

AATCC Standard Reference Detergents and Laundry Detergents in General

Developed in 1995 by AATCC Committee RA88; revised 1981/1982, 1991, 1998 (with title change), 2005, 2017 (with title change); numbered in 2011.

1. Background/History

1.1 The AATCC and other testing and development groups have used standard reference detergents since the 1960s. AATCC Standard Reference Detergent 124 and WOB (without brightener) were the first formulations adopted by the AATCC to represent typical home laundering products of that era, primarily phosphate-built powder detergents. The proliferation of detergent formula variations and the elimination of phosphate due to environmental pressures made Standard Reference Detergents 124 and WOB obsolete.

1.2 Since the discontinuation of 124 and WOB, new representative detergents have been available for use. The following paragraphs provide some perspective on laundry detergent trends and the AATCC standard reference detergents.

2. Current and Future Trends in the Detergent Industry

2.1 Consumer laundry detergents today come in a variety of product forms including powders, liquids, and single unit dose packs. All forms are primarily composed of surfactants and builders (except non-built liquid detergents, which contain primarily surfactants). They also contain processing or delivery aids for product stability and can contain many optional ingredients to provide performance or aesthetic benefits, such as fluorescent brighteners, enzymes, bleaches, anti-redeposition agents, fiber and dye protective agents, perfumes, suds control agents, etc.

2.2 A key difference between powder and liquid laundry detergents is their builder system. Powder detergents are typically better built than liquid laundry detergents, have a carbonate-builder system, often contain aluminosilicates (zeolites) for added builder capacity, and perform optimally at higher pHs (pH $\approx$ 10). Heavy-duty liquid laundry detergents are typically citrate-built and perform optimally at lower pHs (pH $\approx$ 8.5). Single unit dose packs can contain liquid and/or powder components and the corresponding builder system.

At the time of this writing (2017), the market share for consumer detergents in the United States is approximately 75% for liquids, with the remaining being split between powders and packs.

2.3 The detergent market will continue to evolve as the demands of the consumer and chemical industries change. Detergents of the future will be impacted by many factors, including environmental concerns, conservation efforts, chemical availability, raw material costs, performance benefits, and consumer needs. There is, therefore, a need to ensure that reference detergents are reflective of consumer products and should be updated after major shifts in the detergent industry are noted.

3. Rationale for Using 1993 AATCC Standard Reference Detergent

3.1 With this background and especially the environmental concerns with the use of phosphates, new AATCC Standard Reference Detergents, with and without brightener, were developed in 1993 and are still used today. These concentrated powder formulations use carbonate builder instead of phosphate and were created without enzymes due to possible changes of enzyme strength over the storage life of the product.

3.2 Laboratory comparisons between 1993 AATCC Standard Reference Detergents and consumer products would likely show differences in washing performance. However, comparison among consumer products could also show differences of similar or even greater magnitude.

3.3 One of the factors leading to possible differences between results using the 1993 AATCC Standard Reference Detergents and current consumer detergent products is water hardness. In hard water situations, the 1993 AATCC Standard Reference Detergents may give better soil removal results because they are more effective across a broader range of hardness than most consumer products.

3.4 Other Standard Reference Detergents are used in various ISO test methods. These detergents are specified in methods designed for home laundering equipment sold outside the United States.

3.5 AATCC 1993 formula is suitable for toploading machine and accelerated (Launderometer) testing. It is not suitable

for high efficiency top loading or front loading machines.

4. Rationale for using AATCC Liquid Detergents

4.1 Due to the growing market share of liquid detergents, AATCC saw the need and developed a liquid standard reference detergent that was relevant to the current laundry market.

4.2 Although powder and liquid detergents are designed to provide cleaning and stain removal, they achieve these objectives differently. A key difference is the pH regime in which the two product forms operate. Powder detergents perform optimally at higher pHs (pH $\approx$ 10). This higher alkalinity helps stain removal efficiency; however it also negatively impacts fibers and dyes. Over the years, technologies have been developed to deliver benefits under alkaline conditions and powder detergents have been able to overcome many of their initial disadvantages.

4.3 Liquid detergents perform optimally at lower alkalinity (pH $\approx$ 8.5). Because this pH is closer to neutrality, liquid laundry detergents tend to be less harsh on fibers and dyes. Over the years, technologies have been developed to help liquid laundry detergents deliver stronger cleaning benefits while remaining less harsh on fibers and dyes. Due to significant formulation differences between powder and liquid laundry detergents, different reference detergents are needed to fairly represent them.

4.4 AATCC's first liquid detergent was the 2003 formula, with and without brightener, and was suitable for traditional toploading machines. Its use was discontinued in 2016 as a newer formula was developed that could be used in both traditional and high efficiency machines.

4.5 The 2015 HE Standard Reference Detergent, available with and without brightener, is the current recommended standard liquid for both traditional toploading and high efficiency machines. Testing of this detergent at the time of its introduction showed that its stain removal performance was comparable to current consumer detergents.

5. Rationale for Use of Reference Detergents in Laboratory Testing

5.1 Many fabric attributes critical to consumer use and acceptability, such as

dimensional change, surface or smoothness appearance, colorfastness, soil release, and flammability resistance performance are influenced by the manner in which textile products are laundered. The textile industry has adopted standard detergents and laundering conditions to allow for the prediction of the acceptability of textile products to judge the performance of their products. The standard detergents have been designed to represent a cross section of market detergents.

5.2 The use of locally purchased national brands of detergents in testing labs is a fairly common practice. This practice has been driven by several factors: a) in-

accurate assumption that the same detergent brand has the same composition from location to location and from one year to the next one, b) the convenience of buying locally, and c) price. The use of “off the shelf” detergents in laboratory testing adds an element of variability that use of standard test methods and detergents intends to control. The percentage of optical brightener or fluorescent brightener agents has a definite effect on colorfastness evaluations. The amount of optical brightener or fluorescent brightening agents is known to vary within a single brand of detergent sold for consumer use.

5.3 Detergent manufacturers have developed detergents with other cleaning components such as non-chlorine color safe bleach systems. AATCC has standard full-scale (washing machine) and accelerated methods for determination of colorfastness using such products. They are AATCC Test Method (TM) 172, Colorfastness to Powdered Non-Chlorine Bleach in Home Laundering, and TM190, Colorfastness to Home Laundering with Activated Oxygen Bleach Detergent: Accelerated.

5.4 It should be noted that different standard laundering equipment and detergents are used in Europe and Asia.