



TOSOH

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# ANNUAL REPORT

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Tosoh Corporation and consolidated subsidiaries  
Fiscal year ended March 31, 2016

**TOSOH CORPORATION**

**Forward-Looking Statements:** Annual reports contain estimates, projections, and other forward-looking statements, which are subject to unforeseeable risks and uncertainties. Readers should understand that Tosoh's business and financial results could differ significantly from management's estimates and projections.

For reference purposes only, US dollar amounts have been translated, unless otherwise indicated, from yen at the rate of ¥112.68 = US\$1, the prevailing exchange rate at the end of the fiscal year under review.

Tosoh Corporation's 2016 fiscal year covers the period from April 1, 2015, to March 31, 2016.

## TABLE OF CONTENTS

|    |       |  |
|----|-------|--|
| 3  | ..... | <b>At a Glance</b>                               |
| 4  | ..... | <b>Message from the President</b>                |
| 7  | ..... | <b>Strategy</b>                                  |
| 10 | ..... | <b>Review of Operations</b>                      |
| 20 | ..... | <b>Corporate Social Responsibility</b>           |
| 25 | ..... | <b>Board of Directors and Corporate Officers</b> |
| 27 | ..... | <b>Research and Development</b>                  |

## AT A GLANCE

### Values

Values based on a craftsmanlike approach to product detail and quality have shaped Tosoh Corporation's destiny and growth for more than 80 years. We take pride in having established a resilient global enterprise whose products and services are woven into the fabric of modern life.

### Basics

Tosoh Corporation was established in 1935 and is listed on the First Section of the Tokyo Stock Exchange. We are the parent company of the Tosoh Group, which comprises more than 100 companies worldwide, has a multiethnic workforce of more than 12,000 people, and generated consolidated net sales of ¥753.7 billion (US\$6.7 billion) in fiscal 2016, ended March 31, 2016.

### Products

Tosoh furnishes the raw materials for an astonishing array of products that have revolutionized modern civilization. Look around you. It is almost impossible to find a manufactured item that does not include something from Tosoh.

## Message from the President

*To all of Tosoh's valued shareholders, business partners, employees, and various stakeholders, it is my pleasure to present you with this year's corporate annual report for fiscal 2016.*

*During the fiscal year under review, I succeeded Kenichi Udagawa as the company's president. We are grateful for Mr. Udagawa's six years as president and his many years of experience and counsel will be invaluable as he serves as Tosoh's corporate adviser.*

*In my new position as president, I will strive to take Tosoh to greater heights than ever before by making the company stronger than it has ever been. In pursuit of this, I kindly ask for your support in continuing to move the company forward guided by the foundations, knowledge, and vision of my predecessors, contemporaries, and of new generations.*

Since its beginnings, Tosoh Corporation and the Tosoh Group have sought technology through chemistry. We strive collectively to be a unique chemical company that is rich in more than merely a financial sense. We are, for instance, growing in so many ways amid the expanding role of chemistry in dealing with environmental- and energy-related societal challenges. The urgent need to face these realities compels us to strengthen our business foundation and utilize innovations in chemistry to contribute to better societies and more fulfilling lifestyles. Tosoh's rapid responses to its ever-evolving operating environment continually increase its corporate value, as does its emphasis on fair and transparent management practices.

Specifically to establish a business structure that is increasingly resistant to external factors, we are strengthening our commodities and expanding our specialties operations. Our objective is nothing short of formidable competitiveness globally, so our efforts regarding our commodities and specialties are laying the groundwork essential to growing our presence worldwide. We are, in that vein, forging ahead with a medium-term business plan released recently. And we are of course cultivating a corporate culture of safety by continuing to act on the safety reforms that we put into place early in August 2012.

### Performance Overview

Although we experienced mixed results in fiscal 2016, I can say that Tosoh is on stable ground and posted record profits despite lower sales. The company moved ahead with core strategies to further its profitability and to position itself and its group for growth in a rapidly changing business environment.

In fiscal 2016, profit rose to record levels despite a decline in sales. Lower crude oil and naphtha prices caused petrochemical product prices to fall, in Japan and overseas.

Consolidated net sales fell 6.9% from a year earlier, to ¥753.7 billion (US\$6.7 billion). Operating income, however, rose 35.1%, to a record ¥69.4 billion (US\$616.3 million). Ordinary income climbed 9.3%, to ¥65.8 billion (US\$584.1 million).

The increase in operating income was due mainly to lower prices of raw materials and fuel and to an increase in volumes sold. Improvements in operating and ordinary income notwithstanding, profit attributable to the owners of the parent company declined 36.3%, to ¥39.7 billion (US\$352.1 million). This was largely the result of deferred tax assets posted during fiscal 2015 in relation to Tosoh's merger with Nippon Polyurethane Industry Co., Ltd.

Commodities and specialties operations contributed to the growth in operating income. Among our commodities operations, the operating income of the Chlor-alkali Group jumped despite a decrease in group net sales. The Chlor-alkali Group was, in fact, the major contributor to Tosoh's consolidated net sales among Tosoh's operating groups. Although vinyl chloride resin sales volume grew because of expanded vinyl chloride monomer (VCM) production capacity, the margin of growth was not enough to offset the decline in petrochemical product prices. The Petrochemical Group, therefore, experienced a drop in sales, but it did achieve a substantial increase in profits.

Our Specialty Group maintained net sales in fiscal 2016 equal to those in fiscal 2015. This group, however, upped its contribution to our operating income, generating 47.1% of Tosoh's consolidated operating income.

### The Year in Review

In the first half of fiscal 2016, Japan's economy experienced sluggish exports and production as a result of slowdowns in China and some developing nations. Corporate revenues in Japan nevertheless continued to recover. And Japan's economy entered a gentle upswing amid a steady recovery in hiring and household incomes and a resulting brisk uptick in personal consumption. Unexpectedly, toward the end of the first half we were forced to revise downward our forecast for full-year net sales because of declines in domestic and overseas product prices caused by falling prices for crude oil, naphtha, and other raw materials.

Overall, though, the Japanese economy recovered somewhat in our fiscal 2016 on account of the economic and fiscal policies of the Japanese government and the Bank of Japan. As we entered calendar 2016, however, there was downward pressure on the global economy, such that stock prices weakened and the yen strengthened. The resulting lack of confidence in business conditions amid increasingly negative consumer sentiment slowed Japan's recovery.

The Chlor-alkali Group's net sales decreased, but its operating income increased on the back of increased sales volume. Shipments of caustic soda rose on the higher production volume

ensuing from an increase in the operating rate of electrolysis equipment. Domestic caustic soda product prices declined slightly, while export prices improved owing to the weak yen. Shipments of VCM and polyvinyl chloride (PVC) rose, given a boost in VCM production capacity in fall 2014. But VCM and PVC product prices fell, largely because of a decline in the price of naphtha.

In September, Tosoh increased its stake in Mabuhay Vinyl Corporation (Mabuhay) to 87.97% from 39.92% and made the Philippines-based chlor-alkali manufacturer a subsidiary. Chlor-alkali sales are expected to see stable growth in the Philippines, and Tosoh views this overseas operation as vital to its vinyl isocyanate chain. Tosoh will gradually integrate the new subsidiary's management system with its own. In the meantime, shipments of urethane raw materials were down because of a slowdown in China's economy and softening overseas markets.

Petrochemical Group net sales declined, but as with other commodities groups the Petrochemical Group's operating income rose thanks to increased sales volume. The decline in net sales was chiefly because petrochemical product prices fell in Japan and abroad in association with lower crude oil and naphtha prices worldwide. We've established a flexible naphtha cracker production and sales system that adapts to the business environment. And in the year under review, we maintained a high, 95% cracker operating rate to leverage high-volume ethylene purchases. We also set a price structure whose spreads on raw materials costs helped expand the Petrochemical Group's profit margins. In addition, we strategically continued to heighten the added-value of polyethylene (PE) products by increasing our sales of functional and special PE for the pharmaceutical and food packaging industries.

Specialty Group shipments of ethyleneamines decreased as competitors expanded production capacity, exacerbating an imbalance between supply and demand. Ethyleneamine product prices increased abroad because of the weak yen. Shipments rose of such separation-related products as liquid chromatography packing materials. Similarly, shipments increased of diagnostic-related product in-vitro diagnostic reagents. Shipments of high-silica zeolite (HSZ<sup>®</sup>) likewise increased, thanks to a boost in production capacity in fall 2014. Shipments of zirconia for dental applications also rose.

Net sales and operating income for the Engineering Group increased. Domestic sales of water treatment facilities, services, and related chemicals were up. This reflected growth in plant construction and in requests for maintenance and renovation overall in the water treatment industry, primarily for the electronics sector. Overseas sales rose largely as a result of increased demand from a rising number of electronics plants.

## Seeds of Growth through Research and Development

In fiscal 2015, we reorganized our research and development (R&D) activities out of an awareness that we must plant the seeds for growth now. We have high hopes that this reorganization will achieve strong results.

Our R&D structure centers on technical field and function, which grants us the opportunity to realign our resources in accordance with Tosoh Group priorities. Tosoh's seven research laboratories operate in line with three long-term themes focused on life science, functional polymers, and advanced materials. Their activities aim to enlarge our business by pursuing such promising new areas as batteries and printed electronics.

## Outlook for Fiscal 2017

Japan's economic recovery is expected to steadily gain momentum in fiscal 2017 as personal income and the employment situation improve further. Note, though, that business downturns in China and other Asian nations and in countries that provide raw materials make it increasingly difficult to be certain about trends in the global economy and financial markets.

The Tosoh Group is making every effort to increase its profitability. It is expanding its sales volume, maintaining an optimum pricing structure, reducing costs, and boosting earning power throughout its operations, among other things.

For fiscal 2017, Tosoh predicts net sales of ¥720 billion, operating income of ¥72 billion, ordinary income of ¥72 billion, and profit attributable to the owners of the parent company of ¥47 billion. These forecasts are based on a domestic standard price for naphtha of ¥40,000 per kiloliter and on an exchange rate of ¥110 to the US dollar.

We plan to increase capital expenditures to ¥36 billion from ¥27.9 billion in fiscal 2016 and to raise R&D expenses from ¥13.7 billion in fiscal 2016 to ¥15 billion. We aim to reduce interest-bearing liabilities by ¥24.6 billion, to ¥175 billion from ¥199.6 billion, further increasing our equity ratio to over 50% from fiscal 2016's 46.3%. And we intend to increase our total dividends to ¥15 per share from ¥14 and to see our earnings per share advance from ¥62.61 to ¥72.43.

In addition, we anticipate our workforce growing from 12,037 to 12,300 persons. We expect to increase production capacity in enzyme immunoassay reagents and zirconia powder. And we plan to complete a new plant for HSZ in Malaysia and to replace a boiler for electric power generation at the Nanyo Complex.

Key areas of concern remain the slowdown in China's economy; the recovery in the eurozone; the prices of raw materials, particularly of oil and naphtha; and the exchange rates, as the yen has rebounded in recent months. We nevertheless aim to continue our safety reforms, to

improve the profitability of our commodities business, to optimize our value chain, and to expand our specialty chemicals business.

### **Medium-Term Business Plan**

Tosoh's corporate governance code calls for three-year, medium-term business plans. Our most recent plan will guide us through fiscal 2019 and features realistic and attainable goals related to building a strong company that consistently generates value for its customers, investors, and stakeholders based on a dual commodities and specialties approach to business. This report subsequently presents highlights of our medium-term plan and the strategies that we are pursuing in our commodities and specialties operations to stabilize profitability in the years ahead. For that in-depth summary, we refer readers to the Medium-Term Business Plan and Strategy section of Tosoh Annual Report 2016.

