

# STARCH

Properties and applications of starches



# About Us

Thailand is a country with many agricultural areas and top agricultural products in the country. And Thai agricultural products exported in ASEAN, including rice and rice products, Cassava and products, Sugar and rubber products, fruits such as fresh longan, fresh durian, mangoes etc.

CMC (Thailand) is a company that specializes in procurement and procurement. All types of tapioca starch, we have strengths in finding quality raw materials that meet the needs of customers. And is also a company that supports fast delivery. Because the company has made inventory to respond to the needs of customers as well.



<http://www.Chengming.com>





# CONTENT

## PRODUCT APPLICATIONS

AMPHOTERIC STARCH

CATIONIC STARCH

OXIDISES STARCH

MODIFIED STARCH

## FOOD INDUSTRY

NATIVE STARCH

EXTRUDATES STARCH

PHOSPHATE STARCH

## DUSTING POWDER

## TEXTILE INDUSTRY

## PAPER AND BOARD

STARCH FOR WET END

STARCH FOR SPRAYING

STARCH FOR SURFACE SIZING  
AND COATING

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# Product Applications

Modified starch is used in various industries and thus creates more value-added to a wide range of Thailand's agricultural products in the export market.

Production lines are divided into two separated groups. The first one is the food-starch product line which greatly emphasizes on cleanness, hygiene, safety, and quality. The other is the industrial-starch product line where quality is marked as the first priority. At present, the company has 6 core production lines consisting of:

- 1) Cationic and Amphoteric Starch
- 2) Oxidized and Cationic & Oxidized Starch
- 3) Native Starch and Modified Food Starch
- 4) Dusting Powder
- 5) Phosphated Starch
- 6) Extrudates Starch



# Amphoteric Starch

Amphoteric starch is a modified starch that contains positively and negatively charged substituent groups. It is used as wet-end additives, surface sizing agent and coating agent in the paper mill industries.

In the paper making process several materials are anionic such as wood fibers, titanium dioxide, clay, expanders, pigment dispersant, black liquor, bleach chemicals etc, whereas some materials are cationic such as alum, polyaluminium chloride (PAC), cationic resin, some retention aids etc. So it is very significant to maintain a clean and ionically balance environment to attain efficient result, which is done by amphoteric starch.

Amphoteric starch at the same time contains cationic group and anionic group. Usually cationic groups can be amino, ammonium, sulphonium or phosphonium group whereas anionic groups may be phosphate, phosphonate, sulfate, sulfonate or carboxyl groups. Among these cationic groups quaternary ammonium group is more preferred by the paper makers.

On the other hand among the anionic groups phosphate group is best choice. The position of the anionic groups and cationic groups may be at same position or different position in the starch. The effective raw material for producing amphoteric starch is waxy maize due to highly content amylopectin.

## Function of amphoteric starch

The benefits of amphoteric starch are following; especially when alum and PAC are used in paper making process.

- Enhances dry strength properties
- Improve drainage which lead to better sheet formation.
- Retention of fines and fillers
- Better print quality





Brighten your paper with

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# Cationic Starch

Cationic starch is produced by treating the slurry of partially swollen granules of starch with a reactive compound. This reagent contains quaternary nitrogen, yielding a positive charge that is independent of PH. The reagent usually attaches to the starch at the C6 position, the most accessible of the -OH groups. the typical level of derivatization is one to two charged groups per hundred glucose units. Because the reaction is usually carried out in slurry, it is expected that the distribution of charged groups will be highly non- uniform. Cationic Starch finds extensive use in the paper industry and its key functions are as a Dry strength additive, Emulsification of sizing efficiency at lower alum level, which ultimately helps to reduce lighting problem of paper.

