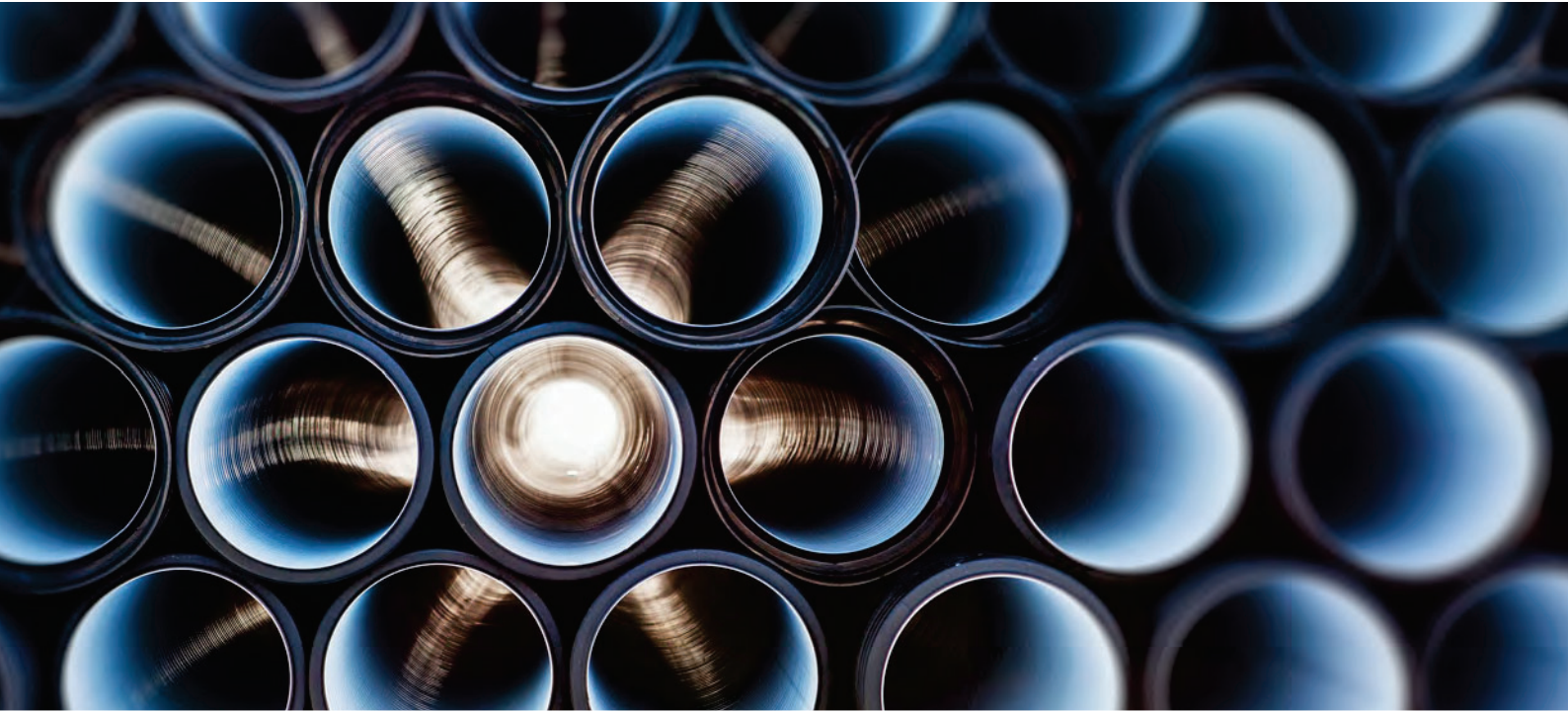


ADHESIVE RESIN

ADMER™



INDUSTRIAL



Mitsui Chemicals
Group

ADMER™ Adhesive Resin

ADMER™ KEY FACTS

- ⊕ **MALEIC ANHYDRIDE GRAFTED POLYOLEFIN**
- ⊕ **EXTRUDABLE**
- ⊕ **TIE RESIN**
- ⊕ **ADHERING TO BARRIER MATERIALS**
ETHYLENE VINYL ALCOHOL (EVOH), POLYAMIDE (PA), METALS

ADMER™ resins are modified polyolefins with functional groups, designed to bond to a variety of polyolefins, ionomers, polyamides, ethylene vinyl alcohol (EVOH), polyester (e.g. PET) and metals. They serve as **tie layer in multilayer applications** such as films, sheets, bottles, tanks, pipes, tubes and others and, thus, help to combine the excellent properties of incompatible materials, as, for example, gas barrier resins and moisture barrier resins.

