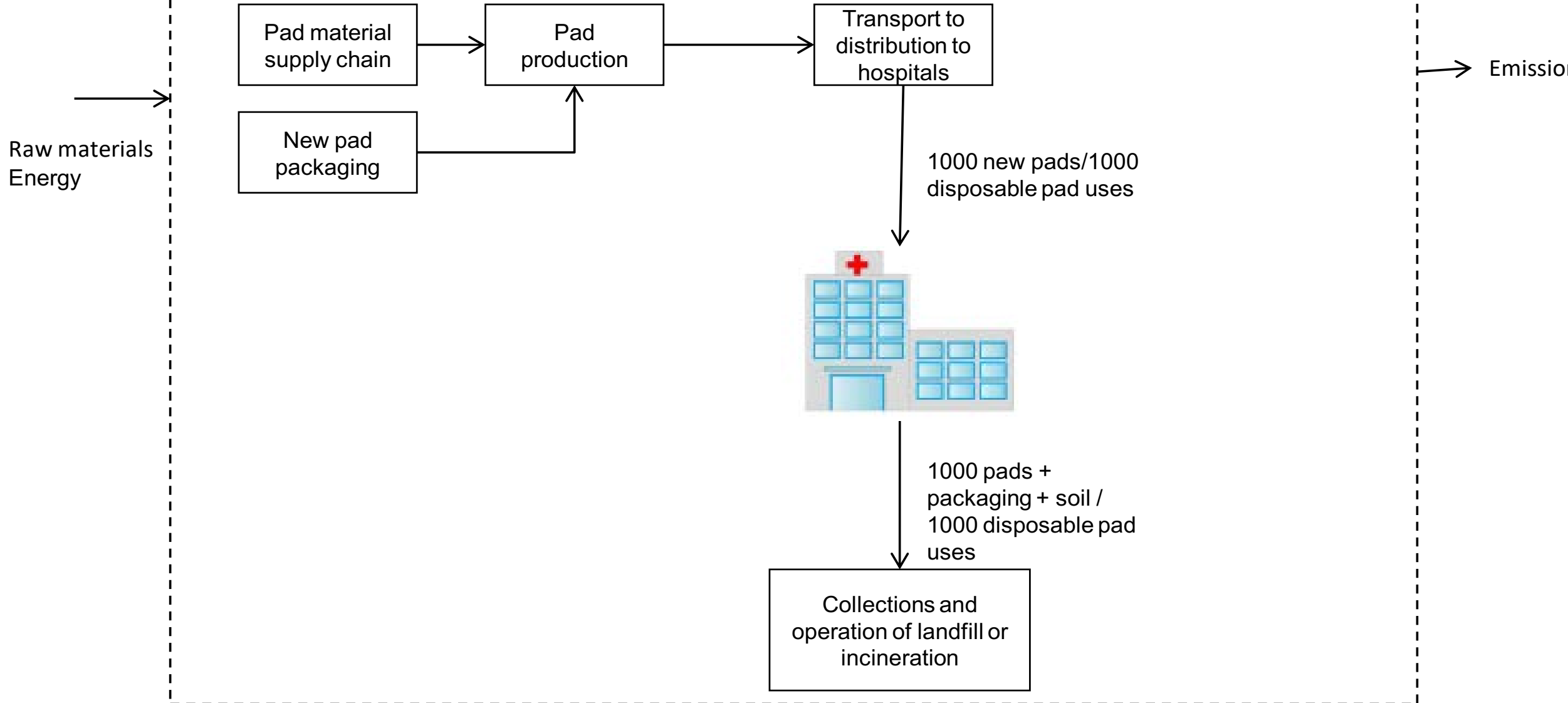
Reusable underpad layer	Material	Total mass of single PU barrier reusable pad, g	Total mass of single PVC barrier reusable pad, g
Top patient layer	Polyethylene terephthalate ester (PET) fiber, knitted construction, brushed surface.	64	64
Absorbent layer	Absorbent mixture 25 wt% rayon : 75 wt% PET fiber	184	184
Impermeable layer option 1	Polyurethane	139	
Impermeable layer option 2	PVC		122
Bottom layer, air permeable	PET, knit	64	47
Total reusable pad		451	417