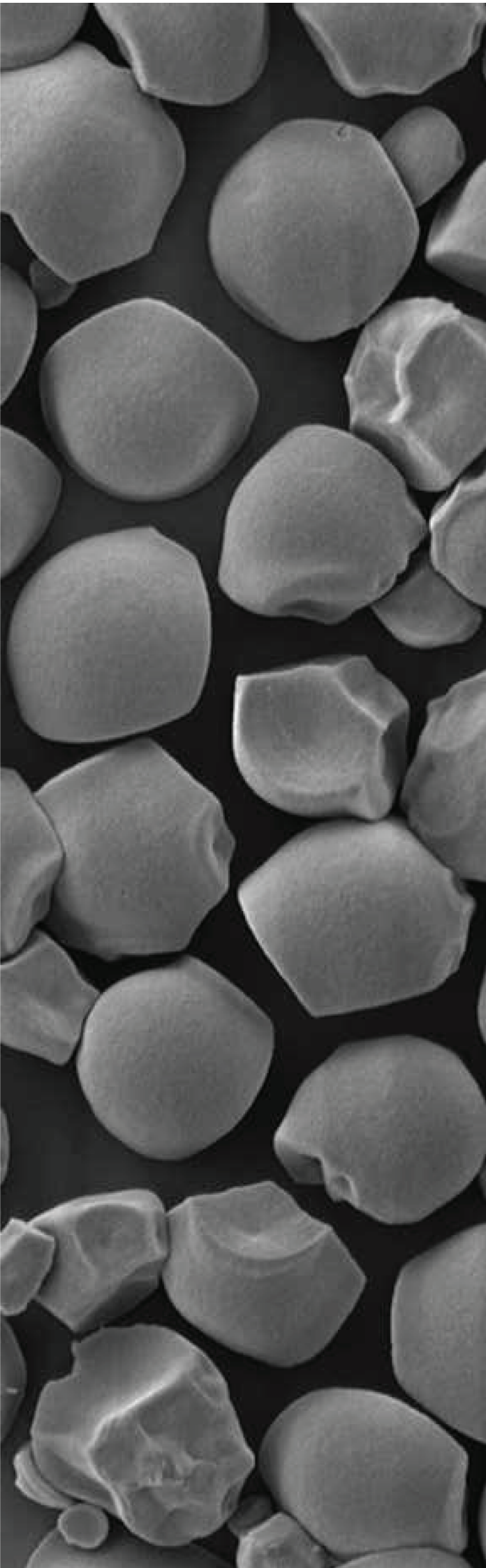


# Oxidised Starch

Native starch is treated with a variety of oxidizing agents and oxidized starch as are obtained. oxidized starches have shorter chain lengths than native starches. It improves whiteness and reduces microbiological content. In addition, the hydrogen bonding reduces the tendency to retro-gradation. Producing soft- bodied gels of high clarity, oxidized starches are the best thickener for applications requiring gels of low rigidity. This improves adhesion in batters and breading.

Diluted solutions of highly oxidized starches remain clear on prolonged storage, making them suitable for clear, canned soups and transparent confectionery products. oxidized starch is also widely used in surface sizing for paper industry and for warp sizing in textile industry. Lamination, paper coating, paper Adhesive building materials.





# Modified Starch

Modified starch is an additive prepared by treating starch or starch granules, causing the starch to be partially degraded. Modified starch is used as a thickening agent, stabilizer, or an emulsifier. Apart from food products, modified starch also find use in paper manufacturing, Pharmaceuticals and various other industrial applications. Starches are modified to increase their stability against excessive heat, acid, and freezing to change their texture or to lengthen or shorten gelatinization time. A modified starch may be an instant starch which thickens and gels without heat, or a cook-up starch. While Acid-treated starch is prepared by treating starch or starch granules with in-organic acids. Other treatments may produce modified starch with different enzymes, such as alkaline- modified starch bleached Starch Oxidized starch Enzyme-Treated starch oxidized starch, Enzyme, Treated starch Acetylated starch and Acetylated Oxidized starch.







# Food Industry

Key features of starch are s a source of carbohydrates but still qualified Another that makes the dough Tapioca has an important role in the food industry is

1. Helps to cause thickener in food
2. The food to stabilize
3. Food coalesce better
4. Food is a binder

Besides that, starch is also an easy thing to find. And the price is quite cheap Baby food, Bread products, noodle, sausage, ice cream etc. Everything as said is made from flour as well.

# Native Starch

Native starches are basically pure forms of starch. They can be obtained from sources such as corn, wheat, potato, rice, cassava and tapioca. These long-chain carbohydrates are insoluble in cold water and swell to different degrees, depending on type and temperature. Native starches have been used for decades in the food industry, but because of limitations such as breaking down when reheated or in acidic environments, some food manufacturers moved to using food starches which have been physically, chemically or enzymatically modified.







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# Native starches may often be used to meet product needs

CMC have studied the properties of dozens of native starches. They have discovered that via custom blending and careful formulations, these basic starches can successfully fulfill many product requirements

## Native starch functionalities:

- Thickening
- Texturizing
- Stabilizing
- Moisture retention
- Gelling
- Film forming
- Dusting
- Dough binding

## Native starch applications:

- Bakery mixes
- Frozen cakes
- Sheeted snacks
- Batters & breadings
- Brewing adjuncts
- Dry mix soups and sauces
- Pet foods
- Processed meat
- Pudding powders
- Cold Process Salad dressings & Dips
- Frozen prepared entrée sauces
- Fruit Preps



# Extrudates Starch

Extruded starch is one of the most versatile commodity products due to its properties and thickening agents to form gels. Depending on the properties, extruded starch products are used to impart appropriate texture, the form (state), moisture, consistency and stability during storage. Tapioca starch extrusion forms a viscous, transparent paste, compared to corn and wheat starches. Therefore, it is widely used for the production of ketchup and sauces and mayonnaise with a low fat content. Technically, tselyukukuruzny and potato starch extrusion used in the paper industry, the textile and pharmaceutical industries, as well as in the manufacture of mortars.