ADMER™ resins are also used as coupling agents, compatibilizers and impact modifiers in various types of composites. ADMER™ adhesives are thermoplastics and can be as easily processed as any other polyolefin by (co-)extrusion or powder coating. ADMER™ is famous for its excellent quality and is therefore the world's leading polyolefin-based adhesive. Production sites all over the world assure a constant and convenient availability of our top quality adhesives.

- ⊕ ADMER™ RESINS ARE WELL KNOWN FOR SETTING THE MARKET STANDARDS IN TERMS OF QUALITY AND EFFICIENCY.
- ⊕ ADMER™ RESINS ARE **THE MISSING LINK FOR YOUR MULTILAYER INNOVATIONS!**

Multilayer Structure with ADMER™

Characteristics

1. STRONG ADHESION

By thermal reaction ADMER™ adheres to ethylene vinyl alcohol (EVOH), polyamide (PA), polyester (PET), polyolefins (PE, PP) and metals.

2. ADHESION DURABILITY

ADMER™ shows excellent long-term adhesion strength even after secondary processing like pasteurization, hot filling, boiling and sterilization.

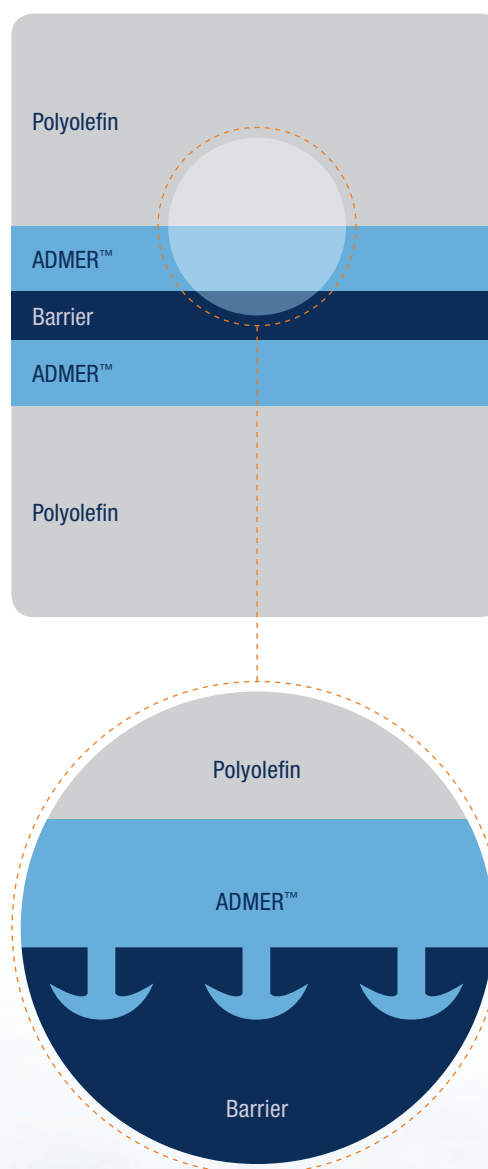
3. POLYOLEFIN-LIKE PROPERTIES

Since ADMER™ is based on polyolefins, it retains the physical properties of each polyolefin or co-polymer including mechanical strength, heat resistance, chemical resistance and recyclability.

4. EASY PROCESSING

ADMER™, a thermoplastic, can be processed as easily as any other polyolefin by the following methods:

- ⊕ FILM CO-EXTRUSION
(CAST AND BLOWN FILM)
- ⊕ CO-EXTRUSION BLOW MOULDING
- ⊕ SHEET CO-EXTRUSION
- ⊕ TUBE CO-EXTRUSION
- ⊕ CO-EXTRUSION COATING
- ⊕ METAL COATING
- ⊕ CO-INJECTION



Construction

ADMER™ is well-known for superior performance as tie-layer in a wide range of industrial applications:

