



White Paper

Healthcare Textile Life, Loss and Replacement

FOREWORD

TRSA has conducted Executive Roundtables with representatives of textile services operations to identify opportunities to better meet customers' needs for clean textile products and related services. One such opportunity: improve launderers' return from their inventory investment by curtailing textile losses. The Roundtables agreed that theft, and deliberate or inadvertent abuse of textile products, are the major causes of their premature removal from service, which raises both laundry and user facility costs.

Participants concluded that TRSA could take the following steps to mitigate roadblocks related to optimizing textile inventory investment:

- Educate end users about how the industry measures and maximizes textile life
- Enhance information-sharing among launderers on best practices to maximize linen life

This white paper is the first public communication vehicle created to achieve these. As more data is collected and opinions sought, this document will be revised and outreach will be ongoing. Compiled from various TRSA research projects in recent years and other industry sources, data and practices described here include:

- Leading causes of premature removal of textile inventory from service
- How launderers measure such loss
- Impacts of losses on costs

While inspired by the F&B/Hospitality sectors, data and practices included here apply to textiles deployed in the healthcare and industrial sectors as well. A healthcare-sector-specific table is included at the end of this report, including typical textile servings of common items used in inpatient and outpatient settings.

OVERVIEW

With merchandise expenditures making up as much as 25% of textile services' total annual expenditures, launderers have a huge incentive to closely manage inventory and pinpoint textile loss and abuse. TRSA has supported these efforts by facilitating calculation of industry averages for servings of textile products, enabling laundries to benchmark with the norm in their markets.

Such comparison helps textile services forecast inventory costs, budget their annual textile merchandise needs, schedule insertions, and determine which textile items have reduced life so they can concentrate management efforts on these goods and educate users to prevent abuse. Adjusting for loss/abuse and insertions (due to growth) helps refine expected servings for each textile item and provides a more accurate picture of what's taking place with total merchandise inventory and cost.

Textile services operators consistently and accurately tabulate their insertions and servings by item to unveil developing problems with an item, which allows management to quickly respond. Data on losses continues to improve as companies' databases grow and their results become more consistent over time.

BEST PRACTICES TO MANAGE TEXTILE ASSETS

Collecting and managing loss data has become fundamental to textile asset management. The following section details the language of textile inventory management and common practices required.

Key Metrics

Laundries keep close tabs on the following statistics as important indicators of merchandise consumption:

1. **Pounds—Total Clean Pounds of Laundry Delivered**

Proper accounting of the total usable pounds

of laundry delivered is critical to determining measurable cost and comparing alternatives.

2. **Rewash/Rejects—Percentage of Work Rejected in the Laundry Process**

Controlling the amount of product rejected for quality in the laundry process and managing the reclamation of the same is an important element of textile asset management.

3. **Ragout—Percentage of Product Removed from Service**

When an item is rejected after it is rewashed or otherwise deemed unworthy of remaining in service, it is removed as "ragout." It may have completed its normal useful life (survived anticipated number of servings). If not, its premature demise is often attributed to misuse by end users, trouble with laundry chemistry, production equipment or textile construction.

4. **Replacement Cost—Total Cost Per Pound of Textile Purchases**

Tracking the cost of textiles based on consumption (pounds) provides the ability to measure the textile's life cycle cost most effectively.

5. **Par Levels—Textile Inventory in Circulation**

Maintaining sufficient in-circulating inventory of textiles for efficient laundry operations and services.

Techniques

The use of inventory management systems and calibrated scales for the receiving and shipping of laundry is critical to the accurate tracking of pounds of laundry. Textile services operators use these tactics and measures, among others, to accurately account for inventory:

1. Empty cart (tare) weights. When weighing a cart to determine how many pounds of items have been returned by an end user to the laundry, the cart's weight is subtracted from the total to indicate only the goods' weight.
2. Cost per pound. Calculated for every textile product served to budget for ongoing replacement.

