2011 Technical Mat Bulletin
Washing and Cleaning Mats

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I. WOM® Recommended Wash Formula

See Appendix A for the WOM® Recommended Wash Formula.

Note the biggest difference is this formula and many that are in use today is the amount of detergent and water levels. It is important that there is sufficient surfactant to clean the mats and sufficient water to get proper mechanical action.

Also note, it is ALWAYS recommended that mats are washed with one cycle of the WOM® Recommended Wash Formula BEFORE they are put in service.

The use of REUSE water (especially reuse water from shop towels and mops) is not recommended. The use of reclaim water is acceptable.

It is also important not to over load the machines. See Appendix B for an article by Larry Patton explaining the importance of proper loading and loading by volume.

II. WOM® Recommended Clean Up Wash Formula

See Appendix C for the WOM® Recommended Clean Up Formula. The procedure is recommended for cleaning heavily soiled or stained mats. This formula should only be used when mats are stained to a level that cannot be cleaned using the Standard WOM® Wash Formula for mats. Continued use of this formula will shorten the life of a mat causing either fading, rubber damage, or both.

III. WOM® Recommended Wash Formula for Rubber Mats

See Appendix D for the recommended wash formula for solid rubber mats. This includes Kextreme Comfort™ Anti-fatigue Mat, Scraper Mat, Logo Scraper mat, UltraFlow™ Mat and the UltraSan™ Mat. It is *very* important to note that solid rubber mats CANNOT be mixed with pile mats in the wash wheel. Also, solid rubber mats should *always* be stored flat. Storing solid rubber mats folded will results in premature rubber cracking.

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IV. Merchandising Replacement Cost (MRC)

MRC (also known as Put in Service Cost) allows plants to maintain good quality mats at a reasonable cost. MRC can be calculated by dividing the mat purchases by the total mat revenue for that same time period. WOM® recommends an MRC of approximately 7%.

It is important to keep a mat grading and mat maintenance program in place to ensure damaged mats don't stay in service too long and the inventory is up kept.

V. Energy® Mat and G-Force Calculations in Extracting

All WOM® fabric mats have the Energy® Mat feature. This feature allows mats to be dried in the extract cycle instead of the dryer, hence lowering the processing cost. The Energy® Mat extraction is heavier than extractions that non energy mats can withstand.

To successfully extract the Energy® MAT sufficiently to by-pass tumble drying, the extraction procedure must be carried out under adequate centrifugal force, i.e. G-force. The Energy Mat has been fabricated in such a manner that most washer/extractors or centrifugal extractors create the necessary G-forces to effectively extract the mat. See Appendix F for instructions on calculating G-Forces in extractors.

Note: Fabric mats 5x12 and larger are not Energized and may require drying. MegaHold® mats are not Energized and may require drying.

VI. Storing and Rolling Mats

All mats should be rolled or laid flat for any long term storage. Covering the flat mats with black poly to prevent light exposure will produce the best results. Rubber mats with no pile should always be stored rolled or flat even for short periods. When rolling mats for storage, you should not "double up" on one end of the mat or half way across the mat. This means do not fold a 3x10 in half and then roll it. Also do not fold over the first few inches of a mat and then roll it. This is a common practice that makes rolling easier, but it can cause cracks and wrinkles in the mat.

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VII. Quality

A. Stained Mats

WOM® mats are easy to clean; however, almost everyone will encounter dingy/stained mats that routine cleaning procedures are inadequate for. If oils are present around the mat installation, cleaning the mats become even more challenging. The mat clean up formula in Appendix C can help clean up heavily soiled/stained mats.

B. Rippled mats

Mat rippling can be caused by many reasons including but not limited to solvents, oils, extreme extract speeds, improper processing temperatures, etc.