# Phosphated starch

Is a modified resistant starch. It is derived from high amylose maize starch and contains a minimum of 70% dietary fiber. It is currently used as a food additive as a freeze-thaw-stable thickener (stabilizes the consistency of the foodstuff when frozen and thawed) within the European Union in products such as soups, sauces, frozen gravies and pie fillings.



# Dusting Powder

Dusting powder is prescribed for the skin for the therapeutic, hygienic, or cosmetic reasons. Powdery, chemically inert plant substances (various starches) and mineral substances (talc, zinc oxide, kaolin) are usually used in dusting powder.

By drying and cooling the skin, dusting powder allays inflammation. Its hygroscopic particles adsorb perspiration and sebum and increase the surface of evaporation and heat exchange. When necessary, substances with pharmacological properties are added to dusting powders. They are used to treat acute skin inflammations, to cleanse the skin when there is increased sweating or seborrhea, to protect the skin from external irritations (solar rays), and, sometimes, to make ointments and creams adhere better to the skin. Various oils, special dyes, fragrances, and essential oils are added to cosmetic dusting powders.



# Textile industry

The thread that will be used to weave the fabric has to go through the plating process the flour first the thread will be smooth and smooth without hair also besides in the process of printing the fabric, the flour will assist to print the pattern evenly.







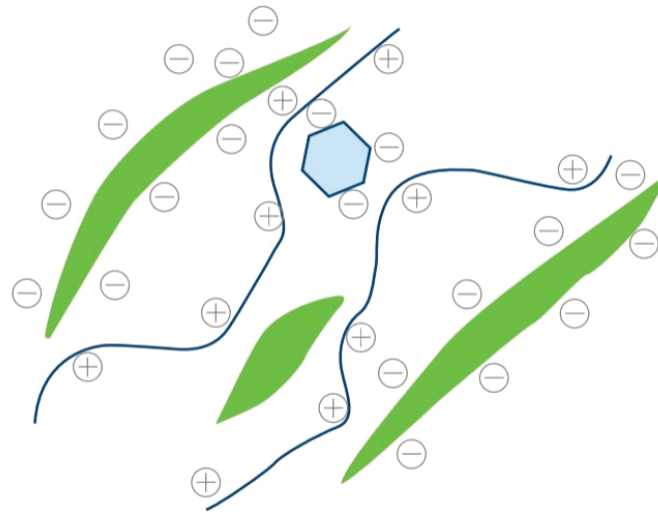
# Paper and Board

Next to cellulose and fillers, starch is another vital component of quality paper. Starch influences every step of the paper making process, from sheet formation to surface improvement. Starches are also used in most paper grades, Whether it be printing and writing paper, board or corrugating base.

Starch is the most cost-efficient way to increase paper dry strength, improve surface Condition, printability and processability in further use. By adding 1 to 2% cationic starch in the wet end, strength increase while it improves paper smoothness considerably. Ultimately, starch binders reduce the total cost of coating formulations.

CMC Group offers starch for each application. Beside cereal based native starch, we also produce modified starch, tailor-made for each application and designed to fulfill your requirement. In addition, our R&D department is continuously investigating the latest technologies, in order to create state-of-the-art solutions to new demands.





## Starch for wet end

The most important property of cationic starch in wet end is that it forms bridges between the cellulose fibers. This results in a strong fiber network and paper sheets with higher tensile and burst strength (see

Thanks to the cationic groups the starch, the anionic fibers and the fines are retained more efficiently, to lower organic load in white water. This is particularly true for papers with a high recycled fiber content

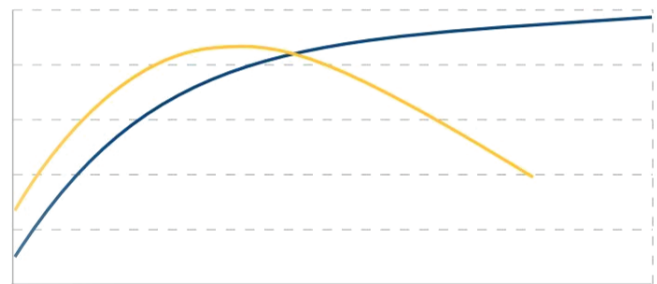
Moreover, cationic starches improve the retention of anionic pigments, which enables higher filler levels (graph 3). Cationic starches also contribute to faster dewatering.