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3. Inventory tracking systems such as radio frequency (RF) ID and barcoding are effective alternatives for many applications including uniforms and linens. Uniquely serializing (tagging with an RF chip) items can provide insight into usage, loss, required par levels, inventory, turnover, hoarding and more. RFID specifically provides for complete counting of tagged inventory with little to no additional labor. Diligence is needed to avoid commingling of chipped and non-chipped items. When both are contained in a bag, for example, which is scanned to determine its contents, the antenna finds only the chipped items, possibly creating the misconception the non-chipped items are missing.
4. Used wash test pieces enable monitoring of tensile strength loss.
5. New textiles are tested to assure reasonable durability for commercial laundering.
6. Ragout is subtracted from the total of all unreturned pieces to determine what is missing.

Adequate and accurate recordkeeping is the first step toward getting control of linen replacement costs.

FACTORS THAT IMPACT TEXTILE LIFE CYCLE AND COST

Incidental Loss, Theft and Abuse

Textiles are at risk of theft while at the laundry, in transportation to the use areas and while in use. In addition to outright theft of product from unsecured areas, it may be removed from service as rags to be illicitly resold or removed as trash and reclaimed downstream as part of an organized theft.

In hospitals and other institutions, laundry chutes can cause textile damage in the following ways:

- Chutes with unrepaired metal tears and fatigue cause mechanical damage to textiles.
- Typically, there's no consideration given to provide access to laundry chutes from inspection and repair, often making repairs to damaged chutes very difficult and in some cases impossible.
- Chutes allowed to accumulate soiled textiles in some cases back up the chute to the highest floors of the building. When this happens, thousands of pounds of pressure are realized at the bottom of the chutes.
- Many floors of soiled textiles in the chute create significant weight at the bottom of the chute. When product is pulled from the chute under such conditions, it typically may result in tearing the textiles.
- Cement floors—"disaster" occurs when wet textiles fall directly on the floor, creating conditions that make it extremely difficult to remove the cement stains.

Chemical Damage in End-User Locations

Many disinfectants, cleaners and medications contain alkalis, acids, bleaches or other chemicals that can damage fabric and cause it to deteriorate. Damage begins when these chemicals come in contact with textile products through improper handling practices, such as:

1. Using soiled textiles to wipe up spilled cleaners and disinfectants.
2. Resting containers of cleaners and disinfectants on textiles.
3. Accidentally spilling cleaning solutions on textiles, or dropping them into cleaning solutions.
4. Placing cleaning rags together with soiled textiles.
5. Storing cleaning and disinfecting materials with textiles.
6. Using as drop cloths.

Hospitals, clinics and doctor's offices handle many potential harmful substances that can have an adverse effect on fabrics, including corrosives, disinfectants and astringents. These chemicals can damage almost any fabric, regardless of its condition or age. The following table lists several substances that can negatively impact textiles.

Corrosives	Disinfectants and Antiseptics	Astringents
Nitric Acid	Bichloride of Mercury	Tannic Acid
Silver Nitrate	Hydrogen Peroxide	Iron Chlorides (Ingredient of Throat Gargles)
Chromic Acid	Potassium Permanganate	Zinc Sulphate (Ingredient of Certain Ointments)
Phenol (Carbolic Acid)	Silver Nitrate (Ingredient of Argyrols)	Zinc Oxide (Ingredient of Certain Ointments)
Trichloroacetic Acid	Cresol (Lysol)	Alum (Chief Ingredient of Styptic Pencils)
Iodine	Hypochlorites (Dakin's Solution and Zonite)	Zinc Chloride (Component of Certain Deodorants)
Tannic Acid	Picric Acid (Preparation for Burns)	Aluminum Chloride (Chief Component of Deodorants)
Tincture of Ferric Chloride	Mercurochrome	
Alum		

To prevent chemical damage to textiles, textile product users must recognize potential for damage from chemical compounds and take these precautions:

1. Label all chemical substances.
2. Store clean textiles in separate containers or areas, away from cleaning compounds.
3. Store chemical substances in tightly closed containers and prevent or minimize the escape of fumes or powders during use.
4. Keep wiping cloths in separate containers, away from textiles. Rags can be dyed a different color to prevent misuse; wipers sent to the laundry should be kept in separate bags.

