

## Chapter 2

# Advancement through Synthetic Fiber Business: 1953–1970

### Modernization of Management in a Time of Prosperity (1953–1962)

Japan's postwar economy recovered with staggering speed and charged into a period of rapid growth from 1954. Driven by an investment boom, the Japanese economy experienced two major periods of prosperity, known as the Jimmu Boom (1954–1957) and the Iwato Boom (1958–1961). At Toray, managing director Hirosaburo Mori replaced Kikuo Sodeyama as president in March 1960.



Hirosaburo Mori

As a result of having launched a full-scale nylon business, Toray's companywide profit turned up in fiscal 1953 and kept rising until fiscal 1957. In fiscal 1955, the company had the highest net income among all listed companies in Japan, propped up by strength in both rayon and nylon fiber businesses.

In March 1955, Toray officially established its Company Principles, thereby

## Company Principles

Toyo Rayon contributes to communities

For consumers,  
better products at lower prices

For employees, a stable life

For shareholders, fairer dividends



Inaugural presentation ceremony of the Toyo Rayon Science Foundation (March 1961)

documenting managerial principles that had been passed down since the company's founding. "Toyo Rayon contributes to communities." This management philosophy, which positioned the company as a public institution existing for the benefit of society, expressed a noble and progressive stance that mirrored the heightened awareness of corporate social responsibility (CSR) that would come later. At the same time, it was a commitment to fulfill Toray's responsibility to stakeholders, namely consumers, employees, and shareholders.

As a way of giving form to the philosophy behind the company principles, Toray set up the Toyo Rayon Science Foundation (now the Toray Science Foundation) with an endowment of one billion yen, receiving authorization from the relevant authority in June 1960. With the objective of assisting and encouraging science and technology, the foundation was to provide grants for basic research in the fields of science and technology and confer awards in recognition of outstanding scientific achievements.

From the mid-1950s through to the early 1960s, it was the nylon 6 fiber and textile business that generated the bulk of Toray's operating

revenue. Although nylon accounted for 35 percent of total sales in fiscal 1953, well short of the 62 percent from rayon, the contribution from nylon increased steadily to overtake rayon and peaked at 70 percent in fiscal 1957. The following year, fiscal 1958, sales of polyester fiber began, and in fiscal 1962, nylon accounted for 52 percent of sales, polyester for 33 percent, and the share from rayon fell as low as eight percent.

In September 1958, the Aichi Plant was capable of producing 50 tons of nylon filament yarn daily, and the Nagoya Plant, 15 tons of nylon staple fiber, for a total capacity of 65 tons, but there was no room for any further expansion at either plant. Construction therefore began on a new filament yarn plant in Okazaki City. The basic concept for construction of the Okazaki Plant was that the resulting facility had to be one of the world's most advanced. Technology surveys were even carried out in Europe and the United States. The plant was officially opened at a ceremony on March 10, 1960. Work also began on a new filament yarn facility at the Shiga Plant. It was finished in October 1959.

A new method for manufacturing nylon 6 raw-material caprolactam—photo-nitrosation of cyclohexane (PNC)—was developed independently by Toray based on basic research undertaken by Yoshikazu

Ito (later president). In September 1960, almost a decade after the research officially began, a pilot plant was established and, in March 1962, equipment for an initial phase of quasi-mass



Okazaki Plant (1960)

production with a five-ton daily capacity was completed inside the PNC facility at the Nagoya Plant.

## The Launch of Polyester Fiber Business

In June 1952, Toray decided to prioritize polyester in establishing a second synthetic fiber business. Polyester fiber was effective for pleat retention and crease recovery and those notable properties could be brought out even when blending polyester staple with a natural fiber and without losing the natural fiber's texture and feel. The researchers moved their research into industrialization of the polyester fiber they called *F-III* (*Fiber III*), in reference to its following after rayon and nylon, into full gear. In July, Sodeyama visited the British firm Imperial Chemical Industries Ltd. (ICI) to kick off negotiations with a view to introducing some of their technology. A series of talks were held, but around the same time, competitor Teikoku Jinzo-Kenshi Kaisha, Ltd. (now Teijin Limited) had also approached ICI about a technological alliance.

On December 8, 1955, ICI indicated that it was willing to grant both Toray and Teijin licenses of identical status, asking a licensing fee of 100,000 pounds (approx. one billion yen) for both companies combined and allowing royalties to be based on the combined sales of the two companies.



