

SEVEN DECADES OF DISPOSABLE DIAPERS



A Record of Continuous Innovation and Expanding Benefit

Author : Davis Dyer

The Winthrop Group, Inc. on behalf of EDANA

August 2005

Attends Healthcare Products, Inc

EX1013

Page 1 of 15

Table of Contents

Introduction	3
1. Product Invention (before the 1930s)	4
Key Lessons of the First Period (before the 1930s)	5
2. Early Commercialization (1930s-1950s)	6
Key Lessons of the Second Period (1930s-1950s)	8
3. Rapid Adoption (1960s-1980s)	9
Key Lessons of the Third Period (1960s-1980s)	12
4. Continuous Improvement (since 1990)	13
Key Lessons of the Fourth Period (since 1990)	14
Endnotes	15

Introduction

One of the most significant consumer products of the twentieth century, the disposable diaper (or “nappy” in some usages) continues to evolve rapidly in the early twenty-first century, becoming smaller, cheaper, easier to use, friendlier to the environment, and more ubiquitous every year. Today, more than nine of every ten diaper changes in the developed world and a growing percentage elsewhere are disposables. The disposable diaper provides a modern solution to an age-old need—to keep infants clean, dry, and safe from infections—while liberating parents from an age-old problem—to clean up after infants and small children during the earliest years before potty training.

The story of the disposable diaper begins more than a century ago, but it became commercially viable in Europe and North America seven decades ago, in the late 1940s. Its evolution was hardly smooth, however, and the huge success it has become was hardly foreseen at the outset. In taking a long view of the product, it may be helpful to think about its development in four distinct periods:

- 1. Product Invention (before the 1930s), when numerous independent inventors sought better solutions to traditional diapering;**
- 2. Early Commercialization (1930s-1950s), when private corporations introduced disposable diapers and slowly cultivated the market;**
- 3. Rapid Adoption (1960s-1980s), when demand exploded as disposable diapers became affordable and widely available; and**
- 4. Continuous Improvement (1990s-present), when the leading manufacturers are competing on a global basis to offer consumers a product undergoing constant innovation and improvement.**

Let us consider each of these stages, in turn.

1. Product Invention (before the 1930s)

The problem of diapering—of clothing infants not yet potty trained—is as old as human history. For millennia, mothers living in warm climates typically left their children naked and cleaned up the waste only when it interfered with eating, sleeping, or working. When infants needed to be moved, they were wrapped tightly in home-spun cloths or in shells fabricated from plants or animal hides. (A familiar example is the Native American “papoose,” a bundled infant often depicted as carried on its mother’s back.) In colder regions, infants were often bound up, neck to toe, in “swaddling clothes” or blankets that served multiple purposes: keeping the infant warm and secure, freeing mothers to undertake chores, and acting as primitive diapers. We do not know how often such garments were changed, though there is not much evidence of progress through the centuries. One source claims, for example, in the sixteenth century infant garments were changed every three or four days, while wet garments may not have been washed but simply dried and re-used.¹

In the mid-nineteenth century, cheap manufactured cotton fabrics, which were newly available and affordable with industrialization, filled demand for cloth diapers around the world. Diapers were typically rectangular or square in shape and were folded and fastened on infants as garments or undergarments. An important advance occurred in the late 1840s with the invention of the safety pin. The basic cotton diaper meanwhile evolved little through the decades, as it was inexpensive, versatile (bigger children could use bigger cloths), moderately absorptive, washable, and reusable (often from child to child in a family or community). In some cultures, mothers might insert a natural absorbent material such as moss or peat into the diaper to help collect at least some waste, or they might put two or more diapers on the child to limit leakage. Diapering habits generally correlated with socio-economic status: wealthier families could afford more frequent purchases and changes (and nannies!), while poorer families made do with fewer diapers and fewer changes during a given period.