### **Corporate Social Responsibility**

Tosoh is committed to being a good corporate citizen. Around the world, it complies with regulations and guidelines, works to achieve safe operations, ensures employee health and welfare, and contributes to local communities through corporate social activities.

For fiscal 2016, we plan for the first time to issue a corporate social responsibility report. That report builds on the Responsible Care (RC) reports that we've prepared since 1997. It is unfortunate that we will have to show in that inaugural report that we were unable in the year under review to fulfill our targets for safe and continuous plant operation. Improving our record in these areas will go a long way to helping us expand our business and increase its profitability.

Tosoh's corporate governance system, meanwhile, ensures transparency, compliance, and operational efficiency. We believe in the system's ability to enhance corporate value and growth.

We will continue, meanwhile, setting up programs to improve the safety of our domestic production operations. That means a hands-on approach at our major production facilities in Japan, including speaking with the managers and employees of those facilities about the progress and effectiveness of our safety programs.

We value our people and have programs in place to oversee their health and welfare, job satisfaction and productivity, and personal growth. Our employee programs instill an awareness of such important issues as environmental concerns and social contributions.

### **Key Issues in Moving Forward**

As we head into fiscal 2017, a number of principal issues confront the company. Foremost among them is the safety of our workers and customers—a perennial focus for Tosoh.

We all remember vividly the 2011 VCM plant explosion and must never forget what happened. To prevent a recurrence of this tragedy, we have invested ¥10 billion in plant safety over the past three years. Efforts in regard to safety will never be complete, but we have achieved a measure of plant and equipment safety preparedness and are seeing tangible results.

We are also concentrating on “soft elements” to ensure that our employees are trained in and aware of safety measures and safety-related technology. This is helping to create a work environment that is better for everyone, and we are confident that we can count on the cooperation and support of all in furthering the safety of our operations.

Our record profit in fiscal 2016 was thanks to the unstinting efforts of our employees, reduced petroleum costs, and a lower yen. In recent months, however, oil prices and the yen have been rebounding, so we must prepare ourselves for less-favorable business conditions. We must further boost our profitability to ensure the continued success and prosperity of our company. To that end, it is imperative that we sow the seeds of growth now.

Our commodity products are basic materials with long life cycles. And we are working at high rates of capacity utilization to manufacture most of them. Apart from recent developments in petroleum and product prices, we know that the expansion of production capacity and the construction of production facilities are vital to our future. We must continue to ensure the price competitiveness of our products and to enhance their value-added. We must also seek feedback from our customers regarding particularly our made-to-order products.

We think that market participants understand our products. But we need to do more in this area. We won't, however, be able to if our products lag the performance of their rivals. To bring to market new products with higher value-added, we must have a speedy and accurate grasp of changing market needs. Our R&D efforts must bear fruit in marketable products. We are expecting strong results from our reorganized R&D activities.

In all of our endeavors, we look forward to your continued and much appreciated support in fiscal 2017. My aspiration is for Tosoh to be a crystallization of its employees' skills and knowledge, a company that we can be proud of and confident in, a company that fosters the next generation of leaders.

Toshinori Yamamoto

President

## STRATEGY

### Medium-Term Business Plan

Just after the start of fiscal 2017, Tosoh announced a medium-term business plan that will guide the company through fiscal 2019 as it builds on its hybrid management, dual commodities and specialties approach to consistently generate value for its customers, investors, and other stakeholders well into the future. This feature presents highlights of that plan for fiscal years 2017–2019 and of the strategies that the company is employing in its commodity and specialty operations to stabilize profitability in the years ahead. It is based on information available at the time of writing, so be advised that changes in economic conditions and other, unknown factors in Japan and internationally could cause actual results to differ significantly from any projections presented.

#### Plan Overview

Our medium-term business plan has three policies. The first is to focus on hybrid management. That involves balanced efforts to strengthen our commodity and specialty businesses. As part of those efforts, Tosoh will optimize production capacity to make its commodity products more competitive and profitable. Tosoh will also invest to expand its capabilities in offerings with high-growth potential, broadening its business scope through research and development (R&D) and mergers and acquisitions.

The plan's second policy is to maintain and strengthen Tosoh's financial position to support a flexible investment strategy for growth. And the third policy is to drive safety reforms, the two elements of which are to develop safe, stable operational technologies and to effect improvements that eliminate safety problems and incidents.

#### Business Positioning

Tosoh's business is positioned on the company's commitment to hybrid management. This entails a robust portfolio of commodity and specialty products that is impervious to fluctuations in the operating climate and that enhances corporate value through balanced growth.

Tosoh's commodities operations generate profits and cash flows to underpin its business. And Tosoh will continue to ensure that it sources highly competitive high-quality feedstocks for its commodities products and that it equips its commodities operations with state-of-the-art technologies. Amid swings in the business climate that adversely affect profits, Tosoh will take advantage of continuing firm demand for basic raw materials.

The company's focus in regard to specialty products includes pursuing higher earnings to drive growth and maintaining high profitability through the continued development of new offerings. Tosoh expects lead times of more than 10 years from development to profitability.

### Financial Targets

Tosoh looks to maintain steady overall revenues and to lift operating income from ¥69.4 billion in fiscal 2016 to ¥85.0 billion by fiscal 2019. The objective is an operating income ratio exceeding 10%, up 0.8 percentage points from fiscal 2016. This requires raising the operating income ratios for commodity products by 2.1 percentage points, to 8.6%, and for specialty products by 3.0 percentage points, to 21.7%.

Management anticipates a slightly stronger yen in fiscal 2019 and assumes exchange rates of ¥110 to the US dollar and of ¥120 to the euro. Management also assumes a domestic naphtha price for fiscal 2019 of ¥40,000 per kiloliter, an increase of ¥2,775 over fiscal 2016.

Through fiscal 2019, Tosoh will undertake ¥130 billion in capital spending, of which it will allocate ¥30 billion for acquisitions. Two policies guide the company's capital expenditures. The first is to invest in renewal and productivity improvements that maintain and improve supply stability and competitiveness in commodity products. The second is to boost investment in specialty products—to increase the production capacity of existing growth businesses and to leverage R&D with universities, start-up ventures, and other partners and acquire bioscience and other firms to broaden Tosoh's business scope.

Capital expenditures will center on increasing production capacities in various areas. Priorities are HSZ, zirconia, Toyopearl<sup>®</sup> separation and purification media, polyvinyl chloride operations in the Philippines, and functional polymers and functional urethanes. Additional investment will go toward enhancing Tosoh's power generating efficiency.

### Financial Position and Shareholder Returns

Tosoh plans to generate an equity ratio exceeding 50% by fiscal 2019 while continuing to reduce its interest-bearing debt. The company will in the meantime continue its policy of paying stable dividends and of determining dividends based on comprehensive assessments of performance, free cash flow, and business development potential. Over the medium and long terms, Tosoh will target a payout ratio of 30%.

### Balanced Growth

The medium-term business plan builds through fiscal 2019 on Tosoh's competitive edge globally in supplying diverse industrial chemicals and functional and advanced materials. The company will continue to balance large-volume commodity operations with high-value-added specialty operations to bolster revenues and earnings in good and bad operating climates.

Tosoh's operational structure—with chlor-alkali and petrochemicals on the commodity side and advanced materials, bioscience technologies, and organic chemicals on the specialty side—

helps it weather the inevitable downturns and rapid changes in business environment experienced by its commodity operations. That structure also enables it to secure high margins from participating in the world's most technology-intensive industries.

### **Specialty Operations Expansion**

Tosoh has increasingly come to rely on its specialty operations to shore up its profitability when the cash-generating capabilities of its commodity operations lag. Specialty products regularly contribute a substantial portion of Tosoh's consolidated net sales, and this is especially vital amid tough years mainly for their chlor-alkali- and petrochemical-based commodity counterparts.

Until recently, specialties accounted for around a mere 20% of the company's net sales. That increased to 23.1% in fiscal 2016 and should reach 23.5% in fiscal 2019. Specialty products are even more important as earnings drivers. They represented 47.1% of operating income in fiscal 2016 and should remain around that level for fiscal 2019.

Tosoh plans, however, to expand the role of its specialty operations and will give them a more central role in overall corporate growth. That specialties already play a rising role in Tosoh's operations is indicated in part by their growing physical presence around the globe. This is particularly true for the company's bioscience business.

Tosoh's Bioscience Division has added several companies in the past two years or so to strengthen its clinical diagnostics operations. Tosoh Latin America SpA, in Chile, supports the division's expansion in Latin America. To better serve customers in Europe and the Middle East and Africa, the division established Tosoh Europe International N.V. in Belgium and then opened a branch office of that subsidiary in Dubai. The division also acquired India-based in vitro diagnostics firm Lilac Medicare Private Limited to strengthen Tosoh's presence in India.

Advanced materials, too, are on the move. Tosoh is constructing an HSZ plant in Malaysia that is slated for completion in fall 2016. The plant will expand Tosoh's HSZ production capacity and stabilize its supply of HSZ.

### **Commodity Operations Profitability**

Commodity products are a core Tosoh business and, like the company's specialty products, are being optimized. They continue to earn the lion's share of consolidated net sales, but they are sensitive to changes in the market. The latter is especially true for chlor-alkali, a longtime core Tosoh product. Tosoh will improve the profitability of its Chlor-Alkali Group by enhancing the group's ability to deal with market pressures and to control costs, by adjusting the group's product mix, and by furthering the integration and the efficiency and effectiveness of the vinyl isocyanate chain.

Among the Chlor-Alkali Group's products, Tosoh is particularly intent on raising production capacity for vinyl chloride monomer (VCM). Doing so will ensure an abundant and stable supply of VCM for increased production capacity at Tosoh's domestic and overseas polyvinyl chloride (PVC) production facilities. Tosoh's PVC business will, in turn, capitalize on the stability and abundance of VCM supply by boosting sales of PVC to customers worldwide.

Caustic soda is central to Tosoh's operations. The company was, after all, founded in 1935 as Toyo Soda Manufacturing Co., Ltd. Tosoh's ongoing production of caustic soda should benefit from the medium-term plan's aim of full electrolysis operating rates at the Nanyo and Yokkaichi Complexes. The higher production of caustic soda that results should strengthen profitability through heightened sales of soda and chlorine derivatives.

Tosoh's 2014 absorption of Nippon Polyurethane Industry Co., Ltd. (NPU), augments the Chlor-alkali Group's polyurethane (PU) capabilities. And our medium-term plan ensures that the group is better able to control the development, manufacture, and sale of commodity grades of isocyanates, or PU raw materials. The plan, moreover, also ensures the group's leverage of NPU's expertise in functional urethanes and PU foaming system products and of NPU's manufacturing and sales facilities in China.

Other commodity operations that Tosoh will strengthen include the Petrochemical Group's olefin operations. The company intends on raising the operating rate of the naphtha cracker at its Yokkaichi Complex, which contributes to the manufacture of VCM and PVC as well as olefins. In addition, Tosoh will work to heighten the responsiveness and flexibility of its olefin manufacturing and sales system.

Tosoh's emphasis, meanwhile, for the Petrochemical Group's polymer operations is on the further development of high-value-added functional and specialized polyethylene products. This includes improved engineering grades of polyphenylene sulfide (PPS) resins and better, non-contaminating grades of chloroprene rubber (CR). As well, the polymer operations will increase sales of their advanced and specialty grades of functional polymers, especially chlorosulphonated polyethylene (CSM), of which Tosoh is the world's leading producer.

### **Commodities and Specialties Innovation**

Tosoh supports innovation in its commodity and specialty operations through leading-edge technology and R&D. That support enables these operations to generate the next-generation products for the advancement of civilization, including increasingly versatile and functional products for niche applications.

