Thank you for your interest in Milliken products. Over the years, we at Milliken have strived to improve our products and services to form profitable partnerships with our customers. In doing so, we have developed revolutionary fabrics which provide benefits to the end user and improved ROI for the launderer. The processing of these fabrics has also evolved.

Enclosed is a compilation of articles and tips to be used as a reference only. These come from many sources, and there are various opinions involved. Some of this may conflict with your current practices and should be studied and tested on a small scale before real world application. Again, this information is to be used as a guide, to troubleshoot and stimulate thought regarding laundering practices. Please consult and confer with your experts, chemical, mechanical, and trade organizations, and other suppliers to the industry. We welcome your comments and any information you might add to future publications.

Thank you to all the sources for the information included in this booklet. Happy laundering.

Milliken Technical Representatives
1-800-322-TEAM

MILLIKEN®

SUGGESTED COLOR GROUPINGS FOR WASHING MILLIKEN TABLE LINEN FABRICS

The general rule for mixing table linen colors in the wash is to keep similar colors and similar degrees of color darkness together. If you have any questions about mixing colors call your Milliken technical representative at 1-800-322-TEAM.

Name	Encore Plus Number	Signature Plus Number	Name	Encore Plus Number	Signature Plus Number
White	9660	9297/9680	Nude	7666	
			Dusty Rose	1059	1113
Ivory	9722	9245	Violet	8726	8122
Bermuda Sand	7684	7043	Deep Coral	1494	
Maize	4647	4504	Raspberry	8488	
Salmon	1421	1903	Cast Red	1884	
Beige	7616	7284	Burnt Orange	5089	5251
Wheat	7223	7961			
Light Pink	1625	1686	Kelly Green	3235	3891
Lemon Yellow	4382	4687	Christmas Green	3419	
			Blue Coral	3956	3241
Medrite Gray	6708	6439	Teal	3835	3444
Dove Gray	6648	6390	Ocean Teal	3953	
Powder Gray	6473	6491	Ford Blue	8707	
Light Blue	2584		Royal Blue	2511	2983
Seafoam Green	3558	3800	Forest Green	3345	3130
Allen Turk	8324	3719			
Turquoise	3526	3661	Red	1555	1598
Wedgewood Blue	2375	2228	Navy	2499	2006
			Rust	5922	5000
Tangerine	5499	5732	Maroon	1752	0995
Soft Peach	5062	5428	Dark Burgundy	1004	1861
Peach	5262	5786	Aubergine	8809	8539
Pink	1461	1025	Purple	8529	8871
Blush	1676	1923	Chocolate	7134	7979
T. Rose	1200		Black	5650	6297
Flesh Tone	5220	5219			
Pink Salmon	5711	5098			
Pale Mauve	1447	1720			
Sandalwood	7842	7597			
Gold	4663	4866			

All table linen should be washed separately when new. Dark shades should be washed several times before mixing with a shade group.

Table Linen
Fabrics by

MILLIKEN®

A Laundry Manager's Guide to Washroom Formulas

TROUBLESHOOTING IN THE WASHROOM

The following are usually the factors at fault when problems develop in the washroom.

- ***Poor Soil Removal***
  Not enough suds baths
  Insufficient suds time
  Temperature too low
  Insufficient alkali/soap/detergent
  Overloading wash wheels
  Improper water levels
  Hard water
  Improper classifying
  Missing soil loads
  Wrong formula being used

- ***Poor Color (Redeposition)***
  Hard water
  Overloading wash wheels
  Insufficient alkali/soap/detergent
  Poor balance of alkali to soap/surfactant
  Too few rinses
  Cutting rinse times

- ***Poor Color – Whites (Other than redeposition)***
  Yellow/Brown –
  Iron in water
  Poor rinsing
  Undersouring
  Unneutralizing bleach

TROUBLESHOOTING IN THE WASHROOM

- ***High Tensile Strength Loss***

  Bleach too strong – too much bleach

  Low bleach pH

  Too high bleach temperature

  Steam on bleach bath

  Excessive mechanical action
  - Underloading
  - Too lengthy formulas
  - Too much time between filling/draining
  - Too low water levels

  Excessive use of highly alkaline builders in presence of steam or very high temperatures
  - Improper souring agents

- ***Linting/Pilling***

  Excessive mechanical action
  - Underloading
  - Too lengthy formula
  - Too much time between filling/draining
  - Too low water levels
  - Leaky wash wheels

- ***Short Textile Fibers***

  Low twist yarns

  Rough surfaces in wash wheels, conditioners, tumblers, or on flatwork ironers

  Excessive use of bleach/low pH bleaching/high temperature bleaching

  Excessive use of strong alkalies in presence of steam or very high temperatures

  Improper souring agents

TROUBLESHOOTING IN THE WASHROOM

- ***Odor in Textiles***
  Hard water reacting with soap
  Fermentation of poorly soured loads
  Excessive use of sour
  Poor soil removal
  Incomplete rinsing
  Resin treated fabrics

- ***Flatwork Rolling***
  Excess sour
  Too short a souring time
  Improper addition of sour
  Wrong type of sour
  Work too damp
  Dirty ironer chests
  Build-up on chests
  Rust on chests
  Cold chests
    Improperly sized steam lines
    Steam pressure not high enough
    Traps not operating properly
    Chests bound with air
    Warped chests
    Starch on chests
    Static electricity
    Improper feeding
    Lack of lubrication in fabrics
    Poorly maintained apron covers, padding, ribbons, and guide strings

WASHROOM

- ***Wash wheels***

  Should be cleaned and lubricated regularly

  Check for overgreasing and leaking grease

  Keep water and dump valves tight

  Keep doors and latches tight

  Eliminate rough or protruding edges that cause tears and rips

  Check water gauges and thermometers for accuracy

  Keep cylinders free from lime soap

  Keep motors clean (no lint between fields)

  Keep belts tight with no slippage

- ***Extractors***

  Keep clean and well lubricated

  Should be easy to balance

  Check perforations in baskets for ample size (may need drilling)

  Check for proper speed

  Keep motor clean

  Should attain speed quickly

GRAYING – RESULTS OFF STANDARD

Graying or redeposition refers to the gradual discoloration of fabrics – white or colored. It can generally be recognized as a dull off-color or dingy gray cast on fabrics. The following checklist ranges from the most to least likely common cause.

Causes	*Solutions*
a. Insufficient detergent usage	a. Use product amounts
b. Improper washing and/or rinsing temperatures	b. Set water temperatures at recommended levels for that classification
c. Not enough rinsing, eliminating rinse time	c. Use recommended number of rinses at the correct water levels for the proper length of time
d. Mixing fabrics with different soil levels in a single load	d. Pre-sort items to insure fabrics with similar soil levels are included in each load
e. Water hardness higher than tested when formulas were installed	e. If a mechanical water softener is used, determine if it is working properly or if it needs to be repaired or recharged. If no softener is used, increase detergent usage to compensate for additional hardness

STAINS – RESULTS OFF STANDARD

In referring to stains, as opposed to poor soil removal, we mean items which are basically clean but have an unacceptable rate or presence of stains. The following checklist ranges from the most to least probable cause of an increase in common stains such as blood, food, grease and medication.

Causes	*Solutions*
a. Overloading the wash wheel	a. Reduce fabric weight to meet plant standard
b. Washer controls malfunctioning	b. Insure controls are working properly, especially water level, temperature therm controls, and dump valves
c. Improper break temperature	c. Insure water temperature is at the recommended level during the break
d. Improper bleaching	d. Use correct amount of bleach at the recommended temperature for the recommended time interval
e. Liquid bleach stock solutions not strong enough	e. Mix bleach to obtain proper concentration
f. pH of bleach bath out of range	f. Reduce product usage or give a flush prior to bleach bath
g. Too much soil carried into bleach bath	g. Use recommended number of flushes prior to bleach bath
h. Insufficient souring for acid soluble stains	h. Use recommended amount of sour for that classification

YELLOWING/BROWNING – RESULTS OFF STANDARD

Yellowing/browning refers to a general yellow/brown discoloration or deposit on the fabric as opposed to a dull gray color (grayness). It can be splotchy in appearance and in severe cases, deep in color. The following checklist ranges from the most to least likely common causes of this trouble.

Causes	*Solutions*
a. Not enough rinses	a. Use recommended number of rinses at the correct water levels and temperatures
b. Insufficient souring - confirm with pH test	b. Use recommended amount of sour
c. Bleach overuse	c. Use recommended amount of bleach
d. Fabric softener build-up	d. Insure fabric softener is added at the right time in the right quantity and at the right temperature
e. Iron in the water - confirm with water iron test	e. 1. Use an iron sequestering agent 2. Use recommended amount of rust-removing sour
f. Fabric retains too much chlorine	f. Use an antichlor

ODOR

The sense of smell can be a useful laundry evaluation tool. Knowing the smell of a particular soil can sometimes tell you the cause of a problem without elaborate testing. Specific causes and solutions include:

Causes	*Solutions*
a. Oily, greasy smells (work not thoroughly clean)	a. Insure correct formula is being used for that classification
b. Oily, greasy smells (incomplete rinsing)	b. Rinse properly
c. Chlorine odor	c. Use bleach properly
d. Mustiness (fermentation)	d. 1. Sour properly and cool load before pulling 2. Don't let load stand overnight without extracting
e. Fatty odor (lime soap on clothes)	e. Soften water
f. Sharp odor - sour odor (overuse of sour - confirm with pH test)	f. Use proper amount of sour

SUPPLY COSTS - RESULTS OFF STANDARD

The following checklist ranges in a sequence from the easiest to check most likely causes, to the more difficult to check less likely causes.

Causes	*Solutions*
a. Check to see if several production unit costs are out of range	a. 1. If yes, check production tallies for math errors 2. If no, continue
b. Review record for accuracy 1. Inventory 2. Billing	b. 1. If inaccurate, correct 2. If accurate, continue
c. Review historical data for "highs" and "lows" from different billing inventory periods	c. If yes, average high and low periods and compare to base period
d. Is washman using the wrong size scoops?	d. 1. If yes, weigh and cut proper size scoops 2. If no, continue
e. Is washman using the wrong number of scoops?	e. 1. If yes, train washman to use the appropriate amount 2. If no, continue
f. Are wheels being improperly loaded?	f. If yes, load wheels to plan standards

POOR SOIL REMOVAL – RESULTS OFF STANDARD

By poor soil removal we refer to items which simply do not come out clean as opposed to gradually discoloring. The following checklist ranges in sequence from the most to least likely common causes.

Causes	*Solutions*
a. Incorrect formula being used	a. Use correct formula for each classification washed.
b. Improper product usage	b. Use product amounts recommended.
c. Skipping formula operations	c. Insure all formula operations are followed completely and in the proper sequence.
d. Improper pre-sorting	d. Insure items are properly pre-sorted so formulas accurately match soil levels being washed.
e. Overloading the wash wheel	e. Reduce fabric weight to meet plant standard.
f. Washer controls malfunctioning	f. Insure controls are working properly, especially water levels, temperature (therm) controls, and dump valves.
g. Water hardness higher than tested when formulas were installs (confirm using water hardness tests)	g. If a water softener is used, determine if it is working properly or if it needs to be repaired/recharged. If a water softener is not used, slightly increase detergent usage to compensate for additional hardness.

IN HOUSE SMALL LAUNDRIES
RECOMMENDATIONS FOR HANDLING SIGNATURE PLUS™
HOME TYPE WASHER & DRYER

Equipment: Maytag, Kenmore, General Electric, Whirlpool, etc.

Loading: Do not overload washer or dryer. Wash loads must have good flotation and agitation.

Washing: Use perma press cycle or split water temperatures (110-130º) with a cold water rinse. Use chemicals recommended for home type washers. Do not use softeners, as they may waterproof the linen.

Dryers: Use perma press cycle for 12-15 minutes with an 8 minute cool down. (Times may vary due to load size and extraction.) If dryers do not have perma press cycle, use medium heat (120-160º), and "air" for cool down step. Do not overload dryer; linen must tumble freely for optimum flat dry results.

Check List for Wrinkles:

1. **Overloading** - wash loads may be too large for size washer or dryer (no mechanical action or flotation equipment).
2. **Overdrying** - linen may be too dry before cool down begins. Reduce dryer time to where linen is just dry before cool down cycle begins.
3. **Thermal Shock Wrinkles** - drastic changes in fabric temperatures. Examples: water temperature drops from 180º-100º; dryers are being stopped while still hot (140º-160º).
4. **Improper Cool Down** - dryers have been stopped before linen has been cooled to normal body temperature for folding.
5. **Process Wrinkles** - wrinkles due to mishandling. Linen which has been set in the washer, dryers, or buggies for prolonged periods of time.
6. **Improper Storage** - inadequate storage on shelves or racks. Linen also may have been folded improperly before reaching storage areas.
7. **Shelf Time** - recommended shelf time for linen is 24 hours for optimum flat dry results.

IN HOUSE SMALL LAUNDRIES
RECOMMENDATIONS FOR HANDLING SIGNATURE PLUS™ HOME TYPE WASHER & DRYER

Check List for Stains:

1. **Overloading** - no mechanical action or linen has been packed too tight for proper agitation.
2. **Improper Chemical Usage** - the amount of detergent may be too small for the size wash load being processed, or the soil level is too high.
3. **Abusive Stains** - these type stains are usually of three types:
   A. carbon based - grill grease - ashtrays, etc.
   B. silver polish
   C. cement stains

   Usually bleach will help salvage the linen unless stains are of above types.
4. **Softeners** - we do not recommend the use of softeners. Most softeners coat the Signature Plus™ linen making it waterproof and hard to remove stains due to this waterproofing action.
5. **Hard Water** - chemicals that may be found in water make cleaning at normal detergent loads difficult. Some stains may be due to iron, calcium, which may be found in the water. Check with your chemical representative for this type of problem.

NAPERY TROUBLESHOOTING GUIDE
Problem
DISCOLORATION

CAUSE	SOLUTION
Bleach on Colors	Do not use bleach on colors.
Residual Dye Transfer	Prewash colors separately on first wash to prevent residual dye transfer. Sort napery into recommended color groupings for subsequent washings. Always wash white separately.
Soil Redeposition	Reclaim napery with soil redeposition by using additional temperature and supplies. Prevent redeposition by adjusting the formula for soil level. Specific recommendations are available from your Milliken Technical Services Representative.
Chemical Reaction	Avoid chemical discoloration by thoroughly rinsing all chemicals out of the napery before drying or finishing.
Yellowed Whites	Chlorine bleach will not damage Milliken fabric, but residual bleach on white napery can cause yellowing if the chlorine is not neutralized before exposure to heat. Avoid yellowing by using an antichlor in the second rinse after bleaching with chlorine.
Incorrect Ordering	Order napery colors by the four-digit code number or the distributor color codes to avoid confusing similar colors.
Glazing	Keep ironer chest temperatures under 350° F and use correct roll pressures to prevent glazing.

NAPERY TROUBLESHOOTING GUIDE
Problem
WATERPROOFING

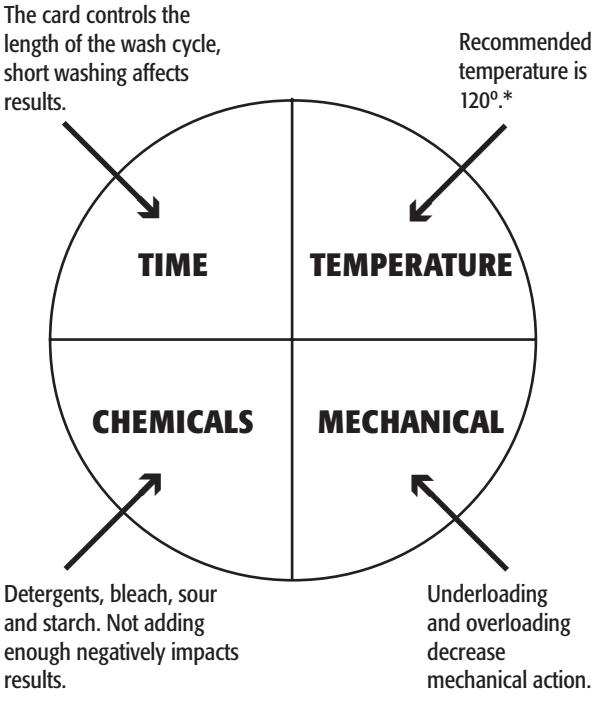
Contrary to what many people may think, polyester can be modified to be very absorbent. This is a particularly good characteristic for table linen fabric. A major quality issue for table linen is the ability to absorb spills. Milliken Table Linens are engineered with a permanent chemical treatment that makes them very absorbent when completely clean. This same treatment that makes them absorb liquids also allows the fabric to release stain and odor in the washing process. This absorbency enhancement also allows for good starch adhesion.

You should test your finished, dry fabric periodically for absorbency. Gently place a drop of clean water on the clean and cooled piece of fabric. A properly washed piece of our table linen fabric should completely absorb this drop in well under 3 seconds. The cleaner the fabric, the faster the water will absorb. The easiest way to determine if your linen is washing clean and performing as it should is to do this simple wicking test. Can your linen pass the test? If not, refer below for reasons that cause waterproof linen or contact your Milliken LST representative.

CAUSE	SOLUTION
Fabric Softeners	Fabric softeners prevent Milliken napery from absorbing liquids. Do not use fabric softeners on Milliken napery.
Tallow Soap	Do not use tallow soaps on Milliken napery. Instead, use built detergents, surfactants, and solvated surfactants.
Mildewcides	To help minimize mildew growth on Milliken napery, use only mildewcides that have no quaternary ammonium base.
Washing with Cotton	Wash Milliken napery with other 100% synthetic fabrics. Do not wash with cotton or poly-cotton blends.

Soil Redeposition	See DISCOLORATION – Soil Redeposition.
PVAc Build-Up	Reclaim, then reformulate the starch ratio: four parts natural starch to one part PVAc.
Insufficient Surfactant	Sufficient surfactant must be used to allow suspension of greases and oils allowing the fabric to wick moisture and allow starch to adhere.

WASH PIE



To properly clean linen, if one slice gets smaller, another slice has to increase to achieve the desired results.

*120º washing for Signature Plus, Encore Plus, Defender, and Milliken Damask fabrics. Other non-Milliken fabrics may require higher temperatures and additional wash chemicals.

NAPERY TROUBLESHOOTING GUIDE
Problem
STATIC

CAUSE	SOLUTION
Overdrying	Reduce extraction or conditioning, and cover wet work to maintain 20% - 25% moisture retention in napery before ironing. (See following page concerning moisture retention.)
Incorrect Grounding	To effectively ground equipment, sink a 6′ steel rod in the ground and attach grounding straps. Also, use static bars on folders and conveyors.
Friction	Eliminate friction from goods slipping on the belts by synchronizing the speeds of adjacent belts.
Folders	Check folder adjustments and/or use more starch on napery.
Low Humidity	Low relative humidity can cause goods to stick due to static electricity. On particularly dry days, a humidifier may be needed.

TROUBLESHOOTING – STATIC
MOISTURE RETENTION

How to determine the percentage of moisture retention after extraction.

The best way is to weigh ten sheets after extraction, then – tumble dry and weigh again. Take the difference of these two weights and multiply by 100 then divide by the dry weight. This will give you the percentage of moisture in the goods after extraction.

EXAMPLE #1

Extraction Weight 14 Lbs

Less Tumble Weight -9 Lbs

5 Lbs x 100 = 500

$$\frac{500}{9} = 55.56\% = \text{MOISTURE RETENTION}$$

In this example, the moisture content is more than 50% and should be decreased before the goods go to the flatwork ironer. Variations in the size of loads may result in difference in moisture content with the same amount of extraction time, and you should adjust accordingly.

EXAMPLE #2

$$\frac{\text{wet weight - dry weight x 100}}{\text{dry weight}}$$

$$200 \text{ lbs wet} - 150 \text{ lbs dry} = \frac{50}{150} \times 100 = 33.3\%$$

25% to 40% range is best for flatwork ironing. Over tumbling produces static – blows out sizing and affects ironing quality.

NAPERY TROUBLESHOOTING GUIDE
Problem
STAINS

CAUSE	SOLUTION
PERMANENT:	
Bleach Spots/Cleaners **Carbon/Metal** **Heat Set Food/Cement**	For all permanent stains, try reclaiming with more supplies and higher temperatures to reduce stain heat visibility. Napery with noticeable stains should be ragged, overdyed by a qualified dye house, or cut into smaller pieces.
REMOVABLE:	
Blood	Use a warm water flush, then normal washing. Do not use hot water on protein soils.
Fats/Corn Oil **Salad Dressing**	Use solvated surfactants to boost regular formula.
Motor Oil/Grease	Use solvated surfactants to boost regular formula.
Lipstick/Candle Wax	Use solvated surfactants and/or higher temperatures.
Rust	Use an oxalic acid prewash or rust-removing sours.
Mildew	Use chlorine bleach on whites. As a last resort, use 1% available chlorine bleach at 1-2 quarts/CWT to remove mildew from colored napery. This will cause some color deterioration. A mildewcide with no quaternary ammonium base should be used to minimize mildew growth.

STAINS AND RECLAIMS
GETTING THE NAPERY CLEAN

Table linens present the toughest cleaning problems faced by any laundry. Here are some troubleshooting tips for on-premise laundries aimed at preventing and removing stains.

TROUBLESHOOTING

BY KEVIN KEYES

If food stains were all you had to deal with on table linens, your job would be easy. Right? But for virtually all laundries, this is not the case. In addition to food, table linens can contain all types of dirt and stains caused by food and beverage personnel, restaurant patrons, and even the laundry itself.

Listed below are the types of stains often encountered, the best formulas for removing them, and tips on when to throw in the napkin and rag an item.

IN THE RESTAURANT

Often, linen is permanently stained before it reaches the laundry. For example, food and beverage personnel use table linen as all-purpose rags to wipe up spills, clean ashtrays, clean the grills and polish silver and brass.

This kind of abuse presents a virtually insurmountable problem for the laundry, particularly the silver and brass polishing since the cleaning compounds chemically bond with the linen and are impossible to remove.

The solution is two-fold:

- Take the time to educate the food and beverage staff of the damage this type of abuse causes, and
- Make an abundance of rags readily available since staff tend to use what is the easiest to reach.

Other problems occur when the linen is improperly stored. It should never be placed on the floor. This is especially crucial on bare cement floors since wet, soiled linen absorbs the concrete particles, forming permanent stains. (I've seen reports that claim using motor oil in the wash formula will remove concrete stains, but I personally haven't seen it done.)