SOLVENT CONTAMINATION – Solvent contamination of rubber-backed mats with solvents or other rubber softening agents will cause the rubber portion of the mat to swell. Rubber swelling from solvent or other rubber softening agents results in the form of ripples and/or humps depending on the nature and degree of the contamination. For instance, if a quantity of solvent is spilled in a localized area of the mat, a hump, resembling a volcano, will occur. Ripples in the border of the mat in such a case <u>may</u> or <u>may not</u> occur depending upon the severity and proximity of the hump to the border.

Ripples around the borders can occur from solvent contamination that is more even over the body of the mat: for example, by the inclusion of solvents and/or solvated detergents in the wash formula.

Cross contamination can also be a problem when washing unaffected mats with those contaminated by rubber swelling agents. These agents can go into solution with the water in the wash wheel and contaminate other mats in the load.

A few years ago, advances in rubber chemistry and compounding resulted in rubber compounds suitable for manufacture of mats that are also considerably more resistant to the chemicals which have caused damage to mats in the past. However, even with these improvements certain substances such as chlorinated solvents and other agents will result in rubber swelling.

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Solvated detergents and formulas calling for the addition of solvent cleaners in the laundering cycle must be avoided. The use of solvent for pre-spotting must also be avoided. Route drivers must be trained to spot solvent contamination in the field - notice any humps in mats which formed during the week at a particular account; notice any mats which smell of solvent or feel unusually greasy.

OIL CONTAMINATION – Mats are very useful and popular in restaurants. However, cooking oils and animal fats are not subsequently laundered from the mat because temperature/alkalinity restrictions prevent adequate emulsification. Unfortunately, as these contaminations build up in the mat and eventual contact with rubber backing occurs and causes a rippled mat.

EXTRACT SPEEDS – See Appendix F for G-force calculations. Keeping G-forces under 250 should be adequate to keep from rippling mats in the extract cycle.

EXCESSIVE HEAT -The substrate fibers used in baking mats is susceptible to excessive heat - i.e., heat that is above the level needed to efficiently dry the mat. Repeated exposure of 270-290 degrees F° can cause the substrate to shrink causing mats to ripple or curl.

Dryers must be periodically checked to verify the temperature gauge indicator is a true reflection of the actual temperature inside the basket. This may be done with heat-sensitive tapes which are applied to the dryer veins. If the tape readings which differ from the set temperature, it indicates a malfunctioning dryer. However, in many cases the malfunction may be an erratic occurrence and therefore a difficult source of damage to detect. Thus an extensive testing program may be required.

C. Torn Border or Body

Borders and corners of mats are very vulnerable to damage because of their physical position on the edge of the mat. This can be caused by:
a) Mats can get caught between the stationary housing and rotating drum of either the extractor or the dyer (pinching off the corners or borders)
b) Protective dryer gaskets can wear out providing a larger gap between the stationary housing and rotating basket of the dryer in which mats are damaged. Additionally, worn out bearings may cause these uneven gaps, because of the uneven/wobbly rotation

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c) Any rough edges, loose screws, sharp metal points, etc. in the washer, extractor and especially the dryer basket will cause mats to be nicked. The nick will propagate into more severe tears from the forces of mechanical action in processing
d) In the field, mats may get caught in doors and between pieces of furniture, or be run over by large pieces of equipment causing a nick, tear or gouge which can develop over time into more severe damage.

To reduce the occurrences, the following actions should be taken:
a) Verify that the basket has been mounted properly in the housing of the dryer - the gap between the housing and the basket should be the same throughout the rotation.
b) Replace or repair worn dryer gaskets as needed. Many types are available: asbestos, brass, plastics, teflon.
c) When removing mats from the washer, take care not get the mats caught between the basket and housing by using a guard to "bridge" the gap.
d) Take care when loading the extractor to assure no mats will "ride high" and rub the cover of the equipment.
e) Periodically inspect the interior surfaces of all equipment for loose screws, other loose components, nicks, burrs, rough spots, sharp points and repair by tightening loose parts, filing down rough edges and replacing screws or other components as needed. Any area which feels rough to the touch is a potential cause of torn borders.
f) Route drivers must be responsible for verifying damage is <u>not</u> occurring at their accounts. Careful observation of the mats as they are picked up will help in isolating problem accounts.