Tosoh's recently revised R&D organization is favorably poised to undertake a growing volume of R&D projects. It can also bring its R&D resources to bear more fully than ever on short-term development initiatives for products and technologies related to organic, inorganic, polymer, and polyurethane materials. In addition, the new R&D organization makes possible enhanced

R&D for Tosoh's three long-term priorities: life sciences, energy and environmental conservation, and electronic materials. The commanding focus that these priorities have in our specialty operations reflects Tosoh's shifting of its specialty operations from a supporting role—whereby they shore up profits when the business cycle for commodity operations takes a downturn—to a leading role as a driver of the company's business.

As Tosoh's markets have shifted, the company has faced the challenge of managing increasingly frequent crises while keeping its long-term business plans on course. Each of Tosoh's groups and divisions faces different issues, but overall are united by Tosoh's strategy to expand its specialty businesses, to reinforce its commodity operations, and to thereby continue to grow and to ensure its ability to fulfill its commitments to its stakeholders and society. That strategy is well expressed in the company's new medium-term business plan, the achievement of whose aims will set Tosoh on sound footing well into the future.

## REVIEW OF OPERATIONS

### SPECIALTY GROUP

#### Snapshot

The Specialty Group meets the needs of its varied customers for high-value-added bioscience, organic chemicals, and advanced material products and technologies. Its extensive offerings are solidly positioned in stable and expanding niche markets and drive Tosoh's profitability.

The Specialty Group's clients span the globe and include companies in the pharmaceutical, health care, semiconductor, consumer electronics, and automobile industries. Among them are emerging businesses whose successes hinge on the Specialty Group's development of solutions to fuel their progress. Innovative products and technologies from the Specialty Group align Tosoh with market opportunities and offer potential for sustainable expansion strategies.

#### Group Performance and Markets

##### *Results Overview*

In fiscal 2016, Specialty Group net sales decreased 0.2% from a year earlier, to ¥174.5 billion (US\$1.5 billion). That constituted 23.2% of Tosoh's consolidated net sales, up from 21.6% in fiscal 2015. Group operating income climbed 9.1%, to ¥32.7 billion (US\$290.2 million), and accounted for 47.1% of Tosoh's consolidated operating income, compared with 58.3% a year earlier. The group's operating margin was 18.7%, an increase from 17.1% in fiscal 2015.

Shipments of ethyleneamines by the Specialty Group decreased in fiscal 2016 as Tosoh's competitors expanded their ethyleneamine production capacity, exacerbating an imbalance in favor of supply over demand. Overseas, the group also faced increased prices for its ethyleneamine products because of a weak yen.

Among the group's separation-related products, shipments of liquid chromatography packing materials rose. The group's diagnostic-related products experienced a similar increase in shipments of in vitro diagnostic reagents. Its shipments of high-silica zeolites (HSZ) likewise increased, thanks to a boost in production capacity in fall 2014, as did its shipments of zirconia for dental applications.

#### Developments

##### *Capital Investments*

During the year under review, Tosoh began increasing zirconia powder production capacity at its Nanyo and Yokkaichi Complexes in response to growing global demand, particularly for dental and fashion parts applications. Construction to expand capacity for producing zirconia

powder at the Nanyo Complex, in Shunan City, Yamaguchi Prefecture, commenced in June 2015 and was completed in November 2015. At the Yokkaichi Complex, in Yokkaichi City, Mie Prefecture, the construction of zirconia production facilities began in February 2016 and is slated for completion in October 2016. These expansions should boost Tosoh's zirconia production capacity around 30% at an investment cost of about ¥3.9 billion.

In the meantime, the Specialty Group launched the commercial production of zirconia powder at the Nanyo Complex's new facilities in March 2016. It is scheduled to do so in April 2017 at the Yokkaichi Complex.

Elsewhere, work is progressing with the construction of a reaction tower for the Specialty Group's bromine operations. When completed in fiscal 2018, the state-of-the-art tower will lower production costs and raise competitiveness for Tosoh's bromine business.

##### *Network Expansion*

In fiscal year 2015, the Specialty Group's Bioscience Division set up Tosoh Europe International N.V., in Belgium. It then opened a branch office of this new company in Dubai, in the United Arab Emirates, to better serve customers in the Middle East and Africa.

Early in fiscal 2016, Tosoh expanded and strengthened its bioscience operations by acquiring Indian in vitro diagnostics company Lilac Medicare Pvt. Ltd. Lilac's products have become well known throughout India since that company's establishment in 1997. And Tosoh is drawing on the renamed Tosoh India Pvt. Ltd.'s domestic network and product familiarity to boost its share of the growing Indian market. Specifically, Tosoh is using the Specialty Group's immunological and diabetes diagnostic analyzers as stepping-stones toward establishing a firm position in India for its bioscience business.

#### Strategies and Outlook

##### *Organic Chemicals*

The Specialty Group has three strategic objectives for its organic chemicals business segment. The first is to boost profitability by reinforcing the production structure and by enhancing cost-competitiveness in ethyleneamines, bromines, and flame retardants. The second is to create new business by capitalizing on growing demand for more environmentally friendly polyurethane amine catalysts, heavy metals treatment agents, and industrial cleaners. The third is to build a superior technological position as a supplier of organic electroluminescent materials.

Tosoh is one of the world's largest producers of ethyleneamines, and it exports around 80% of its 71,000-metric-ton annual ethyleneamine output. To reinforce its competitive position, in fiscal 2017 and beyond the company will review its manufacturing processes and setup for ways to increase its production of high molecular weight amines. That increase will contribute

to a more stable supply of higher amines in the absence of global production capacity increases by competitors who use the same ethylene dichloride production process to make ethyleneamines as Tosoh. At the same time, Tosoh will prioritize lowering its ethyleneamine-related logistics costs and inventories.

The Specialty Group, therefore, will continue its shift to high molecular weight amines while enlarging its ethyleneamine derivative network globally. As part of that drive, it will act on proposals for systems to better produce the isocyanates and polyols for its RZETA<sup>®</sup> polyurethane catalyst operations that are so key to the automotive and furniture industries. It will also bolster the formulation capacity of its Toyocat facilities.

To ensure long-term growth for its eco-business products and services, the Specialty Group has a twofold business strategy. It will reinforce its competitiveness in top-of-the-line brands for the environmental and recycling market by continuing to make the piperazine-based agents that are its core environmental product line. It will also look beyond its domestic market to the emerging markets of China and other Asian countries, where rapid economic development poses pressing environmental issues.

#### *Advanced Materials*

##### *Zeolites*

Tosoh offers a broad lineup of high-quality synthetic zeolite products, consisting of the high-silica zeolite HSZ series and the zeolite molecular sieve Zeolum<sup>®</sup> series. The priority for the Specialty Group is to continue meeting steadily growing demand for HSZ products from the automotive, oil and energy, and environmental industries.

The group is boosting HSZ production capacity and developing HSZ innovations to accommodate rapidly evolving trends in industry requirements and environmental regulations. And Tosoh is constructing an HSZ manufacturing plant in Malaysia. That plant is scheduled for completion in late calendar year 2016, and sales are anticipated to begin in mid-2017. This will be the first production facility that Tosoh has built in Malaysia, and it will boost the company's HSZ production capacity 40%.

##### *Ceramics*

The goal of the Specialty Group's zirconia powder operations is to maintain top share of the global fine ceramics market. The group established Tosoh as a major player in the dental materials market when in 2011 it introduced Zpex<sup>®</sup>, a translucent, colored, high-strength grade of zirconia. In December 2014, it furthered Tosoh's presence in dental materials with the launch of Zpex Smile, a high-translucency zirconia for front teeth.

Zirconia's popularity in fashion parts for wristwatches, car accessories, and mobile phones is another opportunity for sales and profits growth for Tosoh's fine ceramics.

#### *Battery Materials*

Tosoh is the world's largest producer of electrolytic manganese dioxide (EMD) and a major supplier of EMD to the conventional battery market globally. And the Specialty Group helps maintain and expand the company's competitive position. The EMD market is mature and competitive, but there are opportunities for growth.

The Specialty Group, meanwhile, is establishing itself as a principal producer of manganese-based cathode materials for the lithium-ion secondary battery market. Demand for lithium-ion secondary batteries is anticipated to grow substantially, and the expanding market for electric vehicles is undeniably a market where Tosoh can contribute. In addition, rising standards of living, improving infrastructure, and growing personal incomes in emerging countries are expanding purchases of handheld, or portable, electronic devices, for which batteries are essential, presenting Tosoh with yet more opportunity to expand its business in battery materials.

#### *Electronic Materials*

Thin-film materials and quartz are other areas where the Specialty Group is expanding operations to meet growing demand. The semiconductor market should grow as demand rises for handheld devices, electronics in automobiles and other consumer products, and digital information technologies. So the Specialty Group is implementing measures to serve the next-generation memory and printable electronics markets and is developing and expanding sales of products for atomic layer deposition and coating applications.

#### *Bioscience*

##### *Separation and Purification*

Tosoh is committed to a major presence in the global bioscience market. Through its Specialty Group, it has established its bioscience brands in the leading markets of Japan, the United States, and nations in Europe. The group now targets high-growth markets in China, India, Southeast Asia, and the Middle East. Over the medium term, the focus is on selling high-performance liquid chromatography (HPLC) separation columns and Toyopearl separation media. Measures in fiscal 2015 to develop and launch grades of separation media and columns for ultrahigh-performance liquid chromatography (UHPLC) systems bore fruit in fiscal 2016 and will be followed by efforts to increase Tosoh's market share of the UHPLC market for years to come.

Globally, the Specialty Group seeks to increase its share of the separation media market by leveraging the popularity of its Toyopearl AF-r Protein A HC-650F product. The group developed this grade of Toyopearl to address biopharmaceutical industry demand for antibody purification media. Another group offering is Toyopearl Sulfate-650F, a separation and purification medium that Tosoh commercialized in October 2015.

## Clinical Diagnostics

Tosoh continues to build its worldwide presence in clinical diagnostic systems. The company has an especially positive reputation in the global diabetes market thanks to a line of Specialty Group glycohemoglobin (GHb) analyzers. And the group plans to increase Tosoh's share of this approximately ¥50 billion and rapidly growing market.

The Specialty Group's plans include producing compact, reasonably priced GHb analyzers suitable for developed and developing countries and expanding the support network for all of its GHb analyzer models. Its plans also encompass a 30% expansion of analyzer-related reagent production capacity, scheduled for completion in October 2016.

The global molecular testing market, too, is growing steadily and is estimated to be worth over ¥500 billion. Market growth is particularly strong in emerging countries, where molecular testing is most valued in testing for infectious diseases, for which Tosoh's nucleic-acid amplification testing products are particularly useful. The group has made steady inroads in the market, especially with its next-generation TRCReady-80 system.

## Medium-Term Business Plan

Tosoh's medium-term business plan targets ¥40 billion in operating income for the Specialty Group and an operating margin of 21.7% by fiscal 2019. These aims represent increases of ¥7.3 billion and of 3.0 percentage points, respectively, over fiscal 2016.

The three-year strategy for advanced materials is to develop new grades of and to boost production capacity for HSZ. Initiatives include improving the development system and building an HSZ production facility in Malaysia. Construction of the Malaysian plant is scheduled for completion in late 2016. Sales of its HSZ should start in mid-2017.

The zirconia product strategy is to continuously market distinctive grades while adding capacity. The Specialty Group will work on increasingly translucent zirconia dental materials and on accelerating development to meet customer needs. Tosoh, meanwhile, will complete a production capacity upgrade at the Yokkaichi Complex in fall 2016.

In EMD, quartz glass, and sputtering targets, the Specialty Group will focus on advanced functionality. This includes heightened differentiation in Tosoh's EMD. It also includes heightened competitiveness in quartz glass by reducing manufacturing costs and developing new materials. The group will also emphasize sputtering targets for touch screen applications and the development of high-performance products. Touch screen demand should grow as emerging economies follow developed countries in expanding smartphone usage.