Disposable Underpad Layer	Material	Total mass of single disposable pad, g
Top patient layer	Nonwoven polypropylene (PP)	16.2
Absorbent layer	Absorbent mixture 30 wt% super absorbent polymer (sodium polyacrylate): 70 wt% cellulose	75.4
Impermeable layer	Polyethylene film	9.3
Bottom layer, air permeable	Nonwoven polypropylene	43.1
Total Disposable Pad		144

Boundary for reusable incontinence pads



Boundary for disposable incontinence pads



Supply Chain

The environmental benefits of reusable healthcare textiles are derived from the supply chains needed to manufacture and launder/sterilize these products.

- Full product – where much of the environmental benefits are generated (known as cradle-to-product).
- Full life cycle – extends analysis to the use of products and end-of-life outcome (known as cradle-to-end-of-life).

Environment and economic results can track each other, but not always

Underlying Supply Chain

Supply chain for acetonitrile from natural resources in the earth (salmon-colored cells, 6,781 kg) to make 1,000 kg of acetonitrile, numeric values are mass flows in kg.

Common solvent and constituent in acrylics.

Cradle to gate chemical tree for acetonitrile							
Key	Natural resources	Unallocated	Allocated				
Level 1	Level 2	Level 3	Level 4	Level 5	Level 6		
acetonitrile 1,000	crude acetonitrile 1,145	Ammonia 458	Natural gas 94.3	blue water 30.5			
				Natural gas (unprocessed) 96.2			
			nitrogen from air 176	Air (untreated) 176			
				oxygen from air 78.1	Air (untreated) 78.1		
			Water for rxn 122		Water (untreated) 122		
			oxygen from air 1,852	Air (untreated) 1,852			
			Propylene 1,100	Naphtha 1,122	blue water 3,145		
					oil (in ground) 1,136		
			Sulfuric acid 133	Sulfur trioxide 108	oxygen from air 67.3	Air (untreated) 67.3	
						Sulfur 46.7	oil (in ground) 48.1
		Water for rxn 4.08				Water (untreated) 4.08	
		Water for rxn 27.1			Water (untreated) 27.1		

Reusable pad data from laundries [a Adjusted patient day]

Supplier	Turns/pad	Turns/pad at end of life	pads/APD ^a	Notes
1	55	100	no data	
2	34	63	0.8	10,000 beds
3	94	94	0.4	842 beds
4	70	70	0.8	22,000 beds
5	45	no data	no data	
6	52	no data	no data	
7	38	no data	no data	
8	36	64	no data	120 facilities
9	30.7		0.8	4,400 beds
10	31	56	no data	
11	26.5		0.385	3,300 beds
12	35	no data	no data	
13	no data	no data	0.5	248 facilities
Average	45.6	74.5	0.69	
Median	37.0	67.0	0.65	
Standard deviation	19.7	18.1	0.33	
standard error of mean	5.7	7.4	0.12	

Anecdotal observations that disposables are used more per patient than reusables

Incontinence Underpad Usage

Reusables

Facility	pads/APD	pads/APD range	notes
1	0.8	no data	10,000 beds
2	0.4	no data	842 beds
3	0.79	no data	22,000 beds
4	0.47	no data	no data
5	1.36	no data	120 facilities
6	0.8	0.1 to 1.5	9 facilities 2 yrs
7	0.385	0.15 to 0.66	6 facilities 2 yrs
8	0.5	0.1 to 2.4	248 facilities
Average	0.69		
Median	0.65		
Standard deviation	0.33		

Disposables

Facility	Pads purchased	Patient days	Pads/patient day	APD estimate	Pads / APD estimate
1	1,785,000	612,035	2.92	1,089,422	1.64
2	1,090,110	423,433	2.57	753,711	1.45
3	434,980	118,171	3.68	210,344	2.07
4	432,810	64,165	6.75	114,214	3.79
5	367,710	375,268	0.97	667,977	0.54
6	322,350	108,874	2.96	193,796	1.66
7	498,540	272,413	1.83	484,895	1.03
8	423,500	221,139	1.92	393,627	1.08
9	399,710	32,226	12.40	57,362	6.97
10	298,480	93,784	3.18	166,936	1.79
Total	6,053,190	2,321,508	2.61	4,132,284	1.46