To ensure proper storage, place bags or carts for the soiled linen close by the clean linen so that people find using the containers as easy as not using them. Provide enough containers to allow restaurant

employees to separate the various types of linen.

Set up a system to get the soiled linen to the laundry as soon as possible. Stains that might otherwise be easily removed will become much more difficult to deal with if allowed to sit too long. Mildew becomes a problem after 36 hours.

IN THE PLANT

Once the table linen is in the plant it's not necessarily out of harm's way. How it's handled during sorting, loading, washing, and ironing determines the quality of linen returned to the food and beverage department.

Sorting and loading

There are three key steps to focus on in this area.

- Do not mix dissimilar types of linen. While it may be obvious that you don't wash towels with table linen, or sheets with chef coats, it is equally important that you keep cotton napery separate from poly napery. When mixed, the process quality of both fabrics suffers.
- Just as a two-by-four board is only 11/2 by 31/2 inches, a 100-pound capacity wash wheel will not effectively clean 100 pounds of linen. A 100-pound load might be approached when washing towels and sheets, since the majority of this soil is water soluble, but the greasy stains found on table linens demand adequate mechanical action.

Experience has shown that table linens process best at approximately 80 percent of the machine's rated capacity. This figure should be reduced further if the wash wheel isn't an open-pocket machine.

- Use the proper formula program or card. Table linens will not clean properly on a sheet or towel formula. Conversely, there is a lot of waste if these light-soil items are washed using a table linen or chef coat formula.

Washing

First-quality processing begins with the right formula. In the majority of on-premise laundries, the chemical representative programs or cuts the cards for the washers. Only the laundry manager should review the process; in no case should anyone else be allowed to tamper with the formula.

A solid formula includes each of the following steps:

- *Flush* – 2 minutes at a high water level and a split (100-120° Fahrenheit) temperature. This step serves several purposes. The most important being the removal of a large portion of loose soil

and particulate matter, allowing the chemicals in the next step to go right to work on the difficult stains.

- *Break* – 10 to 12 minutes at a low level and a high (120° F) temperature. Chemicals should include a built alkaline product and a detergent containing surfactants in quantities recommended by your chemical representative.

Washroom technology has been evolving away from high alkalinity and towards high-surfactant chemistry. This type of formulation works very well for poly napery since polyester doesn't require high pH. In fact the surfactants will do the great majority of the cleaning.

- *Carryoversuds* – 5 to 6 minutes at a low water level and a high (140° F) temperature. The main purpose of this step is to use up the residual chemicals while supplying additional time and mechanical action to the formula.
- *Bleach* – 6 to 8 minutes at a low water level and a high (140-150° F) temperature. These parameters apply when using a chlorine product on white table linen only. Oxygen bleach is ***not*** recommended.

Though it is true that oxygen bleach doesn't degrade cotton to the same degree as chlorine, is safer to use on colors and does have some cleaning effect. It is very expensive relative to chlorine and has no effect on mildew stains. In addition, chlorine has no degrading effect on poly napery. Using oxygen bleach on colored table linen is a very expensive alternative to a sound wash formula, and more white table linen will be discarded due to stains than by the wear of chlorine bleach.

- *Rinses* – three rinses of 2 minutes each at high water levels. Decrease the temperature with each rinse, the first at 130° F and the third at 100-110° F.
- *Sour* – 4 to 5 minutes at low water level and low (90-100° F) temperature. This step neutralizes any alkalinity left from washing. A pH of 5.5 to 6.5 is recommended for flatwork ironing.

Do not use a sour/softener product here. Fabric softeners coat the surface of linen and waterproof the fabric. This prevents table linen from absorbing spills, makes starching difficult, and locks in stains.

- *Starch* –adds 4 to 5 minutes to the sour step. Starch is added 2 minutes after the sour and allowed to run for the remaining time. Amounts depend upon the type of linen, load size, and type of starch or sizing.
- *Extract* –the main rule here is to keep this step to the shortest time and slowest speed possible. If starching, high speeds and long cycles throw off much of the starch. If in a wash and tumble operation, excessive extraction sets in wrinkles that are difficult to remove in the dryer.

SPECIFIC PROBLEMS

Even with the best formulas, some stains will occur due to unexpected problems. The following are problem areas that I've observed in on-premise laundries around the country:

- Steam capability at the wash wheel is very useful to boost wash temperatures. However, in some facilities the steam jets go unused for extended periods and get rusty. Check steam jets often, since metals from the rust will combine with many linen stains to form a stain that can only be removed with an oxalic acid scour.
- Leaks in a wash wheel can often go undetected for a long period unless the washer is regularly checked. Loss of water and chemicals during the break lessens cleaning action. The problem is compounded when fresh water is added to satisfy automatic level controls.
- Control cards can be switched between machines. If using control cards, make sure that they are identical for each category, or are used only on the intended machine. Formula consistency is a key factor in quality processing.
- Liquid feed systems can also be confusing. If using liquid feed systems, set them up in the same configuration for each machine. For instance, if the bleach supply is the fourth line on one machine and the third on the other, you run the very real risk of the wrong product being added at the wrong time, particularly if control cards are interchanged between machines.
- Quality can suffer if white and colored linen are washed in the wrong formulas. The best solution is to maintain a separate program for white and colored linen.

Some laundries have a program card for white linen that requires the wash person to press a "defeat" switch at the bleach step when washing colored linen. This is a very dangerous practice that can lead to color loss, as the switch is invariably forgotten. Also, the extra time for the bleach step is unnecessary.

- Liquid supply systems can clog. Check the supply system weekly by triggering each of the supply lines while holding a measuring cup under the delivery end. This is the only way to check that you are getting the proper amount of each product. It is amazing how frequently the feed tubes clog or the drum runs out, and the problem is unnoticed for a long time.

RECLAIMING STAINED LINEN

Obviously the idea is to do everything right the first time and not have reclaims. Unfortunately this isn't realistic, but reclamation can be a relatively inexpensive and successful process if done properly. Train your ironer personnel to notice stains ***before*** the linen is ironed. Many stains that might easily be removed become impossible when set by ironer temperatures of 300-350° F.

A good reclamation formula is not difficult to attain. NO exotic chemicals are required. Generally, a formula with 50 percent additional time and chemicals will recover 80 percent of the linens with removable stains.

If this does not work, the stain is certainly either permanent, as discussed earlier, or has been locked in by combining with metals. In the latter case, an oxalic acid scour, recommended by your chemical representative, followed by a standard wash formula should solve the problem.

If the item is still stained after these steps, reclaim it or have it overdyed. Reclaim kits are not recommended. These packages usually consist of a small quantity of alkali, chlorine bleach, and oxalic acid—all products that you likely have on hand—and cost several times more than the same quantity of the individual products.

SUMMARY

Keeping table linens looking good and protecting your facility's linen investment are two goals that should be shared by laundry as well as food and service personnel. Steps to reaching these goals include:

- educating the food and beverage staff on how to prevent abuses,
- using a sound wash formula,
- enlisting the full cooperation of your chemical representative to maintain your level of quality, and
- running reclaims intelligently, being prepared to rag some of your linens rather than waste undue time or money.

Follow these steps to success.

Kevin Keyes is a laundry services representative for Milliken & Company, Spartanburg, S.C.

CHLORINE BLEACH OR OXYGEN BLEACH?

Steven J. Tinker
Director, Research & Development
Gurtler Industries, Inc.

Several key factors in the laundry industry have seen major changes in the last several years. Polyester fabrics have become more dominant vs. cotton. Today, 100 percent spun poly fabrics are replacing cotton/poly blends in many applications. Tunnel washers are becoming more prominent as smaller, less efficient plants are being consolidated and upgraded. Water and energy conservation and wastewater quality are greater concerns. The nature of detergents is being changed to meet the new challenges in the industry, with more emphasis on surfactant cleaning and a reduction in the use of harsh alkaline builders.

One are in laundry chemistry has been left unexamined in light of all these changes, and that is: ***What bleach will work best for my operation?***

Let's look at the pros and cons of the two major bleaches, chlorine and oxygen. (We will limit this discussion to liquid bleaches.) There are several areas that we should consider: bleaching efficiency, fabric safety, storage requirements and employee safety, and environmental concerns.

Bleaching efficiency: First, let's review the function of bleach. In laundry applications bleach is primarily a stain removal agent. As such, bleaching is best done after the bulk of the soil is removed from the fabric and flushed away. Bleach cycles in traditional washers are usually done "in the clear" or in fresh water so that excessive amounts of dissolved soils won't react with the bleach before it can react with the stains remaining on the fabric. Bleaches oxidize stain molecules, breaking them up into smaller, more soluble molecules that can be washed away. (Or bleaches will react with colored stains making them colorless.)

Liquid chlorine bleach chemically is a solution of sodium hypochlorite, usually about 12 percent active as chlorine. In a traditional wash application chlorine bleach is applied at a rate of 75-150 parts per million (ppm) of active chlorine, in a wash temperature of 140º-150ºF, at a pH of 10.2-10.8. Chlorine bleach will become more aggressive as the pH decreases and less aggressive as the temperature decreases. So some have recommended low temperature (90º-120ºF) bleaching be done at a lower pH, around 9.8-10.5, to maintain bleaching efficiency. The potential drawback with this bleaching is creating an over-aggressive bleaching environment that my damage some fabrics.

Liquid oxygen bleach chemically is hydrogen peroxide, and can be as high as 35 percent, which calculates to about 16.5 percent active oxygen. Oxygen bleaches differ from chlorine bleaches in the most efficient application. Generally oxygen bleaches are used at a little higher level, about 100-200 ppm activity. And, they need higher temperature and higher pH to be activated. The recommended levels are temperatures of 150º-160ºF and pH of 10.8-11.8. Unlike chlorine, oxygen bleaches become less aggressive as the pH decreases. However, like chlorine, oxygen also becomes less aggressive as the temperature decreases. Since oxygen bleaches work well at high pHs, in many situations you can combine the detergent and bleach steps for a more efficient wash formula. Tunnel washers that may have a limited number of modules may benefit from oxygen bleach, as you can combine the detergent and bleach operations in one zone of the tunnel.

Fabric safety: Chlorine bleach is generally considered to have greater potential to damage cotton-based fabrics. Cotton can easily be oxidized by chlorine when it is applied wrong, creating a weakness in the fiber that can lead to thin areas or to excessive linting. Cotton is especially vulnerable to damage when chlorine bleaches are not properly rinsed out of the fabric. And a residual of just a few parts per million of chlorine in the fabric can be a major problem when a sour is added to the final rinse, dropping the pH to under 7.0. This activates the chlorine to it's most aggressive chemical form and can cause significant damage to cotton. So, it is always a good idea to use an "anti-chlor" to neutralize residual chlorine before the sour step in the wash formula.

Chlorine bleach, when used at lower temperatures (90º-120ºF) and increased chlorine concentrations (200 ppm) at the proper pH of 9.8-10.5 will give excellent results, with very little tensile strength loss. This method is used in tunnel washers for bleaching in the rinse zone with great success. It also applies to conventional washer bleaching as well. This low temperature chlorine bleaching method is often utilized in Europe. It is very important to use an anti-chlor with this method to avoid potential fabric damage caused by chlorine carryover into the sour operation.

Polyester fibers are generally unaffected by chlorine or by oxygen bleaches. However some permanent press finishes on fabrics can react with chlorine and possible retin the chlorine in the fiber, causing a yellowing of the fabric.

Oxygen bleaches are sometimes referred to as "color-safe" bleaches. However, oxygen bleaches can be aggressive on fibers and dyes as chlorine bleaches, if applied in inappropriate methods. But, generally oxygen bleaches are safer on fabrics because they are "deactivated" by the low pH of the sour step. And when dried, oxygen bleaches degrade

to water and oxygen, which will safely evaporate away without damaging the fabric.

Storage requirements and employee safety: Concentrated chlorine bleach solutions are very unstable. They actually begin to slowly degrade immediately after they are manufactured. The degradation can be accelerated by storing at high temperatures (over 90ºF). Exposure to sunlight will also increase degradation. Contact with organic material or metals are also detrimental to stability. In the concentrated form, chlorine bleach can be very dangerous if accidentally mixed or contaminated with an acidic product, such as a laundry sour. This can cause rapid release of chlorine gas, which is toxic.

Oxygen bleach is much more stable than chlorine bleach. However, it is good practice to store in a cool place, out of direct sunlight. With proper storage, most oxygen bleaches can be stable and not lose activity for a year or more. Oxygen bleach can become rapidly unstable if it is contaminated with metals or organic materials. Concentrated hydrogen peroxide, when contaminated with incompatible materials can release oxygen and hydrogen gases, which can be an explosive combination.

Exposure to concentrated chlorine or oxygen bleaches can cause irritation, severe burns, or corrosion. Proper Personal Protective Equipment (PPE) should be used when handling concentrated bleaches. Rubber gloves, boots, goggles and/or face shields are recommended. It is best to refer to your chemical manufacturer's Material Safety Data Sheet (MSDS) for proper precautions on storage, handling and spill clean-up procedures.

Environmental concerns: Chlorine bleach has come into scrutiny over the past few years due to environmental concerns. Some claim that chlorine in the water and wastewater streams can cause the formation of certain chlorinated organic materials that may have negative human health impacts. However, the science of these assertions is not fully developed. As a result, in some areas of the world there is pressure to reduce the use of chlorine compounds including chlorine bleaches.

In another aspect, however, chlorine is well known to have excellent anti-bacterial and anti-viral efficacy. In the laundering process, several factors assure us that the finished textiles are essentially bacteria-free. These factors include the effect of dilution from several exchanges of water, temperature, high pH followed by low pH, and the use of oxidizers such as chlorine bleach. Oxygen bleach is considered to be somewhat less aggressive on bacteria and viruses; however, when combined with the other cleaning factors in a laundry formula, oxygen bleach is effective in deactivating residual microbes.

How do you choose? So what do all these differences mean to you? Check what you need in a bleach. If you are running most of your operations at low temperature, chlorine bleach, at the right pH is probably your best choice. But, since chlorine is difficult to rinse at low temperature, it is essential that you use an anti-chlor to prevent cotton fabric damage.

If you have a tunnel washer, your best choice is probably oxygen bleach, especially if it is shorter than 12 mods. The use of oxygen in shorter tunnels lets you wash and bleach in the same zone. Oxygen bleach in this application is less aggressive on colors, and as an added benefit in the tunnel, oxygen bleach is less aggressive on stainless steel when it evaporates. So you can minimize potential rusting issues that may be a problem with chlorine bleaches.

Perhaps you have heavy soiled textiles that need super stain removal performance. Then we would select chlorine bleach due to its rapid aggressive action on stains.

Perhaps you have a lot of light soil classifications, and you want to save water and time. Combining your wash and bleach steps and the use of oxygen bleach would serve you best.

There are numerous scenarios that can be considered. The selection of the best bleach depends on your specific conditions and needs. Our recommendation is to check with your laundry chemical technician for his or her advice. Together you can make the best choice.

The following formulas are specifically designed for Milliken table linens. However, if you experience a similar problem, they can be modified for your particular needs.

I. RECLAIM FORMULA

CYCLE	WATER LEVEL	TEMP. (°F)	TIME (Min.)	SUPPLIES/CWT
Break	Low	180	12	2.5 lbs. Built Product 24 oz. Solvated Surfactant
C/O	Low	180	6	
Flush	High	180	2	
Suds	Low	180	8	1.5 lbs. Built Product 12 oz. Solvated Surfactant
*				
Rinse	High	160	2	
Rinse	High	145	2	
Rinse	High	130	2	
Sour	Low	90-100	2	1-2 oz./Do Not Drain After Sour
Starch	Low	90-100	8	0.75-1.5 lbs.

* For white Milliken napery, insert bleach cycle and antichlor in formula. Bleaching of colored Signature Plus™ is not recommended.

II. RUST REMOVAL FORMULA

CYCLE	WATER LEVEL	TEMP. (°F)	TIME (Min.)	SUPPLIES/CWT
Break	Low	170	15	1-2 lbs. Oxalic Acid
Flush	High	150	2	
Flush	High	150	2	
Break	Low	150	10	1-1.5 lbs. Alkali with Phosphates
C/O *	Low	150	5	Solvated Surfactant
Rinse	High	135	2	
Rinse	High	120	2	
Rinse	High	105	2	
Sour	Low	90-100	2	1-2 oz./Do Not Drain After Sour
Starch	Low	90-100	8	0.75-1.5 lbs.

* For white Signature Plus™ napery, insert beach cycle and antichlor in formula. Bleaching of colored Signature Plus™ is not recommended.

III. CONCRETE AND GRAPHITE FORMULA

CYCLE	WATER LEVEL	TEMP. (°F)	TIME (Min.)	SUPPLIES/CWT
*	3 in.	100	10-15	2 qts. Mineral Seal Oil
** Drain	6 in.	160	5-10	Detergent 2 lbs.
Rinse	High	160	3	
Rinse	High	160	3	
Rinse	High	160	3	
Rinse ***	High	160	3	

* 10W-40 / Dust Mop Oil are also great substitutions for the mineral seal oil.

** On water levels: Do not drain between the extra low level and normal low level (6 inches) functions. Detergent and oil can be added together.

*** Proceed with standard reclaim formula

IV. CANDLE WAX REMOVAL

CYCLE	WATER LEVEL	TEMP. (°F)	TIME (Min.)	SUPPLIES/CWT
Flush	High	170	15	3 oz. Surfactant
Flush	High	140	2	
Break	Low	170	20	32 oz. Alkali 6 oz. Solvent Based
Detergent				
Rinse *	High	160	2	
Rinse	High	145	2	
Rinse	High	130	2	
Rinse	High	115	2	
Sour	Low	90-100	2	1-2 oz./Do Not Drain After Sour
Starch	Low	90-100	8	0.75-1.5 lbs.

* For white Signature Plus™ napery, insert bleach cycle and antichlor in formula. Bleaching of colored Signature Plus™ is not recommended.

HAIR REMOVAL

CYCLE	WATER LEVEL	TEMP. (°F)	TIME (Min.)	SUPPLIES/CWT
Break	Low	160	12	
Flush	High	180	2	
*Caustic Bath	Low	180	15	2-3 lbs. Of Caustic Based Alkali
**				
***				

* Add caustic based alkali only after achieving maximum temperature.

** Proceed with standard reclaim formula.

***For white Signature Plus™ napery insert bleach cycle and antichlor in formula. Bleaching of colored Signature Plus™ is not recommended.

NOTE: Some alkaline hydrolysis will occur. Proper rinsing will keep this to a minimum.

CHECKLIST FOR HAIR PREVENTION & REMOVAL

Prevention:

1. Keep grooming accounts and accounts such as pillow cases and sheets separated from linen accounts.
2. The use of specific laundry bags for grooming accounts is recommended. These bags are not to be mixed with linen account bags.
3. If reclamation or recycled water is being used, check the filtering system and guarantee appropriate filter element sizing that will not allow hair follicles to recirculate.
4. Create standard operating procedures for soil sorting area. Make sure area is swept down and cleaned after sorting of grooming accounts.
5. Maintain a good preventative maintenance program on all flatwork ironers (cleaning and waxing). Keep ironer roll covers free of hair and other debris.

Removal:

1. If hair is detected in Milliken fabrics, the first step is to place affected linen in a tumble dryer. Slightly under load the tumbler and run approximately 20 – 30 minutes at 170 degrees F. This will loosen the hair follicles from the fabric.
2. Follow up the tumble drying step with a complete reclaim wash, utilizing a slightly higher alkalinity wash. Please see attached reclaim formula.
3. Steps 1 & 2 can be repeated until the hair follicles have been removed.
4. As a last resort, the linen can be processed through a caustic bath formula. Please note that a certain amount of tensile and tear strength could be lost after this treatment resulting in a shorter fabric life cycle. Please see attached caustic bath formula. This formula should be used **only** as a last resort and only once.

NOTE: Once hair follicles have been detected in Milliken table linen, the first task is to locate the source and begin immediate prevention. Then separate the contaminated linen from the other inventories. Only then can removal steps be introduced.

NAPERY TROUBLESHOOTING GUIDE
Problem
IRONING REJECTS

CAUSE	SOLUTION
Dirty Ironer	First, do a thorough downtime cleaning. Follow up with regular cleaning and maintenance checks. Do not overwax the ironer to avoid wax build-up.
Roll Pressure	Do the paper test on the first ironer roll. Correct uneven or incorrect pressure.
Side-to-Side Pressure	Check bearings, individual roll pressures, and the pillow blocks.
Drafting	Check the circumference of each roll with adding machine tape to determine if there is appropriately increasing diameter from front to back. If not, replace the ironer padding.
Incorrect Feeding	Carefully instruct all personnel on correct feeding procedures.
Cold Chest	Maintain a minimum chest temperature of 310°F.
Warped Chest	A warped chest must be replaced.
Over or Undersoured Napery	Adjust the amount of sour to maintain 5.5-6.0 pH.
Ironer Tapes	Be sure there are two ironer tapes per lane for napkins. Tapes should be around the ironer rolls and tension bars only – not around the finger roll.
Residual Chemicals	Rinse goods thoroughly, then sour to neutralize rinse water alkalinity. Also, thoroughly clean the ironer chests and roll pad covers to remove chemical buildup.

Quality Tips

TRSA's Strategic Management Committee invites readers to share ideas for improving quality in the office, on the route, and in the plants–tips for doing business better. Send your quality tips to Steven Biller, Textile Rental 1130 E. Hallandale Beach Blvd., Suite B, Hallandale, FL 33009.

Production

— — — — — — — — — —

Ten Commandments For Tip-Top Ironers

To keep your ironers running smoothly and producing top-quality linen, listed are 10 commandments for ironer troubleshooting. Operators who follow these commandments are one step closer to getting the maximum production and quality out of their ironers.

I. **Make sure the ironer chest is silver in color.** If it is not, it is dirty. A dirty chest transfers dirt to linen and causes it to pull and buckle in the ironer.

II. **Lubricate sparingly.** Most operators want a recipe on when and how to lubricate their ironers. The majority of ironers are lubricated too much or not enough. I recommend lubricating often, yet sparingly. During an eight-hour shift, lubricate the ironer every two hours. However, add lubricant to your cloth only if it is limp when cold. If the cloth is hard, it does not need lubrication.

III. **Keep a neutral pH.** Your pH should be neutral–between 6 and 7. A lower or higher pH creates problems. For example, a pH of 5 causes linen to roll up and squeak and squeal.

IV. **Monitor speed vs. feed rate.** Coordinate ironer speed with the rate that items are fed. While 30 ft. per minute is adequate for napkins, 60 ft. per minute is more realistic for 6-ft. sheets if the operator wants to produce 60 an hour. If operators take time to work out linear speed needed to run items, their production rate is sure to improve.