The strategy for the group's organic chemicals operations in ethyleneamines, urethane foaming catalysts, and bromine and flame retardant product lines is to improve profitability and to stabilize new business. The Specialty Group is integral to Tosoh's aim of significantly

improving profitability by shifting to high molecular weight amines. At the same time, it will focus on sales of urethane foaming catalysts, most notably highly functional products for Toyocat, and on bolstering Tosoh's marketing in European nations and the United States for RZETA. Its efforts in bromine and flame retardants will be furthered by Tosoh's investment in more efficient bromine production facilities, which are slated for completion in spring 2017.

Overall, the strategy for bioscience instruments, columns, separation media, immunoassay analyzers, and reagents is to expand markets through R&D and acquisitions and to cultivate demand in emerging economies. Initiatives include acquiring new technologies and products.

The Specialty Group will develop columns and separation media for the biopharmaceutical market and increase production capacity for Toyopearl separation media. It has, meanwhile, complemented its fiscal 2015 launch of its diagnostic AIA<sup>®</sup>-CL2400 automated immunoassay analyzer with the compact AIA-CL1200. The group will expand distinctive reagents in growth areas and cultivate the Indian market, through Tosoh India, helped hugely by Tosoh's completion of its reagent production capacity enhancement in October 2016 to 30% beyond current capacity.

## CHLOR-ALKALI GROUP

### Snapshot

The Chlor-alkali Group operates the largest fully integrated manufacturing capacities of their kind for chemical commodities in Asia and supplies the worldwide chlor-alkali industry with raw materials for a vast range of products. It is well positioned to take advantage of opportunities, especially in Asia's expanding markets.

The group's main products are caustic soda, chlorine, vinyl chloride monomer (VCM), polyvinyl chloride (PVC) resins, calcium hypochlorite, sodium bicarbonate, methylene diphenyl diisocyanate (MDI), toluene diisocyanate (TDI), hexamethylene diisocyanate (HDI), and functional urethanes. It sells these raw materials to external customers and furnishes them as feedstock to Tosoh's fully integrated vinyl isocyanate chain, which yields the company's commodity and many specialty products.

The group's Urethane Division, established in fiscal 2015, oversees the production of MDI, an important raw material for polyurethane and a fine chemical with multiple uses in organic synthesis. MDI also offers attractive marketing synergies with Tosoh's diverse product lines, including organic synthesis compounds, polyurethane catalysts, and specialty polymers. TDI, too, serves myriad applications, many similar to those served by MDI. And HDI is a higher-value-added product with applications in high-performance paints and other specialty polymers.

The Chlor-alkali Group's chemical commodities business is thriving in tandem with the growth of economies worldwide and despite constantly changing shipment volumes and prices as

supply and demand fluctuate. The group has the know-how and systems to optimize its production mix to match circumstances and to enable Tosoh to compete globally in chlor-alkali.

The group also oversees Tosoh's cement operations, which use waste and coal ash, slag, and other by-products from Tosoh's operations and elsewhere. That valuable contribution to recycling also occasions a considerable reduction in the cost of manufacturing cement. The entire cement output is then consigned for sale by Taiheiyo Cement Corporation, Japan's largest cement manufacturer.

## Group Performance and Markets

### *Improved Profitability*

Chlor-alkali Group net sales decreased 4.9%, to ¥279.8 billion (US\$2.5 billion), in fiscal 2016. That represented 37.1% of Tosoh's consolidated net sales, up from 36.4% a year earlier. Operating income improved 116.2%, to ¥18.0 billion (US\$159.6 million), and contributed 25.9% of consolidated operating income. The operating margin was 6.4%, compared with 2.8% in fiscal 2015.

Shipments of caustic soda increased on the higher production volume ensuing from a rise in the operating rate of electrolysis equipment. Domestic caustic soda product prices declined slightly, however, while export prices improved owing to the weak yen. Shipments of VCM and PVC rose given a boost in VCM production capacity in fall 2014. But VCM and PVC product prices fell, largely because of a decline in the price of naphtha. Cement shipments in Japan decreased on account of falling demand. But cement exports increased. Shipments of urethane raw materials were down as a result of a slowdown in China's economy and softening demand overseas markets.

## Developments

### *Post-merger Progress*

In fiscal 2015, Tosoh absorbed its former subsidiary Nippon Polyurethane Industry Co., Ltd. (NPU). The two companies' operations were already tightly linked in a collaboration that turned Tosoh's vinyl chain into the fully integrated vinyl isocyanate chain that it is today. But Tosoh foresaw increasingly severe competition in isocyanates, so it opted to absorb NPU to accelerate decision-making, unify manufacturing, optimize R&D, and heighten management efficiency through a single management structure that will enable Tosoh to better react to changes in the operating environment.

### *Capital Investments*

Tosoh benefited in fiscal 2016 from earlier spending to significantly expand production capacity at the Nanyo Complex's No. 3 VCM Plant. The gain redressed a supply imbalance that had

existed between the company's VCM and PVC operations after an accident destroyed the No. 2 VCM Plant at the Nanyo Complex in fiscal 2012. It also permitted an increase in the electrolysis operating rate, which, in turn, raised the production capacity of one of the Chlor-alkali Group's chief products: caustic soda.

Tosoh subsidiary Taiyo Vinyl Corporation increased its annual PVC production capacity by 10,000 metric tons in October 2014. As such, it is positioned to accommodate substantial need for PVC in Japan to aid in recovering from 2011's Great East Japan Earthquake and in constructing the infrastructure for the 2020 Summer Olympics and Paralympics in Tokyo.

A highlight of fiscal 2016 was Tosoh's investment of around ¥1.5 billion to lift its stake in Philippines-based chlor-alkali manufacturer Mabuhay Vinyl Corporation (Mabuhay) from 39.92% to 87.97%, making it a Tosoh subsidiary. The goal was to augment Tosoh's efforts to strengthen its core vinyl isocyanate chain. Mabuhay is the only electrolytic chlor-alkali producer in the Philippines, where chlor-alkali sales are anticipated to enjoy stable growth. Tosoh's heightened investment in Mabuhay signals the importance of that company to Tosoh's vinyl isocyanate chain. Tosoh is working to integrate Mabuhay's management system with its own.

## Strategies and Outlook

### *Vinyl Isocyanate Chain*

The profitability of the vinyl isocyanate chain has been an issue for the Tosoh Group over the past decade. The chain's operations have faced stiff challenges from steadily rising naphtha and other raw material prices, from substantial expansion in worldwide production capacity, and from global financial crises and the yen's appreciation.

Most affected have been the Chlor-alkali Group's core VCM and PVC products. In addition to measures it is taking to reduce costs and raise the competitiveness of its products, the Chlor-alkali Group seeks to increase the production and sales of its most profitable chloride line of caustic soda and related products. The expansion of VCM production capacity at the Nanyo Complex and the resultant increase in the electrolysis operating rate that enabled the greater production of caustic soda are major steps toward that goal.

Exploiting the cost-effectiveness of Tosoh's independent electricity generation capabilities is another important way the Chlor-alkali Group is boosting the cost-competitiveness of its primary chloride and other product lines. The Chlor-alkali Group is devising methods to share Tosoh's electricity generation capabilities among its operations at the company's domestic factories, beginning with the Yokkaichi Complex, and at the Sakata Plant of Tohoku Tosoh Chemical Co., Ltd. Environmental taxes on fossil fuels will be implemented incrementally in Japan over the next few years, and the group's efforts to distribute Tosoh's electricity generation will contribute to keeping its electric power costs and its product pricing competitive.

The global VCM market is highly competitive but growing. So the Chlor-alkali Group employs a wide range of measures to reduce its VCM production costs and to strengthen its VCM marketing. The group is also considering prioritizing domestic and overseas markets where profitability is greatest amid changing exchange rates, market conditions, and technologies.

The group is focusing on products, including PVC, produced by Tosoh subsidiaries. Its plan is to encourage subsidiaries to collaborate in expanding markets in ways that ensure their profitability. The goals specifically for VCM and PVC operations are to provide stable VCM supplies to Tosoh's PVC manufacturing subsidiaries and to maximize profits for all. This means strengthening domestic sales and tapping sales opportunities overseas in such markets as Indonesia and India. China remains a difficult market because of its increasing use of the carbide method to produce PVC.

Tosoh produces more than 35% of Japan's VCM output and is the domestic leader in PVC resins, accounting for one-fourth of national output. Long term, VCM and PVC demand should increase in Asia, and Tosoh expects to benefit despite heightened competition at home and abroad.

#### *Urethanes*

The Chlor-alkali Group's Urethane Division embodies the full integration of Tosoh's and NPU's MDI, TDI, HDI, and functional urethane operations. From a single location within Tosoh's head office, the division's administrative staff is examining how best to optimize Tosoh's ample resources to further Tosoh's urethane business strategies. This will be particularly important in view of growing volatility in the polyurethane business climate amid raw material cost fluctuations, planned capacity increases by competitors, foreign exchange rate swings, Chinese market risks, and other factors.

Regardless of operating climate, the Urethane Division will pursue efforts to cultivate high-value-added MDI offerings and to reinforce its functional urethane business to bolster Tosoh's profitability. The division also looks to maximize production and sales to help stabilize Tosoh's vinyl isocyanate chain and increase the company's earnings.

Tosoh's conversion to low-cost MDI production was mostly complete before the integration of its vinyl isocyanate chain through the tie-up with NPU's operations. The Urethane Division is now contemplating additional MDI production capacity to increase the presence of Tosoh's MDI products domestically and overseas.

The division also intends to reinforce its MDI export sales structure. While reviewing its sales structure in China going forward, it will attempt to reduce its reliance on China's market. It will instead expand sales in Southeast and South Asia, which offer potential for stable demand. To reinforce its MDI marketing drive in Asia, particularly in ASEAN markets, the division has set up

an MDI stockpiling base in Singapore. At the same time, the division will strive for steady sales in North America.

Strengthening sales of monomeric MDI, meanwhile, is another divisional priority. And again it will attempt to do so in part by boosting sales outside China to offset concerns about demand among that nation's key users of monomeric MDI. The division will also promote sales of a special grade of monomeric MDI suitable for environmental issues and to meet growing demand from major footwear makers.

In addition, the Urethane Division is targeting a growing share of the overseas HDI market, primarily through expanded sales to US and European customers but also to customers elsewhere. The division also plans on expanding its sales of liquid polycarbonate diol (PCD), a highly pliable and tough raw material for polyurethane resin products, and of other of its products.

#### *Cement*

The Chlor-alkali Group's one-kiln cement operations lessen the group's fixed costs through low maintenance and labor and outsourcing expenses. Their improved waste plastic processing capacity and capability also contribute to operational profitability.

Medium term, the group is considering increasing the waste plastic processing of its cement operations. This will involve an upgrade to its cement manufacturing facilities alongside ongoing programs to conserve energy and reduce energy costs.

In fiscal 2017, the Chlor-alkali Group expects that demand for cement will remain steady. Demand related to the 2020 Summer Olympics and Paralympics in Tokyo should pick up in the second half of the year and offset a tapering off in domestic public-sector demand. Overseas, competition in Asia could intensify owing to slower growth in China. Tosoh, though, anticipates operating at full kiln production and sales capacity in fiscal 2017.

#### **Medium-Term Business Plan**

Under its three-year business plan, Tosoh's objective is ¥21 billion in operating income for the Chlor-alkali Group by fiscal 2019, up ¥3 billion from fiscal 2016. Tosoh is also aiming for a group operating margin of 7.6%, an increase of 1.2 percentage points over fiscal 2016.