Now have quantitative estimate that the disposables are used 2.12 times more frequently than reusables

Another Interesting Usage Observation

Unsoiled pads	75%	of all pads returned	1736	pads
Urine wet pads	20%	of all pads returned	463	pads
Feces soiled	5%	of all pads returned	116	pads

Environmental Comparison
of Reusable Versus Disposable
Incontinence Underpads

	Reusable (1000 uses)	Disposable (2120 pads)	Savings (Disposable – Reusable)	Savings, % of dispos-ables
Fossil resources combusted, NREc, MJ (%)	5,094	10,597	5,503	52%
Fossil resources extracted, NREt, MJ (%)	5,551	19,128	13,577	71%
Blue water, kg blue water (%)	753	1,728	975	56%
GWP, kg CO2eq (%)	337	873	536	61%
Solid waste, kg (%)	10.5	345	335	97%

Path Forward

- Peer reviewed journal publication of the environmental assessment provides external review and scientific validation.
- Collection of economic comparison data (reusables versus disposables), documenting anecdotal observations of lower annual reusable costs.
- Publication of environmental and economic comparison
 - Hospital and laundry level
 - Current national level
 - shift to greater sustainability in healthcare (100% reusables)

New Economic Analysis Tool

- Strengthens decisions of Healthcare Value Analysis Professionals in adopting reusables by quantify annual savings
- Built on direct economic proposals (long term contracts) from laundries to supply reusables in place of disposables
- Documenting the % annual costs savings [disposable cost – reusable cost]/disposable cost
- Implemented for cleanroom packages (boots, coveralls, hoods, and frocks) across all four U.S. regions

	cleanroom packages per year	customer region of U.S.	Approximate number of years for bid contract for reusables	Cost Reduction, (disposable cost - reusable cost per year)/ disposable cost per year, %	Region number		
Case # 1	234,000	Northeast	4	64	4	Region	% by region
Case # 2	83,200	West	3	23	1	West	17
Case # 3	52,000	Southeast	5	48	3	Midwest	9
Case # 4	32,240	Southeast	8	33	3	Southeast	26
Case # 5	26,000	Northeast	4	30	4	Northeast	26
Case # 6	18,720	East	3	35	4	not reported	22
Case # 7	11,440	West	8	55	1		
Case # 8	10,400			59			
Case # 9	9,100	Southeast	5	53	1		
Case # 10	7,800			66			
Case # 11	7,280	Southeast	5	29	3		
Case # 12	7,280	Southeast	4	53	3		
Case # 13	7,000	Southeast		53	3		
Case # 14	6,500	Southeast	5	32	3		
Case # 15	5,200	Northeast		50	4		
Case # 16	5,200	Northeast	4	60	4		
Case # 17	4,990	Southeast		53	3		
Case # 18	4,160	Midwest	8	47	2		
Case # 19	3,900	Midwest	3	67	2		
Case # 20	3,900	Southeast	4	57	3		
Case # 21	3,120	East	5	38	4		
Case # 22	2,600	West	5	33	1		
Case # 23	1,248	Southeast		53			
Case # 24	0	Northeast	3	50	4		
Case # 25	0			38			
Total Average	21,891		average savings, %	47			
			standard deviation	12			

