

Special Feature: **ADEKA's polymer additives business and intumescent flame retardants**

The three-in-one value chain making use of **ADEKA rashisa** in development, manufacturing and sales

ADEKA rashisa
It means the essence of ADEKA Group.
We spreading it to all employees of the ADEKA group.

ADEKA and polymer additives

Plastics are synthetic resins made from natural resources, which can be used for a variety of purposes after processing. They are cheaper than other materials, and can be given functional properties. Due to advances in technology, work is underway to develop plastics that are harder than steel.

Polymer additives, forming ADEKA's core business, are what give plastics functional properties. ADEKA is a pioneer in this field, engaging in extensive business fields as a world-class top brand.

Ideas making use of advanced technologies and knowhow

The company develops a variety of additives (see table on right). Whether the full potential of the additives can be drawn out or not depends on the temperature, processing method, and other materials used in combination. ADEKA has an extensive lineup of products developed based on technologies and knowhow cultivated over many years. There are also developmental engineers who can provide technical support by communicating with customers to propose polymer additives that are optimized to their needs.

The main types of polymer additives and their functions

| | |
|--------------------------|--|
| Stabilizers | Improves the workability of resins and prevents time degradation of products |
| Plasticizers | Adds flexibility |
| Antioxidants | Prevents degradation from heat and acid |
| Light stabilizers | Renders UV light harmless →Prevents degradation and discoloring |
| Nucleators | Improves mechanical properties Promotes mold cycling during manufacturing →Boosts productivity |
| Clarifiers | Improves transparency |
| Heavy metal inactivators | Prevents degradation of metals through catalysis |
| Flame retardants | Adds fire-resistance |



ADEKA-style ideas

To provide functional, high-quality products that meet the needs of customers

General manager, Polymer Additives Sales Department
Polymer Additives Division
Tomoyuki Funamizu

ADEKA continues to hold the world's largest market share in condensed phosphoric ester-based flame retardants.

Flame retardants for polyolefin have many drawbacks. They give off toxic gases while burning, and they must be added in large quantities, raising the specific weight and

weakening the physical properties of the resin. The ADEKA Group's intumescent flame retardants address all of these demerits for which they have been steadily winning higher appraisal. The expansion in use of polyolefin has also increased and diversified the need for its flame retardation.

The company has established a system to cater meticulously to the needs of customers. At the same time, ADEKA hopes to contribute to society by making full use of its technological and human resources assets to provide cutting-edge materials that offer safety and security in everyday life.



ADEKA-style sales

To continue being indispensable to customers all over the world

ADEKA (SHANGHAI) CO., LTD.
Kouzou Tachibana

The ADEKA Group transferred the production and sales of intumescent flame retardants to bases in China to set up an optimized global production and supply system.

Plant engineers from Japan were dispatched to ensure strict quality control and operational training of local employees, maintaining quality at the same high level as in

Japan. ADEKA (SHANGHAI) CO., LTD. functions as the global sales hub, creating a customer service system that is able to respond globally and quickly in coordination with all the subsidiaries of the ADEKA Group.

The ADEKA Group's strengths lie in the lineup of technologically superior products, and the group's ability to provide technological solutions to customers throughout the world. Technical discussions are held repeatedly with domestic and international sales, research and production bases to boost the value of final products and meet the diverse range of needs of customers throughout the world.

The global network of the polymer additive business

Intumescent flame retardants R&D,
production and sales bases

Sales: ADEKA (SHANGHAI) CO., LTD.

Production: ADEKA FINE CHEMICAL (SHANGHAI) CO., LTD.

Research and development: Polymer Additive R&D Laboratory





ADEKA-style mass production

Complete localization of production and sales

Manager, Technology Group
Technology & Engineering Department
Takafumi Fujii

It was decided that intumescent-type flame retardants would be produced in China, because the country is a global producer of phosphorus and it is also a promising potential market.

The development project began with experiments on trial products at the company's Fuji Plant. Steady progress was made before the project was transferred to the plant of ADEKA Fine Chemical (SHANGHAI) Co., Ltd.

Success in this project requires complete localization of everything, including maintenance work, so manufacturing equipment made in China was installed in this new plant. A system was laid down in preparation for mass production, including suppliers of raw materials and manufacturing

equipment, and local employees, resulting in the first shipment of products in 2012.

Because intumescent flame retardants will be shipped all over the world from China, the sales base was moved to ADEKA (SHANGHAI) Co., Ltd., and a BCM system was established to ensure the stable supplying of products.

Participation in conferences

The company actively takes part in conferences, exhibitions, seminars, and more, to raise awareness for the ADEKA brand.



Holding of technology exchange events (ADEKA AL GHURAIR ADDITIVES LLC)



ADEKA-style R&D

Focusing on halogen-free flame retardants

General manager, Modifier Solution Department
Polymer Additive R&D Laboratory
Naoko Dai

Some halogen flame retardants, made mainly from bromine-based compounds, emit large amounts of carbon monoxide and black smoke when extinguishing fire. Many fire victims die as the result of suffocation or carbon monoxide poisoning from the smoke emitted by construction materials, furniture, etc. This prompted ADEKA to develop a "halogen-free flame retardant that also limits the generation of smoke and carbon monoxide." This led to the launch of a condensed phosphoric ester-based flame retardant (ADK STAB FP-600) for use in household electrical appliance housings and engineering plastics for construction materials, in 2000. Furthermore,

intumescent flame retardants (ADK STAB FP-2000 series) for polyolefin were launched in 2007.