Signing of the technological alliance agreement with ICI  
(February 1957)

The offer presented relatively relaxed terms compared to other such tie-ups at the time and so negotiations centering on joint introduction of technology by the two companies progressed quickly. In January 1957, ICI director in charge of fibers and plastics, Peter C. Allen, arrived in Japan and the trio of Allen, Toray's President Sodeyama and president of Teijin, Shinzo Oya, signed a written agreement on February 7.

Toray identified potential sites for a new plant to manufacture polyester fiber and settled on a site straddling both Mishima City and the village (now town) of Nagaizumi in Shizuoka Prefecture before purchasing 330,000 square meters for the intended premises. Construction work began in May 1957. Production commenced the following March on completion of facilities for both staple fiber and filament yarn. This was Japan's first commercial-scale operation for the production of polyester fiber. Work subsequently began on construction of a polyester staple fiber mill on Ehime Plant premises. It was completed in January 1963.

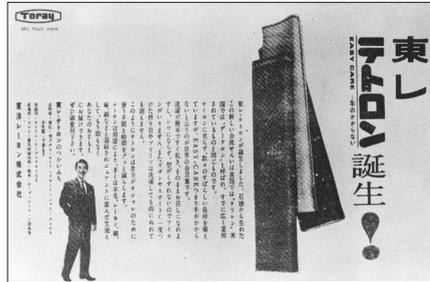
On the sales front, too, Toray started out by looking for customers that the company itself could team up with on product development. Initial product development involved a great deal of trial and error, but



Mishima Plant (1959)

the collaborative activities gave birth to a wide range of goods for daily life, as well as knitted and woven fabrics for use in clothing. Polyester products gradually came to be used more by

consumers. In this way, production and sales alliances broadened their reach. In May 1959, new expressions were adopted in place of *production alliance* and *sales alliance*—“Toray Production Team” (PT) and “Toray Sales Team” (ST).



Newspaper ad for Toray Tetoron (1958)

Prior to putting polyester fiber on the market, Toray and Teijin jointly called for suggestions for a trade name in April 1957. An advertisement with the copy, “Give me a name,” drew a huge response, fielding more than 100,000 submissions. A selection panel was formed to pick the winning entry, *Tetoron*. Toray and Teijin proceeded to deploy the respective trade names, “Toray Tetoron” and ‘Teijin Tetoron,’ in subsequent promotional campaigns.

## A Maturing Market and Management Changes (1963–1970)

The years 1964 and 1965 were marked by what became known in Japan as the *securities recession*, but in the textile industry, it was called the *nylon recession*. It had a severe impact on Toray, which had been enjoying high levels of profit as a first mover in the synthetic fiber business. Ordinary income fell 37 percent between fiscal years 1964 and 1965, from nine billion yen to 5.7 billion yen.

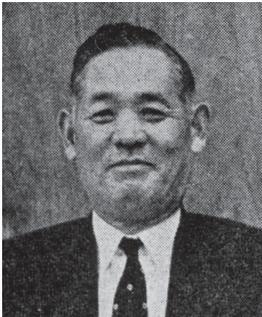
To cope with the worsening slump, Toray curtailed operations, while also making plans to stand down employees and restrict hiring. Alongside

cancellation and reduction of new employee signings, all-out efforts to improve efficiency were continued. A series of measures, including temporary transfers to other companies and the mass secondment of 2,200 employees to newly established subsidiary Toray Engineering Co., Ltd., resulted in a 15 percent downsizing of the workforce over five years from its peak of 28,123 employees in March 1965 to 23,840 in March 1970.

In November 1966, as the company was starting to get back on its feet in the wake of the recession, Hirosaburo Mori, who had been president throughout this period, was replaced by Executive Vice President Seiichiro Hirota. Hirota charted Toray's new course, calling for enhanced international competitiveness and a stronger corporate structure.

The Japanese government responded to the recession with a major boost in spending that, combined with export growth stemming from economic expansion in the United States, resulted in the economy picking up again from November 1965 as it entered the Izanagi Boom, which lasted until July 1970.

Meanwhile, U.S. President Richard Nixon, who was inaugurated in January 1969, made it known that he believed import restrictions should be placed on textiles. The U.S. government then started pressing Japan to sign a bilateral agreement. The Japanese textile industry came together to form a council to address issues concerning textile exports to the U.S. (named the Japan Textile Federation in January 1970) and through it organized a movement opposing the restrictions. But in a summit between the



Seiichiro Hirota

leaders of the two countries in November 1969, as would later be made public, Prime Minister Eisaku Sato made a secret pact with President Nixon that was likened to “using thread to buy rope” in reference to his acceptance of restrictions on textile product exports to the U.S. in return for the reversion of control of Okinawa to Japan (Okinawa is written using the character for rope). The two governments signed a provisional bilateral agreement in October 1971.