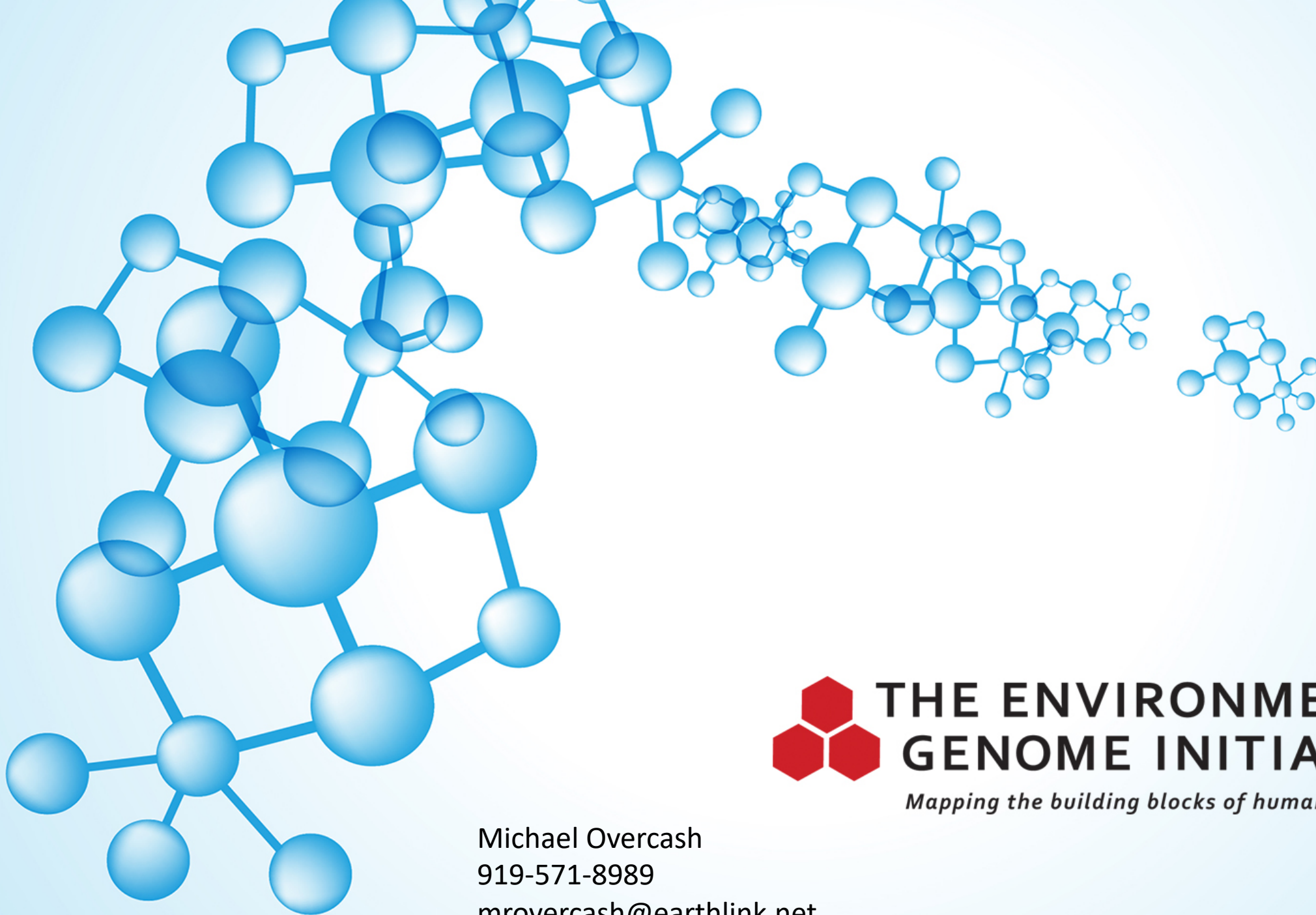
ARTA — Science-based Assessment of the Environmental and Economic Benefits of Reusables

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Conclusions

- Evidence continues to grow that selecting reusable healthcare textiles contributes to the sustainability scorecard for healthcare organizations and suppliers as reduced carbon and water footprints, solid waste, and energy use.
- The scientific quantification of laundry-related causation of healthcare-acquired infections (HAI) shows convincingly that the risk is not consequential. With the Covid-19 shift to reusables, this evidence will reinforce the safety of these decisions, short and long term.
- A series of nine ARTA peer-reviewed scientific studies represent the ARTA -Science-based Assessment of the Environmental and Economic Benefits of Reusables
- The next major environmental study will be for healthcare microfiber cleaning towels and mops.
- The next economic studies will include surgical gowns, isolation gowns, incontinence pads, and microfiber environmental services products (mops and towels).