V. **Monitor conditioning vs. chest temperature.** Keep in mind that the colder the ironer chest, the drier the linen fed through it needs to be. Wet linen will stop dead in the ironer if the temperature is 270° F or lower. The hotter the ironer chest, the wetter the linen can be. The goal is to run the linen through the ironer as wet as possible and still have it come out dry.

VI. **Check roll size.** Regularly measure the circumference of your roller. When roll size drops below the minimums prescribed by the manufacturer, you lose as much as 50% of pressing capacity.

VII. **Monitor linear speed.** Linear speed increase—each roll turning a little faster than the previous one as the linen goes through the ironer—is necessary on all ironers. Most older ironers are built with the rolls turning at the same speed, so increased speed is accomplished by increasing the padding thickness on successive rolls. Linear speed is critical in ironing polyester linen. If linen is buckling between rolls, check the padding to ensure that linear speed is adequate.

VIII. **Make sure rolls are square to the ironer chest.** Sometimes an ironer gets out of level or the bearing blocks wear out. When this happens, the rolls may not be entirely parallel or square to the ironer chest. This can cause problems in feeding. If the rolls aren't square, linen tends to buckle, then tighten and bunch up.

IX. **Check the feed board.** It is common for the feed board to warp. Warping causes an uneven pull on the linen and results in linen with dog ears or with a trailing edge that rolls up. To test the feed board, remove the finger roll and see if the problem goes away. If it does, that is a sure sign you need to replace or fix the feed board.

X. **Check the finger roll.** The finger roll is supposed to be round, but through wear and tear, it may become chipped or split in the middle. If it is not perfectly smooth, the linen may buckle or bunch up. Also check the placement of the finger roll. Many operators like to position the finger roll back toward the safety to provide more room for feeding cotton linen. However, if the plant is running polyester linen, it is best to place the finger roll toward the front of the feed board. Polyester linen does not require the same space to feed it through the ironer.

XI. **Avoid excessive chemicals in wash formulas.** Avoid using excessive chemicals in your wash formulas. Although a load may test with a pH of 7, it may contain excessive chemicals that will evaporate when linen is run through the ironer. The chemicals then attach themselves to the ironer chest and can leave dirt deposits on linen or cause linen to buckle on the leading edges.

P.S. If anyone noticed there are 11 commandments, touché! Checking to see if you're paying attention.

Paul Roche, District Sales Manger
Tague Brown & Co.
Chicago, Ill.

Reprinted with permission of Textile Rental magazine, the official publication of the Textile Rental Services Association of America, January 1995

SOLUTIONS FOR POLY NAPERY IRONING PROBLEMS

Poly napery requires a few adjustments in the flatwork ironing department. Here is an overview of possible problems and where to look for solutions.

TROUBLESHOOTING

BY KEVIN KEYES

Polyester napery has cornered a share of the linen supply market because of its durability and colorfastness. This shift in the market has not, however, been made without a slight learning curve in processing.

It is the hope of this article to help you round that curve to improve and maintain the quality of the poly napery your plant produces.

Probably the greatest concern is with poly napery processing through the flatwork ironer. Problems most often occur because of mechanical faults on the ironer. Several of these problems can be anticipated and solved.

MAINTENANCE

Proper maintenance is often forgotten–whether it's with your personal automobile or your flatwork ironer. A regular maintenance program will help you maintain optimum flatwork ironer efficiency, eliminating unnecessary and unexpected downtime.

This program can be as simple as a daily or weekly check of the following areas: belts, roll pads and covers, chests, aprons, traps, steam lines, drive systems, and emergency stop systems. Take the time to set up a program with your maintenance staff.

DAILY CLEANING

Many flatwork ironer rejects are a direct result of improper cleaning of the ironer.

The flatwork ironer should be cleaned at the start of each shift. A more thorough cleaning can be completed on a day the plant isn't operating.

Several cleaning and scrubbing pads are available that do a very good job of breaking up and removing the dirt and residue from the chest. Once this is completed, run a cloth with a cleaning solution through the ironer to ensure all dirt and residue is removed.

Many products on the market are a combination cleaner and lubricant that may eliminate the need for the additional step of waxing the chest. As with all products in your plant, follow supplier recommendations for proper use.

Once the chest is cleaned, napery should pass smoothly through the ironer. To maintain smooth processing, run the treated cloth through the ironer several times during the day. The best times to run the cloth are at each break and at lunch. Should processing become a problem, then run the cloth as a test to determine if a dirty chest is the cause. If cleaning does not improve processing, then look at other areas.

IRONER CHEST TEMPERATURE

A key element in the proper processing of poly napery is ironer chest temperature.

The optimum flatwork ironer temperature range is 310 to 350 degrees Fahrenheit. Below this temperature, the napery won't pass through properly. At temperatures above 350 degrees Fahrenheit, particularly in the 400 degrees Fahrenheit area, glazing or melting can occur.

Neither of these situations is desirable in your plant, but since chest cooling is often more of a problem than chest overheating, let's look at situations that can cause the chest to cool.

Poly napery must be properly extracted for processing through the flatwork ironer. A moisture retention of 20 to 25 percent seems to work best. Higher moisture content than this can cause the ironer chest to cool and the napery to stick and roll on the first or second roll.

An easy way to determine if chest cooling is the cause of processing problems is to stop feeding for a few minutes. This will allow the chest to once again reach temperature, and the sticking should cease until the chest once again cools down. If this is the case, then either additional extraction time or conditioning is needed.

Another often overlooked but integral part of the flatwork ironer is the steam traps. Traps are used to remove condensate from the chest, which keeps the chest hot. Inoperative traps can't effectively remove water or maintain pressure, causing the chest to cool and the poly napery to stick.

For best results from the flatwork ironer, each chest should be trapped individually. Be sure that traps are in proper working order and replace them when needed. Your flatwork ironer manufacturer can recommend traps and a maintenance schedule for your specific ironer.

PROBLEMS FROM THE WASHROOM

Many of the processing problems experienced in the flatwork department can be attributed to the washroom. Much has been written, or speculated about the effects of residual chemicals and improper souring. Let's look at each of these. Sour is used to overcome the bicarbonate alkalinity of the water supply. It will also neutralize alkali

left from poor rinsing. An optimum pH range for poly napery processing on the flatwork ironer is 5.5 to 6.0. If the pH is too low, below 5.5, then the poly napery tends to roll and crease on the first or second roll of the flatwork ironer.

If the pH is too high, above 6.5, then residue from the alkali and soaps can be left behind. This too can cause rolling and creasing of the poly napery. Unfortunately, the only way to correct these situations is to reprocess the load in the washroom with the proper sour amount.

Residues from improperly soured or rinsed loads can cause a buildup on the chest of the flatwork ironer. These can be seen as a yellow to brown powdery material on the chest and roll covers. This can be removed by the cleaning procedure discussed earlier.

MECHANICAL CONSIDERATIONS

All poly napery is somewhat less forgiving than cotton or blends of mechanical problems caused by poor maintenance of the flatwork ironer. Some of the more common problems have to do with pressure, drafting, roll covers, and warped chests.

Roll pressure is critical for proper processing. Less effort and energy are required to finish poly napery than cotton napery. Therefore, less roll pressure is needed.

A good test for the first roll is the "brown paper test." Fold a piece of brown wrapping paper in half and pass it under the first ironer roll; you should be able to freely pull it back without ripping. If this isn't the case, roll pressure should be reduced.

Ironer rolls must be properly graduated in order to obtain the correct drafting. Padded roll diameter increases from the entry end to the exit end of the ironer. Improper drafting will cause the linen to rise up off the chest between rolls.

An easy way to check for proper drafting is by using adding machine tape to measure the diameter of each roll. Moving from the back to the front, the strip of adding machine paper should get shorter as the roll size decreases. If this isn't the case, then adjust the rolls and pads accordingly.

Roll covers on the flatwork ironer must be in good shape. If they're old and slick, the napery will crease and roll going into the first ironer roll. Covers should be replaced before they get old and worn for optimum ironer efficiency. Several manufacturers offer a special cover for the first two rolls to help pull the linen flat as it's fed.

Warped chests can have a detrimental effect on processing efficiency and quality. Once again, linen can roll and crease as a result of this condition. Unfortunately, the only solution is to replace the ironer chest. If this happens to you, you may want to find out what caused the

warping so the same situation doesn't recur.

QUALITY FEEDING

It should be obvious that feeding plays an important role in finished product quality. Workers should be properly trained and supervised to ensure that they understand the correct procedure for feeding all products.

When the napery is fed, it should be fed flat. The trailing ends should not be pulled back, as this can cause a leading bow in the linen. Each napkin lane should have two tapes to keep the linen flat against the chest.

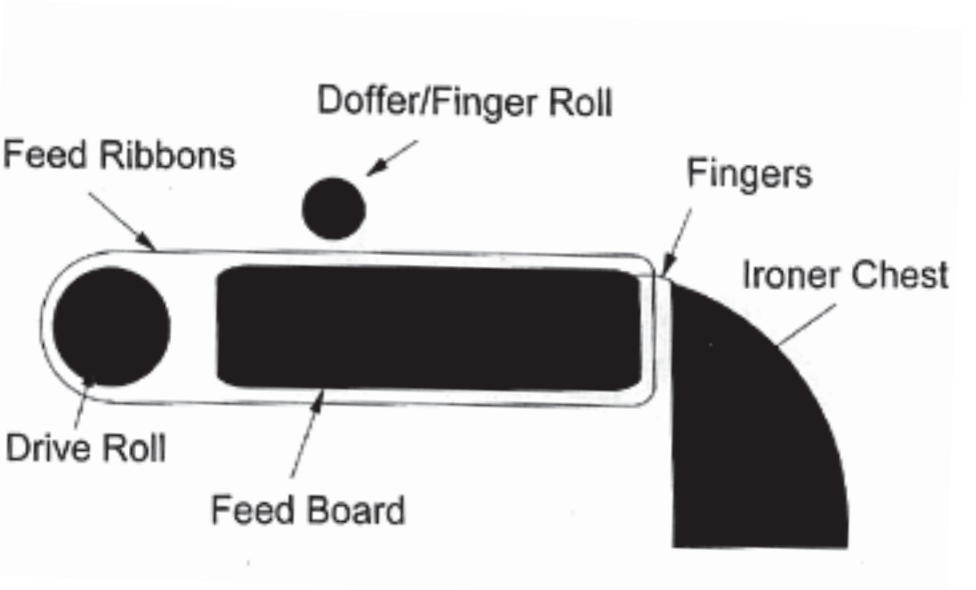
SUMMARY

While we've discussed the main processing problems with poly napery in the flatwork ironer area, the list is by no means complete.

The key to eliminating processing problems is to first understand the situation and then take measures to ensure the problems don't recur. If you need help, look to your equipment manufacturers, textile suppliers, and associations.

Go ahead now and produce the quality of polyester napery your customers have come to expect from you.

Kevin Keyes is a laundry service representative with the napery, uniform, and institutional fabrics division of Milliken & Company, Spartanburg, S.C.

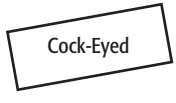

Doffer/Finger Roll
Feed Ribbons
Fingers
Ironer Chest
Drive Roll
Feed Board

COMMON FINISHING PROBLEMS

1. Leading edge not pulled taut enough.
2. Sheet sucker malfunctioning.
3. Half of sheet under other sheets or linen.
4. Worn feed ribbons.
5. Improper waxing & cleaning procedures.
6. Ironer speed too high.
7. Finger roll too far forward.

1. Feeders hanging onto sides.
2. Uneven finger roll.
3. Uneven feed board.
4. Worn feed ribbons.
5. Dirty chest.
6. Improper waxing & cleaning procedures.

1. Dirty Chest.
2. Wet linen
3. Chest not hot enough – (less than 315ºF).
4. Excessive sour.
5. Improper waxing & cleaning procedures.
6. Under - or - oversize rolls.



1. Poor – feed habits.
2. Lack of coordination between feeders.
3. Ironer speed too high.
4. Uneven padding diameter.
5. Split doffer roll.
6. Missing feed ribbons.

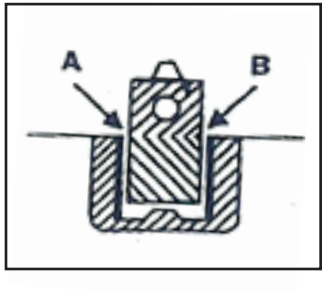
Tingue, Brown & Co.

With worn roll bearings and worn roll boxes, your rolls continually want to climb forward in the chest and then fall back again. This puts tremendous pressure on the front entry point and will quickly wear down the rolls padding.

By inserting a piece of stiff cardboard behind the roll, you can feel if you have this problem.

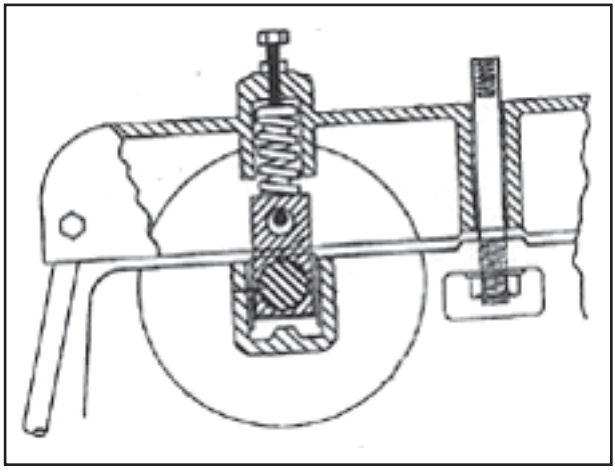
ROLL CLIMBS FORWARD

ROLL FALLS BACK



THE SOLUTION TO THIS PROBLEM IS TO EQUALIZE “A” AND “B” WITH BRASS SHIMS.

ROLL PRESSURE MECHANISM



Static electricity affects flatwork productivity

JOHN SCHNEIDER – Tingue, Brown & Co., Los Angeles

Static electricity causes excessive folder jams each day. It results in iron-overs because of poor folds. Static electricity causes guide tape to be replaced more often than otherwise – also folder ribbons and ironer covers.

Static causes linen to be damaged, results in downtime, lost customers, overtime, poor quality, and increased maintenance. An eight-roll ironer, operating at a rate of 1,200 sheets per hour with five minutes per hour down-time, loses $160 per eight-hour day in revenue. Do we really have to accept continuous productivity losses due to static electricity?

What is static electricity? It is the product of stationary electrical charges, either positive or negative, that result from friction. Linen which carries a sufficient voltage of static electricity – 5,000 to 20,000 volts – will be repelled or cling to parts of the folder, causing a poor quality fold or, worse yet, a jam-up. A positively charged sheet in contact with a positively charged folder ribbon repels the other, as is true if both items are negatively charged. If they carry opposite charges (positive versus negative) they cling to each other.

Where does the friction come from which causes static electricity?

- It comes from the washroom. Chemical residues can be left on the linen after the final step in the formula. Among these residues are alkali, sour antichlors, bleach, or sizing such as starch.
- The presence of these chemicals restricts the smooth flow of linen across the chest, thus causing friction.
- It comes from improper chest temperatures. Friction is increased as chest temperature decreases. One hundred pounds of steam pressure equates to chest temperatures of 338 degrees Fahrenheit. Chest temperatures of less than 310 degrees cause excessive friction. Wet steam due to faulty traps or boiler problems results in poor chest temperature recovery as cool, wet linen passes across the chest.
- Friction comes from excessive tumbling. Linen friction is produced by the rubbing of linens during the conditioning process. Once the moisture has been removed, the linen is no longer a conductor of electricity; that is, the electrical charges produced through friction become static, or stationary, locked on the linen.
- It comes from dirty chests. Ironer chests become dirty from buildups from washroom chemicals, from the carbonizing of

lint and chest lubricants, from plastic wrap, auto-clave tape and adhesive tape.

- It comes from poor ironer chest and roll lubrication. The ironer roll has the largest bearing in the laundry. It must be lubricated with the same principles of lubrication for all bearings – "Not too much: not too little."
- Linen friction comes from the folder ribbons. On low humidity days the folder ribbons become very dry and lose their conductivity. Spraying moisture onto the ribbons can help. Folders pulling away linen at 200 feet per minute from ironers at 150 feet per minute causes friction to build up. Lint buildup on the underside of folder ribbons is an obvious situation where opposite charges attract – lint and ribbons. This lint should be cleaned off frequently.
- Linen friction is caused by padding problems. Incorrectly graduated roll sizes cause drop of tapes and linen. Undersize rolls increase the ironing pressures per square inch beyond the ironer manufacturer's recommendations. These heavier pressures increase the linen friction.
- Linen friction is caused by aprons. Dry bearings on drive, idle and guide rolls cause these rolls to freeze up and generate tremendous amounts of friction.
- If the feed ribbon support roll is set too low, the feed ribbons rub against the lower aprons causing friction.
- If aprons are not strung correctly they rub against each other causing friction. Some new aprons have an excessive amount of surface fuzz and must be "broken in."
- Running guide tape through the upper apron doffs off linen which clings to the upper apron, and helps during periods of breaking in aprons and on low humidity days.

The following are a few methods for reducing static electricity during ironing and folding:

- It is important to maintain the proper pH on high production linens. A pH of six is ten times the acidity of a pH of seven and a pH of five is 100 times the acidity of seven. Conversely a pH of eight is ten times the alkalinity of seven. And a pH of nine is 100 times the alkalinity of seven. Just being close is not enough.
- Blend sheets conditioned from 10 to 20 minutes generate a tremendous amount of static electricity.
- It is important to inspect and clean the first two chests of ironers regularly.

- Consider the use of humidifiers under the folder ribbons. Also some plants have successfully ducted some of the moisture from the ironer vacuum system under the folders.
- Ironers and folders should be grounded together using heavy copper wire. Both the folder and the ironer should be grounded through the floor to the ground with four-feet copper rods. Grounding to the ironer plumbing pipes is not recommended because there is too much resistance in these pipes.
- Successfully combating static electricity is possible with certain managed controls. It is an important part of operating a highly productive plant.

FINISHING METHODS

The following finishing equipment is usually found in the laundry department:

1. flatwork ironers
2. tumblers
3. steam tunnels
4. shirt presses
5. wearing apparel presses

Each one of these types of finishing equipment will be treated separately in this text.

FLATWORK IRONER

A great part of the work mix in the typical laundry will be processed over the flatwork ironer. Some OPL's (on-premise laundries) have eliminated this department and are washing and folding the flatwork. Since most linen is 100% polyester, the resin used in making it will impart a memory to the fabric. Drying and folding this type of linen will produce an acceptable quality for some businesses and institutions. When such procedures and correct extraction principles are used, immediate folding or hanging is necessary. The loss of cotton fibers and resin finish after repeated washings and use will cause a decrease in the appearance quality of the polyester linens.

Most laundries process 100% polyester linens over their flatwork ironers producing an excellent finish. The capacities for processing linens on the flatwork ironer have been increased greatly due to the polyester content. The polyester absorbs no water and dries faster.

There are basically two types of flatwork ironers–the chest type and the cylinder ironer. The chest type has the steam in a series of steam chambers with a padded roll riding in the curvature of the chest. This type of ironer is more prevalent in the industry with very few changes made over the years by manufacturers. Increasing the heating surface by increasing the diameter of roll and the deletion of the aprons are basically the difference between a new and an older ironer. The principle advances are in the addition of feeding and folding equipment in the past years. The chest type ironers also have bare rolls or may be equipped with a vacuum attachment which aids in pulling moisture from the rolls.

The vacuum fan merely pulls the moisture thru the padding. The well contains a number of holes through which the moisture travels to its vacuum attachment at the end of the roll. When using such an ironer, it is essential to keep the openings in the roll as well as all vacuum fittings at the end of the roll, clean and tight so that the vacuum fan can function. These ironers are equipped with springs over the bare metal of the roll so that the moisture will penetrate the padding and pass through the springs into the holes in the roll. Should the holes in the roll become clogged with lint or foreign matter, the operation of the vacuum will be reduced.

The chests are usually heated by steam, however, in recent years some ironers offer the use of "liquid heat transfer." In this system, a hot mineral oil is used as the heat transfer agent. The oil is heated and then circulated through the chests at a low pressure, in most cases not exceeding 15 pounds of pressure. This type of ironer is independent of the general steam system; it permits a degree of flexibility without depending on the steam source. Overtime or weekend use of the ironer will not require the steam from the power plant. The heat transfer of the oil is much better than steam–allowing ironer temperatures of 400°F. or more. The chests themselves can be of thinner construction as they will not be required to withstand the 125 pounds steam pressure required from steam heated ironers. Steam traps will not be required since the hot oil is merely circulated through the chests. The cost of heating the oil should be compared to the cost of generating steam. Liquid phase heat transfer ironers are not for everyone. Their advantages and disadvantages should be considered when purchasing a new ironer.

The cylinder ironer, unlike the chest ironer, has the steam in the roll. Many of the older cylinder ironers were able to give a finish to both sides of the linen.

The greater number of rolls, the greater the capacity of the ironer. Most ironers are four, six or eight roll construction. The chests of the older ironers were placed in the frame of the ironer as the ironer was assembled in the plant. Today, ironers are shipped in sections and can be added later, to the ironer, as the production needs increase. By increasing the roll diameter, the same amount of heating surface results in fewer rolls.

The following eleven points should be understood when operating a flat work ironer:

1. **Steam pressure (PSI).** Older ironers usually required 100 PSI, however, the new ironers require 125 PSI for maximum productivity. A pressure gauge on the steam line going into the ironer will indicate the pressure. This is particularly important when the power plant is some distance from the laundry. A steam pressure of 80 PSI at the ironer can have crippling effects on production.
2. **Steam trapping system.** A steam trap is used to dispose of the condensate water and not waste steam in doing so. In older installations, a single steam trap might be used to drain condensate from all the chests. Individual steam traps on each chest has been found to produce greater productivity since the chests are drained more effectively. Should a steam trap fail to drain the condensate effectively, the chest will become cold causing rolling of the linen to occur as it goes over ironer.
3. **Ironer temperature.** The ironer temperature can be checked with a pyrometer, heat sticks, or heat sensitive paper. The temperature of the chests should be approximately the same temperature as the steam it is using. An ironer with 100 PSI steam pressure should have a chest temperature of approximately 338°F.
4. **Chest warpage.** This condition is usually caused by opening valves to the ironer too rapidly. This often happens when the main steam valve of the ironer is closed every night. When steam is supplied by a main power plant, such as in an institution or hospital, the main steam valve is closed at the end of the shift. To prevent too rapid opening of the main steam line of the ironer, a by-pass of 1/2 inch pipe is inserted around the main valve. By allowing the ironer to be heated with this smaller line, the expansion caused by a large surge of steam will not counteract the cold condensate remaining in the chest. When warpage occurs, the metal edges will bulge a small amount causing an uneven surface. Warpage will cause undue wear on padding

and top covers. If warpage exists, it must be compensated for in the padding.