Even as cotton diapers gained acceptance numerous inventors and entrepreneurs sought to improve upon its limitations—messy cleanup and tendencies to leak and correlate with skin rash. Between the 1880s and 1930s the United States government patent office recorded dozens of relevant “inventions,” including shaped and fitted diaper designs, alternative fastening systems, absorbent inserts, medicated surfaces, and moisture-proof covers. In 1858, for example, J. H. Hall designed a moisture-proof attachment to a cloth diaper to capture and isolate waste. During the next few decades, more ideas and innovations surfaced: a diaper with a disposable paper lining; rubberized panties with medicated surfaces; disposable absorbent cellulose pad inserts.²

None of these inventions resulted in immediate commercial success. By the early 1930s, however, key ideas were coming together and the prospect of developing a better diaper began to appeal not just to individual inventors and entrepreneurs but also to large commercial organizations, heralding a new period of focused, patient, and persistent product development.

Key Lessons of the First Period (before the 1930s)

- In the long scheme of human history, the cotton cloth diaper is a relatively recent arrival. Its period of ascendancy extended from the mid-19th century to the late-20th century.
- From the beginning, users recognized the limitations of cloth diapers, especially leakage, discomfort, and cleanup.
- As early as the 1850s, inventors and entrepreneurs were looking to overcome these limitations and offer consumers diapers that were moisture-proof, more absorbent, disposable, and hygienic.

2. Early Commercialization (1930s-1950s)

In the 1930s, industrial researchers in Europe and North America followed separate paths toward the disposable diaper, one originating in papermaking and the other in specialized fabrics for medical uses.

In Europe, the pioneer was the Swedish paper company Pauliström Bruk, which capitalized on recent advances in papermaking in Germany. The Germans—perhaps in anticipation of wartime supply disruptions—were seeking alternatives to imported cotton for medical purposes and had developed a technique to fabricate a soft cellulose tissue (“Cell-Stoff”) from wood pulp. In Sweden, which also imported cotton but possessed a booming forest products industry, engineers took note. In 1936, a Pauliström manager visited Germany to learn the technique, which he brought back to Sweden. Among the first customers for Pauliström’s new material were several hospitals, which used it for disposable absorbent inserts to diapers in maternity wards. The product evidently worked well: after leaving hospital, some mothers began asking Pauliström where they could buy the inserts, and a new business was born. According to one account, Pauliström decided to introduce the material to the trade and designed and delivered a 2.5 kilo box with cellulose tissue sheets cut in a suitable size (35X40 cm). The package was wrapped in blue paper and sealed with an adhesive tape with a drawing of a baby on it.

... The parents just took some sheets from the box, folded them in three layers and placed a sheet of gauze fabric on top so that the paper should not stick to the baby’s skin and put the pad in a cloth or a pair of trousers. To make the cellulose tissue really soft for the baby’s bottom, the manufacturers used a special quality of pulp, called silk-pulp.

...This tissue box was sold in the retail trade from 1936 to 1945. Pauliström produced around 2-3000 tons annually which corresponded to about 70 million diapers.³

Pauliström continued to work on cellulose materials for diapers but did not offer a product called a “disposable diaper”—a two-piece combination consisting of a disposable cellulose insert and a reusable pant—until 1942.⁴ After the war, Pauliström began packaging the cellulose fluff in plastic mesh to keep it from sticking to babies’ skin. After 1950, the company offered this product—the “roll diaper”—in long rolls that consumers could cut and insert into pants.

In the late 1940s, a few other manufacturers of two-piece diapers appeared across Europe. In 1947, for example, Valerie Hunter Gordon, a young British mother who was fed up with messy cloth diapers, developed a two-piece model consisting of a disposable paper insert with cotton wool attached and a waterproof pant. The product worked well enough and attracted notice. After selling more than 400 units, she arranged in 1949 for Robinson & Sons, a maker of bandages and other medical products, to manufacture two-piece diapers under the brand name Paddi Pad. Robinson did little to promote the business, however, and it soon languished.⁵