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THE ENVIRONMENTAL GENOME INITIATIVE

Mapping the building blocks of human creativity

Case Study: Conversion to Reusable Underpads at 300-bed Medical Center in Urban Southwest



Conversion case study

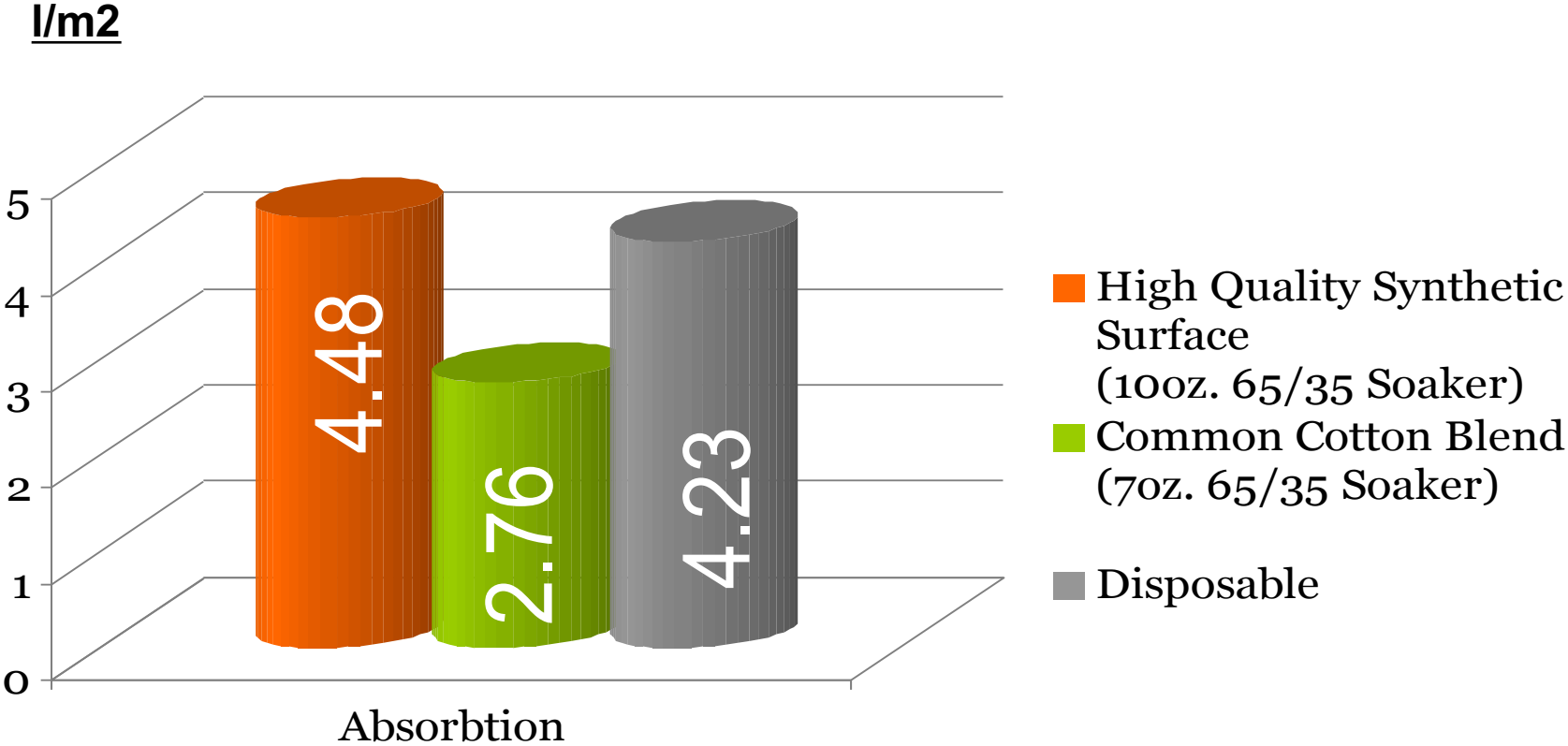
- How a commercial laundry helped a customer “see the light” and embrace reusables.
- 300-bed medical center in the urban Southwest
- Rental
- 1.375M pounds