5. **Linen rolling on an ironer.** The linen must travel smoothly over the chests of the ironer; however, if any friction builds up, the sheet may emerge from the ironer rolled to the diameter of a broomstick. The following are the main causes:

    a. underextraction of the linen.
    b. low steam pressure.
    c. traps not working correctly.
    d. feed ribbons missing.
    e. ironer tapes missing.
    f. use of too much sour.
    g. insufficient rinsing which causes chemicals to build-up on the chests.

    There are more but the trouble can usually be found in the above reasons.

6. **Static on the ironer and the folding equipment.** Any time two pieces of material are rubbed together, static electricity will develop. The aprons on the ironer, as well as the belts on the folding equipment, generate static electricity. By grounding the ironer effectively and keeping the static bar of the folder clean, a great amount of the static can be eliminated. Fabric softeners will help control the static problem to a degree. The static will be greater when the relative humidity is low. That is why static is more of a problem during the cold winter months when the relative humidity is low. Some plants have solved this problem by using a vaporizer which emits a small amount of steam under the folder.
7. **Roll diameter importance.** The padded roll should not be over or underpadded so that it will fit the contour of the chest to get maximum ironing capacity. When the padding loses its resiliency, it will not fill the curvature of the chest so the quality of the ironing will also suffer. When the padded roll is larger than the diameter recommended by the manufacturer, the quality will also suffer.
8. **Proper linen movement through ironer.** For the linen to move through the ironer, it is necessary for each roll to have a slightly larger padded diameter than the preceding roll. When this is not the case, the linen will loop between the rolls. For this reason, the pads are always numbered when purchased.

The padding gets heavier as the numbers progress. If the ironer has spring adjusting nuts, faulty diameters can be corrected by adjusting them.

9. **Pressure amount on rolls.** Good ironing depends on the resiliency of the padded rolls. As pressure is applied to the rolls, the resiliency is lost. In many plants when the ironer is not drying properly, the first action is to apply more pressure to the rolls. This could be a mistake because it would be some other reason such as under extraction of the linen. The pins of the roller bearings should be loose and a piece of kraft paper should feed into the ironer and be able to be withdrawn when the pressure is correct. Addition of unnecessary pressure has been a principle reason for short padding life. Before pressure is added to the rolls, test the pressure with a piece of kraft paper. Assign a person to add the pressure and make sure only that person is responsible for the resiliency of your ironer.
10. **Purpose of aprons.** Aprons are the large duck conveyor belts which carry the linen under the polished surface of the chest. They are used to add additional drying for the linen. With the use of 50/50 polyester/cotton linen, the need for drying power of the ironer has been reduced. This reduction has made it possible to eliminate the use of aprons. The linen then travels from the last chest of the ironer on the primary folder. Aprons are expensive and sometimes difficult to control. If the linen will dry without their use, considerable cost and trouble can be eliminated.
11. **Importance of cleaning the chests.** The metal of the chests should always be kept clean, free of dirt or any blemishes. Dirty or encrusted chest surfaces can result in rolling of the linen. Many chest cleaners and waxes can be used for keeping the chests in good condition. When using cleaners be sure the flash point of the product is high enough to avoid a fire when cleaning the ironer. Usually, if the chests are waxed twice a day, the chest surface will be kept in good condition.

Tumblers

Tumblers have the same function as the flatwork ironer, in that, they evaporate water from the linen. Regardless of their heating source, all tumblers operate in the same manner. Air is heated and circulated through the clothes or linens carrying off the moisture.

TROUBLESHOOTING FLATWORK ROLLING

SPECIAL REPORTER
Vol. 5 No. 4 INTERNATIONAL FABRICARE INSTITUTE

There probably is no problem in laundry production that has been more perplexing to more people than the problem of flatwork ironer rolling.

In some plants the condition is routine and is attributed to an old ironer. It often is accepted as a condition which cannot be eliminated without the replacement of the ironer. In some instances, plants have replaced such ironers with new ones without solving the problem of rolling.

The other type of situation is where rolling is not the usual problem, but occurs every once in a while on everything put through the ironer, particularly sheets and most particularly when the flatwork from one account is ironed. In this type of situation, the desperation to get the work through the ironer is met with frantic instructions: "Open the by-pass at the trap". "Increase extraction time". "Reduce the amount of sour". Immediately or gradually the condition disappears and there is no knowledge of the cause of it. The condition occurs again and again and each time results in the same frantic efforts to stop it.

FLATWORK IRONER ROLLING

Flatwork ironer rolling as considered in this study is a condition found with chest type ironers. It is usually encountered in the ironing of sheets. The leading edge of a sheet going over the chest surfaces of the ironer will roll and in extreme cases will continue to roll the entire sheet into a hard solid mass. When it occurs, it usually does not begin to take place until after several sheets have been fed in quick succession.

Heat-Friction Conflict

Flatwork ironer rolling is attributed to a great many causes which will be discussed in this report. Actually, these only serve to contribute to this basic cause. Flatwork ironer rolling is caused by a conflict between heat and friction. Anything which will increase friction between the damp cloths being ironed and the chest of the ironer will contribute to the possibilities of rolling.

Some simple experiments may be made to demonstrate the relationship between heat and friction. If a wet piece of cloth is laid on an ironing board and ironed with a cool iron, difficulty will be encountered in sliding the iron across the piece of cloth. As the temperature of the iron is increased, it will be found easier to move the iron across the damp cloth. If wax is applied to the ironing surface, the iron will move

more easily than without wax. However, as more wax is added to the iron and hardens to the surface of the iron, it becomes increasingly difficult to move the iron across the damp cloth.

The experiment may be continued by reducing the amount of moisture in the cloth. It will be noted that with less moisture it becomes easier to slide even a cool iron across the cloth. If a wax emulsion or soluble oil is added to the water in the cloth, it will be found that the iron will slide easier until the ironing surface has become coated with any residue from this lubricant.

Then difficulty is again encountered in moving the iron across the damp cloth.

Other Elements Affect Performance

Other elements may be added to the moisture in the cloth to show that increasing quantities of some will increase the difficulty of moving the iron across the damp cloth. These are simple experiments. They may be considered an over-simplification of the problem. Yet if these are kept in mind, they may be very helpful in determining the specific cause of flatwork ironing rolling in a given situation. In hand ironing, the iron is moved across the clothes. In a chest type ironer, the clothes are moved across the ironer. In both cases the heat dries the friction provides the finish.

It appears probable no one condition in itself can be said to be the cause of flatwork ironer rolling. The many elements which are suggested as being contributing factors present a virtually endless list. It is usually combinations of some of these elements which result in the condition. The attack on the problem must be made in the light of basic principles and in various directions leading to the elimination of any factor which may contribute to the condition.

Poor Drying A Factor

It appears that flatwork ironer rolling is most frequently found to exist when poor drying results are obtained in the ironer. This is indicated by the amount of moisture remaining in the clothes after ironing and by the amount of vapor appearing above the ironer. In such cases, the correction of the conditions causing poor drying usually corrects the rolling. A 6-roll ironer should iron sheets dry at a speed not less than 60 feet a minute. An 8-roll should do so at not less than 80 feet a minute.

These speeds are for cotton linens and can be increased when 100% polyester linens are used. For example 130 feet per minute is not unreasonable for an 8-roll ironer if 100% polyester linens are processed, moisture retention of the work is at 30%, and the ironer itself is in good mechanical condition.

The first attack on a problem of rolling should therefore be towards an improvement in drying.

Don't Overlook Washing Operation

When this is achieved, the second step should begin investigation of the washing operation to remedy the excessive or improper use of supplies, the use of improper supplies or the incompatibility of supplies in their effect on rolling.

For the purpose of reporting on this study the many factors have been classified as following, though not necessarily in the order of importance – extraction, the flatwork ironer, steam supply, steam returns, washing, the material ironed and temperature.

Extraction Influence

Satisfactory ironing of flatwork can best be obtained with what is generally stated as "50% extraction". This expression is a literal misstatement of the true condition. It means that extraction of water has been made to a point where the remaining moisture content of the clothes is equal to 50% of the dry weight of the clothes. A load weighing 150 pounds after extraction and 100 pounds after having been ironed dry contained 50 pounds of moisture. This is equivalent to 50% of the dry weight of the load.

Uniform extraction of any one load is not entirely possible. The effect of air drying to the exposed surfaces in the load will result in the removal of more moisture from those surfaces than from the clothes which are not exposed to the air in the extractor. A small sample of clothes taken from one load for weighing to determine the degree of extraction obtained in that load may not be representative of the average extraction of the load.

Redistribute Moisture

When the load is removed from the extractor or the conditioning tumbler and immediately fed into the flatwork ironer, some portions of that load may be ironed more readily than other portions of the load due to uneven moisture removal during extraction and possibly during the preconditioning of the work.

The operations of the flatwork ironer can sometimes be improved by permitting the load to wait until the moisture in that load has been redistributed after extraction. If, on the other hand, a load of flatwork is allowed to remain unironed for a longer period of time, those surfaces of the load exposed to the sides of the basket and to the atmosphere will tend to dry out while the clothes nearest the bottom may contain more moisture than is desirable. The conditioning of

loads immediately may contain more moisture than is desirable. The conditioning of loads immediately before being ironed can be helpful in redistributing the moisture uniformly throughout the clothes. The value of this conditioning can be lost if the clothes are permitted to be stored between the time of conditioning and the time of ironing.

The most common practice in control of extraction is to determine the length of time that a given extractor must be operated to leave the correct moisture content for ironing. Variations in the sizes of the loads may result in differences in moisture content with the same amount of time in the extractor.

In other situations, variations in electrical power or in belt slippage can result in varying degrees of extraction with the same sized load in the same extractor.

Compression extraction will also be affected by faulty pumps if water type compression is used.

Remove Water During Extraction

It is costly to remove water from clothes in ironing. An excessive amount of moisture causes unnecessary friction in the ironer. It condenses more steam than is necessary. It results in the absorption of moisture by the padding to shorten the life of the padding and covers. As moisture is absorbed by the padding, the drying effect of the padding is lost and ultimately the accumulated moisture in the padding causes the clothes to be stained.

Over-extraction to a moisture content below 45% of the dry weight of the clothes leaves creases in some types of fabrics that remain as unsightly lines on the ironed articles. In other types of materials, over-extraction will result in a rough-dry appearance of the clothes after ironing, as does over-drying between extraction and ironing.

Ironer Ills

The first consideration may well be that of the steam chests, both the upper and the lower surfaces. These chests may be rough or dirty: caked direct deposits make rough chests. Dirt may result from a washing residue having been deposited on the heated surfaces. There may be rust spots formed by water dripping on the ironer from overhead. This water may come from an uncovered cold water pipe over the ironer. It may be caused by condensate forming on the ceiling above the ironer during cold weather. Tar from the roof has been known to melt and drip on a flatwork ironer causing rough chests.

Accumulations of carbonized lint, wax, soap, etc., on chests have been found to contribute to rolling. Rough chests have been reported to have caused plastic coated roll covers to shed some of the coating

by abrasion to add to the accumulation on a chest. Where any of these have formed on the chests the ironer should be cleaned by feeding through it an abrasive cloth of the proper degree of fineness until the surface is clean.

The cleaning and removing of rough spots from a chest surface must be done with caution. Improper use of abrasives may result in a rough chest. Whenever an abrasive is applied to the surface of a chest, it should be very fine, and of a type that will not injure the polished surface of the chest. It should be applied in the direction of the flow of flatwork through the ironer.

Check Chest for Warping

Rolling is oftentimes attributed to a warped chest. This is a condition where the length of a chest is not straight. It can be checked by drawing a fine silk thread tightly over the chest or by removing the apron and placing a straight edge underneath the chest. Warped chests are caused by quick heating of the ironer, turning the steam on too fast. It is usually a result of carelessness. It may be avoided either by putting a special valve in the steam line to permit only a small amount of steam to pass until the pressure on both sides of the valve is equalized, or by placing a small by-pass around the main steam valve to the ironer. When the by-pass method is used, the by-pass valve is opened fully until the ironer is hot. Then the main steam valve is opened to permit a free and adequate flow of steam to the ironer.

If a chest is found to have been warped to a point of causing difficulty, it is advisable to have that chest replaced.

Vibrations May Change Alignment

The alignment of chest surfaces in relation to each other is important. The delivery edge of each chest must be slightly higher than the receiving edge of the next chest. When a flatwork ironer is assembled, the chests are lined up in that manner. Vibration of some ironers may cause these positions to change. It is advisable to provide regular inspection for a possibility of this condition and then have a factory mechanic change the alignment of the chests whenever it is detected.

Whenever flatwork ironer rolling is encountered it is common practice to try to eliminate the condition by waxing the ironer. The application of wax usually has the immediate effect of eliminating rolling. However, excessive use of wax, or the use of improper wax, aggravates the condition in two ways. Wax is built up on the chest surfaces as a residue which causes roughness, resulting in friction. The use of wax with a low melting point causes the wax to seal the pores of the cover cloth and padding, and results in wet padding.

Paraffin oils with a high volatilization point or a type of grease or oil as used in the baking industry, seem best. Whatever wax or oil is used, it should be used sparingly and infrequently. There is available a prepared cloth for use in cleaning and oiling an ironer surface. This cloth contains a piece of fine emery cloth intended to remove any residue by its abrasive action on the surface.

The ironer chest must be level and square at all times. The shifting of the ironer, after its installation, frequently causes distortion in the level or the squareness of the machine itself.

Pad Rolls Properly

The padded rolls are important in the good operation of a flatwork ironer as well as in the consideration of rolling. Each roll must fit the contour of the chest in which it rolls. The diameter of the rolls must always be maintained within the limits specified by the manufacturer, neither smaller nor larger. If the proper diameter of the rolls is not known, it can readily be determined by contacting the manufacturer of the ironer to the serial number of that ironer.

A reliable method of determining the diameter is that of wrapping a two or three inch wide strip of wrapping paper around the roll and marking that paper to indicate the circumference of the roll. The measurement of that circumference divided by 3.1416 will give the diameter. It is advisable to measure each roll at both ends and the center.

Different grades or types of padding behave differently in use. It is advisable to check the diameters throughout the life of the padding to assure that at no time is that diameter reduced below the manufacturers' recommended minimum. Steel padding requires the same type of checking.

The most common cause of insufficient roll diameter is excessive pressure of the roll against the chest. This pressure should never be greater than is necessary for good ironing. Excessive roll pressure should never be resorted to for the purpose of overcoming the effect of other conditions which should be corrected.

It is easy to check the pressure of the roll against the chest. Take a strip of wrapping paper two or three inches wide and stick it under the roll while it is revolving under pressure. If the paper is immediately pulled away the pressure is excessive. The pressure should never be greater than that which will allow the paper to be withdrawn from below the rolls with some effort.

Center Padded Roll

The padded roll must be in the center of the chest. A worn bearing may cause the roll to press more against one side of the concave chest than on the other. This can be checked by stopping the ironer with the rolls under pressure and inserting a shirtboard on both sides of the roll. If it is possible to pass more of the shirtboard under one side of the roll than the other, it will be advisable to check the bearings for proper alignment.

Check Vacuum on Spring Pads

Certain flatwork ironer rolls are equipped with springs over which padding is applied. One end of these rolls is usually connected through a manifold to a motor driver exhauster which serves to draw out the moisture from the padded rolls to keep the padding dry. When it is operating properly, this system is effective. However, faulty operating can result in an accumulation of moisture in the padding, especially on the rolls at the front end of the machine.

The smaller amount of padding reduces the moisture absorbing ability of the spring padded roll drastically unless the vacuum exhauster system is maintained in proper operating condition. The pipes, fittings, and the manifold should be removed yearly and cleaned of any accumulation of lint, wax, oil, or grease. A free outlet and drainage must be provided from the exhauster. The vacuum pump impeller must rotate in the right direction to provide suction to the padded rolls.

Static Electricity

In some instances, flatwork ironer rolling has been attributed to excessive static electricity in the ironer. Static electricity in a flatwork ironer is more frequently associated with the ironer aprons. It is a condition which causes clothes to stick to the apron and may result in sparks leaping from the aprons to the fingers of the folders. It is usually encountered when the two aprons do not travel at the same speed in feet per minute.

Static electricity is caused by friction and is most frequently encountered after the installation of a new apron. A new apron is stiff and requires more traction at the drive roll than an old apron does. Apron drive rolls are made with rough surfaces to provide the needed traction. This traction may be lost by an accumulation of dirt on a rough surface or by the wearing down of that surface. When loss of traction is the result of an accumulation of dirt, the roll should be cleaned. When it is due to a worn drive roll, the drive roll should be replaced, or it may be coarse sand blasted to again roughen that surface. The drive roll may be cleaned and then painted with a paint containing abrasive material.

Other apron rolls may contribute to friction of the aprons, resulting in one apron traveling faster than the other apron. These rolls should be checked to assure that they rotate freely and that they are in proper alignment. Moderate waxing of a new apron will serve as an aid in reducing the friction between the two aprons.

A temporary correction for excessive static may be resorted to by suspending a stout wire over the top of the folding end of the inside apron and then hanging Christmas tree tinsel from this wire to contact the surface of the apron. It has been reported that in other cases wire has been clamped to the apron roll shaft and attached to a cold water pipe and this has resulted in the elimination of static.

The ironer itself should be correctly grounded to eliminate the possibility of static. For best grounding a pipe driven into the damp earth under the floor is far more effective than grounding the ironer to a steam or water pipe.

Electronic static bars are used on all primary folders and will operate effectively if kept clean. It is essential to blow the static bars at least once a day to prevent lint from interfering with the static bar.

Use of fabric softeners in the washing formulas will also prevent friction build up which produces static charges.

The installation of a piece of copper tubing under the belts of the primary folder has helped in many chronic static conditions. The _" tubing runs the width of the folder and is perforated by a number of small holes which will emit a small amount of steam. This steam will raise the moisture level and prevent the static electricity. A globe rake at the one end can be used to throttle the amount of steam escaping from the holes.

Warm Up Ironer Sufficiently

When flatwork ironer rolling is found to be encountered only early in the day, it can usually be attributed to insufficient heating of the ironer before operations were started. It is important that after the chest has been heated the ironer motor be started, the roll pressure applied and the ironer be permitted to run until the padding in the rolls has reached its proper temperature before the ironer is put into use.

Poor Feeding May Cause Rolling

The manner in which sheets are fed into an ironer can contribute much towards rolling. If the leading edge of a sheet going into the ironer is fed loosely and matted in the center, the mass of cloth and

moisture at that point places a heating load as well as a friction load on a small area of the chest out of proportion to other parts of the chest. The leading edge of a sheet should always be pulled tight to distribute the area of the cloth as fully as possible over the ironing surface.

Several cases of rolling are reported to have been traced to excessive feed ribbon speeds. These excessive speeds are caused by overpadding the feed ribbon drive roll. The diameter of the drive roll should never be greater than will provide a ribbon speed slightly less than the speed of the first padded roll.

Control Steam Supply

One of the greatest problems encountered in obtaining maximum utilization of steam heated flatwork ironers is a lack of understanding of the importance of the many factors involved in the behavior of steam. The many rules common to steam engineering and steam piping seem wholly inadequate when related to flatwork ironer operations. It must be recognized also that the operating speed of the ironer and degree to which the chests are covered with fabrics being ironed contribute greatly to steam requirements.

Steam piping tables will show that for steam at 100 p.s.i. a 1 1/4" steam line is ample for a 6-roll flat work ironer. Experience, however, indicates a 2" line is adequate only when the length of that line is not excessive, and if that pipe is properly insulated. Flatwork ironers operate most successfully when provided with steam lines of adequate size directly from the boilers and with no other equipment using steam from those lines.

The older chest type flatwork ironers were constructed to include 1/2" steam and return lines between the headers under the ironer and the chests of the ironer. It was found that these short lengths of 1/2" pipe were inadequate on some chests. Newer ironers are being built with pipe in these locations as large as 1" for at least the first few chests in the ironer.

In some cases, improvement in drying of old ironers has been obtained by replacing the 1/2" lines to the first two or three chests with 3/4" or 1" lines. Caution must be used in the drilling and tapping of chests to avoid damage to them.

Drain Steam Lines

All steam supply lines to flatwork ironers should be pitched towards the ironer and should be provided with drains or traps at the low point in the steam line to remove any condensate accumulating between the boiler and the ironer. Condensate pockets in a steam line reduce the effective size of the pipe by the amount of water that is permitted to accumulate in that pipe.

Insulation Cuts Condensate

The type of pipe covering used is important because it must serve its purpose of providing good insulation. At steam temperatures used in the laundry industry, 85% magnesia or its equivalent appears to be most practical.

Steam Quality

The quality of the steam delivered by the boiler is an important factor for flatwork ironer utilization. Steam should be clean and at least 98% dry. Inadequate boiler blowdowns can result in poor quality steam as may improper treatment of boiler feed water. Poor steam may be due to an excessive amount of air or other non-condensable gases in the boiler feed water. This may be reduced by proper treatment of boiler feed water and maintaining it at pH 10.5.

Fluctuations in steam pressure are frequently noticed in laundries. It has been observed that during even moderate drops in steam pressure, the clothes will not dry when passing through the ironer and they may roll at such times. The ironer speed must be that at which the clothes will dry when pressure is at its lowest. An accurate pressure gauge should be installed near the steam valve at the ironer.

Control Back Pressure

In the case of the high pressure trapless system, it is important to guard continuously against the possibility that regular or intermittent discharge at high pressures from one piece of equipment may restrict the flow of condensate and insoluble gases at lower pressures from other equipment.

When traps are used, an open by-pass or a leaking trap can easily build up pressure in the return line to restrict the flow of condensate and non-condensable gases from other equipment.

Free Discharge Required

In all cases, the objectives should be a free discharge of condensate and gases without loss of steam into the atmosphere.

Superheated Steam

Questions of the value of superheated steam in laundry ironing equipment are frequently raised. The value of steam in ironing equipment is in the latent heat given out when that steam is converted into water. Steam superheated to a temperature beyond that at which the steam condenses provides little heat value, if any, at an ironer. Any value of superheat in the laundry industry is confined to providing enough superheat to maintain a steam temperature above that of

condensation during the travel of the steam through the steam line to the ironer itself.