Tosoh's strategy for its Chlor-alkali Group, and specifically for the group's PVC, VCM, caustic soda, and chlorine derivatives operations, is to maximize profits by optimizing the vinyl isocyanate chain. Initiatives include ensuring the stable procurement of competitively priced raw materials and building competitiveness through greater efficiencies in power generation, power consignment, and other areas. As well, Tosoh Group company Philippine Resins Industry, Inc., will boost PVC production, and Tosoh will strengthen the profitability of its soda and chlorine derivative products.

Tosoh, meanwhile, will continue its shift to high-value-added MDI production and to strengthen its functional urethane operations. This, accordingly, will accelerate the company's move from commodity to specialty products and from single-item to system sales. The Chlor-alkali Group will underpin Tosoh's strategies in this regard especially through an MDI marketing drive in Asia reinforced by the Urethane Division's MDI stockpiling base in Singapore. In addition, the division will promote sales of functional urethanes in medical fields and add production capacity for HDI derivatives.

## PETROCHEMICAL GROUP

### Snapshot

The Petrochemical Group supplies diverse customers with conventional and high-performance and specialty products. Polymers, including polyethylenes and functional polymers, and olefins are the group's main product lines, and the group maintains its competitive edge by moving its products upstream, managing its product mix, cutting its costs, and diversifying its product lines. The Petrochemical Group bridges the gap between the Specialty and Chlor-alkali Groups in Tosoh's dual commodities and specialties strategy.

Tosoh has utilized olefin feedstock from the Petrochemical Group to become an integrated manufacturer of hydrocarbon-based products and their derivatives, including ethylene, propylene, cumene, and aromatic compounds. Customers use olefins to manufacture a broad range of products, from automotive additives to food flavors and fragrances.

The Petrochemical Group's polymer operations manufacture ethylene vinyl acetate (EVA); low-density polyethylene (LDPE); linear low-density polyethylene (LLDPE); high-density polyethylene (HDPE); and such functional polymers as chloroprene rubber (CR), adhesive polymers, and engineering plastic resins. The polymer operations adapt product specifications to meet customer needs for polymers in consumer and industrial products. Various grades of EVA are found in everything from solar cells to shoe soles. LDPE is used in medical applications and food packaging. And HDPE is applied in injection moldings and high-purity pharmaceutical containers.

Chlorosulphonated polyethylene (CSM) rubber and polyphenylene sulfide (PPS) feature in the Petrochemical Group's functional polymer lineup. CSM is a highly durable rubber, and Tosoh is the leading global CSM producer. PPS is also in great demand globally as an engineering plastic, as it helps automakers develop lighter, more fuel efficient vehicles.

### Group Performance and Markets

#### *Significantly Improved Profitability*

The Petrochemical Group's net sales decreased 21.6% from a year earlier, to ¥175.4 billion (US\$1.5 billion). The group's contribution to Tosoh's consolidated net sales likewise declined,

from 27.6% to 23.3%. In contrast, operating income rose ¥4.7 billion, or 67.7%, to ¥11.6 billion (US\$103.0 million), owing to increased sales volumes and accounted for 16.7% of Tosoh's consolidated operating income. The group's operating margin was 6.6%, up from 3.1% a year earlier.

Among shipments of olefin products, cumene shipments rose because of increased demand for derivatives. The cumene market, though, weakened abroad, and decreases in the cost of raw material feedstocks translated into low prices for cumene products in the Japanese market.

Shipments of polyethylene resin increased amid improved trade conditions for exports because of the weak yen and lower raw material prices. But polyethylene resin product prices in Japan declined, reflecting falling naphtha prices. The weak yen, meanwhile, improved export prices for CR and CSM.

### Developments

During the period under review, Tosoh allocated around ¥1.9 billion to Petrochemical Group R&D. The group, in turn, continued and continues to develop and commercialize new grades of polyethylene suited for use in infusion bags that are heat resistant and transparent and that meet Japan's safety standards. The group also plans to develop and sell variations of its two newest polyethylene grades for application in medical bottles, ampoules, and unit-dosage dispensers for eyedrops and other medicines. Sampling is under way.

The Petrochemical Group, meanwhile, continued its development in fiscal 2016 of a CR grade with well-balanced heat-resistance and dynamic properties. Its work on developing a new rubber polymer with enhanced oil resistance was and is likewise ongoing. R&D during the year under review also encompassed developing specialty PVC paste grades for wallpaper, flooring, and automotive materials. As well, work continued on the development of new polymers based on proprietary concepts for liquid crystal optical materials, flexible display substrate materials, and other applications.

### Strategies and Outlook

#### *Olefins*

One of Tosoh's domestic competitors shut down its ethylene plant in fiscal 2015 and thereby improved the supply and demand for olefins in Japan. The resultant decline in supply has allowed Tosoh's Nanyo Complex to raise the operating rates of its ethylene production facilities and to thereby lower costs at those facilities.

In Asia, the Petrochemical Group sees olefins as a growth market in the long term despite rising competition from Middle Eastern and Asian suppliers. Developing economies invariably consume increasingly large amounts of olefins, as is happening throughout the Asia-Pacific region, and the group maintains some advantages over competitors in many markets.

The Petrochemical Group relies on its refinery and petrochemical modeling system (RPMS) to deal with a changing business environment. It adjusts the mix of its cracker output, for instance, to maximize profitability. As a result, it is prepared to expand by taking advantage of opportunities that arise from managing the balance among production rates, product mix, and market prices.

#### *Polyethylenes*

A significant amount of polyethylene from the United States should flow into the Chinese and other Asian markets in the year ahead. This could affect cracker operating rates, but those markets should be able to absorb the surplus polyethylene.

The Petrochemical Group's strategy for its core polyethylene products is differentiation. It will focus on high-value-added grades, new products, and customization for market segments and major customers.

#### *Functional Polymers*

The Petrochemical Group is repositioning itself in the technically advanced segment of the CR market by expanding its line of superior-grade products. This includes introducing injection-mold and sulfur-modified CR grades.

Even without the advantage of a weak yen, Tosoh has been the world's top supplier of CSM to the high-end market for many years. To maintain and further that position, the Petrochemical Group has an ongoing product development program and plans for production capacity expansion in line with sales growth.

Demand for PPS resins from the principal customer for these products, the global automobile industry, is estimated to grow over the medium term. The Petrochemical Group is poised to meet that demand and continues to develop PPS grades for new applications in automotive parts to aid automakers reduce vehicle weight. The latter include already-developed Susteel<sup>®</sup>-brand PPS, which features superior metal bonding for automotive applications. Also included is SGX-grade PPS resin, which a leading smartphone maker began using in its mobile phone casings in 2013. Several Chinese smartphone makers have subsequently also begun using SGX-grade PPS resin.

#### **Medium-Term Business Plan**

Tosoh's medium-term business plan has as an objective ¥17 billion in operating income for the Petrochemical Group by fiscal 2019. This represents a 46.6% rise over the three years from fiscal 2016. The plan also aims for an operating margin of 10.4% for the group, an increase of 3.7 percentage points over fiscal 2016.

The plan's focus in olefins is on ethylene, propylene, and cumene. A priority will be to optimize earnings by maintaining high-capacity utilization rates for the Petrochemical Group's naphtha crackers. As part of that effort, the group will work to enhance its energy-intensity competitiveness and to build a pricing structure that incorporates an appropriate spread. The Petrochemical Group relies on its RPMS to deal with a changing business environment. It adjusts the mix of its cracker output, for instance, to maximize profitability. As a result, it is prepared to expand by taking advantage of opportunities that arise from managing the balance among production rates, product mix, and market prices.

Polymers, too, figure in the medium-term business plan, where the emphasis is on polyethylene and the functional polymers CR and CSM. The Petrochemical Group's overall thrust in polymers is on differentiating its offerings and ensuring high added value. Its aim specifically for polyethylene is to expand domestic sales of specialty offerings for food, medical, and electronics applications and to cultivate overseas markets. Another priority for polyethylene is to boost quality to penetrate high-end markets.

The focus in functional polymers is to expand sales of special grades of CR, particularly of sulfur-modified and injection-mold CR. The group will also establish a second CSM plant and carry on with its plan to introduce a polymer with enhanced oil resistance.

#### **ENGINEERING GROUP**

##### **Snapshot**

The Engineering Group comprises water treatment and pure water generation leader Organo Corporation and construction company Tohoku Denki Tekko Co., Ltd.

Organo maintains three principal businesses. Its plant business sells water treatment systems to electronics, chemicals, oil refinery, food and beverage, paper and pulp, waterworks and sewage treatment, health care, and other companies. Its solution business maintains and manages systems, suggests ways to enhance efficiency and lower environmental impact, and provides water treatment outsourcing services. And its functional products business sells standardized water treatment systems and chemicals and food processing materials.

Tohoku Denki Tekko has five main businesses. The construction business engages in machinery, plant, steel structure, environmental and sanitation facilities, and container construction. Its four other businesses encompass electrical machinery, instrumentation, civil engineering, quality assurance, and maintenance.

## Group Performance and Markets

### *A Solid Performance*

In fiscal 2016, the Engineering Group's net sales amounted to ¥84.2 billion (US\$747.1 million), an improvement of 11.1% over fiscal 2015. The group's operating income climbed 37.4%, to ¥4.6 billion (US\$40.6 million). The group accounted for 11.2% of Tosoh's consolidated net sales, compared with 9.4% the previous fiscal year. Its operating margin was 5.5%, a decline of 6.5% from fiscal 2015.

Domestic sales of water treatment facilities, services, and related chemicals were up. This reflected growth in plant construction and requests for maintenance and renovation overall in the water treatment industry, primarily for the electronics sector. Overseas sales rose largely as a result of increased demand from a rising number of electronics plants, one demand driver being Taiwan. Sales were down at construction subsidiaries.

### **Developments**

#### *Strategic Collaborations*

Organo has taken steps to consolidate its businesses and expand its service capabilities. Those steps include forming a business alliance with Katayama Nalco Inc. in fiscal 2014 that sees the two companies collaborating to expand their water treatment businesses. Organo's chief products are in water and wastewater treatment chemicals, while Katayama Nalco's core lines are process-related chemicals for steel, petrochemicals, and pulp and paper. The alliance should contribute significantly to the Engineering Group's net sales in the years ahead.

A fiscal 2016 Engineering Group highlight was the launch of a water treatment joint venture in India in September 2015 with the India-based Muragappa Group. Organo owns 49% of the joint venture, called Muragappa Organo Water Solutions, which targets Japanese and non-Japanese customers in India and aims to serve the emerging needs of manufacturers there.

### **Strategies and Outlook**

#### *Water Treatment*

In fiscal 2017, Tosoh subsidiary Organo Corporation intends to bolster its earnings capacity, develop and improve technologies and products that strengthen its businesses, and allocate resources to bolster R&D activities as part of efforts to generate long-term growth. Organo's management expects that sales will remain basically unchanged but that operating income will probably decline, reflecting a downturn in solution business sales in its water treatment business. Organo's management also anticipates significantly increased capital investment.

Large electronics industry projects should again contribute to Organo's performance, although domestic and overseas orders in that industry will probably be down. In addition, Organo will target sales to the water treatment chemicals industry and reinforce its solutions business while continuing to reduce costs to improve profitability.

Organo hopes to capture opportunities emerging from planned construction in the Tokyo area. This includes in particular construction for the 2020 Tokyo Summer Olympics and Paralympics and the linear motor car project of Japan's major railway company.

A mature domestic market, meanwhile, compels Organo to increasingly look abroad for business especially in water treatment for power stations. Organo is thus leveraging its network of subsidiaries and affiliates in China, Thailand, Malaysia, Taiwan, Vietnam, and Indonesia and converting its overseas activities to local operation and staffing as appropriate.