Observed End-User Inventory Practices

We have seen that reducing par levels to a low level reduces the life cycle of textiles. The resulting unintended consequence of lowering the inventory isn't usually recognized for what it is, e.g. increased operational hours due to interruptions to cover shortages, increased housekeeping, labor, etc. The "bottom line" is higher operational costs.

Also, linens that are circulated at hospitals with on-premise laundries may still be warm from processing

when placed into service. Under these circumstances, cotton fibers are more vulnerable to damage.

Maintaining an adequate inventory of textiles in circulation achieves a lower cost of replacement, in part due to textiles having an opportunity to recover from the laundering process prior to being injected into service.

POSITIVE IMPACT OF PROFESSIONAL LAUNDERING

Malfunctioning equipment and abuse of chemicals are rare in professionally managed laundries. Textile services professionals recognize that abuse of chemistry, mechanical action and excessive temperature can surpass all other loss issues quickly, if allowed to go uncorrected. Thus, continuous monitoring of wash formulas to ensure textile quality is the industry norm.

Launderers also recognize the importance of machinery maintenance and repair to prolonging textile life, wary of how washing machine doors or any rough spots in a washer cylinder can snag and tear textiles. Transports and carts are kept free of protruding nails or sharp edges to reduce snagging. All washing and finishing machinery is kept clean, so that oil and grease stains don't increase ragout counts.

Textiles exhibit some long-term effects of chemistry, mechanical action, drying and flatwork finishing during their lifetime—but it often takes hundreds of washings for these to become visible.

Professionally managed laundry facilities interviewed for this report indicated the value of improving laundry processes to extend textile life. One central laundry calculated savings of up to 20% in textile replacement due to improved chemistry and formulations in the wash and other process improvements, citing alternative wash formulas; proper calibration, maintenance and operations of dryers; and increased efforts to reclaim textiles that had been rejected for quality.

Preventing Tensile Strength Loss

Tensile strength is the ability of a fabric to resist tearing and breaking. All fabrics lose tensile strength over time, but excessive tensile strength loss (TSL) is costly. The higher the TSL, the less resistant the fabric is to tearing, and the shorter its useful life. This leads to frequent replacements and high costs.

Bleach can be the most damaging of all the chemicals that laundries use. For this reason, laundries control the release of bleach during the bleach bath to prevent high TSL. The pH level must not get too low and the temperature must not get too high, or the bleach will be released too quickly and start to attack the fabric. Using too strong a bleach or too much bleach will have the same effect. Residual bleach, if left on the fabric, leads to high TSL.

Another factor that leads to high TSL is excessive mechanical action—this causes fibers to be pulled from the yarns. Excessive mechanical action can be caused by underloading, protracted processing, too much time between filling and draining, and not using enough water. Also, a combination of high alkaline builders and very high temperatures can lead to high TSL. Proper use of

alkaline builders shouldn't affect the tensile strength of linens.

Reducing hot water temperature without adjusting the washing procedure to the lower temperature can cause excessive tensile strength loss due to the nondecomposition of chlorine bleach.

Overdried cotton fabric can have less than half the strength as fabric that has been brought to room temperature and humidity.

Calculating Annual Replacement Costs

With so many factors potentially affecting a laundry's textile replacement costs from year to year, textile services operators are incentivized to be aware of them all and maintain consistent practices for processing and handling textiles. Annual replacement costs still can go up and/or down, but over time, the highs and lows average out. Factors that lead to variation include:

1. How often accounts are served—the longer the period between service calls, the greater the chances a customer may abuse, wash and lose items.
2. How counts are made—pieces actually served versus pieces processed.
3. Accounting for lost, stolen and abused items.
4. Accounting for items dyed, downgraded and served as other items.
5. The quality of items purchased (the higher the quality, the longer the life).
6. Increases and decreases in the laundry's customer base.
7. Textile life related to wash formulas and type of equipment used to wash and dry items.
8. Accounting methodologies—when were the items purchased and how are the items amortized or expensed during the calendar year?