Traps – Number and Locations

Many flatwork ironers are provided with a separate trap for each chest. Others are equipped with only one trap serving all of the chests. It appears probable that this conflict of experience may be attributed to other factors not readily determined. The amount of steam condensed by a 6-roll ironer in one plant may be greater than that condensed in another plant.

The size of the trap is important. The trap must be large enough to adequately discharge the condensate and gases. There appears to be some validity to the contention that the trap should be small enough at the same time to provide for frequent discharges and thereby increase the turbulence of the steam within the chest. When only one trap is used for a flatwork ironer, it appears advisable to install that trap at a level below the floor to provide suitable drainage of the condensate into the trap.

Traps are designed to suit specific operating conditions. It must, therefore, be recognized that each trap will operate most effectively at the pressure for which it was designed. If the steam pressure at the ironer is 100 p.s.i. the trap must obviously be one intended to operate at 100 p.s.i. At the same time, consideration must be given to the pressure or vacuum to which a trap discharges.

Some laundry equipment manufacturers recommend the installation of by-passes around traps. This is intended for use as an aid in quickly heating the flatwork ironer, as for example, in the morning. It is also intended for use in an emergency requiring the removal of the trap for repair. Experience has indicated that when by-passes are used they are frequently opened and then forgotten.

In other cases, it has been observed that by-passes are regularly cracked open slightly to improve the continued operations of the equipment. In still other instances, it has been observed that apparently because of the expansion and contraction of the metal in the by-pass valves, slight leaks cause wire drawing of the valve seats and result in large losses of steam. For these reasons, consideration should be given to the elimination of by-passes and, perhaps, the installation of petcocks in or at traps for testing and for emergency use.

Adequate Pipe Size

The size of the piping in the return lines is important. As in the steam supply lines, these pipes should be of adequate size. The use of "Y" fittings in the return lines is to be preferred to "T" fittings. When

"T" fittings are used, there is a tendency for the pressure discharges from one part of the plant to reduce the discharge into a main return line from other parts of the plant. When "Y" fittings are used, pressure discharge from one part of the plant will tend to aid rather than restrain the discharge from another part of the plant.

It has been reported that in one plant with a flatwork ironer equipped with traps at each chest, rolling was eliminated and the drying by the ironer was materially increased by running a separate return line from the flatwork ironer to the receiver in the boiler room.

All traps should be regularly inspected to assure that they are functioning properly. Frequent mechanical action within most traps result in wear of the moving parts. These can usually be replaced without replacing the entire trap.

Non-Condensable Gases

In some cases, flatwork ironer rolling has been eliminated by the installation of air eliminators between the chests and the traps. These air eliminators are constructed to open by the cooling effect of an accumulation of air. The installation of such an air eliminator in the return end of the last chest of an ironer has been reported to have eliminated flatwork ironer rolling and increased the drying capacity of the ironer.

Affect of Washing

There is much confusion about the effect of each of many elements of washing on flatwork ironer rolling.

Any influence of washing on flatwork rolling is in the final condition of the fabric as it goes to the flatwork iron. It is believed that any of the following may contribute to rolling.

1. Presence of any residue which may cause unnecessary friction in the ironer.
2. Absence of residues which may serve as lubricants
3. Presence of lubricating residues which carbonize with heat and adhere to the chests of the ironer.
4. Temperature of the clothes.

Souring May Effect Rolling

In the washing operation itself, the supply most commonly mentioned as a contributing factor to flatwork ironer rolling is sour used in excess. Sour is used to overcome any alkaline supplies used in the washing operation as well as the alkalinity of the water supply itself. Alkali remaining in clothes after the complete washing cycle may result in a discoloration of the clothes during the ironing process. It may

also cause skin irritation to people exposed to the use of clothes after laundering.

Variations in the size of the load, the temperatures of the various baths, the characteristics of the water supply, water levels in the various baths may result in wide pH variations with a given amount of sour.

Because of the variations which may result from these factors, it is highly important that the quantity of sour added to the load be precisely determined and used. When flatwork ironing is considered, it must be recognized that it may not only be the pH of the moisture in the clothes that is the determining factor. Consideration must also be given to the quantity of sour and type of residue remaining in the clothes after washing. A given quantity of acetic acid will neutralize the alkalinity at a pH of 5.3. Regardless of the quantity of acetic acid added beyond that point, there is very little reduction in the pH of the solution. If, on the other hand, equivalent amounts of other sours are used, lower pH values are obtained.

The more commonly used fluoride sours fall in this group. Sours marketed under trade brands generally fall within the range of the fluoride sours. Regardless of the brand of sour used, it is important to determine the exact quantity of that sour necessary for a given load and then provide containers suitable for properly measuring that quantity with subsequent supervision to assure that quantity, and that quantity only, is being used.

The distribution of the sour in the load is important. When a dry form of sour is applied to the washer, sufficient time and temperature must be provided to assure complete solution of the sour and its distribution throughout the load.

In the purchase of sour, it is important to consider good quality merchandise designed for this purpose. Occasionally, laundry owners will purchase a type of sour not designed for laundry use – but one which appears to give adequate souring at low cost. Such sours may contain matter which leaves a residue in the clothes that contributes to flatwork ironer rolling. It has been reported that some types of silicated sours when used in the presence of unrinsed alkali, may form a residue and cause rolling in flatwork ironers. Other types of silicated sours may combine with unrinsed soap and provide lubricating properties.

Soap Limited Hazard

Soap normally is not regarded as contributing towards flatwork ironer rolling. More commonly, soap is considered as an aid in reducing the condition. The soaps designed for laundry use have shown no indication of being a contributing factor to the subject under discussion. But other types of soaps may contain ingredients which will not entirely rinse out in the washing but leave a residue in the clothes to be ironed.

Opinions Differ on Alkali Bleach

The degree to which any type of alkali may contribute to flatwork ironer rolling appears to be highly controversial. Alkali may contribute towards rolling of flatwork in two ways. In the first place, new cotton sheets contain a certain amount of fats which serve to lubricate the fibers. Whenever alkali is used in quantities or at temperatures to reduce the amount of lubrication in the fibers, friction may result. In the second place, it appears probable that alkali may react with some sours to form a residue and then contribute to rolling. This effect appears due to inadequate rinsing rather than to the type of alkali used.

Bleach

Bleach is not commonly considered as having any effect on flatwork ironing rolling. It appears possible that it may be a factor in some cases. With bleach prepared in the plant from lime and soda, the lime should be allowed to settle out from the liquid that is to be used. The chlorinated lime powders made for use in commercial laundering are designed to settle out readily. Other types of lime intended for other purposes and not for laundry use may not settle out as readily and should not be used for this purpose.

Poor Rinsing Leads to Rolling

Rinsing is highly important in consideration of the possible effect of washing on flatwork rolling. The presence of objectionable residues in the clothes after washing is largely dependent on the degree of rinsing. Alkali removed in rinsing cannot combine with sour to form a residue.

There appears to be considerable evidence that a small amount of unrinsed soap left in the fabrics serves as a lubricant in ironing. This soap may be in the form of lime soap resulting from the use of hard water, or it may be in the form of an acid soap formed by souring in the presence of soap and with completely softened water.

However, when the practice of leaving soap in the fabric is used it is invariably found to result in dirty ironer chests which cause rolling. If a lubricant is desired, it appears preferable to add it to the last washing operation. It should be of a type that will not carbonize with the heat of the ironer to form objectionable residue on the chests.

It has been reported that in some cases soap and alkali residues have accumulated in fabrics with repeated washings to cause greater problems in ironing as well as noticeable harshness to the fabrics.
Any investigation of rinsing must include consideration of load size, temperature, time, water levels and number of rinses.

Control Starch Quantity

The principle reason usually given for not using starch on flatwork is that when it is used, it tends to deposit on the chest of the ironer. If any starch or sizing is to be used on any flatwork, it must be of a type prepared and used in such a manner that it will not readily deposit on the surface of the ironer. The factors to be controlled are quantity, penetration and lubrication.

Impurities in Water Supply

Water suitable for the washing of clothes should not in itself contribute towards flatwork ironer rolling. All natural waters contain some impurities. It is believed that in some cases a large amount of minerals or other suspended matter may contribute towards the condition. Proper filtering and pre-treatment of the water may reduce this possibility.

Plants have reported that the installation of a water softener has resulted in flatwork ironer rolling. When no water softening is used, even small amounts of calcium hardness will convert soluble soaps into lime soaps. The residue of lime soap in the clothes serves as a lubricant. Whenever a water softener is installed, the washing formula must be adjusted accordingly. Softened water requires less soap and alkali than does water which has not been softened. A reduction in the amount of soap and alkali is normally followed by a reduction in the amount of rinsing and in the amount of sour necessary.

Consider Types Material Ironed

A discussion of the subject of flatwork ironer rolling cannot be complete without consideration of the material that is being ironed. It is believed by some that finishing agents used in the manufacture of textiles may have a bearing on this problem of rolling.

Heavy fabrics contain more moisture per square foot than light fabrics. Consequently more steam is required to iron them dry. On the other hand, light fabrics requiring less heat, are more easily affected by friction in the ironing.

Temperature Affects Rolling

The temperature of fabrics as fed into the ironer influences the heat demands on the first chest or two. Cold fabrics require more heat than warm fabrics do.

Extraction appears to be influenced by the temperature of clothes when placed in the extractor. Studies indicate that more moisture is removed by an extractor during a given time if the clothes are warm than if they are cold.

When cold water is used in the last washing operation, considerable seasonal variations in final temperatures will result in plants buying water in northern climates. The incoming cold water may range from 35°F in the winter to 70°F in the summer.

In climates with wide seasonal variations in relative humidity, rolling is often encountered during the highly humid seasons. This can probably be attributed to the inability of humid atmosphere to absorb more moisture at existing temperatures. Corrections can usually be made by better extraction, better heating of the ironer, or lower ironer speeds.

Maintain Control

One of the greatest difficulties in determining the cause of flatwork ironer rolling in any one plant is in the difficulty of maintaining continued controls of all the many factors involved. This appears to point towards the advisability of more positive attention towards maintaining stable physical conditions.

Flatwork ironer rolling should never be encountered when all operating conditions are correctly maintained. When it does exist, it can be eliminated by correcting each condition that may contribute to rolling.

Check These	Look For	What To Do
The Flatwork Ironer	Static-caused by apron friction.	See that both aprons run at same speed in feed per minute.
	Ironer too cool when feeding started.	Turn on steam in ironer earlier. Run ironer to heat padding well before using.
	Poor feeding.	Train and supervise feeders to feed properly.
	Feed ribbons travel too fast or are missing.	Reduce diameter of feed ribbon drive roll.
Washing General	Residue in clothes after washing.	Eliminate residues that may cause friction or carbonize on ironer surfaces.
		Consider leaving non-cumulative lubricants that will not carbonize on ironer surfaces.
Sour	Too much used.	Use only enough to neutralize alkalinity usually to pH 5.0.
	Poor distribution.	Run sour bath long enough and at temperatures to assure thorough distribution.
	Poor quality sour.	Purchase from reliable supplier.
Soap	Not intended for laundry use.	Use good quality soap intended for laundry use.
Alkali	Too much used.	Use only enough for good results on type of load washed.
Bleach	Residue from unsuitable bleaching powder.	Purchase good quality for laundry use from reliable supplier.
Rinsing	Inadequate.	Rinse thoroughly. Use proper water levels, proper time, and number of rinses.
Starching	Residue on ironer chests.	Use no starch on flatwork or control starch for quality, penetration and lubrication.
Water Supply	Objectionable impurities.	Filter, treat, or properly soften water.
The Material Ironed	Heavy materials.	Use lower ironer speeds.
	Light materials.	Clean ironer chests.
	Accumulated residues.	Wash correctly until residue removed.
Temperature	Low temperature of clothes leaving wash-wheel during winter months.	Increase final temperature to improve extraction. Preheat clothes immediately before feeding.
	Low temperature of clothes fed into ironer.	Increase extraction. Improve ironer heat transfer.
	Effect of humidity on ironing.	Reduce ironer speed.

PRESSING & FINISHING PROBLEMS
SPECIAL REPORTER
INTERNATIONAL FABRICARE INSTITUTE Vol. 9, No. 5

There is no substitute for proper padding in producing quality work. Income and profit depend on economically finished, quality work that pleases the users.

Probably more words have been written concerning the operation of flatwork ironers than any other piece of laundry equipment. Even so, much needs to be said about proper padding of ironers – its importance and purpose.

Ironers have often been considered a "temperamental" piece of equipment but much of this was due to the lack of understanding its operation, improper or worn padding, and poor maintenance.

What are the principles of ironing?

1. The linen is ironed when the heat from the chests or cylinders drives the moisture from the cloth into the padded rolls so the moisture can be dispersed.
2. Gloss or sheen is supplied by the clean, smooth surface of the chest surfaces.
3. To smoothly and uniformly iron the entire piece of linen, the padding on the rolls must be sufficiently resilient to absorb the irregularities of cloth seams.
4. Each succeeding roll is slightly larger than the one proceeding it, so the linen can move lightly and smoothly through the ironer.

Undersized padded rolls or oversized padded rolls will not give maximum contact with the heated surface of the ironer. This reduced contact does not permit proper heating for efficient moisture elimination or drying. Consult your ironer maintenance manual for the padded roll size which is correct for your ironer.

PADDING PRINCIPLES

Ironers are padded to obtain proper resilience, roll size and graduation. The heat retention of the padding is another factor to consider when selecting padding.

Since the chest type ironer is used the most, much of this material pertains to such ironers.

Padding

Cost, instead of initial price of padding, is the prime concern when making your selection. The various advantages and disadvantages of each type of padding will be discussed.

Knitted cotton is supplied either by the yard or in cut pieces and has a

short resilient life. It will burn out and have a low heat retention, losing the roll size within 12 weeks.

It has the lowest initial cost; however, the cost involved in changing this type of padding every 12 weeks really makes this padding the most expensive to use. It produces an excellent finish during the first part of its short wear life.

Nylon pads are usually supplied in cut pads. The pads are numbered so that roll graduation is built into the padding. The nylon pads are inserted between the padding. The nylon pads are inserted between the binder and its top cover and usually lasts for nine months with forty-hour-week operation.

The nylon pad has a higher initial price than the cotton pad; but, considering the wear life, nylon has a lower cost than cotton. Nylon is absorptive and loses roll size less rapidly than cotton.

Asbestos type pads have virtually disappeared from use due to its ingredient being declared a carcinogen. This type of padding had enjoyed wide use in the fabricare industry since it would not "burn out." Its finishing qualities were good and it required little servicing.

Metal padding is made to size for the individual ironer with roll graduation incorporated in the pad. Such padding is installed by the manufacturer since they guarantee a specified wear life.

While metal padding has the highest initial price, it will usually have the lowest overall cost.

Check These	Look For	What To Do
Extraction	Too much water in clothes.	Check weigh full or partial extractor load after extraction and after ironing dry. Damp weight should not be over 150% of dry weight.
The Flatwork Ironer Chests	Dirty.	Clean carefully with kerosene cloth or use very fine emery cloth on both top and bottom of chests.
	Rough surfaces.	Ask manufacturer.
	Warped.	Check by drawing silk thread over length of chest.
	Chest walls may be too thin as result of poor corrective of warping.	Replace chest
	Improper alignment.	See that delivery edge of each chest is slightly above the receiving edge of the next chest.
	Improper waxing.	Use proper wax. Apply smaller amounts. Use less frequently.
	Not level.	Make ironer level.
	Not square.	Make ironer square.

Check These	Look For	What To Do
Rolls	Too large or too small	Keep padded roll diameters within manufacturers limits for that ironer.
	Too great roll pressure against chest.	Check by inserting strip of paper under roll. Should be able to pull paper out with some effort. Keep roll pressure low.
	Not in center of chest.	Replace bearings.
	Vacuum system not working properly.	Remove vacuum pipes, fitting, etc., and clean thoroughly.
Steam Supply	Poor drying.	Use slower ironer speed.
	Too small steam line.	Install larger size line.
	Too much equipment on steam main.	Run separate main from boiler to ironer.
	Water in steam line.	Drain condensate from all low points in steam line.
	Poor insulation.	Cover with 85% Magnesia or equivalent.
	Wet steam from boiler.	Blow down better or install “dry-back”.
	Improper feedwater treatment.	Maintain boiler feedwater at pH 10.5. Keep non-condensable gases down.
	Less steam pressure.	Use not less than 100 lbs. steam pressure at ironer or reduce ironer speed.
	Fluctuations in steam pressure.	Maintain constant pressure at ironer.
Steam Returns	Improper trap sizes.	Use traps neither too large nor too small.
	Poor location of traps.	Provide for ample drainage between chests and traps.
	Non-condensable gases not removed.	Use traps with proper air vents.
	Improper traps.	Use traps designed for operating pressure used.
	Poor return system.	Consult with competent steam. Stop steam leaks, laundry steam, or other steam.
	Excessive back pressure on traps.	Stop steam leaks thru other traps.

PRESSURE ON THE ROLLS

Pressure which is set wisely and sparingly will add considerably to the wear life of the padding and covers. In some plants, there is a tendency to increase the pressure whenever the work is not drying. In most cases, more pressure on the rolls is not required, but the reduced drying capacity is due to some other cause, such as water-extraction.

If the ironer will feed a piece of kraft paper which can be pulled back out from the rolls, it has sufficient pressure. Careless pressure adjustments on the roller will reduce the wear life of the padding and top covers.

CHEST MAINTENANCE

Clean, smooth chests are essential to good finish, clean work, and will prevent excessive top cover wear. Excessive tape breakage is often due to dirty chests.

A scheduled cleaning-waxing program will help prevent the troubles mentioned above. A suggested schedule is listed below. It may require some variance to meet your operating conditions.

1. Use a steel wool chest cleaner. Run this once a day, paying particular attention to the ends of the chest. Run it twice a day if you are experiencing considerable buildup.
2. Be sure to put the folder in "by-pass" or turn it off when running the chest cleaner.
3. Run a wax cloth after the steel wool cleaner.
4. For normal operating conditions, the wax cloth, using 1/4 cup of powdered wax per ironer roll, is run each morning. The wax cloth will be run again without adding any wax.
5. Run the wax cloth at noontime without adding additional wax.
6. For faster operating ironers or heavier chest buildup, it will be necessary to run the wax cloth with wax morning and noon using 1/4 cup of wax per roll each time. The wax cloth is run an additional two times without more wax at each using.
7. Use wax cloth twice at mid-morning and twice at mid-afternoon without using more wax.
8. For breaking-in new covers, run the wax cloth with about 1/2 cup of wax per roll making sure to run the cloth four or five times after the initial run without adding wax. After running eight or ten sheets, follow with the wax cloth again with 1/2 cup of wax per roll. The cloth will then run an additional 2 or 3 times without additional wax.

   At noon, run the wax cloth with 1/4 cup of wax per roll, followed by 2 or 3 times without additional wax. The wax cloth without additional wax should be run during the afternoon.

For the rest of the first week, use 1/4 cup of wax per roll on the wax cloth first thing in the morning. Then, use an 1/8 cup of wax per roll at noon. After the first week, revert to the normal waxing schedule.

There are a number of good wax and clean products available. After the initial break-in period on covers, there should be no hesitation in using one.

VACUUM TUBES

When the ironer is equipped with springs and a vacuum system, ensure the tube at the end of the roll is kept clean and tight. It is not unusual to see several of the connections loose or unconnected. When this occurs, the vacuum system will be ineffective for the roll.

Every few months, the vacuum tube should be cleaned so it is free of any accumulations. The purpose of the vacuum is to aid in the faster elimination of moisture. It can only function effectively when it is clean and fits tightly.

PADDED ROLL LENGTH

It is usually not wise to pad the ends of the rolls which receive no use. Not only is it a waste of money for unused padding but it causes excessive cover wear. Much of the padding is tapered at the roll edge to avoid excessive wear in this area.

If cross folders are not used, it is advisable to feed large pieces alternately to one side and then the other to prevent dirt deposits on the edge of the rolls.

APRONS

The apron on the ironer is actually a long canvas belt used to add drying time by passing the linen over the polished bottom of the chest.

AN ANALYSIS OF GRADUATING METHODS

1. USING PRESCRIBED PRESSURE SCREW ADJUSTMENTS

This method requires:

Uniformity from pad to pad.
No variation within the pad itself
Consistent and equal spring strength
Perfect mechanical condition of the ironer (no warped chests, no worn bearing boxes, etc.).

2. USING GRADUATED-WEIGHT PADS

This method requires:

Enough weight difference between the graduated-weight pads to give proper roll size graduation
No variation within the pad itself
Perfect mechanical condition of the ironer
Consistent and equal spring strength (If screw adjustments are prescribed).

In both of these methods travel is judged visually – by watching work flow. If there is a considerable amount of buckling, scabbing (using additional covers or inserts) or "guess-work" screw adjustments are used to adjust for some of the variations that exist. Lacking accurate means of measurement, however, proper graduation results only by chance.

3. USING THE VELOCITY STEAM CALIPER TO GUIDE PRESSURE SCREW ADJUSTMENTS

This method is independent of any physical qualities of padding, cover, or ironer. Roll size is the all-important factor.

The Velocity Steam Caliper method allows for variation in padding consistency and recognizes that ironers differ and mechanical misalignments are frequent.

Use of the Velocity Steam Caliper to guide screw adjustments insures accurate graduation.

HOW TO GRADUATE WITH THE VELOCITY STEAM CALIPER

Because new pads are the most resilient, rolls should be graduated at the time of padding so that the pads will react most directly to screw adjustments.

1. With ironer padding and covers installed according to the manufacturer's instructions, allow the ironer to come to full heat.
2. As soon as the pads are installed and loosely "wound in", loosen all individual roll pressure screws completely.
3. With the ironer running at slow speed, apply light bar pressure until covers just touch the chests, and observe the covers paying particular attention to the unused areas at both ends of each roll. Any pulling, dragging or distortion at this stage indicates a dirty chest or that something is under the roll. This should be corrected immediately.
4. Apply more light pressure until the pad is snugly fitted to the roll. Watch for humps, knots, etc., and correct them at once.

THE FIRST FOUR STEPS SHOULD TAKE APPROXIMATELY 1/2 HOUR

It has been standard practice to apply bar pressure until the first pin is loose as soon as padding is applied. Applying only light bar pressure initially is a safeguard for padding and covers since it prevents excess pressure application before knots and lumps which can cause deep distortion of the padding, have been smoothed out, and gives time to remove glue or dirt which may pull and damage covers.