Mechanical damage can also cause tears, holes and gouges in body of tha mat. Abrasion marks such as scratches, scrapes and nicks on the rubber near a hole, tear or gouge are signs that mechanical abuse is the cause of the damage to the mat. This mechanical damage might occur in the field but most likely laundry equipment is the problem source.

Make sure laundry equipment is well maintained: no rough spots in the baskets of washers, extractors or dyers; they care not to let mats be caught in the equipment during loading, processing and unloading; and be observant of possible unnecessary mechanical damage being inflicted throughout the processing plant. Route drivers must be responsible for observing possible problems in the field at the customer's location.

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Mechanical Damage can also cause cuts and tears. Cuts or tears result in mat losses. Without proper inspection one might be misled in determining if the damage is a tear or a cut. Obviously knowing the difference can often provide clues as to the source of the problem.

Possible causes include:
a) Cuts are caused by a knife or other sharp object penetrating through the rubber or both rubber and fabric.
b) Tears may be started by a nick, gouge, hole, or cut and develop or grow from mechanical action as a processing. (This propagation accelerates under the influence of hear.) Identification of a cut vs. tear is made by examining the nature of the rupture.

Tears may be prevented by eliminating or reducing mechanical damage to the mat: nicks, cuts, holes, gouges, etc. inflicted by either the laundry machinery, customer damage or other causes. Cuts may be prevented by careful handling.

D. Loss of Fiber

Loss of fiber in a mat can be caused by an old or worn out mat.

E. Chewing Gun

Chewing gum can be removed from a mat by using a product called “De-Solv-It” or by applying peanut butter to the mat and leaving it overnight.

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Appendix

A. WOM® Recommended Wash Formula

B. “Ask the Experts” article by Larry Patton

C. WOM® Recommended Clean up Formula

D. WOM® Recommended Wash Formula for Rubber Mats

E. G-force Calculations

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Appendix A

MILLIKEN & CO. – KEX® BUSINESS
STANDARD WASH FORMULA

SUPPLIES & WATER LEVELS BASED ON **100 LB.** LOAD.

	OPERATION	WATER LEVEL	TEMP F°	RUN TIME (MINUTES)	SUPPLIES (BASED ON 100 POUND LOAD)
1	BREAK	HIGH (12")	120°F	6 MINUTES	8 OUNCES DRY NON-IONIC DETERGENT. (0.5%) OR 2 OZ LIQUID
2	RINSE	HIGH (12")	120°F	2 MINUTES	
3	RINSE	HIGH (12")	120°F	2 MINUTES	
4	EXTRACT – IN WASHER-EXTRACTOR			6 MINUTES HIGH SPEED.	
5	DRYING-NOT NORMALLY REQUIRED FOR ENERGY® MATS	165°F	3 TO 5 MINUTES & 5 MINUTES COOL DOWN.		

1. For more detailed information regarding processing these mats, refer to KEX 2011 Technical Mat Bulletin.
2. Each operation # 1 through 3, is followed by a drain of approximately one minute.
3. This formula assumes all mats in the load are Energy® Mats. Inclusion of other mats may require modification to the extraction and drying steps to avoid damage. See mat bulletin.
4. Strong alkalis such as meta silicate, ortho silicate, or caustic soda should not routinely be used to process nylon on rubber mats.
5. Extract Speeds should not exceed 250 G's.

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Appendix B

Ask the Experts

By Larry Patton

I'm getting some indications that our plant may not be loading our washers and dryers for maximum production and efficiency. What range of issues should I consider to do this right?

To save money and improve quality, I recommend standardizing the loading process. I get a lot of questions about proper machine loading. Whether a company is an independent or part of a larger corporation, there is much to be gained by having standard loading weights for washers and dryers.