By the time Robinson began making Paddi Pads, an American maker of medical products such as bandages and ointments and powders was already pursuing the second path into disposable diapers based on deep knowledge of cotton and newer synthetic fabrics as absorbent material. In 1938, Chicopee Manufacturing Company, a wholly owned and autonomous subsidiary of Johnson & Johnson, had introduced CHIX gauze diapers, which “combined the sturdiness of the traditional birdseye weave” with “higher absorbency and softness.” Sales of CHIX remained modest until after World War II, when, according to the exaggerated claims of the company’s marketing literature, it “climbed to a major position in the baby products market.”⁶

Meanwhile, J&J's senior management pushed to diversify the company's business—a challenge that Chicopee management embraced eagerly. In the late 1940s, Chicopee also introduced an array of cellulose-based disposable products for hospitals and consumers such as bed coverings, absorbent pads, feminine protection pads, adult incontinence products, and baby products. This last category included CHUX Disposable Diapers, "soft and absorbent with waterproof backing" and designed to provide "complete baby protection without panties" and "aimed at the needs of the traveling American family." CHUX was the first one-piece model, although it did not have a fastening system. Chicopee also sold a lower-cost two-piece diaper for more frequent use. The CHIX Pad and Panty combined a "highly absorbent pulp fiber" disposable insert and a waterproof pant with snaps for easy fastening.⁷

In many Western European countries and in North America, manufacturers were well aware of opportunities created by post-World War II population growth, although most believed that disposable inserts and diapers would remain novelty items given a significant price premium over cotton diapers—a factor of ten or more, depending on the model. Disposables were marketed through pharmacies, hospitals, medical supply houses, and department stores. Demand built up gradually, although faster in Sweden, in part because consumers valued the clear advantages of disposables and a strong domestic paper industry could offer them at a relatively low premium over the price of imported cotton diapers.

In the 1950s, another Swedish company, textile-maker Mölnlycke, took over technical and market leadership from Pauliström, continuing to develop two-piece models. Mölnlycke's Quik-Diaper (also called Instant Diaper), introduced in 1957 featured a pear-shaped insert that was tailored to the baby's body and was especially effective in capturing urine.⁸ Meanwhile, other producers emerged across Europe. In France, for example, Peaudouce and Calines cultivated a growing market for the two-piece disposable, while Paul Hartmann AG in Germany, Ontex in Belgium, and Fater in Italy, among other producers, also entered the business. By the mid-1960s, the product was available throughout Europe and was known familiarly as "Swedish pants" ("Schwedenwindel" in Germany; "pantolini svedese" in Italy). In a few countries—in Sweden, Finland, and France, for example—many families used these products on a daily basis. Elsewhere, it was more common for them to be used as supplements to traditional cotton diapers for night-time use or when traveling or for special occasions.

The market in North America evolved in similar ways. As J&J's diapers achieved modest success, other manufacturers appeared. By the early 1950s, Kendall Corporation, a direct competitor to J&J in bandages and surgical dressings, and Parke-Davis, a pharmaceutical and medical supply company, had disposable diapers or absorbent inserts on the market. They were joined soon after by Playtex, a maker of women's undergarments and female protection products, which imported technology and know-how from Mölnlycke. By the middle of the decade, disposable diapers were found in 80 percent of American households with infants, although they accounted for less than one percent of diaper changes due to the high expense. Prices typically ran above—sometimes well above—ten cents per diaper, while cloth diapers sold for 1-2 cents each and diaper services typically charged 3-5 cents per diaper.⁹ Meanwhile, other competitors and new approaches were beginning to emerge, and a dramatic breakthrough was to come from another new entrant, consumer products giant Procter & Gamble.

Key Lessons of the Second Period (1930s-1950s)

- Disposable diapers were developed simultaneously in Europe and North America between the 1930s and 1950s, with most progress after World War II. Manufacturers' interest reflected technological advances in paper making, development of more absorbent materials, and growing understanding of consumer desires and market opportunity.
- Two alternative designs competed: the two-piece product pioneered in Sweden and generally more popular in Europe than in North America; and a one-piece model developed by Johnson & Johnson for a relatively small market niche in the United States.
- Consumers everywhere showed interest in disposables but manufacturers perceived them as a specialty product with limited potential due to their high cost relative to cotton diapers.