### Properties of cationic starches

Graph 3



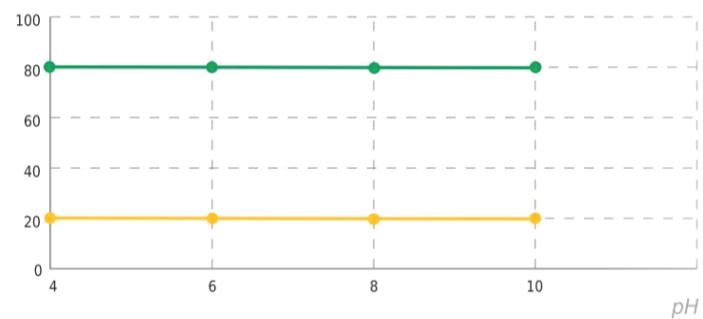
Cationic starch dosis

- Filler retention
- Mechanical properties

### Starch retention

Retention (%)

Graph 2



- Cationic starch
- Native starch



# Starches for spraying

Starch spraying is an easy and cost efficient method to increase paper strength and achieve proper interply bond by spraying in between the layers of multi-layered board.

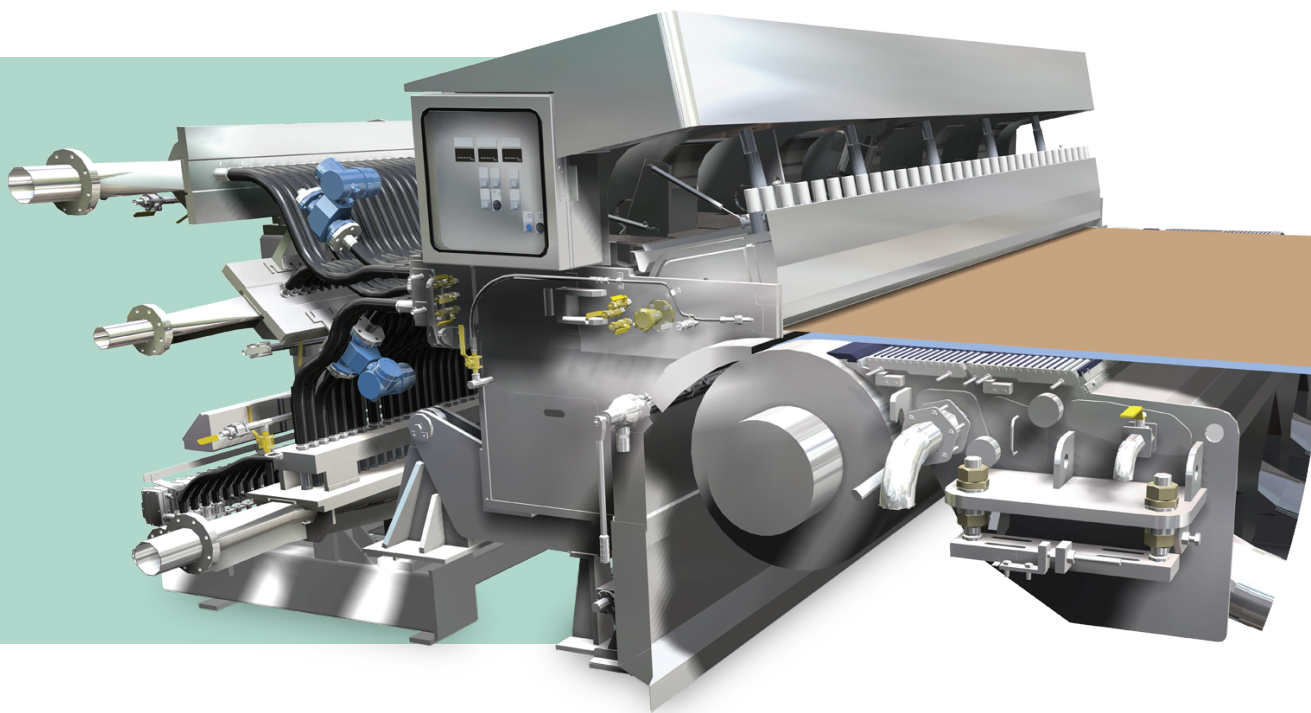
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# Application

The most determining factors in starch spraying are a uniform starch distribution over the machine width and total gelatinization in the first drying section. To guarantee an optimum result, the CMC group advised the following: generally up to 5% starch on paper.

