

## RDIA Annual Meeting

At this year's Real Diaper Industry Association Annual Meeting, there was a fantastic presentation on laundry science. It was presented by Steven J. Tinker, who is the Vice President of Research & Development at Gurtler Industries, Inc. and has over 35 years of experience in the detergent industry. He is also the president of the American Reusable Textile Association and the Vice-Chair of the Advisory Committee of the Healthcare Laundry Accreditation Council.

For the purpose of this newsletter I have drawn on the points I felt were more relevant to home washing, however he did cover much more in his talk that was specific to diaper services. If you are interested in learning more about all this, it would be a good time to [join the RDIA](#), as they have videotaped his talk and made that and his slides available to members.

Please note that in the following summary, I have added a bit of factual information here and there where I felt it to be relevant or necessary.

## Laundry Science

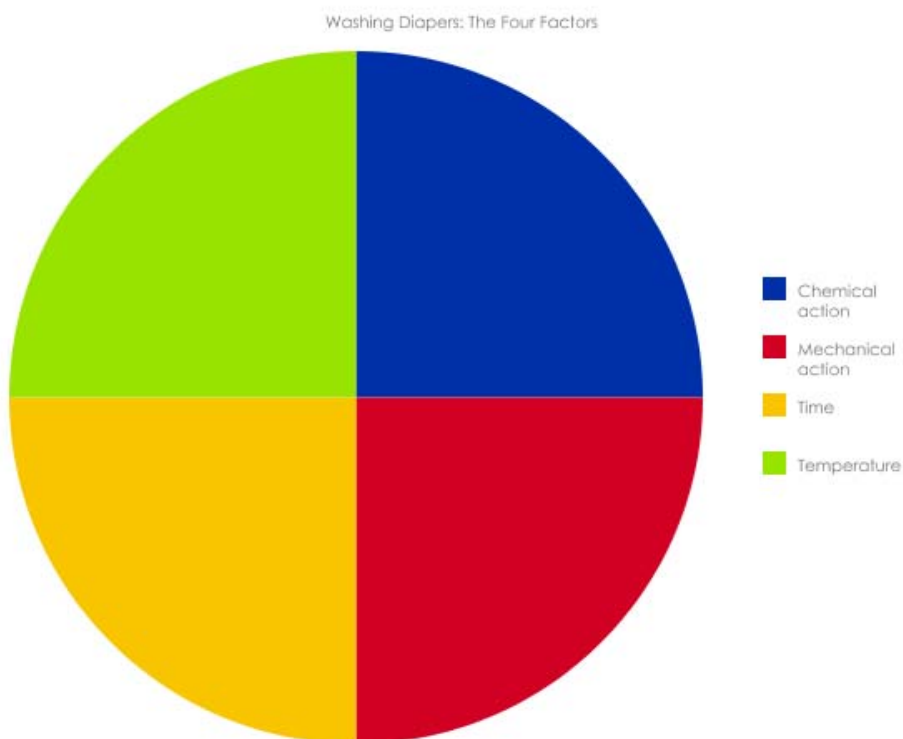
### Water

The main point of Mr. Tinker's presentation was that water is 99+% of what we wash with, therefore the quality of your water is critical for the best results. He strongly encouraged all who have even *medium*-hard water to invest in a water softening device. Costs are quickly recovered by savings on detergent and reduction of wear and tear on appliances, fabric and plumbing. Water hardness is a measure of the calcium and magnesium carbonate present in your water.