Finished product quality depends on many factors. You've likely heard that the wash process or "wash pie" is made up of the following parts:

- Time: length of the wash cycle
- Temperature of wash baths and rinses
- Mechanical action: using the machine's action to "drop" the products and provide friction
- Chemicals used during the wash process

Usually, an overloaded machine does not provide proper mechanical action. Without enough of it, you must extend wash time, raise temperature, or increase chemistry to get the same cleaning results. If one part changes, something else also has to change to compensate.

Many companies tend to overload machines to get increased production out the door, but they do not receive this desired outcome. Dryers are overloaded in sequence; this makes them run longer (using significantly more energy to accomplish the task) and the material handling portion of the job becomes more difficult.

I have seen companies load washers using the "that is all I can get into the machine" method. Not good for the wash process or product quality!

We once had a plant that had trouble getting industrial pants clean. Staff was putting 900-plus pounds of these goods into a 750-pound machine. We then asked for the model number to calculate the machine's actual capacity based on volume rather than weight. Converting to this methodology can be the key to proper loading.

A machine's true capacity is reflected by its basket volume. To calculate it, you square the cylinder diameter (inches), multiply that square by the cylinder depth, and divide this product by 2,200. This gives you the volume in cubic feet.

So here's how you would do it for a cylinder that's 72 inches in diameter and 46 inches deep: (72*72*46) / 2,200 = 108.4.

The next part of the loading equation is the load factor: number of pounds of soiled goods per cubic foot of volume. This number varies with the types of products you process. For uniforms, we used 5.62. Between 5.5 and 6.5 are generally accepted load factors. I prefer the lower end of the scale for industrial and the upper end for linen.

So how many pounds of goods should you place in our 108-cubic-foot washer? Multiply 5.6 times 108 and you get 605 pounds. This unit would be classified as a 600-pound machine. Some vendors advertise their machines with the calculated poundage and others use model numbers, but all actual capacities can be calculated with the cylinder diameter and depth.

At Omni, we used this factor as a generic and varied actual load sizes based on goods classification. Shirts were loaded at 85 percent of rated capacity; pants, 100; towels, 100 to 120; and mats, 100 to 125. We developed such percentages for every classification we processed.

Chemical doses need to be set in accordance with machine loadings. Make your laundry supplies vendor part of the production and quality process. Your machine supplier also has many years of experience helping launderers set up production.

Back to my previous example: after calculating the volume of the machine and determining how the plant was loading, we concluded that more than 900 pounds were being placed in a 600- pound (not 750-pound) machine! When we applied the proper percentage, we created 600-pound loads and adjusted chemistry accordingly. Quality suddenly improved and the problem went away.

Under loading is also a problem in washers and dryers. In a washer, you will not get the proper mechanical action, and in a dryer, air will “go around” your products instead of through them.

Another distinction to ensure consistency in processing is to decide whether to use “clean dry” or “soiled” weight. We preferred to use “soiled” because we weighed every classification and it provided us a solid basis for all data and calculations. Some companies use “clean dry,” but we liked “soiled” because we weighed everything before going to the wash floor.

The last consideration in machine loading is product delivery to the machines. If you use a soiled sling delivery system, sling weights should be planned and standardized in a manner that uses the minimum number of slings that can be easily loaded and unloaded into and out of the machines. This helps create easy rules of thumb to follow.

For example: If a washer is rated for 600 pounds and a product’s load percentage is 100, each sling of these goods could be 200 pounds and each load would require three slings.

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Appendix C

CLEANING UP HEAVY SOILED MATS

The following procedure is recommended for cleaning heavily soiled or stained mats. This formula should only be used when mats are stained to a level that cannot be cleaned using the Standard WOM® Wash Formula for mats. Continued use of this formula will shorten the life of a mat causing either fading, rubber damage, or both.