5. Turn all individual roll pressure screws down finger tight. This should be from 1/2 turn to 1 turn past contact with spring caps.
   a. Tighten the lock nuts of the two screws on the last roll (the roll farthest from the feeders).
   b. Make one-sixth of a turn (1 face on a hex set screw) on each of the two pressure screws on the next to the last roll, then tighten the lock nuts.
   c. Continuing back from the last roll, increase the screws on each roll one-sixth of a turn more than the screws of the roll you have just tightened before tightening the lock nuts.

This adjustment is necessary to start getting a graduated roll with correct travel as soon as the machine starts to operate and to test for variations in the padding and/or machine misalignments.

If there are no variations in the padding and the machine is in perfect alignment, roll sizes will now be graduated. Since this condition rarely, if ever, exists it is necessary to locate any variations and compensate for them.

6. Lower the pressure bar until the roll hanger pins of the first roll just become loose.
7. As soon as this pressure has been applied, measure each roll at both ends. Set your Velocity Steam caliper on the roll as far in as reach permits (at least two feet in from the end of the roll) at a right angle to the roll shaft, making sure that both sides and the top of the Caliper are touching the roll. Plan the overall graduation before making any adjustments.
8. Special attention should be given to the covers. If one end of a roll cover is pulling, immediately check the caliper of the roll ends. The end that is pulling will probably be smaller than the other end. The pressure screw on this small end should be backed off by the amount that it is small. If the roll is 1/32" smaller on one end, the screws on that end should be backed off 1/3 of a turn (2 hexes).

It is important that any adjustments necessary to obtain equal diameters at both ends of the roll be made as soon as possible so that padding will not be compressed and unable to respond to backing off of the screws.

9. Run cleaning cloths through the ironer and lubricate the chests and covers well.
10. Work may now be started through the machine. It is suggested that during the initial graduation period all work be run at one speed less than normal.
11. Pins should be checked frequently to keep them loose.
12. Unless the ironer is badly out of alignment (in which case an expert should be called in), compensation for variations in padding and machine misalignments can be completed in one to four hours, and roll diameters should be equal at both ends of each roll.
13. Calipering from the last roll, which should be the largest, to the first, each roll diameter should be approximately 1/32" smaller. If there is not 1/32" graduation, the screws should now be adjusted to obtain it. A guide to the regulation of roll size is: 1/3 of a turn (2 hexes) of the screw equals 1/32" change in diameter.
14. Calipering should be done frequently – at least once every 15 minutes – during the entire regulating period. After any screw adjustment, there will be a short period of time before the pad reacts to the

adjustment. Velocity Steam Calipers should be used constantly to watch the "trend" of the adjustment.

A "trend" that does not correspond to the screw adjustments usually indicates a misalignment in the ironer. For example: if the roll diameter on one side of a roll keeps getting smaller, although screws have been "back off", the shaft on that roll may be bent, or there may be a worn bearing on that side.

NOTE

Once the screws have been adjusted for correct graduation, the screws never have to be touched again as long as the same type and brand of padding is used. When repadding, do not touch the screws (unless calipering after work has started through the ironer indicates that adjustments are necessary).

SUMMARY

Here is a diagram of the ironer rolls during the graduation process.

Ironer has just been repadded, the rolls are very big, all pressure screws have been loosened, and there is no screw pressure being applied. Turn the screws down "finger tight".

Bar pressure has been applied to the point where the pins just become loose. Starting with the left roll, all screws have been increasingly tightened 1/6 of a turn to start graduation and test for variations. Both ends at each roll should be calipered frequently. Record diameters and plan adjustments. Note varying spring compression.

Screws have been tightened or loosened to compensate for variations, using 1/3 turn for 1/32" change in diameter, and the roll sizes are now graduated. From this point on roll sizes will reduce equally as the weights of the rolls are equal and there is no screw pressure being applied. Not graduated roll sizes.

RULES FOR SCREW ADJUSTMENT

1. Apply only light bar pressure until all knots and lumps have been smoothed out and all dirt and glue have been cleaned off the chests.
2. Use 1/3 turn (2 hexes) equals 1/32" as a guide for adjustments.
3. When the diameters at the ends of a roll are not equal, back off the screws on the small end so that the small end will equal the large end.
4. In graduating, start from the last roll which should be the largest, and work toward the feed end of the ironer.
5. Consider the effect of any adjustment in relation to the over-all pattern – both end to end of each roll and roll to roll across the ironer.
6. Once they are adjusted for proper graduation, screws should not be touched when repadding with the same type and brand of padding, or when building up diameters with booster pads, etc. Be sure that built-up rolls fit into the graduation properly.

SHORT CUTS:

In compensating for unequal diameters at the ends of a roll, backing off the screws to enlarge the smaller end is a precaution to reserve padding. However, the graduation pattern may require that the large end be reduced to equal the small end and, after experience has been gained in this method of graduation, only one adjustment may be initially necessary.

A TYPICAL ADJUSTMENT FOR AN 8-ROLL STANDARD IRONER

1. The ironer has just been padded, knots and lumps have been smoothed out, the chests are clean, and pressure screws have been turned down finger tight.

   Starting with the last roll all screws have been increasingly tightened 1/6 of a turn to start graduation.

FIRST CALIPER READINGS

	LEFT SIDE			LEFT SIDE		
Roll	Additional Screw Pressure	Caliper	Adjustment Necessary	Additional Screw Pressure	Caliper	Adjustment Necessary
1	1-1/6	12-11/32	2/3 Turn up	1-1/6	12-13/32	none
2	1	-14/32	none	1	-13/32	1/3 Turn up
3	-5/6	-14/32	1/3 Turn up	-5/6	-15/32	none
4	-4/6	-16/32	1/3 Turn up	-4/6	-17/32	none
5	-3/6	-17/32	none	-3/6	-17/32	none
6	-2/6	-17/32	1/3 Turn up	-2/6	-18/32	none
7	-1/6	-19/32	none	-1/6	-19/32	none
8	0	-20/32	none	0	-20/32	none

2. After operating one to four hours, adjustments have been made for major machine misalignments and both ends of each roll are equal. Note that roll sizes have been reduced 1/32" all the way through, which indicates that during this interval the pins became tight and more bar pressure had to be applied until they become loose.
   Graduation is not perfect, possibly due to variations in the padding, and adjustments must be made to obtain 1/32" graduation.

ADJUSTING FOR GRADUATION

	LEFT SIDE			LEFT SIDE		
Roll	Additional Screw Pressure	Caliper	Adjustment Necessary	Additional Screw Pressure	Caliper	Adjustment Necessary
1	-3/6	12-12/32	none	1-1/6	12-12/32	none
2	1	-13/32	1/3 Turn up	-4/6	-12/32	1/2 Turn up
3	-3/6	-14/32	none	-5/6	-14/32	none
4	-2/6	-16/32	1/3 Turn dwn	-4/6	-16/32	1/3 Turn dwn
5	-3/6	-16/32	none	-3/6	-16/32	none
6	0	-17/32	none	-2/6	-17/32	none
7	-1/6	-18/32	none	-1/6	-18/32	none
8	0	-19/32	none	0	-19/32	none

3. After operating 1/2 to 2 hours. The rolls are graduated correctly and the ironer may be speeded up to normal. Note that roll sizes have again reduced 1/32" throughout, so more bar pressure was necessary to loosen the pins.
   The padding is still in the process of being pulled in and frequent caliper checks should be made for the next two days, making further adjustments if necessary.

START OF PULL-IN

	LEFT SIDE			LEFT SIDE		
Roll	Additional Screw Pressure	Caliper	Adjustment Necessary	Additional Screw Pressure	Caliper	Adjustment Necessary
1	-5/6	12-11/32		1-1/6	12-11/32	
2	-4/6	-12/32		-3/6	-12/32	
3	-8/6	-13/32	N	-5/6	-13/32	N
4	-4/6	-14/32	O	1	-14/32	O
5	-8/6	-15/32	N	-3/6	-15/32	N
6	0	-16/32	E	-2/6	-16/32	E
7	-1/6	-17/32		-1/6	-17/32	
8	0	-18/32		0	-18/32	

4. After operating for one or two days. The padding is now pulled in and properly graduated. It should not be necessary to add bar pressure as frequently. The screws, guided by the Velocity Steam Caliper, have served their purpose in regulating the padded roll size. They should not have to be touched as long as the same type and brand of padding is used.

   As the padding pulled in, the springs rebounded so that now there is no screw pressure being applied.

AFTER PULL-IN

Roll	Caliper	
1	12-9/32	CAUTION! The sizes are 1/8" larger than the manufacturer specifications and apply only to ironer operating with the high heat levels of Velocity Steam. For ironers operating with traps or other systems, all caliper readings should be 4/32" less.
2	-10/32	
3	-11/32	
4	-12/32	
5	-13/32	
6	-14/32	
7	-15/32	
8	-16/32	

Padding in this case has pulled in a total of 1/8" (4/32") since the first caliperings. The amount of pull-in will vary with the kind and quality of the padding used.

Remember: It's the pulled-in diameter that finally determines padding efficiency.

How Velocity Steam High Heat Levels Lengthen Effective Padding Life and Enable the Use of Larger Roll Sizes for the Highest Possible Utilization of All Available Contact Heating Surface

Padded roll sizes after pull-in may be 1/8" larger when ironers have heat levels that are high enough to keep friction wear on the covers at a minimum and padding resiliency at a maximum.

1. FRICTION
   Friction varies inversely with heat – the more the heat, the less the friction.
   Just as a hot hand iron slips more easily over a damp cloth surface, a padded roll slips more easily over a hot ironer surface.
   Since a Velocity Steam heated ironer consistently maintains a high heat level, ironer roll friction is reduced to a minimum and excessive friction drags are avoided…. even when pads are "over-sized".

2. RESILIENCY
   a. Heavy thick pads are more resilient because they have more body.
   b. Wet pads are less resilient – more heat means faster evaporation and drier pads.
      Only the last rolls exceed the manufacturers' specified maximum operating roll diameter. The greatest moisture evaporation load is always on the first rolls. When these first rolls are hotter they do even more of the work… leaving very little moisture to be evaporated by the last rolls which retain their resiliency longer. (Note that in the typical calipering it is the last four rolls which exceed the manufacturers' specified maximum.)

3. PADDING LIFE
   The higher heat levels resulting from Velocity Steam's reduction of air and water films give greatly increased resiliency to the padding. This greater resiliency enables the padding to conform exactly to the concave of the ironer chest. The result is a snug fit – as true as a machined bearing – after pull-in, insuring full utilization of all of the ironer's contact heating surface and longer effective life for the padding.

Mechanical and Maintenance Factors Which Affect Ironing Efficiency

After proper graduation, pressure, and heat have been obtained, any lack of ironing efficiency is probably due to maintenance factors or mechanical misalignments. Since space does not permit listing every possible contingency, only the most common are given here.

While some of the mechanical misalignments may temporarily be compensated for by screw adjustments, any mechanical misalignment should be checked with the ironer manufacturer.

Dirty Chests

There are many reasons for residue forming on chests, and this is probably the most common – and most overlooked – maintenance factor. Dirty chests cause rolling, buckling and streaking.

To test for dirty chests: In the middle of the ironer between the first and second rolls rub a fine piece of emery cloth on the lip of the chest. If it comes away dirty (chalky white), or there is a chalky white dust on the chest, the chest needs cleaning.

Worn Bearings

If one bearing on a roll is worn more than the other and pressure is applied, the roll end with the worn bearing will rest on the chest before the other end. This causes an unequal pressure across the roll and unequal diameters result. Screw adjustment, guided by the Velocity Steam Caliper, compensates for some of this wear, but if it is too great the only solution is replacement of the bearings.

Dropping a wrench into the ironer, work piling up between the rolls then being released so that the whole pile goes through; accidentally reversing the ironer which unwinds the covers and padding so that they wad up between the rolls and then go through; or other very thick items going under the rolls cause terrible pressure and strain, and something on the ironer has to give.

Bent or Cracked Pressure Bar

The pressure bar may bend or crack making it impossible to maintain proper pressure, graduation or roll size.

Sometimes a cracked pressure bar can be welded satisfactorily. Have the manufacturer check the ironer to see if this is possible.

Bent or Out-Of-Alignment Shafts

Another common result of severe strain is bending of the roll shafts. It is impossible to maintain proper roll size and graduation and to keep bearings in an ironer when the shafts are out of alignment.

Warped Chests

Chests warp because of different rates of expansion in the chest when it is heated up too rapidly.

Water which collects as the chest cools down at night insulates the bottom of the chest so that it cannot heat up as fast as the top. This is a major cause of chest warpage because return systems are unable to effectively drain all the water out of an ironer. Velocity Steam automatically drains the system when the steam is turned off, thus preventing chest warpage.

It is difficult to pad satisfactorily to compensate for a warped chest. The more resilient types of padding will adapt to slight warpage, and it is sometimes possible to compensate by "scabbing." In severe cases of warpage the chest should be replaced; grinding down the warped chest is not quite as satisfactory.

Vertical or Horizontal Misalignment

One corner of the ironer may "settle" causing undue strain on the operating parts of the ironer.

It is also possible for the ironer to get "out of square", which causes similar strains and may also result in permanent distortion.

Improper Chest Installation

This is fairly easy to detect as it usually causes the work to hit on one edge of a chest. (When the chests are set into the ironer, they are positioned so that the edge of each chest is slightly lower than the edge of the preceding chest. Work flows smoothly because it drops as it transfers from one chest to the other.) Shimming will correct

this condition.

Worn Gears

This occurs when the teeth of the gears wear thin there is slack in the meshing of the gears and the rotation of the rolls is jerky and noisy. This affects the pressure of the roll on the chest. Worn gears should be replaced.

Off-Standard Rolls

Some rebuilt ironers have off-standard rolls. If the rolls are not too off-size they may be properly padded using standard padding. If the rolls are far off-size special pads, must be ordered.

Regardless of the size of the bare rolls, if the chests are standard, the padded roll sizes should meet the specifications for proper graduation.

Off-Standard Chests

If all of the chests of an ironer have been reground equally, properly padded rolls may be obtained by using the Velocity Steam Caliper and ordinary thickness initial pads.

If only one chest has been reground, it is possible to have either proper roll size or graduation, but not both. It is better to sacrifice roll size and obtain graduation.

TODAY EVERY IRONER CAN BE PADDED EFFICIENTLY

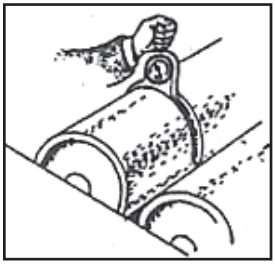
Until the development of the Velocity Steam Caliper, there was no way of accurately measuring roll sizes under operating conditions. Various devices have been tried – tapes, bands, machinists' calipers and fixed maximum-minimum calipers, to mention a few. These methods require that the ironer be stopped while the rolls are being measured. Some even require that the rolls be raised from the chests. The accuracy of the readings depends on the skill of the individual doing the measuring. Even at best, none of these methods is dependably accurate.

The importance of obtaining maximum diameters has been overlooked because there has been no dependable method for closely measuring operating roll sizes. Since accurate graduation also depends on operating roll size, the net result has been too many inefficiently padded and operated ironers.

Velocity Steam engineers saw they must have an accurate device for measuring operating roll diameter if laundry operators were to gain full advantage of the super speeds made possible by Velocity Steam's higher heat levels.

To fill this need, they invented a floating arm caliper that would be dependable under normal operating conditions – independent of the type or brand of padding, and applicable to all standard and super-roll ironers.

The Velocity Steam Caliper



OPERATION OF THE CALIPER: The Velocity Steam Caliper is a precision tool which accurately measures roll diameters to within 1/32". With the ironer operating normally, with or without work being processed, set the Velocity Steam Caliper on the roll and a right angle to the roll shaft, with both sides and top touching the roll. The movable arm automatically adjusts to the roll, and diameter is read directly form the gauge.

ROLL PRESSURE

Pressure is a vital factor in ironing efficiency because even the best-padded roll has a natural tendency to climb out of the chest. An air gap only the thickness of a cigarette paper between the chest surface and the work, or between the roll and the work, will lower the heat level considerably.

The roll is made to fit snugly in the chest by bar pressure application.

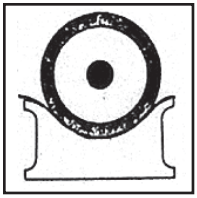
No Pressure

Material hugs the roll instead of being ironed against the concave.

When there is **NO PRESSURE**, the roll does not rest in the chest. Work never touches the heating surface of the concave.

When there is **INSUFFICIENT PRESSURE**, the roll jumps up and down in the chest. Work touches the heating surface of the concave only part of the time.

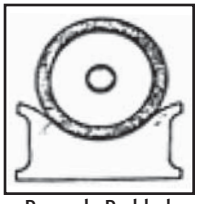
Insufficient Pressure



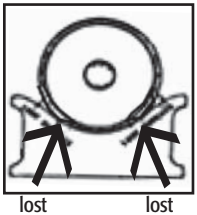
Proper Pressure

When there is **PROPER PRESSURE**, heat is wiped off all the concave heating surface.

A **PROPERLY PADDED ROLL** fits snugly into the chest utilizing the maximum contact ironing surface in the concave.



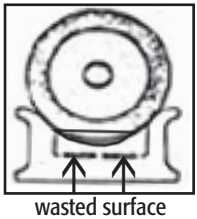
Properly Padded



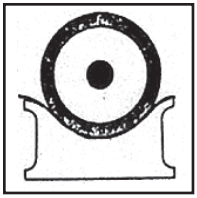
Under-Padded

UNDER-PADDED ROLLS: When the initial padded diameter of the roll is less than the minimum, some contact heating surfact is lost. This happens quite frequently. Because padding is constantly being compressed and losing its resiliency, the diameter of a padded roll is reduced with usage. Sooner or later the roll becomes underpadded and must be re-padded or built up to size.

OVER-PADDED ROLLS: After the padding is pulled in, if the diameter of the roll is larger than the concave can accommodate, the roll cannot "seat" all the way into the chest and the contact heating surface at the bottom of the chest is wasted.
This happens infrequently and usually from using a pad that is incorrect for the particular ironer.



Over-Padded



Slightly Oversized

A **SLIGHTLY OVER-SIZED ROLL** will improve ironing if the pad has sufficient heat to reduce friction wear.

The weight of the roll will force the padding into the chest and the resilient padding and will conform **exactly** to the concave. Then, as the padding loses its resiliency, it will maintain its shape and fit as snugly as a machined bearing.

Since the padding is **compressed** to the maximum operating diameter (and therefore, will not compress much smaller with continued use) it will remain at the maximum size for a longer period of time. In other words, **the effective life of the padding is increased considerably. However, you must have a heat level that is high enough to keep padding resiliency at a maximum and friction wear on the covers at a minimum.**

1. KEEP CHEST CLEAN
2. LUBRICATE CHEST SPARINGLY & OFTEN
3. NEUTRAL pH
4. SPEED vs. FEED RATE
5. CONDITIONING vs. CHEST TEMP.
6. ROLL SIZE NOMINAL
7. LINEAR SPEED INCREASE (GRADUATION)
8. ROLLS SQUARE TO CHEST
9. FEED BOARD CONDITION
10. FINGER ROLL CONDITION
11. AVOID EXCESSIVE CHEMICALS
12. FINGER ROLL PLACEMENT

TINGUE TOPICS
FLATWORK IRONER CHEST CLEANING AND LUBRICATION

The residues which are deposited on ironer chest are carbon from lubricants, burnt lint, washroom products, plastic and hospital tapes.

If linens are not adequately rinsed, carbonates or silicates from the products which remain in the fabric can be deposited on the chest. If the water contains a high bicarb content, or if any high concentration of salts from silicaflouride base sours remain in linens, a buildup will occur on the chest.

Salt build up comes from faulty operating water softeners. Excessive use of powdered softeners and antichlors also contribute to the problem. Since the residue build-up causes excessive friction, the linen will not slide on the chest, which in turn causes excessive static and rolling problems. Quality and production is directly affected; then add to this the cost of damaged roll dressing, guide tape and folder ribbons. Lubricants and cleaners help overcome these problems.

If the washroom is in perfect order, there would be little need for chest lubricants. There is no miracle cleaner that will instantly clean an ironer chest merely by feeding the product through the ironer via a wax cloth. Chest surfaces must be cleaned by hand or by the use of a Continuous Cleaning Belt. After the build up is removed, regular use of various cleaners and lubrication products will help prevent further building. The cleaners and lubricants must be used sparingly and regularly. The following is a guide to various cleaners and lubricants and their intended use.

1. LUBRI-KLEEN COMPOUND:
   Combination lubricant, antistat and cleaner. One step product to be used at regular intervals daily. Available in paste form for steam and thermal ironers. LUBRI-KLEEN OIL is available for steam heated ironers only.

2. POWDERED WAX LUBRICANT:
   For lubrication only. Safe for steam, thermal and gas ironers. Granular form, synthetic wax manufactured from glycerides. A cloth containing wax should be run 3 or 4 times throughout the work day.

3. THERMA LUBE COMPOUND:
   Special high temperature chest lubricant for thermal heated ironers with temperatures in excess of 400ºF.

4. LUBRI-KLEEN #2:
   Cleaner only. A semi-liquid compound which contains pumice. For hand cleaning ironer chests and for use in the Continuous Belt Cleaning device.

Lubrication and Cleaning Aids

1. TINGUE LUBRICATING APRONS
   Wax cloth 2 ply coverdux sheeting, overedged, 120" width. Also available in cotton double face panel.

2. KLEENO PAD
   Woven steel wool sewn to heavy cloth. Aids in removal of heavy duty build ups, i.e., melted plastic, autoclave tape, carbon, washroom residue, etc. 65" width. Designed so that one operator can feed it into the ironer.

3. WAX-N-CLEAN CLOTH
   Ironer wax cloth with built in cleaning metallic scouring section. Helps remove build ups before lubrication is applied on same cloth. Available in 72" and 120" widths. Available with aluminum mylar flap for ironers using needlefelt roll dressing. Keeps felts clean and helps keep lubricants out of roll vacuum systems.

4. CONTINUOUS BELT CLEANER:
   Available in 36" OR 72" widths. Special aluminum scouring edges sewn to heavy canvas duck complete with velcro connecting device. Eliminates hand cleaning. Should be used with special cleaner with pumice Lubri Kleen #2 for maximum cleaning.