3. Rapid Adoption (1960s-1980s)

Disposable diapers rapidly overtook cotton diapers in country after country around the world during the period between the late 1960s and the late 1980s. By the end of the period, the replacement of cotton diapers was virtually complete across Europe and America and well under way in Latin America and Asia. The rate of substitution occurred with a swiftness and on a scale having few parallels in business history: the replacement of analog by digital formats in communications and media; of typewriters by personal computers; of multipurpose household soap by synthetic detergents; of wireline telephones by cell phones. Such massive substitutions take place only when consumers recognize and value the overwhelming superiority of an innovation. Such is the case with disposable diapers.

Consumers switched to disposables for many reasons, including the inherent advantages of the product. Most parents found disposables easier to use. They liberated parents, especially mothers, from time-consuming chores and enabled them to spend more time in other ways, including with their children. Meanwhile, disposables—unlike cotton diapers—improved every year as manufacturers introduced new designs and features such as improved fastening systems, increased absorbency, and closer fit. Once disposables became widely available at affordable prices, consumers flocked to buy and use them.

The rapid adoption of disposable diapers unfolded in two stages: 1) the commercialization of inexpensive one-piece diapers in the 1960s and 1970s; and 2) the introduction of ultrathin models using new absorbent agents in the mid-1980s.

The dramatic success of the disposable diaper in the mass market began with a manufacturing breakthrough at Procter & Gamble in the United States. In the mid-1950s, the company, like Johnson & Johnson, began a determined push to expand and diversify its business beyond its traditional categories in soap, synthetic detergents, and fats and oils. P&G used a combination of proprietary research and acquisitions to enter other new businesses ranging from peanut butter, to cake mixes, to potato snacks, to coffee. Among the new areas was disposable diapers, an opportunity originally suggested, according to company lore, by the nun in charge of the nursery at Cincinnati Catholic Hospital. Certainly P&G was well aware of the huge market opportunity given the post-World War II baby boom in the United States.

In 1956, P&G engineer Victor Mills set up a small-scale project to investigate disposables, but the pace of work accelerated the following year after P&G acquired Charmin Paper Mills, a maker of consumer paper products such as bathroom tissues and paper towels. The company believed it could expand the market for disposable diapers significantly by combining its new expertise in absorbent paper products with its capabilities in mass production and mass distribution. P&G's hopes were eventually realized though it took more than a decade for the company to succeed.¹⁰

P&G initially developed a two-piece diaper similar to those already on the market in Europe and the United States but featuring a folded insert for improved fit and absorbency. In the summer of 1958, however, P&G failed miserably in its initial test market in Dallas, Texas, in part because mothers disliked using the plastic pant in hot weather. The test results were so discouraging that P&G nearly abandoned the project.

After considering an array of options, P&G decided to try again, this time focusing on a simple one-piece disposable consisting of an absorbent tissue core bonded to a plastic back. The product possessed several innovative features in addition to basic design, including a hydrophobic top sheet made of rayon to help keep moisture in the absorbent tissue layer, and a large plastic back sheet to help contain leakage. Like a cloth diaper of J&J's one-piece Chux, P&G's disposable was fastened with pins. P&G test marketed its new disposable, now branded as Pampers, in Peoria, Illinois in 1961. Consumers rated the product highly although sales remained disappointing due to prices still four or five times above those of cotton diapers.

P&G concluded that large demand for the product would materialize only if the company could lower prices by 40 percent or more. During the next several years, engineers focused on a new manufacturing process to simplify and speed up production while also redesigning the product to use less and lower-cost material. Perfecting the new production process "turned out to be the most complex manufacturing challenge P&G had ever faced," involving developing and debugging a massive, block-long continuous-process machine capable of producing up to 400 diapers per minute.¹¹ In 1964, the new process was ready for another test market, this time in Indianapolis, Indiana. Introduced at less than 6 cents per diaper, Pampers quickly sold out the initial allocation, and consumers clamored for more.