CONCLUSIONS AND RECOMMENDATIONS

Not all laundries are the same—there may be significant variations in the achieved life cycle of textiles and of the performance of products and processes. Generally, larger operations are more likely to take advantage of opportunities to drive consistency of product and quality and thereby achieve the greatest return from their textile assets.

These opportunities include textile testing and inspection, which reveal the advantages of certain products (those likely to last substantially longer than others) based on the raw materials used and construction of the fabric. Testing of new products assures reasonable durability for the intended purpose and to help identify the potential benefits of alternative products.

Maintaining adequate inventory of textiles in circulation and taking steps to secure product and reduce abuse and theft contribute significantly to the most efficient laundry supply chain. Loss and abuse of textiles are a significant cost that should be included in the budget, since these costs may not be controllable.

Laundry operators, end users, textile manufacturers and chemical suppliers working together have demonstrated an ability to extend textile life and thereby reduce life cycle cost. The controllable factors that affect textile life cycle cost include:

1. Quality of the raw materials
2. Quality of the textile construction
3. Chemical formulation
4. Equipment maintenance and processing practices
5. Quality of measurements of key performance indicators
6. Adequate textile inventory
7. Textile security
8. In-service staff should discard nothing—only the laundry should remove product from service

With proper focus on the factors mentioned above, laundry operators develop methods to extend the life of their textiles, lower operating costs and thereby boost profit margins.

SERVINGS & REPLACEMENTS

This table shows the servings of items that we surveyed in healthcare facilities for this report. Note the high percentage of the total product removed from service that's missing [(actual replacements – ragouts)/actual replacements = % missing].

Item	Actual Servings	Actual Replacements	Ragouts	% Missing
Underpads	72	12,864	4,549	65%
Sheets, White	73	18,720	8,858	53%
Sheets, Bone	119	720	426	41%
Knit Contour, White	58	8,220	4,134	50%
Draw Sheet, White	39	2,400	543	77%
Pillowcase, White	24	29,340	10,180	65%
Thermal Blanket	68	3,410	1,726	49%
Ether Blanket	50	5,426	2,097	61%
Bath Towel, White	20	151,800	12,573	92%
Bath Towel, Striped	24	3,720	734	80%
Washcloths	9	93,600	7,464	92%
Magna Gowns	20	180	1	99%
Patient Gown—Snowflake	88	7,824	1,664	79%
Patient Gown—Multistripe	42	480	—	100%
Patient Gown—10XL	33	444	—	100%
Telemetry Gown	36	3,190	368	88%
PJ Pants	3	912	2	100%
Baby Shirt White—3 Months	4	288	2	99%
Baby Shirt White—6 Months	4	432	—	100%
Baby Shirt White—18 Months	6	1,728	6	100%
Child Gown Yellow	5	144	—	100%
Child Gown Green	4	144	—	100%
Child Gown Blue	3	120	—	100%
Child PJ Pants	2	120	—	100%
Wrapper Jade 24x24	20	120	3	98%
Wrapper Jade 45x45	35	192	45	77%
OR Towel	3	900	—	100%
Bar Mops—White	1	1,200	97	92%

Note: Snowflake gowns had a greater life cycle in this survey due to application in long-term care where there is typically less theft than in acute or ambulatory care.

USE ONLY LAUNDRY PROVEN CLEAN & GREEN

TRSA certified textile services cost-effectively launder and deliver reusable linens, gowns, scrubs, other garments, towels, floor mats and more to hospitals and medical centers allowing you to focus on patients.

To be Hygienically Clean, laundered items must be tested for microbes. To be Clean Green, laundry water and energy conservation success must be gauged.

It's the same kind of scientifically rigorous and valid performance measurement required of more and more functions in healthcare facilities. TRSA inspects and verifies these outcomes and assesses laundry management practices.

Prove your linen contributes to your efforts to conserve and control infection.
Find a Hygienically Clean and Clean Green laundry at www.trsa.org.



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