

“I was very fond of Dick [Byerly] but you’ve got to understand the man to understand what he did... Dick was an obstinate cuss in some ways. Tenacious as all get out!”

G. Thomas Halberstadt, Interview, April 7, 1984, P&G Archives

Duncan goes to Europe

In April 1931 Robert Duncan, a process engineer with Procter & Gamble, toured the I.G. Farben Research Laboratories in Germany. He was told that during the First World War – when Germans were unable to obtain soap – one of Farben’s chemists had visited a little textile plant that used bile from slaughtered cattle as a wetting agent in its dyeing process. I.G. Farben isolated the active ingredient in the bile, which it then synthesized and marketed as Igepon to the textile trade. Duncan was told that Igepon was a good wetting agent, a fair detergent, and effective in hard water.*

Duncan also learned on his trip that another German chemical company, Deutsche Hydrierwerke, was about to market a competitive product. Duncan visited the factory which was producing saturated fatty alcohols by catalytic hydrogenation, hoping to sell the finished alkyl sulfate to the textile trade. Duncan purchased 100 kilograms of the material, which he express shipped to Procter & Gamble’s research facilities in Cincinnati.

P&G’s research facilities in Cincinnati



The German research intrigued Duncan because P&G made soaps, and traditional soaps did not work well in hard water, where they deposited a residue of scum, or curds. Duncan understood that the properties that made the surface-active agent (“surfactant”) an effective wetting

agent theoretically should make it an effective detergent as well. With the German material in hand, P&G researchers went to work to synthesize surfactants and discovered that it was possible to create a two-part molecule – resembling a string – which would allow water to break up oils and grease and float away dirt. One end of this molecule bonds with oils and grease, the other with water. The molecule pulls the oils and grease into a water solution, which can then be washed away.

Dreft®

During the summer and early fall of 1931 P&G’s research department tried to process the alkyl sulfates into bars, flakes, granules, or liquids to determine the best form for potential marketing, and researchers conducted tests on the stability and quality of the suds the alkyl sulfates produced. P&G provided samples for home tests in an informal consumer survey.



With the tests favorable, Procter & Gamble decided to market a granulated laundry detergent and a liquid shampoo. The company launched Dreft, the first synthetic detergent in the United States, in 1933 and Drene, the first synthetic hair shampoo, the following year. Both products found a niche in the market, but sales were relatively small. Dreft in particular represented a breakthrough in detergents because it cleaned clothes in hard water without leaving curds, a significant benefit for those who lived where the water is hard, which is roughly the Midwest to the Rocky Mountains. But the detergent did not clean heavily soiled clothes. P&G chemical engineers knew that cleaning ability could be

improved by “building” the surfactant, that is, by adding chemical compounds – sodium phosphates – to increase the surfactant’s ability to get at deeply embedded dirt. But the “builders” left clothes harsh and stiff because the chemicals reacted with the water’s hardness to form insoluble, granular deposits that would not rinse away. Because of its limitations, Dreft without builders remained a useful product, but one with a narrow market appeal – for delicate fabrics and baby clothes.

Developing Tide®

Throughout the 1930s Procter & Gamble’s chemists and chemical engineers at the Ivorydale Technical Center in Cincinnati worked to develop a heavy-duty synthetic laundry detergent. The researchers experimented on the surfactant-builder problem, attempting to develop an alkyl sulfate-based detergent that cleaned heavily soiled clothes without leaving them hard and stiff. They tried to build the surfactant with different chemicals; they added soaps to synthetic detergents; they mixed and matched formulae, testing them as flakes, granules, and liquids. But nothing worked satisfactorily.

By the end of the decade, the company had all but given up developing a heavy-duty synthetic detergent, and management began shifting research into other projects. But one researcher, David “Dick” Byerly – ultimately the holder of the key Tide patent – refused to shelve what was known in the company as Project X. Byerly’s doggedness insured that Procter & Gamble would be the developer of the first heavy-duty synthetic detergent.

Byerly kept experimenting with superphosphates as the builder. He



Researcher David Byerly

* The terms soap and detergent are often used interchangeably, but there is a difference. The broadest definition of a detergent is a compound or combination of compounds used for cleaning. Therefore, all soaps are detergents but not all detergents are soaps. Soaps are generally made from the reaction of animal or vegetable fat (oil or glyceride) with a base, such as found in wood ashes, to yield a salt of a long chain fatty acid. The long organic chain is hydrophobic, i.e., it hates water, but does dissolve grease, oil and dirt, while the salt end of the molecule is hydrophilic, i.e., it likes water. The combination in a single molecule gives soap its cleaning power. A detergent, as used in this brochure, is a compound that has been specifically designed and synthesized to have hydrophobic and hydrophilic parts, but it is not derived from animal or vegetable fats, and has cleaning properties equal to or better than any soap. A wetting agent is a compound that increases the ability and speed with which a liquid displaces air from a solid surface thus improving the process of wetting that surface. A surfactant is a wetting agent.

tried a variant called sodium pyrophosphate, which cleaned well enough, but left clothing feeling like sandpaper. Because management frowned on his work on Project X, he ceased including it in his weekly reports. Byerly's efforts were further hampered by the outbreak of World War II, which led to shortages of raw materials.