The Pitch — September

- Contract administrator was looking for savings and ways to reduce HAIs. Open to ideas from the commercial laundry
- After estimating nearly \$500K in annual savings, Crothall brought quote to CNO
- CNO was familiar with reusables and committed to making the change

Absorption comparisons



Cost and environmental concerns

Disposable Underpads

- **Increase medical waste costs.** Using disposable pads can add up to 27 tons of refuse annually for a typical 300-bed hospital
- Have generally **higher inventory costs** due to stocking requirements
- Are **packaged in multiples**; partially used packages are thrown out or sent home
- Have a ***low perceived value*** which encourages using multiples per patient and also multipurpose uses for cleaning, placemats, bibs, bath mats, etc.
- **Require an additional positioning device** based on AHRQ guidelines

Environmental concerns may resonate more based on geography.

The roll-out — December

- **Tuesday** - Presented to clinical educators who were tasked with in-servicing staff
- Discontinued ordering/distributing super absorbent high-tech disposable to supply carts, although smaller “chux” maintained
- **Friday** - Product delivered to hospital by commercial laundry and distributed to units on hospital linen carts.

Challenges

- Initial negative feedback regarding poor absorption revealed that the reusable product samples had not been washed prior to delivery.
- Staff confused about how long to leave reusable pad in place, due to its large-volume fluid capacity, leading to poor patient care.
- Instinct was to throw reusable pad away if particularly nasty due to infection concerns.
- Some staff putting it the reusable wrong-side down despite labeling!

The fix

- Brought in product specialist to do intensive in-service effort and dispel misconceptions.
- Followed up routinely over the next few weeks to make sure all issues were addressed.
- A spike in *C-diff* was revealed through linen sample testing by laundry to have NO relationship to product.

Lessons learned – October

- It's not always easy and it's often not pretty.
- Get nursing involved sooner rather than later.
- Make sure samples are washed first!
- Bring in product specialists to immediately address any clinical issues.
- Plan on spending some time following up with staff.
- The ROI is worth the headache.

Other documented case studies

Super absorbent disposables drive costs up!

- **514-bed hospital in Florida**
 - Used an average of 11,430 standard reusable pads/month at an average cost of \$5,850. After converting to the new technology disposables, usage was 25,550 pads/month at a cost of \$24,800.
- **Hospital system in the Northeast (4 facilities) averaging 242 beds**
 - Experienced a 220% increase in draw sheet usage at an average additional cost of \$11,600/hospital.
- **300-bed hospital in Texas**
 - Experienced a 76% increase in underpad usage and a 22% increase in fitted sheets after converting to the new technology disposables.

Clinical testimonial

After we brought the XXX Pad into the facility, our hospital acquired pressure ulcer rate fell to less than 0.5%.

The XXX Pad has all but eliminated perineal dermatitis in our facility. Because of the connection with incontinence and pressure ulcers, it has proven itself as a superior product in assisting healthcare professionals provide quality skin care.”

— Rhonda Antonetti, RN,MSN,CWON

WOCN Department Roper Hospital

Cost savings example

	Reusable	Disposable
Initial purchase price	7.00	1.50
Waste disposal cost	0	0.02
Estimated number of uses	100	1
Total fixed costs	0.07	1.52
Can capture other potential costs here		
i.e. storage and distribution		
Cost of laundering	0.45	0
Total per use cost	0.52	1.52

Thank you!

Questions?

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COMING SOON! ARTA's next Speaker Series is set for Wednesday, Dec. 8.

How Practice Greenhealth's 1,300 Member Hospitals Position Reusable Textiles

Practice Greenhealth is a member organization of 1,300 hospitals in the United States. Learn how these hospitals are positioning reusables in a pandemic and with respect to infection control.

By Julie Moyle

Director of Practice Greenhealth's Greening the OR.