Internally, there was growing sentiment toward industrialization of acrylic fiber as a third synthetic fiber after nylon and polyester. With a view to commercializing acrylic fiber using its own technologies, Toray resumed full-fledged research into *F-IV (Fiber IV)* at the Central Research Laboratories. In July 1959, a quasi-production facility with a daily acrylic staple fiber production capacity of three tons was completed at the Nagoya Plant. Prior to this, in May, Toray had settled on “Toraylon” as the trade name, but because the company was a latecomer to the business, it sought to streamline manufacturing by completing a continuous polymerization process. Toray also decided to centralize production at the Ehime Plant, setting up an acrylic staple fiber manufacturing facility with a capacity of 15 tons per day. Operations were launched in March 1964, with sales beginning around the same time. The facility at Nagoya was also transferred to Ehime in July.

Furthermore, in March 1961, Toray was extended a sublicense by Mitsui Chemical Industry Co., Ltd. relating to the introduction of polypropylene fiber technology of Italy’s Montecatini Chemical & Mining Company. In July, Toray and other sublicensees, Toyobo Co., Ltd. and Mitsubishi Rayon Co., Ltd., jointly settled on a common trade name, “Pylon.” However, Pylon’s drawbacks in terms of properties such as



Signing of the agreement on establishment of Toyo Products (February 1963)

dyeability were not easily overcome. In 1965, Toray resolved to wind down business relating to apparel applications and brought an end to related research and development in 1966.

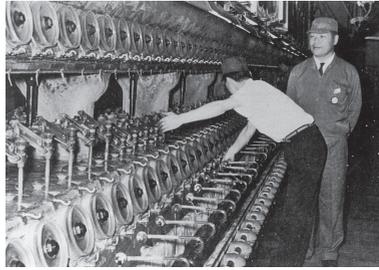
Then in 1959, following DuPont's announcement that it had developed and industrialized 'Lycra,' a polyurethane fiber called spandex (elastic) fiber, Toray started sounding out DuPont about introducing technology with an eye to commercialization. DuPont, however, expressed a desire to proceed with commercialization through not a technology license, but a joint venture. The two companies exchanged a memorandum of understanding relating to the establishment of a new company in October 1962. In November, the trade name "Opelon" was decided, and in February 1963, Toray and DuPont entered agreements relating to establishment of a new company and technological assistance. In keeping with foreign capital law, a 50-50 joint venture was approved in December. It was established as Toyo Products Co., Ltd. (now Du Pont-Toray Co., Ltd.) in June 1964. This particular business is currently run by Toray Opelontex Co., Ltd., which markets under the Lycra brand.

## **Business Restructuring and Company Renaming**

In April 1961, Toray decided on, and put into action, a policy to phase out its rayon filament business, entailing the gradual dismantling of related

facilities between September 1961 and May 1963. The state of rayon staple operations was also debated, but at that time Toray had nothing to replace the product with and the course chosen was to seek profitability improvements through the development of speciality products. However, profitability improvements did not come to pass. Toray ended its rayon staple production in May 1975.

From the 1960s, Toray aggressively pursued new product development. The company constructed a plant in Gifu Prefecture (now the Gifu Plant) to produce artificial leather that looked and felt like real leather. Monthly capacity was 30,000 meters. However, commercialization in the shoemaking domain did not progress well and therefore fundamental improvements to business were explored. Set a deadline of two years, researchers were spurred into activity and out of all their efforts a product took shape. The artificial leather, fabricated from bundles of ultrafine fiber, was reported as being extremely similar in appearance and texture to materials such as deerskin, but performed better than natural leather in terms of the physical properties of uniformity, dyeability and launderability. Until then referred to by its test code, XL-223, the artificial leather was given the name Toray-223. It was



Rayon filament yarn—the final thread cut (1963)



Paris haute couture show (July 1970)

given a spectacular entry onto the world stage, used by six top fashion designers in their 1970 Paris haute couture collections for the autumn/winter season.