OPERATION	LEVEL	TEMP (°F)	TIME (MIN)	SUPPLIES/ 100 Pounds	
BREAK	LOW	160	10	2 lbs. Powered or 8 oz Liquid	Built Detergent
RINSE	HIGH	160	2	None	
RINSE	HIGH	160	2	None	
RINSE	HIGH	140	2	None	
RINSE	HIGH	140	2	None	
RINSE	HIGH	120	2	None	
RINSE	HIGH	120	2	None	
EXTRACT			8 to 10	High Speed	

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Appendix D
Standard Wash Formula for Kextreme™ Comfort, Scraper, Logo Scraper, UltraSan and UltraFlow mats

	OPERATION	WATER LEVEL	TEMP F^0	RUN TIME (MINUTES)	SUPPLIES Based on 100 Pounds Load
1	BREAK	HIGH (12")	COLD TO 90^OF	5 MINUTES	1.0 Oz Nonionic Detergent.
2	DRAIN			1 MINUTE	
3	RINSE	HIGH (12")	COLD TO 90^OF	2 MINUTES	
4	DRAIN			1 MINUTES	
5	RINSE	HIGH (12")	COLD TO 90^OF	2 MINUTES	
6	DRAIN			1 MINUTE	
7	TUMBLE			2 MINUTES	At wash speed to remove pockets of water.
8	EXTRACT			2 MINUTES LOW SPEED, **ONLY IF REQUIRED**, **THIS STEP CAN USUALLY BE OMITTED**	
9	DRY		160^0F	2 MINUTES, & 5 MINUTES COOL DOWN. (ALL THAT IS REQUIRED IS TO WARM UP THE MATS, THEN COOL THEM DOWN)	

NOTES:
1. In some locations, it may be desirable to begin processing with the "Shakeout" in step 1, to remove loose soil and sand. This consists of running the load at wash speed with no water. This step may be omitted if trial loads show it to be unnecessary.
2. All run and drain times are approximate, and should be adjusted to suit conditions.
3. KEXTREME COMFORT™ ANTIFATIGUE, SCRAPER, LOGO SCRAPER, ULTRASAN, AND ULTRAFLOW mats should not be washed with mats that have pile. High speed or prolonged extraction required for pile type mats may result in blow-outs on the scraper type mat. Load the wash wheel to its rated capacity. Overloading may cause pockets of water to be retained on the last rinse.
4. Do not use detergents that contain solvents on any rubber mat.
5. Use the lowest temperature for washing that gives satisfactory results. Solid rubber type mats are much easier to clean than conventional mats with pile. Less detergent , lower temperatures, and shorter cycle times should be used.
6. Extraction can probably be omitted, if mats do not have pockets of water.

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Appendix E

CALCULATING G-FORCES DEVELOPED IN EXTRACTORS

To successfully extract the ENERGY® MAT--sufficiently to by-pass tumble drying-- the extraction procedure must be carried out under adequate centrifugal force, i.e. G-force. The Energy Mat has been fabricated in such a manner that most washer/extractors or centrifugal extractors create the necessary G-forces to effectively extract the mat. For those wishing to calculate G-force of a given extractor, a formula is given below:

$$G = \frac{D''/(36)\ (.9144)\ (RPM^2)}{1790}$$

Where D = diameter of extractor in inches and 0.9144 = conversion of diameter to meters. RPM^2 = square of extractor speed(revolutions/minute).

As an example: A washer/extractor has a diameter of 42" and an extraction speed of 600 rpm's. What G-force will it create?

$$= \frac{(42)/(36)\ (.9144)\ (600^2)}{1790}$$

$$= \frac{(1.167)\ (.9144)\ (360{,}000)}{1790}$$

= 214.5 g's (minimum limit, approximately 175-190 g's)

Note: G-Force above 250 Gs may cause damage to the mat due to mat explosion or micro-valve elongation. In the case of larger diameter wheels, such as an eight hundred pound washer/extractor, It may only take 220 Gs to get the mats sufficiently dry.