- proper spray beam design (the CMC group supplies spraying units or can assist you to optimize the existing beam).
- positioning of the spray beam near the water line (depending on paper quality or paper machine) or just before the junction of two plies (board machine).
- temperature of the first drying cylinders should be sufficient to fully gelatinize the starch granules.
- paper entering the drying section needs to have a sufficient moisture level.





# Starches for surface sizing and coating

CMC native starches are the standard products for size press application. Once hydrolyzed, they can penetrate into the paper sheet and increase strength values by up to 50 to 100%.

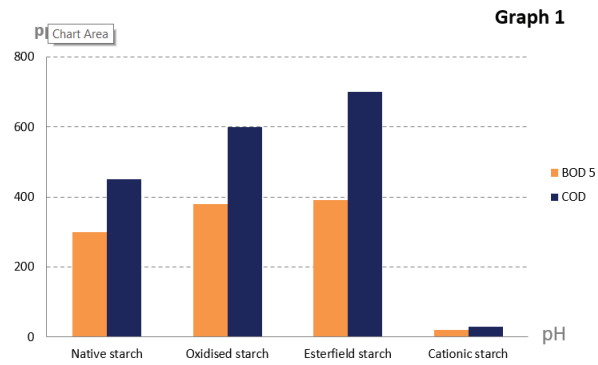
Our product range is specially designed to ensure optimum enzyme conversion. After in-mill hydrolysis and sizing of the paper, they improve mechanical properties, surface smoothness, printability and they reduce dusting

Cationic starches which are used in size press will be retained in the sheet when re pulped, with up to 90% reduction in BOD load of effluent water, compared to non-cationic starch (see graphs 1, 2 and 3). This is particularly interesting for paper grades generating a significant amount of broke (like printing and writing paper). CMC group can provide detailed technical information about this subject.

Because of their unique charge properties, cationic starches also improve the printability of the paper, even in ink-jet printing.

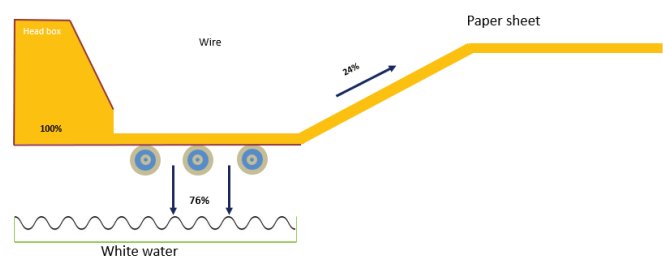
In coating applications, CMC native starches are used as low-cost viscosity and rheology

BOD/COD of effluent water



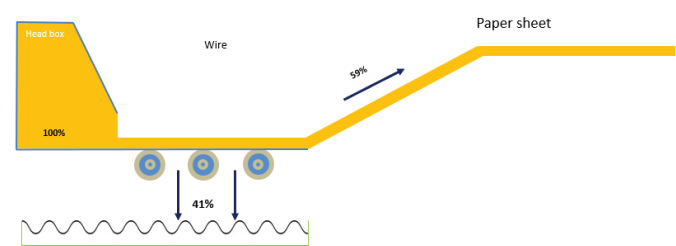
Graph 2

Starch balance  
Native starch: Amyzet 120



Graph 3

Starch balance  
Cationic starch: Collofilm 140







# Improving together

Our range of native and modified starch provide the complete functionality our customers require to economically produce consistently high quality food products. Our technical support service provides our customers with the means to develop traditional and innovative new products quickly.

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# R&D

CMC's R&D department focus on working together with our customers to provide new or improved solutions. We build on and continuously strengthen our four cornerstones of:

## 1. Application support

Our application specialists guide you through the functional and nutritional values of our products. We work together in desiccated partnerships to solve existing and potential problems you are facing and create products that take advantage of new marketing opportunities.

## 2. Product characterization and quality monitoring tools

The thorough characterization and understanding of our products is the basis of our added value for your recipes and processes. It is a crucial factor in out ability to monitor and guarantee consistently high quality.

## 3. New product development

This area has a direct bearing upon your future growth. We work on your developmental needs in dedicated partnerships that allow you to leverage our collaborative network with research institutes and universities around the world.

## 4. Process development and optimization.

This is the core of our continuous effort to provide you with cost-effective products that meet your most stringent requirements.

Our sales force and global technical support team are your direct access to our R&D department.