Meanwhile, deliberations were underway regarding changes to the company name and its articles of incorporation given that the winding down of the rayon filament business in 1963 had created inconsistency between the name of the company—Toyo Rayon Co., Ltd.—and the activities it actually engaged in. Criteria considered in the selection of a new name included that it should be consistent with the company's direction for development, and that people at home and abroad should find it easily recognizable and easy to become attached to. From a number of options on the table, "Toray Industries, Inc." was selected as the new name. The company was officially renamed on January 1, 1970.

## **Overseas Deployment of Operations Begins**

In 1955, Toray established trading company Trilon Co., Ltd. in Hong Kong, its first overseas operation involving a capital contribution. The move came on the back of a determination that if Toray wanted to capture a competitive position in the Hong Kong market, which at the time was the biggest textile center in Asia, it needed its own sales company, rather than rely solely on the local branch of a general trading house. Trilon, by expanding operations in a tie-up with a local sewing enterprise, set a precedent that would be followed as the Toray Group's overseas trading network took shape during the 1980s.

In the 1960s, Toray responded to import substitution industrialization policies adopted by developing nations by actively moving to set up

local corporations as joint ventures, deploying business in partnership with trading firms. The first full-scale manufacturing joint venture was Thai Toray Textile Mills Co., Ltd. (now Thai Toray Textile Mills Public Co., Ltd.; TTTM)



TTTM (Thailand)

in Thailand. TTTM took on the “GOLDEN EAGLE” brand of polyester/rayon blended fabric that Toray had been exporting and locally undertook integrated manufacturing of the products from spinning through to weaving, dyeing, and finishing, as well as sales.

## **The Launch of Plastics Business**

Toray commenced sales of nylon 6 resin in March 1953, but as a nylon molded material, its supply was limited to specific users. Come the late 1950s and a number of new nylon resin manufacturers entered the fray. The heightened competition pushed prices down, at the same time expanding applications, increasing demand. From that point on, Toray was constantly expanding facilities and increasing production.

In December 1960, Toray established an independent division for its plastics business, aiming for concerted administration of production and sales functions. The fact that 20 to 30 percent of total R&D investment around 1965 was channeled into plastics, even though plastics business accounted for no more than three to four percent of total sales, was an



Chiba Plant

indication of management's intention to develop plastics as a future core business.

In February 1963, Toray attached the trade name "Toyolac" to its ABS resin and

commenced sales of the product in March. In February 1964, a production facility was completed at the Nagoya Plant, where monthly production increased to 600 tons by 1967. With demand predicted to keep rising, construction began on the Chiba Plant in July 1969. The new plant went online in July 1970. As a latecomer to the business, Toray struggled on quality and distribution fronts, but sales promotion activities eventually bore fruit as major applications were found in the automotive field. Production of nylon 66 resin, meanwhile, got underway at the Nagoya Plant in 1965. Nylon 66 was to exist alongside nylon 6 and likewise be developed into a full-scale business.

Polyester film products were launched first by ICI in 1953, as 'Melinex,' and the following year by DuPont, as 'Mylar.' The films were imported to Japan, drawing attention with superior characteristics not possessed by existing film materials. While advancing research into the industrialization of polyester fiber, Toray also conducted a basic examination of the future potential of a polyester film business and related production technology. Research into polyester film industrialization began in 1957.

Equipment was installed in a corner of the Mishima Plant in October 1959 and trial production got underway. Electric appliance manufacturers

and other were approached for their evaluation. As quality was deemed to be no inferior to Mylar, sales began in March 1960 with “Lumirror” settled on as a trade name.

Lumirror production began in 1963 at the Shiga Plant following the transfer of facilities from the Mishima Plant. Production increased between 1967 and 1969 and a decision was made to construct a new plant. Toray purchased a 130,000-square-meter site from Gifu Prefecture, formed the Gifu Plant and began Lumirror production there in July 1971. The Mishima Plant also embarked on full-scale production of Lumirror in October 1982.

Polypropylene film trial production began at the Mishima Plant in February 1962 and sales under the trade name “Torayfan” began in July. Mass production commenced at the Shiga Plant in June 1963 and at the newly established Tsuchiura Plant in October 1970. In addition, Toray established technology for producing cross-linked high-expansion polyethylene sheet, with “Toraypef” as the trade name. Trial production got underway at the Shiga Plant in April 1966. Demand for Toraypef as a molded packaging and container material was predicted to jump and a mass production facility was completed in September 1968.



Gifu Plant groundbreaking ceremony  
(June 1970)