Still, Byerly made progress. By 1941 he had concluded that the best builder was sodium tripolyphosphate. More importantly, Byerly made a counter-intuitive breakthrough. All previous research on soaps and detergents had shown that reducing the amount of builder in a formula yielded a less harsh product (and it was the harshness of products with builder that hamstrung the project for so many years). Like his predecessors and colleagues, Byerly at first tried to keep the proportion of surfactant – the actual cleaning agent – as high as possible. But when he inverted the ratio by boosting the level of builder well above the amount of surfactant, he got a surprising result: the detergent cleaned well without leaving clothes stiff and harsh. After a great deal of trial and error, Byerly determined that the most effective formula was one part active detergent, alkyl sulfate, to three parts builder, sodium tripolyphosphate. No one could figure out why it worked, but it worked.

Marketing Tide

In mid-1945 Procter & Gamble senior managers received a demonstration on Project X. The executives sensed immediately that the researchers had developed an innovative product that called for innovative production and marketing techniques and schedules. They decided to scrap P&G's normal schedule for producing, testing, and marketing a new product.

That schedule could take up to three years before a national rollout. Management feared that P&G's competitors would use that time to get test samples of Project X, then develop and market their own synthetic detergent. But if P&G rushed into production, the company would have at least a two-year head start over Colgate and Lever Brothers.

Project X quickly moved from a backchannel research oddity to the forefront of P&G's product development. Tide was chosen as the name, though no one can recall why. The marketers quickly swung into action. The famous box of concentric rings of vivid orange and red in a bull's eye motif with Tide in blue letters was developed. The slogan

"oceans of suds" became part of the early marketing campaign. In addition, early advertising stressed that Tide was a "Washday Miracle" that promised to wash laundry "cleaner than soap." The advertisers were confident in making those claims because Tide's performance was truly superior.

Still, it was a significant claim for a company whose livelihood depended on soaps.

Producing Tide

While the marketers forged ahead, the process engineers had to solve several problems. First, the company had to secure sufficient quantities of sodium tripolyphosphate to justify a major plant expansion. Second, P&G needed to build new facilities, particularly four new towers to granulate, or blow, Tide. Existing facilities could not be converted to produce Tide because synthetics required a different granulation process than soaps.

Then the process engineers had to work out some problems in the original formulation of Tide, which did not blow well. It built up in the towers and clogged the feeder valves. The towers had to be shut down and cleaned out regularly. The addition of a small amount of sodium silicate solved the problem, allowing for crisper granules that could more easily be blown.

With the granulation problem solved and with new towers in production, P&G began test marketing Tide in October 1946 in six cities: Springfield, Massachusetts; Albany, New York; Evansville, Indiana; Lima, Ohio; Wichita, Kansas; and Sioux Falls, South Dakota. The date of the introduction coincided with the spread of automatic washing machines. The link between the new heavy-duty synthetic detergents and the new automatic washers was reinforced a few years later when P&G struck agreements with a number of washing machine manufacturers to pack boxes of Tide in the new machines.

Tide was an instant marketing success, selling out in markets all over the country as fast as P&G could make it. Tide quickly boosted Procter & Gamble's share of the laundry market as both Colgate and Lever Brothers scurried to develop synthetic detergents. That was the good news; the bad news was that Tide also undermined P&G's traditional soap brands. By 1949 production of the company's synthetic detergents outstripped its soap production. To a certain extent P&G strategists were caught off guard by Tide's phenomenal success. The company had expected Tide to sell well in hard-water regions, where traditional soaps did not perform effectively. But in fact, consumers all over the country, even in soft-water areas, quickly switched to synthetics, with Tide leading the way. By the early 1950s Tide had captured more than 30 percent share of the laundry market, and it has been the number one selling laundry detergent every year since.



National Historic Chemical Landmark

The American Chemical Society designated the development Tide by Procter & Gamble as a National Historic Chemical Landmark in a ceremony in Cincinnati, Ohio, on October 25, 2006. The commemorative plaque at P&G headquarters reads:

In 1933 Procter & Gamble introduced Dreft, a synthetic detergent made from an alkyl sulfate. Dreft cleaned clothes in hard water without depositing a residue of soap scum, a problem common to traditional soaps. But it was not strong enough to clean heavily soiled clothes. To solve this problem, P&G chemists, working at the Ivorydale Technical Center, added a "builder," sodium tripolyphosphate, to the surfactant (cleaning agent) and determined that an effective formula contained three parts builder to one part detergent. These breakthroughs led in 1946 to the debut of Tide, the first heavy-duty synthetic detergent. The simultaneous introduction of automatic washing machines saved the consumer time and effort.

About the National Historic Chemical Landmarks Program

The American Chemical Society, the world's largest scientific society with more than 158,000 members, has designated landmarks in the history of chemistry for more than a decade. The process begins at the local level. Members identify milestones in their cities or regions, document their importance, and nominate them for landmark designation. An international committee of chemists, chemical engineers, museum curators, and historians evaluates each nomination. For more information, please call the Office of Communications at 202-872-6274 or 800-227-5558, e-mail us at nhclp@acs.org, or visit our web site: www.chemistry.org/landmarks.

A nonprofit organization, the American Chemical Society publishes scientific journals and databases, convenes major research conferences, and provides educational, science policy, and career programs in chemistry. Its main offices are in Washington, DC, and Columbus, Ohio.

Acknowledgments:

Written by Judah Ginsberg

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