During the next several years, the company rolled out Pampers across the United States in small (infant), medium (daytime), and large (nighttime) sizes. By the end of the decade, the product had become P&G's second-largest brand. In addition to the manufacturing breakthrough, a key part of the company's success was clever marketing, including programs to convert hospital maternity wards and day-care centers to disposables and free samples given to new mothers.

Although P&G had expected Pampers initially to attract affluent consumers, it found the product had immediate and widespread appeal across all segments of the market. The company once received a grateful phone call from an impoverished woman who lived in a New York tenement building. Before Pampers, the woman said, she was forced to take a pail of soiled diapers down four floors and then walk through an unsafe neighborhood to the laundromat located two blocks away. A similar pattern emerged later when Pampers was introduced worldwide. Consumers in less developed countries, where household washing machines and dryers were less common, rushed to buy disposables.¹²

Meanwhile, other manufacturers quickly countered the introduction of Pampers. In Europe, Mölnlycke introduced its one-piece Combinett diaper in 1967. Featuring a tape-fastening system, Combinett was the first complete one-piece model. In the United States, Kimberly-Clark, a leader in paper tissues and feminine hygiene products, had worked on disposable diapers for years before introducing Kimbies in 1968. Kimbies featured several key innovations that became industry standards, including a contoured shape, a new absorbent material (fluff pulp instead of tissue pulp), a spun-bonded polypropylene liner, and adhesive tape fasteners.¹³ In 1971, Johnson & Johnson began to phase out the original Chux line in favor of a new premium design with an especially soft feel and sold under the company's brand name. Several other producers also entered, including some that manufactured store brands for leading retailers and supermarket chains. By 1980, disposables accounted for more than 90 percent of all diaper changes in North America.¹⁴

In Europe, low cost, one-piece models did not sweep the market quite as quickly or evenly although the eventual outcome was the same. P&G began production of Pampers in West Germany in 1973, and the brand soon became the domestic market leader. In Scandinavia and France, however, the two-piece models remained popular for a time.

Mölnlycke found that consumers remained comfortable with two-piece models and did not promote its one-piece Combinett aggressively. In France, Peaudouce and Lotus continued to promote a T-shaped insert that was particularly effective in absorbing liquid. One-piece models became available in 1975 through imports from Scandinavia, Germany, and the United States as well as from local producers such as Linett and Tendresse. The one-piece models gained between 8-10 market share points per year, eventually achieving market dominance in the mid-1980s.¹⁵

Meanwhile, low-cost disposables of both types (one-piece and two-piece) hastened the replacement of cotton diapers in most European countries. According to data compiled by the European Disposables and Nonwovens Association (EDANA), between 1970 and 1979, the percentage of the total market accounted for by disposables surged from 52 to 97 percent in France; from 41 to 85 percent in Germany; and from 28 to 75 percent in Switzerland. Market penetration already was high in Scandinavia in 1970 but surpassed 95 percent by the end of the decade. Only in the United Kingdom and in The Netherlands did replacement proceed more slowly, largely due to the entrenched strength of local diaper service companies.¹⁶