   Be cautious of compounds which claim to clean ironer chest merely by feeding through a cleaner cloth. These products could be caustic, thus causing damage to covers, pads, roll springs, apron ducks and chest surfaces.

   Concentrate efforts in the washroom; in doing so, there will be very little chest lubricating and cleaning problems. Feed linens across the entire width of the padded roll so that ends of the chest and roll covers will remain clean.

For additional information, contact your Tingue, Brown & Co. representative.

RECOMMENDED AMOUNTS OF CLEANERS AND WAX RECOMMENDED TIMES FOR PERFORMANCES:

1. To apply cleaners, use 54" or 72" wide cotton flannel as long as the ironer chest (i.e. 100", 110", or 120").
   - If you are using a paste cleaner, spread about three pounds of paste on cotton flannel. Fold the flannel so paste is enveloped in cloth.
   - If you are using an oil, saturate the first 12 inches of cotton flannel with oil then wring out the excessive oil with your hands.
   - This procedure should be followed three times a week, at morning start-up Monday, Wednesday and Friday.
2. A heavier material such as a bath towel should be used down the sides of the ironer where padding is tapered.
3. After running cleanser through the ironer on these three days, the Resillo Kleeno pad should be run through the ironer after cleaning cloth. This helps loosen any dirt on ironer chests.
4. After running the Resillo pad, follow-up with the waxing of the ironer.

Waxing procedure should be followed every day of operation in the following manner.

1. Every morning apply about a half cup of powered wax to the wax cloth (which is a different cloth than the cleaning cloth).
2. Run wax cloth through the ironer at morning start-up, after morning break, after lunch break and after the afternoon break. This is four times a day every day of operation. Do not add wax to the wax cloth during the day but only at the morning start-up.
3. When running cleaner or wax through the ironer, always allow the cloth to run under the first roll of ironer then stop the ironer for about 10 seconds to allow wax or cleaner to become soft. This will insure good cleaning and lubrication to all the rolls.
4. Never use wax or cleaners when ironer is about to be shut down. The soft lubricant on the chest as the chest cools down will have the ability to harden and it may pick up lint or chemicals and fuse together to cause a buildup on the lips of the chest.
5. In multiple ironer plants, separate cleaning and waxing cloths for each ironer. This saves time and insures the same amounts of cleaner and wax is applied to each ironer.
6. After cleaning and waxing, turn vacuum system and static bars back on and set folder on operation desired.

CLEANING AND WAXING SCHEDULE

Time	Mon.	Tues.	Wed.	Thurs.	Fri.
Start-up	K.P. L.K. C.W. 3	K.P. C.W. 3	K.P. P.W. C.W. 3	K.P. C.W. 3	K.P. P.W. C.W. 3
Each 2 Hrs.	C.W. 3	C.W. 3	C. W. 3	C.W. 3	C.W. 3
Each Day	B.D.	B.D.	B.D.	B.D.	B.D.
Each Week			S. & E. C.		
Each Quarter			B. C. P.		

1. "K.P." – Kleeno Pad – After ironer is hot and before start-up time, run "Kleeno Pad" through ironer on each side. Use normal pressure.

2. "L. K." – Lubri-Kleen should be applied to clean-n-wax cloth on Monday morning. Use one double handful. Spread evenly inside "pocket" and close it. An alternate product is white oil A.

3. "C.W. 3" – Clean-N-Wax cloth should be run through the ironer 3 times: Once on the far left (lapped over the edge of the chest), once on the far right (lapped over the edge of the chest) and straight down the middle. **Never** drag cloth on the floor.

4. "P.W." – Powdered Wax should be applied to the Clean-N-Wax Cloth on Wednesday and Friday mornings. Use approximately 3 cups. Spread evenly inside "pocket" and close it.

5. "B.D." – Blow Down ironer thoroughly every day to reduce fire hazard and prevent residue "Build-Up."

6. "S. & E.C." – Scraper and Emory Cloth – Once a week when ironer is cool and **Power is off**, use a scraper and emory cloth to clean the "reachable" area of the chest.

7. "B.C.P." – Belt Cleaning Pad – Once a quarter, run on each side of the ironer with a good application of lubri-Kleen, depending on dirt residue. Run for 1-4 hours only on warm ironer.

Note: When applying "Fresh" wax, stop the ironer when the wax is under roll #1, wait about 10 seconds, then continue running through. On the next pass, open the flat and do not stop the ironer.

On Hamilton Spring Roll-Type Ironers, turn the vacuum off when waxing and for 10 minutes afterward. Then turn vacuum back **on**.

THE BEST IRONING TEMPERATURE FOR NAPERY

If napery is losing color or melting after finishing, check ironer temperature.

TROUBLESHOOTING

BY KEVIN KEYES

One of the most detrimental types of processing that can occur in the laundry is the continued ironing of table linen at temperatures in excess of 330 degrees Fahrenheit.

Particularly harmful is ironing repeatedly at over 400 degrees Fahrenheit. At 400 degrees Fahrenheit, all major types of table linen – 100 percent cotton, 50/50 polyester/cotton blends, and 100 percent polyester are damaged.

The damage to each type of fabric is different.

WHAT TO EXPECT

At high temperatures, the cotton fiber in 100 percent cotton napery is not hurt; it is the dye on the fabric that is damaged. Dye is sublimated off the fabric at 400 degrees Fahrenheit or higher. This means that the dye literally disappears – vaporizes if you will off the fabric surface.

This loss of color due to heat is in addition to the normal color loss that occurs in processing 100 percent cotton. Therefore, cotton should not be ironed at 400 degrees Fahrenheit or higher.

One hundred percent polyester has a different set of problems. The sublimation that occurs on cotton also occurs on the polyester. In addition, at 400 degrees Fahrenheit, polyester melts or at least glazes, depending on the time and pressure the fabric encounters in the ironer. Obviously, polyester should not be ironed at 400 degrees Fahrenheit or higher.

With 50/50 polyester/cotton blend linen, the problems encountered are the combination of what can happen to each fiber separately. As with 100 percent cotton and 100 percent polyester, dye sublimation occurs off both parts of the 50/50 blend fabric. Also, the polyester can melt, leaving melt balls with edges sharp enough to cut and damage the adjacent cotton fibers in the weave. Therefore, as with the other table linen fabrics, 50/50 blends should not be ironed at 400 degrees Fahrenheit or higher.

THE IDEAL TEMPERATURES

So what is the best temperature? A maximum of 350 degrees Fahrenheit is the most efficient ironer temperature without sacrificing quality or productivity, or damaging table linen.

Usually this decrease in temperature requires a decrease in ironer speed to assure that the table linen still dries in one pass through the ironer. However, there is almost never a loss of productivity at this slower speed since feeders can work only so fast. The ideal situation is a fully covered ironer or gaps of only two to three inches between items.

In summary, since any or all of the types of table linen are damaged at temperatures above 330 degrees Fahrenheit and severely damaged at temperatures in excess of 400 degrees Fahrenheit, table linen life can be preserved and extended by running ironers at a maximum of 330 degrees Fahrenheit.

NAPERY TROUBLESHOOTING GUIDE
Problem
LAUNDRY PICKS & SNAGS

CAUSE	SOLUTION
Burrs & Sharp Edges	Check for burrs and sharp edges on machinery and handling equipment by using a wet napkin. Do not use staples to fasten ironer tapes, and check for loose or broken wires on feed and exit apron connectors.
Washing with Tableware	Be sure all tableware and other foreign objects are removed before washing.
Rough Shelves & Table Corners	Eliminate rough spots and protruding nails on shelves. Tape table corners.
Personnel	Educate personnel on correct handling techniques.

PICKING/SNAGGING CHECK LIST

If picking and snagging are problems, and the source of this is not obvious, the following check list may be helpful in determining this source.

1. How is the soiled linen handled on truck? Bagged, thrown in bin, piled on the floor of truck?

2. Is the linen sorted from foreign matter?

3. What is the condition of equipment in the soil sort area?

   Transport buggies, conveyors and belts (including belt fasteners), loading chutes and ducts (on overhead load vacuum systems, the screen over fan has been source of damage to Signature Plus™ linen – may need finer mesh cover to prevent ends of over-edged napkins from contacting fan blades or blower cage and avoid chewing off corners).

4. Is the wash wheel free of burrs? (Door tracks and new welds are prime source of burrs. Also, on unloaders check washer/can extension board, as these receive rough treatment through repeated collisions by extractor cans). Check drain holes of wash wheels with a shear fabric to uncover burrs in drain holes themselves.

5. If tumblers are used, is the basket freed of melted plastic and imbedded foreign objects? On new tumblers, perforations may have burrs. Also, check for missing drum gasket at door. Check door for weld burrs and imbedded foreign objects.

6. Are staples used to fasten ironer tapes?

7. Are feed and exit apron connectors free of loose or broken wires?

8. Has the chest been damaged by dropping tools on them?

9. Are the folder/accumulator belts and blades free of burrs or broken connectors?

10. Are there any rough covered traction rolls on ironer or folder/accumulator?

11. Are clean storage shelves, bins, or carts free of splinters or burrs?

12. How is napery handled for transport to the customer?

If nothing is found in any of the above areas, it will be necessary to go to the restaurant location to check on handling.

NAPERY TROUBLESHOOTING GUIDE
Problem
STARCH/SIZING

CAUSE	SOLUTION
TOO STIFF: PVAc Buildup or Excessive Starch	Reclaim with additional alkali and more heat. Then reformulate four parts natural starch to one part PVAc.
TOO LIMP: Water Level	Use lower available water level for optimum starch penetration. Actual level varies by washer.
Sour	Starching results are best at pH levels between 5.5-6.5. Add sour at least two minutes before starch to allow even distribution.
Temperature	Maintain bath temperatures between 90º – 105º F for starch.
Supplies	Check with your Milliken Technical Services Representative for the recommended amounts and ratios of supplies for each type of starch or sizing material.
Load Size	Starch penetration is limited when the washer is overloaded. Use the following clean dry weight capacities as a guideline for load size: Full Drop: 90%, Split Pocket: 75%, Y Pocket: 65%
Overdrying	Too much extraction or conditioning causes starch to be lost. Maintain 20% - 25% moisture retention in napery before ironing.
Time	Allow at least eight minutes starch time for even penetration of starch.
Inadequate Cleaning	Reformulate washing process to insure thorough cleaning of napery so starch can adhere to the fabric.
Personnel	Carefully instruct all personnel on correct starching procedures to insure consistency from load to load.

MILLIKEN TABLE LINEN STARCHING CHECKLIST

If you are having trouble getting your napkins starched enough to suit you, check to be sure you are doing the following:

1. Linens should be clean and processed without fabric softener. If they are waterproof or slow to absorb (taking longer than 3 seconds to absorb a drop of water), then napkins are not getting sufficiently clean, and food grease or fabric softener is preventing starch adherence.

2. Linens should be properly soured to a pH of 5.5 – 6.5 before starch is added.

3. Sour should not have fabric softener or door lubricant in it – this will waterproof the linen.

4. Water level during starch should be low, and starch cycle should run at least 6 minutes - preferably 8-10 minutes.

5. Starch should be added to the wash wheel based on the wash wheel size, not the amount of linen being washed.

6. If mildewcide is being used in the wash cycle, be sure it is not a quaternary ammonium type (softener containing), which will also waterproof the linen.

7. Final extract time should be as short as possible – preferably between 30 seconds to 4 minutes, so that you do not sling the starch out of the linens.

8. Whenever possible, take damp linens from the washer right to the ironer. If some tumbling is necessary, keep it to a minimum (5 minutes or less) to avoid exhausting the starch out of the dryer.

9. Make sure linens are damp (20-25% moisture retention), not dry, going to the ironer.

10. Ironer temperature should be in the proper range, between 310ºF and 330ºF.

If you have any additional questions, contact your Milliken Technical Service Representative at 1-800-322-TEAM.

STARCHING SOLUTIONS FOR POLY NAPERY

In a new column on troubleshooting processing problems, John Potts discusses how to get the best results possible when starching poly napery.

TROUBLESHOOTING

BY JOHN POTTS

You are using polyester napery to take advantage of durability and color fastness. Your customers ask for more body and a firmer hand in order to make fancy napkin folds. From your experience, this is a perplexing problem. With cotton napery it was simple, but can anything be done with poly napery? Of course. It's a matter of understanding the starching process, and just as important, the napery.

First, let us talk about starches and sizing materials. Starches are derived from natural substances like corn, wheat, or rice. They are available in either raw or instant form and can be chemically modified to produce thick or thin boiling starches. Raw starches usually need to be cooked prior to using. Instant starches, having been precooked, are added dry to the wash wheel and are considered the easiest to use.

Synthetic starches or sizing were developed to provide an improved and enhanced hand for blend and all-poly fabrics. Sizing can be totally synthetic or blended with natural starches, and most chemical suppliers have generic or proprietary sizing for synthetic flat goods and garments.

STARCH OR SIZING?

Which type of starch or sizing should you use? The choice can be involved, but in fact, a reasonable degree of firmness can be achieved on poly napery with either type of starch or sizing. As a rule, for light to moderate firmness, starches work well. For a stiff to boardy hand, sizing is sometimes necessary. The choice between raw or instant starch depends on what your starch supplier offers and whether a cooker is available in the laundry. Additional factors include the napery characteristics as well as the processing situation.

Starching or sizing is both a chemical and a mechanical operation. The effectiveness depends on the type of napery, previous processing, current procedures, later handling, as well as the type of sizing substance used. Why should the fabric characteristics be important? Cotton, for example, is an organic fiber. It has a non-uniform cross section, is hollow and porous, and has a relatively scaly surface. Cotton provides a good substrate on which the small particles of natural starches can become attached.

Generic polyester is a manmade petrochemical-based substrate with a smooth, non-porous surface and a uniform cross section. It is difficult

to achieve satisfactory starch film buildup on unmodified polyester napery.

Much of the polyester napery used today has been engineered to take advantage of the desirable characteristics of cotton, but this doesn't mean that the starching procedure will not need a few minor modifications.

HOW PROBLEMS OCCUR

Nearly all the various types of starches and sizing compounds work satisfactorily with cotton, blends, and surface-modified polyester napery when used as directed by the manufacturer. But if the desired result isn't achieved, attention should be focused on the overall wash process and process control in the laundry.

With any type of linen, but particularly with polyester napery, the major prerequisite is a clean fabric surface. Redeposited soil, residual softeners, and mildewcides can coat the fabric, preventing the proper interaction of starch or sizing with the fibers. The result is light starch film formation with most of the starch going down the drain or coming off on ironer covers. An adequate wash formula is necessary to prepare the poly napery for starching.

As basic as it may seem, most of the same situations that cause failure in the break, carry-over, and bleaching operations also cause inconsistency and poor results in the starching or sizing process.

For example, overloading the wheel reduces the mechanical action necessary to work starch and sizing materials into the yarn. In fact, more mechanical action is needed with poly napery to overcome its lack of natural porosity. Overloading also causes poor distribution of starch throughout the load, resulting in poor uniformity.

Water levels are important, as with any part of the wash cycle. A high concentration of the starching material is needed, so keep the water level low, about two to four inches above the basket.

Improper control of pH, time, and temperature also reduces the quality, degree, and consistency of the starching operation.

THE RIGHT PROCEDURE

The starching procedure essentially should work like this:

1. Following the last rinse of the napery wash formula, refill the wheel with tempered water (90 to 105 degree Fahrenheit) to a starching or low level (two to four inches).
2. Add a good grade of laundry sour in an amount sufficient to reduce the pH to 5.5 to 6.5. This is the correct range for proper adhesion of most starching or sizing compounds, as well as, for proper flatwork finishing. The cycle should run for no less than two minutes to ensure proper distribution of the sour throughout the washload.

3. Without draining the wheel, add the cooked/instant starch or sizing substance and continue the cycle for eight to ten minutes. In my experience, the major source of starching failures is the tendency to short-cut with a four minute cycle. It's essential to allow enough time at this point to work the starch or sizing into the poly fabric.
4. When the cycle is complete, drain the wheel. At this point, the linen should have a uniform application of starch.
5. It is now very important not to undo all of the time, chemicals, and cost invested by over-extracting. Since optimum starching results depend on minimal handling and flexing of the poly napery, a washer/extractor is the ideal wash and extract equipment.

   Not all companies have washer/extractors, though. Next best is an off-line centrifugal extractor, and the most common are hydraulic and diaphragm extractors. Since these types of extractors nearly always require conditioning, if only to break up the cake, it is essential to control the conditioning time involved. This tumbling and flexing will undo a proper starch or sizing application more than any other handling.

   The time and speed of all extraction and conditioning should be controlled to retain a moisture level of 20 to 25 percent. This is easy to achieve in poly napery with four minutes in a centrifugal extractor at high speed or 375 pounds per square inch; in a diaphragm-type extractor followed by two to five minutes in an efficient tumbler. Obviously, these are guidelines, as all equipment is different.
6. The residual moisture in the poly napery is dried by flatwork ironing, setting the starch or sizing film. As the linen cools, the film becomes less flexible and the job is done.

WHY PROBLEMS OCCUR

Certain problems will become visible at this point, such as highlighting, lumpy deposits of starch, or disappointing results in degree or consistency of firmness in the napery. Heavy buildup of the white starch or sizing on the first two or three rolls of the ironer also can be seen at times.

When problems occur, troubleshoot your procedure. For the most part, highlighting and deposits of starch on the linen result from failing to properly maintain starch particles in suspension. Suspects are: Residual wash chemicals in the fabric, too cold a water temperature, and any condition that prevented proper dispersion and distribution throughout the load. Was too much starch product used for the amount of linen? Could the starch or sizing material be contaminated? Was the proper starch or size used?

Occasionally, a buildup of some sizing products will occur. Symptoms are inconsistency of firmness, too boardy a hand, or inadequate

absorption by the napery. The solution to this problem is a simple reclaim wash to strip the buildup of sizing before the next application. As a rule, using an adequate wash formula to begin with prevents the situation.

Inconsistency or lack of firmness are related to the amounts of starch used as well as the type of starch. Was linen too dry going to the ironer? Tumbled too long? Were lubricants used in wash chemicals to assist with wheel door operation?

This has not been an attempt to cover all aspects of starching or sizing polyester napery; it's a guideline to understanding the interaction of the mechanical and chemical environment involved.

By taking into account these factors and some trial-and-error modifications, you will be on the right track to satisfying your customers with the elegant napery they desire while reaping the rewards of durability and profitability using polyester napery.

John Potts is a Milliken & Company associate, Spartanburg, S.C.
Reprinted with permission from Clean Scene Magazine, January 1989

NAPERY TROUBLESHOOTING GUIDE
Problem
WRINKLES

CAUSE	SOLUTION
Thermal Shock	Thermal shock wrinkles occur when napery is exposed to sudden changes in temperature. Avoid thermal shock by tempering cold water in the winter. Then reduce the water temperature in 15º increments to 100ºF before extracting.
Extraction	Reduce pressure, RPM or time during extraction.
Insufficient Cool Down	Cool to a temperature of 100ºF or less before extracting or removing from washer or dryer.
Hot Spots on Dryer	Be sure gas flame is not impinging on the dryer basket.
Malfunction	Inspect all machinery and maintain on a regular schedule.
Overloading	Washer capacity should not exceed 90% of clean dry weight for full drop machines, 75% for split pocket, and 65% for Y pocket. Tumbler loads should be 50%. Also, do not leave carts or slings overloaded for extended periods.
Folder Stacks	Reduce the size of napery stacks on the folder or increase air flow to cool the napery before stacking.
Storage	Fold napery correctly before storing, and allow adequate storage space to prevent wrinkling.

SIGNATURE PLUS™, TABLE LINEN WRINKLING CAUSES & SOLUTIONS

1. Cause: Overloading washer
   Solution: Load 2/3 dry rated capacity

2. Cause: Overloading dryer
   Solution: Load 1/2 dry rated capacity

3. Cause: Excessive extraction
   Solution:
   1. Limit extract to low speed only if possible for 2-3 minutes
   2. If high only – minimum possible time
   3. If low speed built in (stabilize machine time usually 45 to 55 seconds) run low plus minimum high speed

4. Cause: Excessive drop of water temperature (more than 15º drop, especially at 150º plus) from last break to first rinse to second rinse.
   Solution: Temperature drops between steps of 15º or less.

5. Cause: Not drying linen
   Solution: Linen cycle for synthetics is:
   1. Wet and cold when you put it in the dryer
   2. Wet and hot as it dries
   3. Dry and hot for as short a time as possible
   4. Dry and cool until linens are completely cool (100ºF or body temperature).

6. Cause: Overdrying linen
   Solution: Not serious except in conjunction with no heat controls (i.e. no cool down).

7. Cause: Insufficient cool down or no cool down
   Solution: "Memory" of fabric for flat state requires slow cooling to room temperature.

8. Cause: Faulty drying equipment – controls, air flow gauges
   Solution: Equipment must have proper and adequate controls for hot cycle, cool cycle, temperature control.

9. Cause: Dryer capacity too small for size of linen
   Solution: Large cloths in small diameter dryers won't work

10. Cause: Temperature of heat cycle too low
    Solution: Suggested range for dryer heat wetting is 180º– 190º (this is where perma-press cycle runs). This yields an exhaust temperature of 160º – 170º.

11. Cause: Temperature of heat cycle too high
    Solution: Only a problem if high enough to damage cloth or no cool down

12. Cause: No shelf life
    Solution: Linens need 24 hours of shelf life

When problems with wrinkling occur, this procedure should enable the restoration of the linen to a non-wrinkled state.

SIGNATURE PLUS™, TABLE LINEN WRINKLING RECLAIM PROCEDURE

1. Load gas dryer 50% capacity or preferably less with dry wrinkled linen.
2. Run on "hot" setting (190º – 210ºF) from 20 to 30 minutes.
3. Run 10 to 15 minutes "cooldown" or until dryer is sufficiently cooled to about 100ºF.
4. Be sure dryer does not stop during either heat or cool cycles.
5. Remove linen as per proper handling instructions as outlined in Milliken's processing sheets.
6. Allow shelf life, if possible, to remove remaining "soft" wrinkles.

Hard creases and wrinkles should be gone. The high heat and extended time allow the fabric to "relax" back into its flat dry state.

NOTE: For steam tumblers more time may be necessary due to the limited temperature range of the machine.

If the dryer does not get hot enough to do a reclaim, the linens may be taken to a laundromat to run this procedure. Or, a rental laundry or dry cleaners can run the linens through a flatwork ironer (set at 325º – 340ºF) to remove the hard wrinkles.