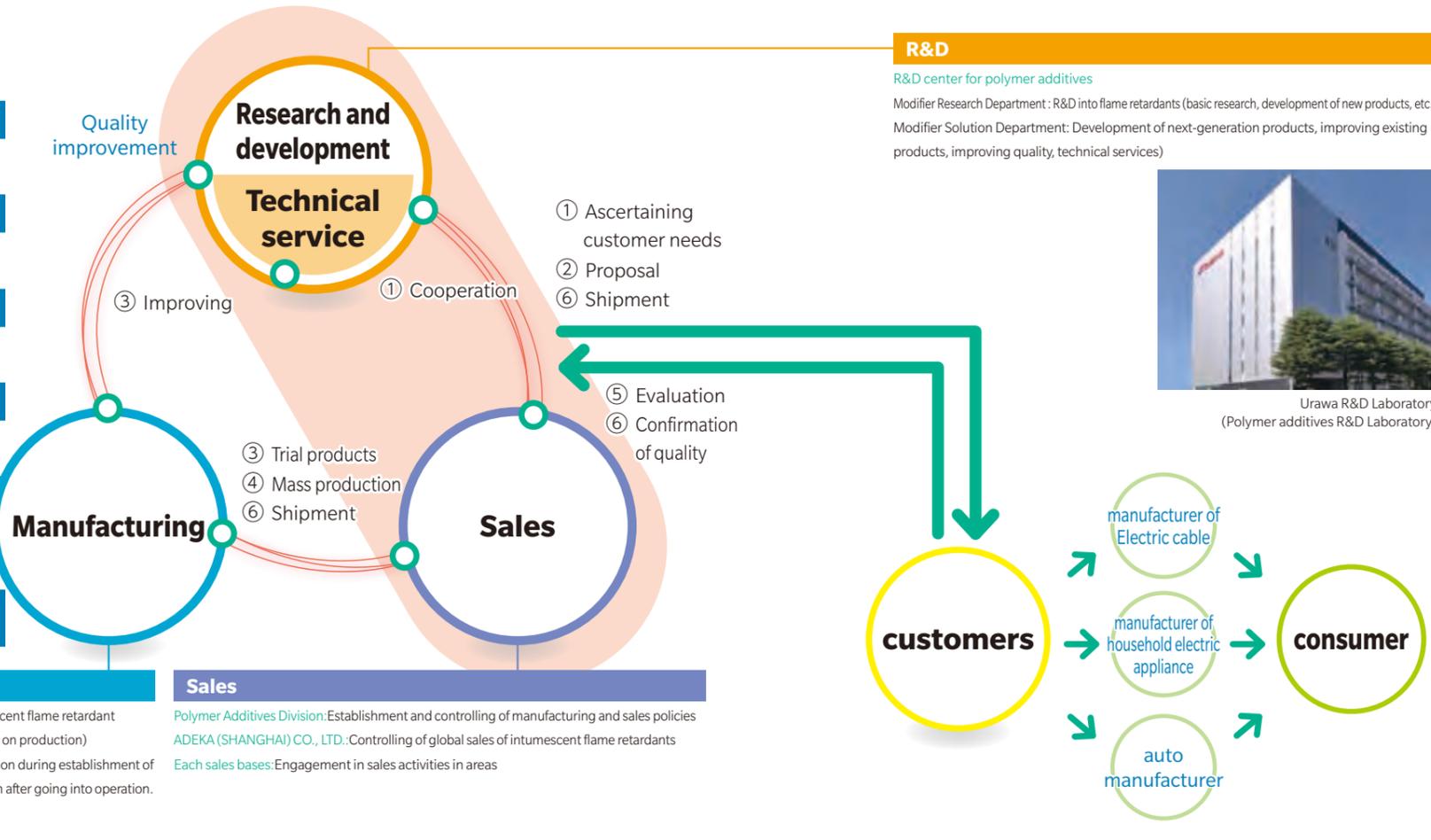
There has been an increasing demand for safer flame retardants that do not hinder the evacuation of people not only from public facilities where many people gather, but also from modern, airtight houses.

The FP-2000 series developed by ADEKA forms a frothy char layer known as an intumescent on the surface of materials while burning. This layer insulates the inside of the material from the heat, which not only flame proofs the combustible polyolefin, but also suppresses the generation of smoke.

They can be used as covering material for electrical wires and cables, as well as in internal parts of household electrical appliances that are combustible or prone to heating. They are expected to be used more extensively in parts around rechargeable batteries, which are prone to heating, with the spread of hybrid and electric vehicles.

Laying down a three-in-one value chain with a global perspective

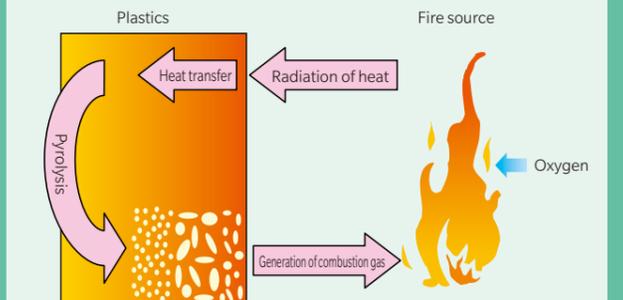
- ① Ascertaining customer needs
- ② Proposing solutions customized to customer needs
- ③ Improving existing products
- ④ Mass production of trial products
- ⑤ Trial production and evaluation at the customer factory
- ⑥ Shipment upon confirmation of quality by the customer



Schematic diagram of burning cycle

Plastic with no flame retardant

Radiation of heat causes pyrolysis of the plastic, generating gas, which turns into fuel feeding the fire, creating a cycle that sustains combustion.



Plastic with intumescent-type flame retardant

It catches fire at the start, but immediately forms a frothy, homogenous char layer with a heat and combustion gas insulating effect, known as an intumescent, preventing continued combustion, and resulting in the fire being extinguished.