The ultimate and nearly complete victory of the low-cost one-piece disposable across Europe awaited a series of technological improvements and innovations between the mid-1970s and mid-1980s. The first was a superior fitted shape with elastic leg openings. P&G introduced these features in 1976 in the United States on a second disposable diaper brand, Luvs. However, P&G could not manufacture Luvs on its existing diaper machines, so the company offered them as a premium brand for affluent consumers. Kimberly-Clark, meanwhile, was working on a successor to Kimbies that would outperform Pampers and the Johnson & Johnson's. Like Luvs, the new Kimberly-Clark design featured a superior fitted shape and elastic leg openings, but it could be manufactured in high volume. Kimberly-Clark launched the new model in 1977 as Kleenex Super Dry and renamed it the following year as Huggies. Sold at a price point between Pampers and Luvs, Huggies became a huge hit in the United States, passing Pampers as the leading brand in the market in the late-1980s.¹⁷ Meanwhile, fitted designs with elastic cuffs spread to Europe, where SCA (which bought Mölnlycke in 1975), Peaudouce, Paul Hartmann, Ontex, and other manufacturers adopted them both for premium and private-label brands. The new models proved extremely popular and accelerated the replacement of cotton diapers in the United Kingdom and in the Netherlands, as well as of two-piece models in other nations.

A second major improvement in diaper design in these years involved the use of superabsorbent polymers (SAPs), which enabled diapers to be shrunk dramatically—by 30 percent or more—in size. The application of SAPs to diapers was patented nearly simultaneously in 1966 in the United States by Carlyle Harmon of Johnson & Johnson and by Billy Gene Harper of Dow Chemical.¹⁸ The researchers found that the SAP could absorb between thirty and sixty times their weight in liquid—a huge advantage over conventional materials such as fluff pulp. European and North American diaper manufacturers began experimenting with SAP as a partial replacement for fluff pulp in the early 1980s. Credit for commercial demonstration, however, goes to Japanese manufacturer Uni-Charm, which introduced its slimmed-down Moonies in 1983, with Kao, another Japanese competitor, in hot pursuit. These innovators used 1-2 grams of SAP in each diaper and demonstrated the power and appeal of the thin-diaper concept. Subsequently, other manufacturers increased the amount of SAP in diapers, which permitted still more shrinkage. By the mid-1980s, ultrathin premium disposables were about one-half the size of their predecessors. During the next ten years, further improvements and sophistication in working with SAPs enabled another 50 percent reduction in size.¹⁹

The thin and ultrathin models proved extremely popular around the world and, as prices came down and the technology spread into store brands, completed the replacement of cotton diapers and two-piece disposables.²⁰ By the late 1980s, disposables accounted for more than 95 percent of diaper changes in Japan, North America, and most European countries. Even in the United Kingdom and The Netherlands, thin and ultrathin models tipped the balance away from cotton diapers and diaper services and by the mid-1990s claimed market shares comparable to those in most other European nations.

The new models delivered the traditional advantages of disposables in a smaller package. Not much bigger than cloth undergarments, they enabled infants and young children to move freely and be dressed fashionably. They produced additional economic and social benefits including savings in distribution, shipping, merchandising, and storage while also generating less waste. Meanwhile, increasing use of disposable diapers correlated with observed clinical benefits for individual children as well as children in group settings. These benefits included reduced instances of diaper dermatitis and improved skin wellness from drier skin and more stable skin pH.²¹

Key Lessons of the Third Period (1960s-1980s)

- Low-cost manufacturing reduced the price premium for disposables relative to cloth diapers and facilitated rapid substitution in the 1970s and 1980s in most developed countries and in a growing number of developing nations.
- Once they became affordable, disposables appealed to all segments of the market, where consumers clearly preferred them to cloth diapers.
- One-piece designs, which simplify use and cleanup, quickly won over customers in Europe and dislodged two-piece models.
- Competition among manufacturers resulted in a steady stream of innovations and improvements in premium diapers, which became better fitting, easier to use, and significantly smaller during the period. At the same time, the growth of store brands, which gradually incorporated many innovations, helped hold prices down and made the product accessible to consumers in low-income households.

4. Continuous Improvement (since 1990)

Since 1990, market trends in disposable diapers that emerged in earlier years have continued to play out. In the premium segment, consumers have been treated nearly every year to new features and enhancements, as well as to the occasional creation of new related products such as training pants and convertibles (diapers that resemble training pants and can be pulled on but also open on the side for easy changes). At the same time, budget-conscious consumers have continued to benefit from the widespread availability and declining real prices of inexpensive store brands.