TO REMOVE LINT FROM NAPKINS, TOPS

- Load dryer to 50% capacity
- Leave door open (slightly) to increase vacuum effect
- No heat
- Run 15-20 minutes

SUGGESTIONS FOR PREVENTION AND REMOVAL OF LINT/CONTAMINATION

1. Reduce contamination in wash wheels by reordering wash loads by fabric type and the potential of each fabric to create lint or loose fibers.
2. Clean ironer covers by brushing with wire brush and collecting lint.
3. After cleaning the ironer, run a few wet sheets to pick up residual lint.
4. Increase the frequency of lint removal methods (blowing down with compressed air, vacuuming, and sweeping).
5. Reduce static in fabrics by maintaining a higher moisture level in the air.
6. Wash laundry bags.
7. Reduce contact with rags or other textiles that produce lint in processing and storage.
8. Try to identify contaminate fiber type and reduce contact. Then, isolate lint producing products.
9. As a reclaim option, try to condition some of the fibers out by conditioning in the dryer for extended cycles. Some people have successfully opened the door slightly during processing to increase the vacuum effect to try to remove lint.
10. As a last resort, you may want to try to burn off contamination with appropriate chemicals for each fiber (but with **caution**!). Below are some of the chemicals used in laundries.

    - Alkali for polyester. This is not recommended as it will eventually damage the napkin too.

    - Bleaching may help to remove natural fibers and could discolor colored lint to avoid detection. (Use on white fabrics only.)

    - Oxalic acid can also help with natural fibers.

    - Contact your chemical representative to discuss these alternatives prior to trying them. They also may have other chemicals with enzymes which will possibly remove cotton lint.

NAPERY TROUBLESHOOTING GUIDE
Problem
FOLDER REJECTS

CAUSE	SOLUTION
Settings	Check manufacturer's recommendations for correct settings.
Slippage	Inspect and maintain gears, belts and conveyors at the apron/conveyors junction. Also, try slowing down the conveyors or using more starch.
Uneven Folds	Adjust folder alignment to manufacturer's specifications and repair or replace worn belts.
Belt Angle	Reduce the incline if the conveyor belt angle is too sharp.
Static	See STATIC – Grounding, and check the speeds of adjacent surfaces.
Dirty Folder	Clean each folder and folder belt with an air hose as needed.
Personnel	Carefully instruct all personnel on correct feeding techniques and lane alignment.

NAPERY TROUBLESHOOTING GUIDE
Problem
CUSTOMER ABUSE

CAUSE	SOLUTION
Excessive Heat	Explain to the customer that excessive heat such as a hot grill will damage linens.
Incorrect Storage	Set-up storage for both clean and soiled napery in a convenient place. Check to be sure correct procedures are being followed.
Soil Segregation	Advise the customer not to mix soiled napery with bleach rags or bar wipes.
Incorrect Usage	Napery should not be used as a grease rag or bar wipe. Offer the customer appropriate items for these applications.

ABUSIVE SITUATIONS SHOULD BE AVOIDED:

1. No polishing silverware with linens
2. No shining shoes with linens
3. No dragging linens across floor
4. No cleaning ashtrays with linens
5. No wiping tables with linens
6. No food/utensils in linen bags
7. No rags in linen bag
8. Associates should shake out linens prior to placing them in their respective bags.

Recommendations for Handling Milliken Napery Fabrics

For Laundries With Finishing Equipment

BASIC REQUIREMENTS:

1. Equipment **must** be free of burns and sharp edges.
2. Washing equipment should have properly functioning water level and temperature controls.

   Follow normal extraction procedures on cool (90º-100ºF) linens. ■

   Cleaning and waxing of ironer chest, and maintenance of roll pads and covers should comply with ironer manufacturer's recommendations. Maintain chest temperature between 315ºF and 350ºF on gas, steam, electric, and thermal fluid ironers.
3. Chemical feed systems must be functioning properly.

PROCESSING REQUIREMENTS:

1. Before placing new linen into service, it should be washed separately to remove manufacturing residual dyes. **Darker shades should be washed separately several times.**
2. Shade groups such as darks, mediums and lights should be washed separately. To avoid color contamination **red colors should always be washed separately**. Contact your Milliken representative for further information on shade groupings.
3. Milliken Napery Fabrics **should be washed separately** from 100% Cotton and Poly/Cotton blends to **avoid contamination** from lint and ensure proper cleaning.
4. Wash formula and wash chemicals should be appropriate for type and amount of soil to be removed. ♦
5. Surfactants are recommended in the break cycle.
6. Use of complex phosphates along with silicated alkalies are recommended where permitted by law.
7. Soaps of animal or vegetable fats should be avoided.
8. Bleaches should not be used on colored Milliken napery.
9. White Milliken napery should receive antichlor treatment after hypochlorite or other chlorine bleaching.
10. For good mechanical action, load wash wheel: Full Drop - 90% Split Pocket - 75% Y-Pocket - 65%
11. Softeners and waxes must not be used with Milliken napery, as these will mask the absorbency of the fabric.
12. Adequate rinsing to remove residual chemical is necessary to ensure maximum fabric life and color retention.

PROCESSING REQUIREMENTS FOR GINGHAM CHECKS:

1. All requirements as stated above.
2. Checks must be washed separately from all other linen products to prevent color transfer from other products. Different colors of checks may be washed together after several washes.

■ Polyester Spun fabrics will retain more moisture and may require longer extract/drying time.

♦ Additional chemicals and/or time may be required for spun polyester.

MILLIKEN®

Tablelinen Fabrics,
Made in America

For Laundries with Finishing Equipment

SUGGESTED WASH FORMULAS & CHEMICAL SUPPLIES FOR MILLIKEN NAPERY

CYCLE	WATER LEVEL	°F TEMPERATURE	TIME (Min.)	SUPPLIES/100 lbs. POWDER SYSTEMS	SUPPLIES/100 lbs. LIQUID SYSTEMS
Flush	High	Split	3	-	-
Break	Low	120°✱	12	1.5-2.5# Built Detergent 15oz. Surfactant (pH 11-11.5)	12-24 Alkali 15oz. Surfactant (pH 11-11.5)
Carry-over ●	Low	120	6	-	-
Rinse	High	120	2	-	-
Rinse	High	120	2	-	-
Rinse	High	120	2	-	-
Sour	Low	90-100	2	1-2oz. Sour/Do Not Drain After Sour (pH 5.5-6.5)	1-2oz. Sour/Do Not Drain After Sour (pH 5.5-6.5)
Starch Extract	Low	90-100	10	Add 3/4 to 1 1/2 lbs. Starch	Add 3/4 to 1 1/2 lbs. Starch

✱Temperature recommendations for Signature Plus™ and Encore® table linens

●Bleaching not recommended for colors. Recommended bleach temperature for whites is 140°

For temperature recommendations for other Milliken table linen fabrics, contact our Laundry Service Team at 1-800-322-TEAM

Items Per Washer Load

Napery Item	Size (inches)	Weight (pounds)	Rated Washer Capacity						
			18#	30#	50#	60#	75#	100#	125#
Napkins	18x18	.09	120	200	333	400	500	666	833
Napkins	20x20	.12	90	150	250	300	375	500	625
Napkins	21x21	.13	83	138	230	276	346	461	576
Tabletops	42x42	.51	21	35	58	70	88	117	147
Tabletops	52x52	.78	13	23	38	46	57	76	96
Tabletops	54x54	.84	12	21	35	42	53	71	89
Tabletops	64x64	1.19	9	15	25	30	37	50	63
Tabletops	70x70	1.42	7	12	21	25	31	42	52
Tabletops	85x85	2.09	5	8	14	17	21	28	35
Tabletops	90x90	2.34	4	7	12	15	19	25	32
Tabletops	54x110	1.72	6	10	17	20	26	34	43

Items Per Dryer Load

Napery Item	Size (inches)	Weight (pounds)	Rated Washer Capacity						
			20#	30#	50#	75#	100#	110#	200#
Napkins	18x18	.09	111	166	277	411	555	611	1111
Napkins	20x20	.12	83	125	208	308	416	458	833
Napkins	21x21	.13	76	115	192	284	384	423	769
Tabletops	42x42	.51	19	29	49	72	98	107	196
Tabletops	52x52	.78	12	19	32	47	64	70	128
Tabletops	54x54	.84	11	17	29	44	59	65	119
Tabletops	64x64	1.19	8	12	21	31	42	46	84
Tabletops	70x70	1.42	7	10	17	26	35	38	70
Tabletops	85x85	2.09	4	7	11	17	23	26	47
Tabletops	90x90	2.34	4	6	10	15	21	23	42
Tabletops	54x110	1.72	5	8	14	21	29	31	58

* for white Milliken napery insert bleach cycle and antichlor in formula. Bleaching of colored Milliken napery is not recommended.

** Time depends on machine design. Use a minimum time.

For additional information and assistance contact:
Milliken & Company
920 Milliken Road, M-143
Spartanburg, SC 29303
1-800-322-TEAM

6.4 oz/yd^2 Items Per Wash Load

Napery Item	Size (inches)	Weight (Pounds)	Rated Washer Capacity (90% Full Drop)											
			18#	30#	50#	60#	75#	100#	125#	200#	250#	400#	600#	800#
Napkins	18x18	0.12	138	230	383	460	575	766	958	1533	1916	3065	4598	6131
Napkins	20x20	0.14	114	189	315	378	473	631	789	1262	1577	2523	3785	5047
Napkins	21x21	0.16	104	173	288	346	432	576	720	1152	1440	2304	3456	4606
Tabletops	42x42	0.54	30	50	83	99	124	165	207	331	413	661	992	1322
Tabletops	52x52	0.83	19	32	54	65	81	108	135	216	270	431	647	863
Tabletops	54x54	0.90	18	30	50	60	75	100	125	200	250	400	600	800
Tabletops	64x64	1.26	13	21	36	43	53	71	89	142	178	285	427	570
Tabletops	70x70	1.60	10	17	28	34	42	56	70	113	141	225	338	450
Tabletops	85x85	2.23	7	12	20	24	30	40	50	81	101	161	242	323
Tabletops	90x90	2.50	6	11	18	22	27	36	45	72	90	144	216	288
Tabletops	54x110	1.86	9	15	24	29	36	48	61	97	121	194	291	387

7.2 oz/yd^2 Items Per Wash Load

Napery Item	Size (inches)	Weight (Pounds)	Rated Washer Capacity (90% Full Drop)											
			18#	30#	50#	60#	75#	100#	125#	200#	250#	400#	600#	800#
Napkins	18x18	0.13	121	202	336	403	504	672	840	1344	1680	2688	4031	5375
Napkins	20x20	0.16	100	166	277	332	415	553	691	1106	1383	2212	3318	4424
Napkins	21x21	0.18	91	151	252	303	379	505	631	1010	1262	2020	3030	4040
Tabletops	42x42	0.54	30	50	83	99	124	165	207	331	413	661	992	1322
Tabletops	52x52	0.95	17	28	47	57	71	95	118	189	236	378	567	756
Tabletops	54x54	1.03	16	26	44	53	66	88	110	175	219	351	526	701
Tabletops	64x64	1.26	13	21	36	43	53	71	89	142	178	285	427	570
Tabletops	70x70	1.83	9	15	25	30	37	49	62	99	123	197	296	395
Tabletops	85x85	2.54	6	11	18	21	27	35	44	71	88	142	212	283
Tabletops	90x90	2.85	6	9	16	19	24	32	39	63	79	126	189	252
Tabletops	54x110	2.12	8	13	21	25	32	42	53	85	106	170	255	340

HOW TO DETERMINE CORRECT TABLECLOTH SIZES FOR MILLIKEN TABLE LINENS

TABLE SIZE	SUGGESTED TABLECLOTH SIZE	TABLE SIZE	SUGGESTED TABLECLOTH SIZE
24x24	41x41 (8)	42x42	61x61 (9)
24x30	41x47 (8)	42x48	61x67 (9)
24x36	41x53 (8)	42x60	61x79 (9)
24x42	41x59 (8)	42x72	61x91 (9)
30x30	52x52 (10)	42x84	61x103 (9)
30x36	52x58 (10)	42x96	61x115 (9)
30x42	52x64 (10)	42x108	61x127 (9)
30x45	52x67 (10)	48x48	71x71 (9 ½)
30x48	52x70 (10)	30" Rnd	51" Dia (10)
30x72	52x94 (10)	36" Rnd	51" Dia (7)
30x84	52x107 (10)	42" Rnd	60" Dia (8)
30x96	52x118 (10)	48" Rnd	70" Dia (9 ½)
36x36	52x52 (7 ½)	51" Rnd	70" Dia (8)
36x42	52x58 (7 ½)	54" Rnd	70" Dia (7 ½)
36x48	52x64 (7 ½)	60" Rnd	80" Dia (9)
36x72	52x88 (7 ½)	66" Rnd	89" Dia (10 ½)
36x96	52x112 (7 ½)	72" Rnd	89" Dia (7 ½)

Note: The tablecloth sizes suggested are cut sizes. The number in parentheses indicates the drop in inches. If you want a larger or shorter drop, then the tablecloth size needs to be modified to accommodate the look you want to achieve.

Milliken & Company – Laundry Service Team

Laundry Audit Form

Auditor: _____ Date: _____

SOIL SORT

1. Are there noticeable material handling (quality, efficiency, or safety) issues from the unloading dock to the soil sort area?

   _____

   _____

2. Is the segregation process automatic or manual ? _____

3. Is polyester separated from cotton? _____

   _____

4. Are there snag points on the equipment?

   _____

   _____

5. Are there any mechanical belt problems?

   _____

   _____

6. Are there any apparent material handling problems (slings, carts, etc)?

   _____

   _____

7. Sorting by color or shade? _____ Are the darker shades washed separately to prevent the residual dye from discoloring other colors?

   _____

   _____

8. Are the load sizes being weighed and procedures followed and/or posted?

   _____

   _____

9. Approximate production rate (pounds, pieces, bags, etc.)?

   _____

10. Comments (safety, housekeeping, etc.):

    _____

    _____

WASH ROOM

1. Chemical Supplier: _____
2. Chemical feed system is automatic or Manual? _____
3. Are chemicals labeled and stored in a safe area? _____
4. Are Material Safety Data Sheets (MSDS) easily accessible?
   _____
   _____
5. Are the wash wheels being properly loaded?
   _____
   _____
6. How is the condition of the equipment (slings, carts, etc.) being used to transport the linen to the washer?
   _____
   _____
7. Are the water hose/lines in good working condition?
   _____
   _____
8. Are there temperature gauges on the machine? _____ Are they accurate? ____
9. Is fabric softener being used? _____
10. Is the proper Personal Protective Equipment (PPE) accessible and being used?
    _____
    _____
11. Are there any burrs or rough edges that could contribute to picks or snags in the wash wheel?
    _____
    _____
12. Are operators checking pH of the linen (5.5 – 6.5)? _____
13. Is the linen dryed/conditioned prior to the ironer? _____

14. Suggested wash formula for Signature Plus™ and Encore Plus™ table linen:

Load: 90% Capacity (Open Pocket)
75% Capacity (Split Pocket)
66% Capacity (Y Pocket)

Operation	Time (mins)	Temperature (ºF)	Level	Supply	Usage/100lbs
Flush	3	Split	High		
Break	5	120º	Low	Solvated Surfactant *Do not drain/add Alkali	12-24 fl. oz.
Carryover	5	120ºF	Low		
*Bleach	8-12	140ºF	Low	pH 10.2-10.8	
Rinse	2	120º	High		
Rinse	2	120º	High		
Rinse	2	105º	High		
Sour	2	90º-110º	Low	Sour, (pH 5.5-6.5) *Do not drain	1-2 fl. oz.
Starch	10	90º-105º	Low	3/4-1 1/2 lb Starch	
Extract					

*Note: *Bleach – For white napery, insert bleach cycle and antichlor in formula. Bleaching of colored linen is not recommended.

Comments/Suggestions for wash formula:

_____

_____

_____

_____

15. Comments (safety, housekeeping, etc.):

_____

_____

COMMON FINISHING PROBLEMS

1. Leading edge not pulled taut enough.
2. Sheet sucker malfunctioning.
3. Half of sheet under other sheets or linen.
4. Worn feed ribbons.
5. Improper waxing & cleaning procedures.
6. Ironer speed too high.
7. Finger roll too far forward.

1. Feeders hanging onto sides.
2. Uneven finger roll.
3. Uneven feed board.
4. Worn feed ribbons.
5. Dirty chest.
6. Improper waxing & cleaning procedures.

1. Dirty Chest.
2. Wet linen .
3. Chest not hot enough – (less than 315ºF).
4. Excessive sour.
5. Improper waxing & cleaning procedures.
6. Under - or - oversize rolls.

1. Poor – feed habits.
2. Lack of coordination between feeders.
3. Ironer speed too high.
4. Uneven padding diameter.
5. Split doffer roll.
6. Missing feed ribbons.

IRONERS

1. Equipment manufacturer(s): _____

2. Are there rough edges or quality opportunities with the equipment that transports the linen from the previous process to the ironing process?

   _____

   _____

3. Is the moisture retention acceptable upon entering the ironer? Was it covered? How long was it staged?

   _____

   _____

   _____

4. Are the ironer feed systems clean and free of rough edges?

   _____

   _____

5. Ironer checklist:

	Ironer #1	Ironer #2	Ironer #3
Tapes:	_____	_____	_____
Roll Covers:	_____	_____	_____
Speed:	_____	_____	_____
Chest Clean:	_____	_____	_____
Temperature:	_____	_____	_____
Feed Roll:	_____	_____	_____
Apron Fingers:	_____	_____	_____
Cleanliness:	_____	_____	_____
Ironer Belts:	_____	_____	_____
Sensors:	_____	_____	_____
Tapes/lane:	_____	_____	_____
Safety Stop:	_____	_____	_____
Chest Level:	_____	_____	_____
Wax Cloth:	_____	_____	_____

6. What is the frequency of waxing?

   _____

   _____

7. Is the linen sticking to the roller covers?

   _____

   _____

8. Are associates stripping the linen and feeding it straight?

9. Are there any noticeable feeding problems?

10. Are there any handling problems at the Entry/Exit of the Ironer(s)?

11. Are the pinch/nip points labeled for safety?

12. Approximate production rate (pounds, pieces/hour, etc.)?

13. See sheet for common finishing problems. Indicate if any occur.

14. Comments:

FOLDING/STORAGE STATIONS

1. Folding equipment manufacturer: _____

2. Is the linen clean and absorbent?

3. Are there any quality or efficiency problems related to the folder?

4. How are rejects handled? Are wrinkled and soiled linen rejected together?

5. Are staging shelves clean and free of rough edges?

6. How is the finished linen presented to the customer (strapped, banded, shrink wrapped, etc.)?

7. How is linen sorted/transported to the designated route trucks? Handling procedure?

8. Comments:

SAFETY & HOUSEKEEPING

1. Is the floor clean and free from trip hazards?

2. Is Lock-Out-Tag-Out (LOTO) procedure in place and being followed? Is the LOTO procedure in writing and communicated to the associate? Is the written LOTO documentation signed-off by the associate acknowledging his awareness of the procedure?

3. Is Personal Protective Equipment (PPE) accessible and being worn in their designated area (chemical storage area, wash room, etc.)?

4. Are eyewash stations present, unobstructed, and in working order?

5. Is excessive water standing on the floor? Slip hazards? Drains covered/blocked?

6. Are fire extinguishers properly labeled and placed every 75 feet? Are sign-off sheets being used showing that the fire extinguishers have been inspected every 30 days?

7. Is adequate lighting present throughout the plant? Dark areas?

8. Are area(s) behind laundry equipment clean and orderly?

9. Are items leaning against the wall(s)?

10. Are "Traffic Lanes" for moving laundry from process-to-process labeled and unobstructed by tools/equipment? Are visitor or designated walkways labeled?

11. Are emergency exits labeled clearly and unobstructed?

12. Comments:

Notes:

OVERALL COMMENTS/RECOMMENDATIONS

1. Comments:

ALKALINE HYDROLYSIS

We have found in visits to other laundries the cause of the fabric weakness near the hemmed area is a condition known as alkaline hydrolysis. Improper wash/rinse procedures will cause this deterioration of the fabric.

Some checkpoints to be aware of are:

1. Is pH exceeding 11.5 in the washing step? Should titrations be performed on several washloads to be certain this is correct? Ideally pH should be in the 11.0 – 11.5 range. If pH consistently runs above 12.0 severe fabric damage will occur.

2. Are chemicals being added only when sufficient water is in the wash cylinder? If high concentrations of alkali are dumped onto fabric before intended water levels are reached, the fabric can be exposed to high concentrations of alkali.

3. Are chemicals added only after steam has been applied and correct temperature is reached? If steam is applied while chemicals are being added some tops and napkins can be exposed to very high temperatures and high alkali concentrations simultaneously.

4. Are high level rinses always used to remove carryover alkali before exposing the fabric to ironing temperatures? Good rinsing will assist in keeping alkaline hydrolysis in check.

5. Quaternary fabric softeners should not be used since they will contribute to alkaline hydrolysis as well as mask the Signature Plus™, soil release chemical properties.

PAR CALCULATIONS

I. NAPKINS:

A. Restaurant has_____ 4 person tables
_____ 2 person tables (deuces)

(_____ 4 person tables x 4) + (_____ 2 person tables x 2)

= _____ total seats

B. _____total # seats x _____ # times seats turn

= # restaurant meals _____

(or use your ticket summary of # of diners, on average)

C. _____ # restaurant meals + # room services means/day

= total # meals/day _____

D. _____ total meals/day x 2.5 par x (1 for daily wash, etc.)
(2 for every other day)
(7 for weekly wash)
= total napkins _____

E. _____ total napkins ÷ 12 = _____ dozen napkins to order

II. TABLECLOTHS:

A. _____ 4 person tables x 2.5 par x (1 for daily wash, etc.)
x _____ # times cloth is changed/day

= _____ # tops ÷ 12 = _____ dozen tops to order

B. _____ 2 person tables x 2.5 par x (1 for daily wash, etc.)
x _____ # times cloth is changed/day

= _____ # tops ÷ 12 = _____ dozen tops to order

III. MEETING ROOMS:

A. Napkins:

_____ total seats x _____ seats served/day

x 2 par x (1 for daily wash)
(2 for every other day)
(7 for weekly wash)

= _____ total napkins ÷ 12 = _____ dozen napkins to order

B. Cloths:

_____ # meeting tables x 2 par x _____ times cloth is changed/day x 1 for daily wash, etc.

= _____ total # tops ÷ 12 = _____ dozen tops to order

Notes: When ordering tops, allow for a 9" – 10" drape on all sides for correct sizing