Organo has revised its medium-term business plan in view of a more challenging business outlook for Japan and overseas, particularly in view of a prolonged slowdown of the Chinese economy. It has accordingly positioned itself to expand market share and to secure solid revenues even in shrinking markets, largely by updating its management plan annually to address fluctuations in its business environment.

#### *Construction*

Tohoku Denki Tekko will continue to enhance its cost structure and public works labor and material costs. The subsidiary's strategic objectives include adopting a solutions-oriented sales approach in its industrial electrical machinery businesses that goes beyond hardware to planning, construction, and installation. New business is always a priority. And the subsidiary will develop its bag filter system business to lift its reputation as a systems provider.

### **Medium-Term Business Plan**

Over the next three years, Organo will prioritize areas offering the most potential. It will cultivate domestic business for power plants and establish operations overseas where electricity demand is expanding. It will also enhance its equipment and systems businesses for the supply of ultrapure water and other washing agents. Measures for functional products will include developing and improving the functionality of products for standardized water treatment equipment, developing functions for ion-exchange resins and other materials, and expanding scale by cultivating new markets.

The Engineering Group's construction-related priorities will be on bolstering Tohoku Denki Tekko's technological and service capabilities. This will be part of efforts to optimize customer satisfaction.

## OTHER

### Snapshot

Tosoh is committed to close connections among its business operations and customers. It relies on its other businesses to ensure those connections. Timely support of its diverse operations is mission critical for Tosoh. Tosoh's other businesses, therefore, are always on call.

In addition to trading companies, Tosoh's other businesses include professional services that assist the Tosoh Group. These include logistics, administrative services, personnel training, information technology (IT) support, and more. Other businesses also contribute essential research and analytical support for Tosoh's introduction of innovative technologies, products, and services.

Tosoh works to ensure that each of its other businesses evolves from a cost center to a profit center. And it ensures that they compete with external suppliers for Tosoh Group business, which benefits them and the Tosoh Group by promoting cost- and administrative effectiveness and technological advances.

### Group Performance and Markets

#### *A Solid Performance in a Challenging Environment*

Other sales declined 3.1%, to ¥39.7 billion (US\$352.6 million), and accounted for 5.3% of Tosoh's consolidated net sales, an increase from 5.1% a year earlier. Operating income was down 9.6%, to ¥2.6 billion (US\$22.8 million), and the group's operating margin, at 6.5%, was also down, from 6.9% in fiscal 2015.

The main factor in the declines was a drop in trading company sales, which offset robust sales at logistics subsidiaries.

### Strategies and Outlook

#### *Logistics*

Logistical support for Tosoh Group companies falls into four categories. The first is to reduce manpower requirements and improve efficiency. The second is to provide risk management processes and other procedures to upgrade safety and quality. The third is to ensure that shipping terminals and warehouses can meet changing needs and optimize shipping route traffic. The fourth is to support overseas expansion.

The Urethane Division that Tosoh formed as a result of its merger with NPU will benefit from ongoing logistical support. Tosoh's other businesses will furnish that division with the logistics it needs to integrate its operations and capture synergies. They will also provide logistics to help the Urethane Division and Tosoh Silica Corporation improve their earnings.

#### *General Services*

Tosoh has established other, general services businesses to handle personnel management and employee benefit administration and training. They also encourage subsidiary and affiliate participation in the Tosoh Group salary administration system to further ongoing efforts to raise group-wide efficiency. Tosoh's general services businesses, moreover, seek to expand and enhance their offerings to optimize the health and safety of Tosoh Group employees.

#### *Analysis and Research*

Tosoh's analysis and research businesses provide an array of sophisticated services to Tosoh Group companies worldwide. These businesses specialize in the organic, inorganic, and polymer chemistry and the electronic materials that underpin Tosoh's product and application development programs.

They also prioritize bolstering Tosoh's technical capabilities, brand reputation, and profitability. They accordingly engage in structural analysis, organic chemistry, surface analysis, high molecular weight polymers, and inorganic chemistry for Tosoh Group companies. Around half of their analysis and research is at the Nanyo Complex, while the remainder is at the Yokkaichi Complex and at various Tokyo-based Tosoh operations.

To maintain first-rate analysis and research capabilities, Tosoh annually allots related other businesses a substantial equipment budget. This enables annual installations of state-of-the-art equipment to upgrade analysis and research for the Tosoh Group. And that, in turn, helps those businesses to become more marketable outside the Tosoh Group in striving to become strong, independent profit centers for Tosoh. External sales in analysis and research have edged up in recent years, and there is every expectation that these operations will cultivate more work from external customers going forward.

#### *Information Systems*

Other businesses offering information systems services maintain servers, personal computers, and networks across dozens of domestic companies. Their work spans administrative and factory operation systems. And their development of an enterprise resource planning system allows Tosoh management to assess the performance of Tosoh Group members in deploying and employing information systems.

Information systems-related other businesses are tasked with evaluating and introducing technologies, systems, and services. They also maintain and upgrade systems and services across the Tosoh Group and thereby reduce group-wide IT costs.

The other businesses involved with information systems services continue to reinforce the skills of their employees through education. Specific areas of training include learning how to write applications for the group's core IT systems, acquiring proficiency in diverse programming languages, and cultivating skills in innovation and process improvement.

## CORPORATE SOCIAL RESPONSIBILITY

### PRESIDENT'S MESSAGE

#### **Knowledge and effort are helping us make steady progress in implementing our three-year plan**

*Our basic Responsible Care (RC) policy in fiscal 2016 was to ensure highly focused, safe workplaces and to heighten the performance of our RC program. We saw improvements in our safety record during the year under review as a result of our safety activities, but unfortunately we were unable to achieve our goal of zero accidents and zero lost work-time incidents. It is our aim to continually improve our safety record while striving to expand and enhance the profitability of our business.*

#### **Transitioning to Corporate Social Responsibility Reporting**

In fiscal 1997, Tosoh began publishing RC reports to communicate its commitment to Responsible Care throughout the life cycle of its products. Our focus was on health, safety, and environmental considerations.

More recently, we have shifted that focus to the development of a governance system committed to optimizing our working conditions and workplace environments and to involvement with our local communities and other stakeholders. We are therefore replacing our RC reporting for fiscal 2016 with corporate social responsibility (CSR) reporting to better convey our activities in these areas.

We have also, for the first time in 30 years, drafted a medium-term business plan, chiefly in response to Japan's Corporate Governance Code, which came into effect during our fiscal 2015. And in the context of introducing our CSR reporting, I also want to take the opportunity to present that 3-year plan.

#### **Striving for a Year of Greater Growth**

We are determined in the year ahead to implement our 3-year, medium-term business plan and to achieve its goals. Fiscal 2017 will be a year of greater advancements for Tosoh as it evolves further into a company with both strong commodity and strong specialty product lines.

We maintain a high operating capacity at those of our plants that produce long-lasting commodity products. But to continue to grow, we believe that it is necessary to augment plant production capacity, with new plant construction if need be; to increase the cost-competitiveness of our products; and to release increasingly high-value-added products.

Although we enjoy widespread market recognition for the functionality of our specialty products, we are also moving to realize a specialty business structure that is resilient to external factors. We are engaged in research and development (R&D) initiatives to produce technologies that

meet our customers' needs fully and quickly. This sees us bringing to market high-value-added and entirely new products.

#### **Moving toward the Elimination of Accidents and Industrial Disasters**

In November 2011, Tosoh experienced a major explosion and fire that resulted in tragedy. We resolved then to never allow such an accident to occur again, and over the past three years we have invested ¥10 billion to improve the condition of our plants. It is gratifying to see the fruits of our investments and efforts—our safety record is improving.

Going forward, we will convey technical skills to, provide training for, and encourage higher levels of awareness among our employees with regard to safety. We will, in short, continue to improve our workplaces. In fiscal 2017, visits will be made to the control rooms of the plants at our Nanyo and Yokkaichi Complexes in an ongoing effort to look for ways to ensure that our plant environments allow for work to be carried out in the calm, methodical manner required for safe operations.

Efforts and gains in safety at parent company operations notwithstanding, unfortunately there has been no reduction in industrial accidents at Tosoh Group companies. Employees there are no less important than employees at the parent company. So we will take every opportunity to ensure that the safety policies applied at the parent are likewise implemented at all group companies. Our goal, of course, is to eliminate accidents and disasters throughout the Tosoh Group.

#### **Becoming a Company that People Trust**

Realizing that goal will ultimately help us achieve our mission of being viewed by all as a reliable manufacturer of products that are safe and that contribute to society. That mission in mind, we are working diligently at our production bases to earn the confidence of the surrounding communities. Tosoh will continue to seek the trust of its stakeholders in its R&D, its manufacturing, its quality assurance, its logistics, and its products. And as always we look forward to your ongoing support and encouragement.

Toshinori Yamamoto  
President, Tosoh Corporation

## MESSAGE FROM THE CHAIRMAN OF THE RC COMMITTEE

**Our safety initiatives are beginning to bear fruit. We will build on these results while maintaining stable business operations.**

At Tosoh, we engage in Responsible Care (RC) activities based on the RC activity guidelines discussed and decided by the RC Committee and on policies that we've devised in line with the needs of our business and research facilities. Implemented RC activities are monitored by our plant managers and the RC Committee chair. Responses to issues that emerge in the course of oversight are included in the activity guidelines for the following year through a PDCA (plan-do-check-adjust) cycle. In this way, we strive to ensure peace of mind for all through safe operations.

Our safety record with regard to disaster prevention and occupational safety and health has unfortunately been such that we have not met our goal of zero incidents. But our safety efforts have begun to yield results, indicating that we are on the road to improvement. I believe, though, that continued gains in this regard make it vital that we carry out increasingly focused safety activities.

Environmentally, our operations have been without significant issues. Our acquisition, however, of Nippon Polyurethane Industry Co., Ltd., in October 2014 makes it necessary for us to proceed with our plans to reduce our atmospheric emissions of materials listed in Japan's Pollutant Release and Transfer Register (PRTR).

There is similarly a greater need than ever before for us to assure product quality given the extent to which the mainstay of our business has shifted toward raw materials for specialty products. We need to prioritize tasks in our quality assurance system and even to rebuild that system to suit the changing structure of our business.

My wish is for Tosoh to engage in RC activities that recognize the importance of working hand in hand with everyone who handles Tosoh products and with our customers and the communities where our production facilities are located.

Keiichiro Nishizawa  
Director, Executive Vice President, Tosoh Corporation  
Chairman, RC Committee

## Environmental Accounting

Environmental cost-benefit accounting quantifies Tosoh's environmental programs. In fiscal 2016, investments in environmental preservation amounted to ¥1.40 billion (US\$12.4 million).

## Health, Safety, Environmental Management

### *Principles Regarding the Environment, Safety, and Health*

Tosoh Corporation contributes to the advancement of society through continuous innovation in chemistry, leading ultimately to the supply of products and services to the satisfaction of customers. At the same time, Tosoh continues to regard environmental protection, safety, and health as top management priorities.

### **Action Policies**

#### Basic Stance

- Promote initiatives with an awareness of the obligation to comply with laws and regulations and self-responsibility
- Set targets, draw up action plans, and implement actions with the participation of all concerned
- Incorporate audit results in future action plans

#### Environmental Protection Initiatives

- Conserve energy and resources through the use of the smallest-possible quantities of resources to obtain the greatest-possible benefits
- Reduce emissions and waste through improved manufacturing processes and operational management

#### Safety Assurance Initiatives

- Prevent accidents and respond to disasters through facility safety management
- Maintain and manage emergency response capabilities through safety drills
- Eliminate accidents and disaster effects through the analysis of case studies

#### Product-Related Environmental and Safety Assurance Initiatives

- Allow consideration for the environment, safety, and health to guide product design and the development of manufacturing processes
- Undertake prior assessment during the development of new products and processes
- Ensure product safety through total quality management

#### Communication Initiatives

- Provide safety management-related information for products and chemical substances
- Enhance public confidence through dialogue about business activities

#### Responsible Care Committee

Tosoh's RC Committee guides and promotes the company's RC activities. The committee is chaired by the director responsible for the company's Environment, Safety and Quality Control Division, and its members include general managers from Tosoh's Purchasing and Logistics Division, operating divisions, manufacturing complexes and offices, and research centers. The RC Committee devises an annual RC activity plan and presents it to Tosoh's president. The president, in turn, presents the plan to the Board of Directors, which makes the final decision on the activities planned. Tosoh's manufacturing complexes and offices subsequently flesh out the plan's details and implement its planned activities.

