

## Key Topic ADEKA Group Products that Contribute to Society

By supplying eco-friendly products that reduce energy consumption and environmental impact and ADEKA Innovative Value (AIV) products that contribute to rich and fulfilling lifestyles, as well as high-value-added products tailored to the needs of the market, ADEKA is contributing to the enrichment of people's lives and a sustainable society.

Reactive Emulsifiers to Lessen Environmental Impact by Decreasing Emissions of VOCs

### ADEKA REASOAP Series

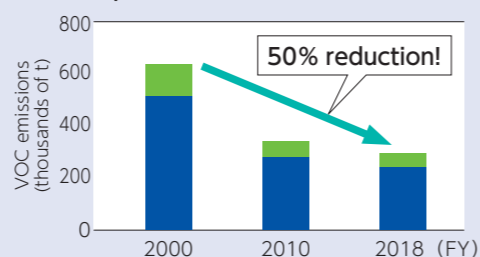


ADEKA developed its first reactive emulsifiers in the 1980s, for use in producing high-quality acrylic-plastic emulsions for water-based paints. Sales of these products expanded, as the emulsifiers bolstered water-based paints' performance. Thanks to these reactive emulsifiers, Japan leads other countries in switching from solvent-based to water-based paints, attaining a 50% drop in emissions of volatile organic compounds (VOCs) since fiscal 2000. This technology has not only spread to China, South Korea and various European countries but is also the world's only series of reactive emulsifiers approved by the US Food and Drug Administration (FDA). As a result, the market for this series has expanded to applications in water-based adhesives for packaging and labels used in contact with food, thereby contributing to the global environment.

Application: Adhesive (for food packaging and labels)



Trend in VOC emissions in Japan



Industrial Margarines that Support Good Flavor and Reduce Food Loss

### Marvelous



Marvelous is a bread-baking margarine whose unique combination of yeast mixture and high-dispersion oil formula knead functional properties into bread. This product preserves the unmistakable moistness and texture of freshly baked bread and extends its shelf life by 50% (according to a comparison by ADEKA). Marvelous requires no oil-temperature management and is easy to knead into bread dough, enhancing the stability and efficiency of the bread-baking process.

This new approach serves to reduce food loss, which is a major problem for society. In recognition of this benefit, Marvelous won the Nikkei Marketing Journal Award of the 2020 Nikkei Superior Products and Services Awards, sponsored by Nikkei.



Plastic Additives that Contribute to a Recycling Society

### ADK CYCLOAID Series



With pollution from waste plastic remaining a persistent social problem, the plastics industry is called on to deliver further enhancements to functionality, as part of the march toward a recycling-oriented society. To scale back environmental impact while enriching people's lives, ADEKA is developing environment-friendly plastics that afford the same or better functionality as conventional plastics, under the brand ADK CYCLOAID.

Applications: Automotive parts (interior and exterior)



Highly Safe Insect Growth Regulator for Paddy-Rice Pest Insects

### APPLAUD®



In the 1970s, demand for increased yield and quality in paddy rice was burgeoning in Japan, as the nation pursued a policy of reducing acreage under production for this staple crop. One problem farmers confronted was the huge damage done at harvest time by derbidiae and leafhoppers, two groups of insect pests, and great hope was placed in the development of high-performance pesticides to counteract them. Nihon Nohyaku's APPLAUD (active ingredient: buprofezin) became the world's first growth regulator for paddy-rice pest insects developed to provide greater safety and labor-saving effectiveness than the organic-phosphate-based and carbamate chemicals then prevalent.

APPLAUD inhibits molting of the target insects in the larval stage, restrains egg-laying by the adult females and interferes with the hatching of eggs, reducing the population density of the forthcoming generation of insects. This unique action mechanism sustains the pest-control effect over long periods. Moreover, APPLAUD is highly species-selective, only slightly affecting honeybees, which are the pests' natural enemies, and other beneficial insects. This sharply reduced impact on biodiversity is one of the superior qualities that makes APPLAUD such a standout product.

In addition to protecting paddy rice, APPLAUD has found a stable market as a pesticide against horticultural pests such as scale insects and whiteflies, which are damaging to fruit and vegetable crops. In recent years, Nihon Nohyaku has begun deploying APPLAUD in new treatment methods in Central and South America, as an insecticide against scale insects that infest banana plantations. Having served as a core pest insecticide for over 30 years, APPLAUD is expected to continue to contribute to agricultural production worldwide as environmentally harmonious pest-control agent.



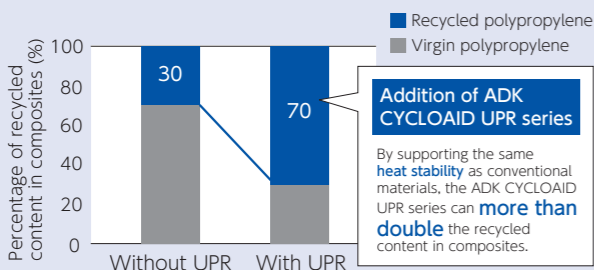
- 1988 Recipient of the Okochi Memorial Technology Prize
- 1990 Recipient of the Science and Technology Agency's Director General's Award
- 1992 Recipient of the Medal of Honor with Purple Ribbon (awarded by the government of Japan for academic and artistic accomplishments)

\* Nihon Nohyaku: A consolidated subsidiary of ADEKA

Additives That Enhance the Performance of Recycled Plastics

### ADK CYCLOAID UPR Series

These additives contribute to the easing of environmental impact by boosting the recycled content of composite materials, thereby reducing consumption of scarce resources and slowing the growth of landfills.



**Addition of ADK CYCLOAID UPR series**  
By supporting the same heat stability as conventional materials, the ADK CYCLOAID UPR series can **more than double** the recycled content in composites.

Environment-Friendly PVC

### ADK CYCLOAID PNB Series

Mainly targeting polyvinyl chloride (PVC), this polyester-based plasticizer\* is biomass-based, providing a good fit for a recycling-oriented society. Made from natural plant materials, this series contributes to the achievement of a low-carbon society. In particular, ADK CYCLOAID PNB-205 is certified by the Japan Organics Recycling Association as a Biomass Mark product (No. 200253).

\* Plasticizer  
An additive that is added to polymers to make them more supple and easier to process.