The opening of markets in Central and Eastern Europe, Russia, China, and India and opportunities in Latin America and other developing markets have propelled the industry's growth. With globalization, the number of producers has declined somewhat, but strong rivals are situated in every region of the world, and the resulting fierce competitive rivalry has benefited consumers. With the industry's target no longer dislodging cloth diapers, manufacturers have focused on constant improvement to disposables, and they have introduced innovations at a rapid and sustained pace.

In the premium diaper segment, not only have diapers become thinner, but a steady stream of innovations has made them more appealing to consumers and their children. The late 1980s and early 1990s, for example, saw the development of gender-specific diapers optimized for the different anatomies of male and female children. Innovations since then have improved leakage control (control shields and guards, curved elastic leg openings, waste barriers); comfort (stretch sides and waste bands, cloth-like covers, breathable materials); hygiene (new liner materials, medicated surfaces, rash guard); ease of use (re-sealable tapes, Velcro and other mechanical fasteners); and aesthetics (cover prints and designs, pleasing scents). Moving beyond the traditional sizes of small, medium, and large, producers have introduced sizes and shapes based on stages of child development, with different version corresponding to a child's size, weight, frequency of urination or bowel movement, and control over these functions. Additional versions are tailored to particular purposes such as "extra-capacity" night-time use and models suitable for use in wading and splashing pools. Most of these innovations are spread quickly around the world, with especially rapid sequencing between North America and Europe where Procter & Gamble and Kimberly-Clark are market leaders.²²

In 1989, Kimberly-Clark introduced Huggies Pull-Ups, the first disposable training pant to facilitate toilet training. Children can dress themselves in training pants and learn to use them just like traditional undergarments. This innovation created a whole new and growing category of disposables. Consumer response has been strong and many diaper manufacturers now offer them, with Kimberly-Clark still the global market leader.²³ As a result of this competition, training pants have been upgraded as rapidly and continuously as diapers, with steady improvement in performance features and development of specialized night-time and swimmable versions. Meanwhile, in 2003 in the United States and in 2004 in Europe Kimberly-Clark introduced convertible models, which appear to be another successful innovation.²⁴

In the value segment, many significant innovations and improvements from the premium brands have migrated to store brands, which deliver excellent performance at affordable prices. Available in convenience stores, grocery stores, pharmacies, department stores, and mass merchandisers, store brands are ubiquitous throughout North America and Europe. The growth of this segment also held prices down. Between 1997 and 2004, for example, real prices of disposable diapers in Europe declined by 20 percent.²⁵

Key Lessons of the Fourth Period (since 1990)

- As the focus of competition shifted from replacing cloth diapers, the pace of innovation in disposables accelerated dramatically, resulting in improved products and more choices for consumers in the premium segment, while the growth of the value segment exerted downward pressure on prices.
- The benefits to consumers of modern disposable diapers are diverse, extensive and profound: ease of use; liberation of parents from time-consuming duties; happier healthier children.

*** ***

The disposable diaper is one of the most significant consumer product developments of the twentieth century. In just a few years after commercialization, disposables virtually replaced traditional cloth diapers as consumers recognized and valued overwhelming advantages in ease of use, increased comfort, better hygiene, and improvement in the amount and quality of time parents can have with their children. At the same time, the industry's competitive rivalry and history of continuous innovation and cost reduction have enabled parents from all parts of the world and all economic circumstances to benefit socially as well as economically.