#### Responsible Care Activities

Guided by core policies, Tosoh made progress with its various RC initiatives in fiscal 2016. The company improved its safety record, but, regrettably, incidents still occurred. In the year ahead, Tosoh will raise the level of its RC activities to achieve its main objectives of zero incidents and lost time.

#### Stewardship

##### *Stewardship of Social Responsibility*

We undertake to continuously innovate products that contribute to the sound development of society, to provide a reliable supply of our products, and to gain the trust of society.

We strive to be a prosperous business and a cooperative and contributing member of the local communities where we do business.

#### Preparedness for Major Earthquakes

The Great East Japan Earthquake of 2011 taught Japan's Central Disaster Prevention Council and other groups that major earthquakes might occur and cause serious damage even where tremors are rare. Meetings in March and August 2012 produced conclusions about earthquakes and tsunami based on analyses of the Nankai Trough using megaquake models. Those conclusions, published in December 2013 and March 2014, included maps and more indicating the impact of tsunami on Yamaguchi Prefecture, home to Tosoh's Nanyo Complex, and Mie Prefecture, home to Tosoh's Yokkaichi Complex.

The Nanyo and Yokkaichi Complexes comply with all legal requirements, including Japan's Construction Standards, High-Pressure Gas Safety Law, and Fire Service Law. They are, with the exception of some electric power generation, designed to safely cease operation at a specified magnitude of earthquake.

Both complexes, moreover, have introduced measures and continue to plan more on an ongoing basis that prioritize saving lives. They hold comprehensive disaster prevention drills for earthquakes and have set up web cameras to enable the remote monitoring of conditions at each complex during a disaster. They have also assessed and reinforced as necessary the earthquake resistance of facilities that have an important role under emergency conditions. In addition, they have in place countermeasures and evacuation procedures in the event of soil liquefaction caused by an earthquake and flooding caused by a tsunami. The complexes have as well stockpiled emergency supplies to sustain employees unable to return to their homes in the aftermath of a disaster.

#### ENVIRONMENT AND SOCIETY

##### Input and Output

Tosoh products are manufactured by reaction, cracking, and distillation. We utilize our power generation plants and coal-fired boilers to supply the electricity and steam, respectively, for reactions and cracking. We use industrial water and seawater to cool reactions.

To balance our product output, we manage our generation of electricity and steam. We also manage our emissions to reduce the burden our production activities place on the environment.

##### Effective Use of Resources

Tosoh makes a significant contribution to recycling in its operations and in the surrounding communities. We collect waste produced on location and from households and other companies near our operations and recycle it into new products.

Tosoh processes much of its waste, such as coal ash, as raw materials at its cement plant. Our Nanyo Complex is able to process not only industrial waste from its facilities' operations and those of nearby companies but also household garbage from local communities.

### **Industrial Waste Emissions**

Tosoh almost completely disposes of and recycles its industrial waste. What we don't process we make available for use outside the Tosoh Group or dispose of in landfills.

Tosoh double-checks the specifics of each type of waste for disposal before issuing a manifest on handling industrial waste. Through our manifests, we supervise waste leaving our facilities on-site and confirm final waste disposal or reuse. We also annually inspect our disposal sites.

### **Product Safety**

Tosoh's raw materials and products contain specified-use and restricted substances under Japan's Fire Prevention Law, Law Concerning Poisons and Other Harmful Substances, and other laws. It is essential to ensure safety at each processing stage in our operations, including R&D, manufacturing, logistics, and quality assurance. Tosoh complies with safety requirements under its RC goals of chemical product safety, quality assurance, logistical safety, and other internal directives.

#### *R&D*

R&D encompasses improving and developing products, from basic materials to cutting-edge technologies. Our R&D programs develop products that meet customers' needs safely and reliably.

#### *Manufacturing*

The main mission of a chemical company is to provide stable product supply. To that end, Tosoh sets up committees to ensure safe operations when adding new equipment, expanding production capacity, and maintaining and upgrading facilities.

#### *Quality Assurance*

Tosoh's quality management system is all-encompassing. Its emphases include responding promptly to customer inquiries.

#### *Logistics*

Tosoh conducts training programs for the companies that transport its products. Our aims are to raise safety awareness and to establish safe supply lines between our operations and our customers.

### **Safe Sourcing of Chemical Products**

Tosoh carries out initiatives to ensure compliance with domestic and foreign legal regulations for the safe handling of chemicals. These include assessing product safety and providing product information.

#### **Tosoh Initiatives**

- Tosoh provides safety data sheets (SDS) to ensure the safe handling of its products. The SDS accord with unified international classification and labeling requirements known as the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).
- Tosoh submits notifications, registrations, and applications in compliance with such domestic laws as the Chemical Substances Control Law, the Industrial Safety and Health Act, and the Pharmaceutical and Medical Device Act.
- Tosoh complies with such foreign legal regulations as Europe's Registration Evaluation Authorization and Restriction of Chemicals (REACH).
- Tosoh participates in the autonomous Japan Initiative of Product Stewardship (JIPS) movement promoted by the Japan Chemical Industry Association. JIPS aims to minimize the effects of chemical products on health and the environment.

### **Human Rights, Human Resources, Diversity**

#### *Human Resources*

Tosoh's human resources system inspires and rewards employees. Employees are inspired to take ownership of their responsibilities and are rewarded for proactively exhibiting a strong sense of such ownership.

#### Principles

*Creative Organization.* Enabling employees to realize their potential

*Challenging Environment.* Applying a grading system for thorough employee evaluation

*Impartial Treatment.* Rewarding employees who make an effort

#### *Employee Education Programs*

Tosoh has long provided education and training programs to enhance knowledge and skills, foster employee interaction, generate a stimulating workplace, and cultivate leaders and

innovators. The company's offerings include on-site, manager and other rank-based, and vocational training. Classes that promote internationalization are also provided.

#### *Recruitment Policies Promote Diversity*

Tosoh follows a nondiscriminatory policy when it comes to hiring new recruits. Tosoh also implements a program of reemploying retired employees so that they can pass on their technical skills to new employees.

#### **Contribution to Society**

Tosoh's many initiatives include promoting two-way communication with all its stakeholders, foremost among them the residents of communities neighboring the company's facilities. The company seeks to raise the quantity and quality of such communication exchanges by providing convenient venues for such activities.

Tosoh uses meetings at these venues as opportunities to encourage an understanding of its operations and RC activities and to listen to the opinions of all interested parties. In this way, Tosoh in part fulfills its commitment to being a company that can be trusted and relied on.

### **GOVERNANCE**

#### **Corporate Governance and Management System**

Tosoh has established a system that enables prompt responses to changing business environments and thereby raises corporate value. We strive for sound management and a high degree of fairness and transparency.

Tosoh's corporate governance and management system comprises committees consisting of directors and general managers from throughout the Tosoh Group. All committees—the Internal Control Committee, Compliance Committee, Antimonopoly Compliance Committee, and the Export Supervision Committee—all function to gain the trust of society.

#### **Compliance**

##### *Antimonopoly Compliance Committee*

The Antimonopoly Compliance Committee prepares in-house rules, manuals, and other instruction methods to ensure compliance with Japan's Antimonopoly Act. The committee also holds meetings on a timely basis to deliberate and make decisions on necessary actions on an ongoing basis. Its Legal and Patents Department conducts hearings on sales price revisions proposed by the sales departments of business divisions. It also holds hearings to confirm whether there have been any meetings with competitors regarding pricing and bidding on government contracts.

The committee annually holds in-house seminars to heighten an awareness of and to ensure compliance with such laws as the Antimonopoly Act and the Act against Delay in Payment of Subcontract Proceeds, Etc., to subcontractors.

##### *Export Supervision Committee*

The Export Supervision Committee prepares in-house rules, manuals, and other instruction methods to ensure compliance with Japan's Foreign Exchange and Foreign Trade Act. The committee also holds meetings appropriately to consider and make decisions on necessary actions. The committee decides on the export management procedures for cargo and other items that fall under Japan's list control and catchall control regulations. Its Export Department manages the procedures. The committee also holds in-house seminars annually to ensure legal compliance with export controls. A total of 251 employees attended its seminars in fiscal 2016.

#### **Internal Control and Risk Management**

##### *Internal Control Committee*

The Internal Control Committee, which convened five times in fiscal 2016, oversees Tosoh's compliance with the financial reporting requirements of Japan's Financial Instruments and Exchange Act. Specifically, it supports the design and improvement of our internal controls.

It evaluates the effectiveness and, based on evaluations by our Audit Office, the status of our internal controls and generates plans therefor. It also prepares and publicly issues internal control reports. Its membership comprises general managers from related departments.

##### *Compliance Committee*

Our Compliance Committee structures Tosoh's compliance systems; formulates its corporate behavior guidelines; and undertakes and implements compliance-related training, research, and fact-finding. The committee issues a code of conduct applicable to the entire Tosoh Group that establishes high standards for group-wide compliance.

The committee has also established a compliance hotline that allows employees and others to anonymously report compliance-related indiscretions. The Compliance Committee, meanwhile, highlights the latest compliance-related developments on Tosoh's intranet. Those highlights include quizzes on compliance, real-life examples of compliance, and more to heighten employee awareness of the importance of compliance.

## BOARD OF DIRECTORS

|                     |                                    |
|---------------------|------------------------------------|
| Toshinori Yamamoto  | Representative Director, President |
| Sukehiro Itoh       | Representative Director            |
| Masaki Uchikura     | Director                           |
| Keiichiro Nishizawa | Director                           |
| Katsushi Tashiro    | Director                           |
| Kouji Kawamoto      | Director                           |

|             |                   |
|-------------|-------------------|
| Tsutomu Abe | External Director |
| Kenji Ogawa | External Director |

## AUDIT & SUPERVISORY

|                  |                  |
|------------------|------------------|
| Katsumi Ishikawa | Internal Auditor |
| Eiji Inoue       | Internal Auditor |

|                  |                  |
|------------------|------------------|
| Tetsuya Teramoto | External Auditor |
| Tsuneyasu Ozaki  | External Auditor |