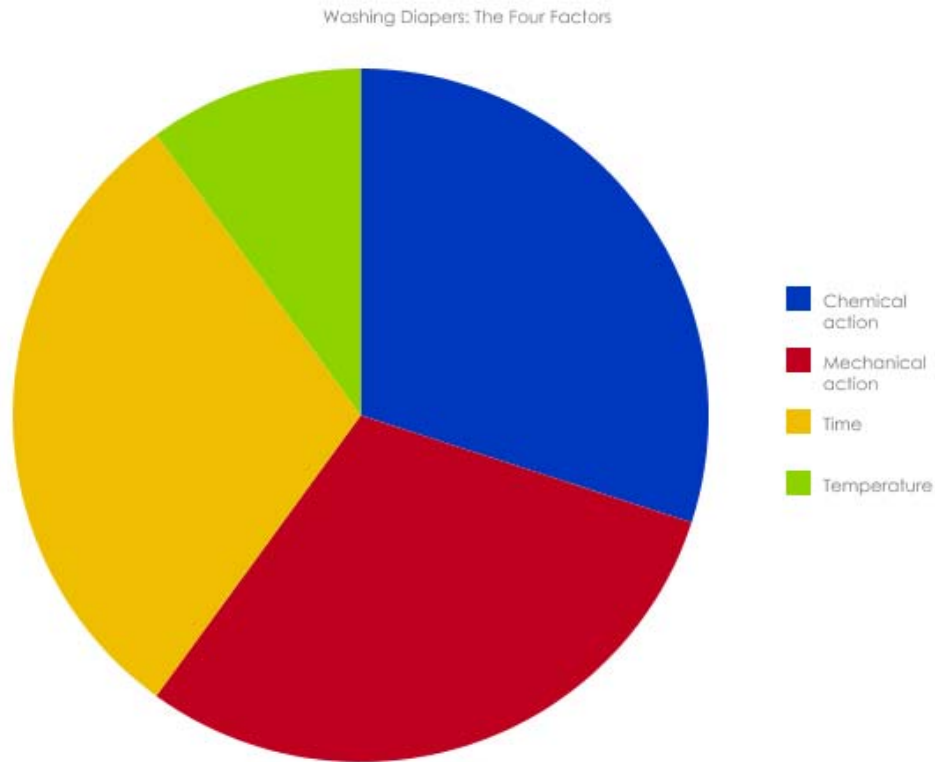
Other factors in water that can affect washing include total dissolved solids, chlorine, iron (yellowing), alkalinity (problems rinsing – harsh fabric), organic matter etc. So in other words, water quality is crucial to washing success.

### The Four Main Factors

The other main factors in washing success are chemical action (detergent), mechanical action (swooshing), water temperature, and time (how long the wash cycle lasts). These four components need to fill the pie chart.



It is crucial that if you decrease one of these four factors you will need to increase the others. For example, if you decrease the temperature of the wash you would need to increase the three other factors:



**Chemical action** is achieved by the detergent you add to the water.

**Mechanical action** is achieved by the movement of the fabrics against one another inside the washing machine. You can slightly under-load your machine, but not by much or there will not be enough fabric to rub against itself. Think of washboards in the river and how pioneers rubbed the fabric against the boards to create the mechanical action that drew the soil out of the fabric. It is also important to note that if you over-load your washing machine, you will not get enough rubbing action either, as there is no room for the diapers to move!

**Temperature:** For every 10 degree drop in temperature below 110F, there is a 50% reduction in the chemical reaction - so washing in warm to hot water is best.

**Time** is crucial! If fabric is not exposed to detergent and mechanical action long enough, water will not penetrate fabric and soils will not be released.

## Steps in the Wash Cycle

### First step: pre-rinse

At this point you can either use water alone or you can add a bit of detergent to start the initial release of soil. Never use hot water in a pre-rinse as it will set stains, but warm water is better than cold, as body fluids are most soluble at body temperature (warm).

### Second step: wash cycle

Here you will need significant chemical action to have a good release of soil. Mr. Tinker recommended detergents with an alkali (to dig out soil) and a nonionic surfactant (to take away soil).

**What is a surfactant?** This is the active cleaning agent in most detergent formulations. Surfactants change the chemical and physical relationship between water and the surface to be cleaned. Some surfactants are naturally occurring and some are synthetic. Surfactants loosen and suspend soil and enhance the wetting property of water. Soaps are a type of surfactant and natural soaps such as soap nuts, castile soap, Ivory Soap, etc. can work well under ideal water conditions. Unfortunately many of us have less than ideal water conditions and in this case the minerals in our water can bind to the soap and create a scum on the surface of the water. This scum can cause repellency and leaking issues as well as causing diapers to look dingy.