- ¹ See <http://www.gpoabs.com.mx/cricher/history.htm> (accessed July 2005) for an overview of the history of the diaper.
- ² Bengt G. Johansson narrative; U.S. Patents 19418 (1858), 318,141 (1885), 342,494 (1886), 1,694,161 (1928), Des. 95,253 (1935).
- ³ Johansson narrative.
- ⁴ <http://www.richernet.com/timeline.htm>. Accessed April 2004.
- ⁵ http://www.bbc.co.uk/radio4/hometruths/20050228_nappy_inventor.shtml . Accessed March 2005; <http://www.didyouknow.cd/history/20thcentury.htm>. Accessed March 2005. In 1979, Robinson re-entered the industry with an "all-in-one" (one-piece) model branded as Cosifit. This likewise failed to stir consumer interest though an Internet search indicates that the Cosifit brand still lives in some countries. See <http://www.robinsoncare.com/history.htm>. Accessed March 2005.
- ⁶ Chicopee Manufacturing Company, Baby Products Division, undated brochure; On Chicopee, see Lawrence G. Foster, *Robert Wood Johnson* (State College, PA: Lillian Press, 1999), p. 129.
- ⁷ Chicopee Manufacturing Company, Baby Products Division, undated brochure; Foster, *Robert Wood Johnson*, p.309; Foster, *A Company That Cares: One Hundred Year Illustrated History of Johnson & Johnson* (New Brunswick, NJ, 1986), p. 116; Carlos Richer website.
- ⁸ Urban Widlund interview, October 19, 2004.
- ⁹ *The Disposable Diaper Industry in 1974* (Harvard Business School Case Services, 9-380-175), p. 2. The "Boater," a fashionable 2-piece diaper product sold in upscale department stores, sold for \$1.95 each.
- ¹⁰ Davis Dyer, Frederick Dalzell, and Rowena Olegario, *Rising Tide: Lessons from 165 Years of Brand Building at Procter & Gamble* (Boston: Harvard Business School Press, 2004), Chapters 5 and 6, esp. pp. 129-138; *The Disposable Diaper Industry in 1974*, p. 2.
- ¹¹ Dyer, Dalzell, and Olegario, *Rising Tide*, p. 132; *The Disposable Diaper Industry in 1974*, p. 2.
- ¹² Dyer, Dalzell, and Olegario, *Rising Tide*, p. 134.
- ¹³ Robert Spector, *Shared Values: A History of Kimberly-Clark* (Lyme, Connecticut: Greenwich Publishing, 1997). Pp. 111-112; Thomas Heinrich and Bob Batchelor, *Kotex, Kleenex, Huggies: Kimberly-Clark and the Consumer Revolution in American Business* (Columbus: Ohio State University Press, 2004), pp. 184-198.
- ¹⁴ *The Disposable Diaper Industry in 1974*, pp. 2-3.
- ¹⁵ *Strategies* (1986); data furnished by Group Hygiene, September 2004.
- ¹⁶ Percentage of Disposable Diapers in Relation to Total Potential Market, 1970-1979, EDANA.
- ¹⁷ Heinrich and Batchelor, *Kotex, Kleenex, Huggies*, pp. 190-196.
- ¹⁸ Malcolm Gladwell, "Smaller: The Disposable Diaper and the Meaning of Progress," *New Yorker*, November 26, 2001; online version http://www.gladwell.com/2001/2001_11_26_a_diaper.htm. Accessed August 2004;
- ¹⁹ Kimberly-Clark, Disposable Diaper Industry Historical Summary.
- ²⁰ "La Course aux Superlatifs," *Points de Vente*, April 15, 1989, pp. 90-92.
- ²¹ Hygiene Products Manufacturers Group, European Disposables and Nonwovens Association, *Diapers: Health Benefits and Environmental Aspects* (Brussels, 2001), pp. 4-6.
- ²² Kimberly-Clark began major investments in Europe in 1994 and acquired the Peaudouce brand from SCA two years later. Since then, Huggies has become the number two brand across Europe after P&G's Pampers.
- ²³ Heinrich and Batchelor, *Kotex, Kleenex, Huggies*, p. 196.
- ²⁴ Kimberly-Clark, Timeline of Disposable Training Pants, 1989-Present.
- ²⁵ <http://www.hapco.edana.org/news/index.asp?qID=10>; Irina Barbalova, Disposable Hygiene Products: Global Trends and Overview," Outlook 2003, p. 18.