## CORPORATE OFFICERS

|                     |  |
|---------------------|--|
| Toshinori Yamamoto  | President  |
| Sukehiro Itoh       | Executive Vice President; President, Chlor-alkali and Petrochemical Groups   |
| Masaki Uchikura     | Executive Vice President; President, Specialty Group; Senior General Manager, Advanced Materials Division  |
| Keiichiro Nishizawa | Executive Vice President; President, Engineering Group; Senior General Manager of Research and Development Planning; Director, Organo Corporation  |
| Katsushi Tashiro    | Executive Vice President; Senior General Manager, Nanyo Complex  |
| Kouji Kawamoto      | Executive Vice President; Manager, Corporate Control & Accounting; General Manager, Purchasing & Logistics; External Director, Lonseal Corporation |
| Masayuki Yamada     | Senior Vice President; Senior General Manager, Bioscience Division   |

|                    |   |
|--------------------|---|
| Nobuaki Murashige  | Senior Vice President; Senior General Manager, Yokkaichi Complex  |
| Shingo Tsutsumi    | Senior Vice President; Senior General Manager, Chlor-alkali Division; General Manager, China Operations   |
| Etsuya Ikeda       | Senior Vice President; Deputy Senior General Manager, Nanyo Complex   |
| Yutaka Nakamura    | Vice President; Senior General Manager, Human Resources   |
| Akira Omura        | Vice President; Senior General Manager, Polymers Division   |
| Katsumi Mineshige  | Vice President; Senior General Manager, Olefins Division  |
| Noriaki Ohshima    | Vice President; General Manager, Tokyo Research Center, Advanced Materials Research Laboratory  |
| Yutaka Kohmoto     | Vice President; Senior General Manager, Urethane Division   |
| Toshinori Hayashi  | Vice President; General Manager, Research & Development, Tokyo Research Center  |
| Noriaki Hajima     | Vice President; Deputy Senior General Manager, Yokkaichi Complex  |
| Nobuhiro Ogawa     | Vice President; Senior General Manager, Legal and Patents   |
| Mamoru Kuwada      | Vice President; Senior General Manager, Production & Technology Planning  |
| Akihiro Aiiso      | Vice President; Plant Manager, Tosoh Hyuga Corporation  |
| Masao Nakano       | Vice President; General Manager, Functional Inorganic Materials   |
| Jun Oyamada        | Vice President; General Manager, Osaka Regional Office  |
| Yoshiyuki Uchiyama | Vice President; Senior General Manager, Organic Chemicals Division; Director, Tosoh Organic Chemical Co., Ltd., Tosoh Finechem Corporation, Tosoh Nikkemi Corporation |
| Akira Hironaga     | Vice President; Deputy Senior General Manager, Nanyo Complex; General Manager, Technology Center  |
| Masanobu Kasai     | Vice President; Deputy Senior General Manager, Bioscience Division; Director, Tosoh AIA, Inc.   |

**CORPORATE OFFICERS (continued)**

|                  |  |
|------------------|--|
| Haruhisa Nishi   | Vice President; General Manager, Nanyo Complex Environment, Safety, and Quality Control  |
| Shunya Shinohara | Vice President; Plant Manager, Tosoh Finechem Corporation; Managing Director, Tosoh F-Tech, Inc., Tosoh Organic Chemical Co., Ltd. |
| Hisaoki Harada   | Vice President; General Manager, Nanyo Complex Cement & Energy Production  |
| Masayuki Kudo    | Vice President; General Manager, Urethane Division Planning & Coordination   |
| Toru Adachi      | Vice President; Senior General Manager, Corporate Strategy   |

(As of June 29, 2016)

## **RESEARCH AND DEVELOPMENT**

Our R&D programs aim to strengthen our core businesses and to enhance our ability to more quickly develop products aligned with the demands of the market. To stay on the leading edge in our priority fields, we stimulate internal cooperation to maximize organizational resources and generate synergies. We also collaborate in joint research projects with external research facilities, at universities and other educational institutions, and at public research laboratories.

Tosoh's R&D team consists of some 890 people focused on product and technology improvements and on laying the groundwork for future business. In fiscal 2016, Tosoh invested ¥13.7 billion (US\$121.6 million) in its R&D programs, up slightly from the prior fiscal year.

Tosoh's priorities in allocating R&D resources are life sciences, energy and environmental conservation, and electronic materials. All of the company's research laboratories focus on these fields.

Life sciences R&D operations strive to give developed and developing economies access to high-end diagnostics and biopharmaceutical technologies. Separation technologies and immunoassay and genetic testing reagents are central bioscience R&D themes. Resources are being devoted in particular to an emerging Tosoh strength in protein modification technology.

Energy and environmental conservation R&D focuses on themes related to shifts in the chemical industry driven by public opinion and regulation. Specifically, this involves R&D programs for high market growth potential rechargeable lithium-ion batteries (LIBs), for catalysts and chelates for removing harmful substances, and for solar power materials.

Electronic materials R&D is dictated by dynamic and sometimes dramatic advances in semiconductors and consumer electronics. R&D emphases revolve around technologies and materials for photomasks and substrates, thin layer deposition, solar power, and electronic displays to keep abreast of and to foster further evolution in the semiconductor and consumer electronics industries.

Discovering ways to combine the strengths of diverse R&D operations for optimum results is an ongoing quest at Tosoh. We constantly explore methods for integrating R&D thematically and for improving collaboration in R&D generally. Our R&D reorganization, in fact, was planned with these goals in mind.

Quality R&D springs from quality people. So we nurture the scientific and leadership skills of our R&D personnel. About six years ago, we introduced a management of technology (MOT) program to develop the skills of our R&D managers. A similar program fosters today's researchers at Tosoh. We also hold events to encourage cohesion among our R&D people and to provide opportunities for them to network and exchange information.

### **Organization**

Tosoh reorganized its R&D structure in fiscal 2015 according to technical field and function, giving the company the opportunity to realign its resources according to Tosoh Group priorities. What previously were the company's three main R&D laboratories are now seven facilities, including the Urethane Research Laboratory that was formerly NPU's R&D facility. The new structure is expected to speed the development of a wide array of exciting new products and materials.

Overall, the reorganization places the seven new research facilities into two categories. Some are product and technology development research laboratories, and others are long-term research laboratories.

#### *Product and Technology Development Research Laboratories*

##### **Inorganic Materials**

Research focuses on developing functional inorganic materials and technologies. Themes include high-performance HSZ for automobile applications, zirconia for dental material applications, and manganese oxide compounds for the cathodes of rechargeable LIBs.

##### **Polymer Materials**

Research emphasizes polymers and petrochemical products and technologies. Themes center on polyethylenes for various applications, including medical and ultrahigh molecular weight polymers and superior grades of chloroprene rubber and PVC pastes, and on applications for polyphenylene sulfide (PPS) and other petroleum resins.

##### **Organic Materials**

Research aims to develop functional organic materials and technologies. Themes include polyurethane (PU) foam catalysts and amine derivatives for environmentally friendly reagents and other applications and advanced electron and hole transport materials used in organic light-emitting diode (OLED) displays.

##### **Urethane**

Research centers on urethane-related materials and technologies. Themes include PU foam for cushion and flame-resistant and other materials and functional urethane for such products as paints and adhesives.

#### *Long-Term Research Laboratories*

##### **Life Sciences**

Research highlights biomedical- and medical-related materials and technologies. Themes include high-performance packing materials for the separation and purification of antibody drugs and early-stage cancer testing technology.

#### Functional Polymers

Research explores electronic, optical, and biofunctional polymers. Themes involve high-performance film materials for LCDs and heat-resistant substrate materials for flexible displays.

#### Advanced Materials

Research spans materials and technologies for energy and environmental conservation and for electronic materials, the two other priorities of Tosoh's R&D strategy. Themes include sputtering targets for LCD displays and organometallic materials for the next generation of integrated circuits.

### R&D by Business Group

#### *Specialty Group*

R&D for the Specialty Group focuses on life sciences, energy and environmental conservation, electronic materials, and other areas. Our life sciences R&D is developing next-generation analyzers and reagents for our immunoassay analyzer business. It is also developing products for the diagnosis of infectious diseases in connection with Tosoh's genetic testing business.

Our emphasis in life sciences R&D is on separation and purification media for the rapidly growing biopharmaceuticals market and on liquid chromatography columns for analysis. Tosoh participates in Japan's Manufacturing and Technology Association of Biologics and is involved in developing innovative processes for the purification and analysis of antibody drugs.

In addition, we are making headway in developing microfabrication technology for early cancer detection. And we are working on developing fashion-use color zirconia for such accessories as watches and those found in automobiles. Tosoh is also developing high-translucency zirconia for dental applications.

Our energy-related R&D work sees us developing improved manganese oxide materials for use in the cathodes of rechargeable LIBs, a sector of the market for which growth is forecasted. And in the interest of environmental conservation we continue to develop zeolites for use in automotive catalytic converters and for new applications. Our ongoing R&D of foam catalyst amine derivatives, meanwhile, led to our commercialization of emission-free reactive amine catalyst RZETA. Similarly, we continue our R&D of heavy metal treatment agents for fly ash processing and wastewater treatment.

Electronic materials R&D sees us pressing ahead with the development of advanced electron and hole transport materials for OLED displays. We have also commercialized sputtering targets for low-temperature, low-resistance thin films used in touch-panel displays and are working on their next generation. In addition, we are responding to increasing demand in semiconductor miniaturization with organometallic compounds and quartz components for

next-generation semiconductors. We are also engaged in the R&D of coating-type organic semiconductor materials, a key material in printed electronics.

Fiscal 2016 Specialty Group R&D spending was approximately ¥7.9 billion.

#### *Chlor-alkali Group*

R&D for the Chlor-alkali Group centers on innovations to Tosoh's core vinyl isocyanate chain. We are developing improved manufacturing processes for isocyanates, the raw material for polyurethane, and aggressively developing new formulas for polyurethane foam, elastomers, coatings, and other urethane-related products.

We are also devising new materials in collaboration with scientists in other fields. Specifically, we are combining forces to produce uniquely lightweight, highly durable, and environmentally friendly automobile seat cushions that are thinner, lower in density, and more robust. They are made wholly of MDI using advanced, low-VOC technology.

Our functional polyurethane R&D, meanwhile, is aggressively developing clear, low-viscosity curing agents and raw materials for chemical-resistant coatings for synthetic leather urethane resin and plastic paints for automotive-related applications. We are also pursuing continuous, energy-saving innovation in electrolytic technology.

Fiscal 2016 R&D expenditures for the Chlor-alkali Group amounted to about ¥2.6 billion.

#### *Petrochemical Group*

Petrochemical Group R&D is dedicated to developing and improving polymers and related technologies. R&D into unique, high-value-added polyethylene products of superior functionality is ongoing. In addition, Tosoh is developing and improving new grades of laminate products, food packaging materials, and other related products. We are, for example, making progress toward clean, heat-resistant grades of polyethylene products intended for medical applications.

Using Tosoh's new, proprietary catalyst, the Petrochemical Group has developed Dekamiren<sup>®</sup>, a world-class, ultrahigh molecular weight polyethylene (UHMWPE). Applications being developed for this product are wide ranging and include separators for lithium secondary batteries, sliding parts, and more.

In the meantime, the market for polyphenylene sulfide (PPS) is growing, particularly for its use in smartphone bodies, and this has contributed to increased group sales of PPS. Petroleum resins, too, are contributing to the group's bottom line because they are in demand to boost tire performance as eco-tire modifiers. Also with regard to automobiles, we have been researching and developing grades of chloroprene rubber (CR) that are appropriate for transmission belts, a Tosoh specialty. Customers appreciate the durability of Tosoh's CR-based transmission belts.

Tosoh is the world's top manufacturer of chlorosulphonated polyethylene (CSM). By further improving the functionality of our CSM, we are raising the quality of and expanding the market for an already high-quality product. We are likewise developing new uses for our PVC paste

beyond wallpaper and flooring materials by listening to the market and responding to customers' needs. And we are moving ahead with developing polymer materials based on our unique concepts for their use as LCD materials, flexible display substrate materials, and other applications.

Fiscal 2016 R&D expenditures for the Petrochemical Group were around ¥1.9 billion.

#### *Engineering Group*

Tosoh subsidiary Organo Corporation's R&D Center is core to Engineering Group R&D. The facility emphasizes basic technologies, new products, and product quality. It also promotes the sale and service of water treatment equipment, such as pure, ultrapure, and clean water producing equipment; large-scale wastewater treatment plants and standard water treatment equipment; water treatment chemicals; and food additives and materials for food processing. The R&D Center has commercialized monosaccharide separation chromatography separating materials and cabinet-type pure water manufacturing equipment.

Fiscal 2016 Engineering Group R&D spending was approximately ¥1.4 billion.