**What about Enzymes?** A detergent may also contain enzymes. There are three basic enzymes: protease (which works on proteins), amylase (which works on starches), and lipase (which works on fats). Mr. Tinker did not feel that protease or amylase pose any problems for skin or fabric. Because fat is stored in the skin, lipase can potentially cause a skin reaction in those who are particularly sensitive. In actual fact however, most people can use enzymes with no problems at all, and he did note that they are effective at removing odours!

### Third step (optional): bleaching

This step is important if you need to achieve 'hygienically clean' diapers or when you need to disinfect your diapers. Time and temperature play a crucial role here as well, especially if using oxygenated bleach. Thus when using oxygenated bleach, you will need to have both mechanical action and adequate temperature in order to activate the bleaching action; very hot water must be used along with at least 10 minutes of agitation. There does exist a type of "activated" oxygen bleach called Peracetic Acid, which can be used at lower temperatures than those required with regular oxygenated bleach.

We encourage the use of oxygenated bleach instead of chlorine bleach for environmental and health reasons, and also because chlorine bleach is extremely destructive to fabrics and laminations, etc. If chlorine bleach is ever used in a home wash – for example to deal with a particularly tough yeast infection – it is important to make sure that all urine is completely rinsed out before using it, because urine + chlorine = ammonia smell from chloramines!

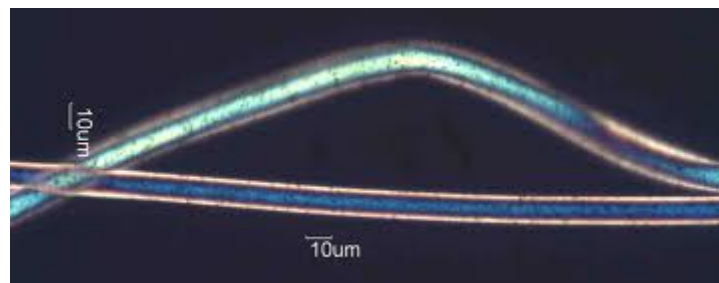
### Final step: rinsing

Rinsing removes any residual soil and chemicals. It can take more than one rinse to achieve great results. Mr. Tinker recommends rinsing in warm water because it releases residues more effectively. But even more importantly, a warm rinse allows water to be released more efficiently in the spin cycle so that clothes dry more quickly! Fascinating!

### Fabrics: do different fabrics wash differently?

**Absolutely!** This is why laundry services wash cottons and polyesters separately. The fibers that make up the fabrics are very different.

**Polyester** is a perfectly smooth round fiber. Its base ingredients are derived from oil so it does not like to get wet (repels water initially). It also likes to hang on to oily stains and the trapped oil could possibly lead to stink if not properly washed.



Polyester fiber (above)

**Cotton** twists and folds over itself, which is why it has such a great capacity for absorption. It is also very "wetable," meaning it loves water and thus washing and rinsing are easy.



Cotton fiber (above)

In reality there is no such fabric called **microfiber**! What people in our industry refer to as microfiber is typically a blend of polyester and polyamides that have been treated caustically in order to create "channels" in the fiber. There are many different microfibers on the market with various appearances but the most common type has a pizza appearance (see below). Moisture is pulled in by capillary action and trapped between the inner core (star) and the "pizza" slices. This causes microfiber to be very absorbent, but also means that it is more prone to "stink" - as urine or bacteria can get trapped in these pockets. It is hard for clean water to penetrate microfiber since the polyester does not like water to begin with and the channels are already full of urine.



Microfiber "pizza" slices (above)

### What helps to achieve hygienically clean diapers at home?

- 1) **Dilution.** Each time you change out the water (pre-rinse, wash, rinse...) you dilute the amount of bio-burden in the wash and flush it away.
- 2) **Heat.** Temperatures of +140F (60C) (hot water wash) deactivate common bio-organisms.
- 3) **pH.** This is applicable mainly in commercial laundries.
- 4) **Oxidation.** Chlorine or oxygen bleaches.
- 5) **Heat from drying** in the dryer on a heat setting.