PIPES

- ⊕ FLOOR AND WALL HEATING OR COOLING PIPES
- ⊕ SANITARY AND HEATING PIPES

Nowadays the requirements for sanitary, floor and wall heating or cooling pipes are getting more and more challenging with regards to mechanical properties, temperature resistance and long-life cycles. Multilayer composite pipes made of polyethylene (PE, PE-RT), cross-linked PE (PE-X), polypropylene (PP) or polybutene (PB) with aluminum or EVOH are designed to guarantee thermal stability as well as adequate oxygen-barrier properties to minimize potential corrosion of the metal parts that is caused by oxygen permeation within the plastic parts of the pipe. ADMER™ works as a tie layer between the polymers and the aluminum or EVOH while providing on top excellent aging resistance and long-term thermal stability. Means, ADMER™ shows:

- ⊕ HIGH MECHANICAL PERFORMANCE
- ⊕ EXCELLENT AGING PERFORMANCE
- ⊕ OUTSTANDING PRESSURE RESISTANCE (AL COMPOSITE PIPE)
- ⊕ STABILITY OVER A BROAD RANGE OF TEMPERATURE (20-95 °C) FOR LONG-TERM LIFE CYCLES

CERTIFICATION

- ⊕ ISO 2578 / DVGW W542

ELASTIC FLEXIBLE PIPES

EASY AND COMFORTABLE INSTALLATION DUE TO FLEXIBILITY

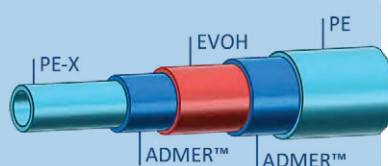
A) PE-X // EVOH

- ⊕ UNDERFLOOR HEATING



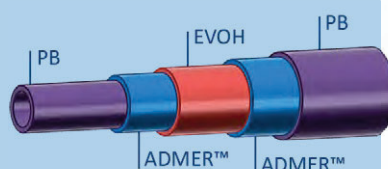
B) PE-X // EVOH // PE

- ⊕ UNDERFLOOR HEATING
- ⊕ 5-LAYER STRUCTURE FOR PROTECTION OF BARRIER LAYER



C) PB // EVOH // PB

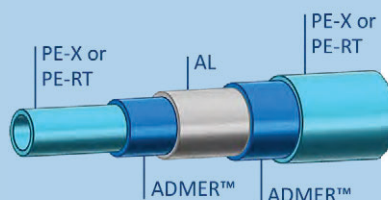
- ⊕ UNDERFLOOR HEATING AND SANITARY PIPE – VERY COMMON IN UK
- ⊕ HIGHER HEAT RESISTANCE THAN PE
- ⊕ ULTRA FLEXIBLE, LIKE A CABLE



NON-ELASTIC FLEXIBLE PIPES

PE-X OR PE-RT // AL // PE-X OR PE-RT

PE-X // AL // PE-X
PE-X // AL // PE-RT
PE-RT // AL // PE-RT



- ⊕ FLEXIBLE BUT NOT ELASTIC; ONCE BENDED IT IS DIMENSIONALLY STABLE
- ⊕ BENDING ANGLE CAN BE ADJUSTED TO CUSTOMER WISHES
- ⊕ MORE EXPENSIVE THAN EVOH PIPES
- ⊕ HIGH PRESSURE RESISTANCE
- ⊕ APPLIED FOR UNDERFLOOR HEATING AND SANITARY
- ⊕ IF NO BARRIER IS NEEDED, THE ALUMINUM CAN BE PERFORATED FOR BETTER BENDING PROPERTIES AND TO AVOID LONGITUDINAL EXPANSION

RIGID PIPES

**PIPES CANNOT BE BENDED
FITTINGS NEEDED TO REALIZE CURVES
VERY HIGH WALL THICKNESSES**

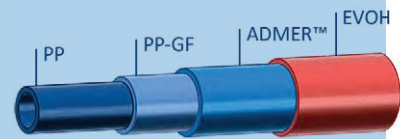
A) PP // EVOH

- ⊕ FIRST GENERATION PP BARRIER PIPE
- ⊕ EVOH LAYER NEEDS TO BE PEELED OFF FOR WELDING



B) PP / PP-GF // EVOH

- ⊕ SAME BARRIER PROPERTIES AS 3-LAYER PIPES BUT LESS LONGITUDINAL EXPANSION



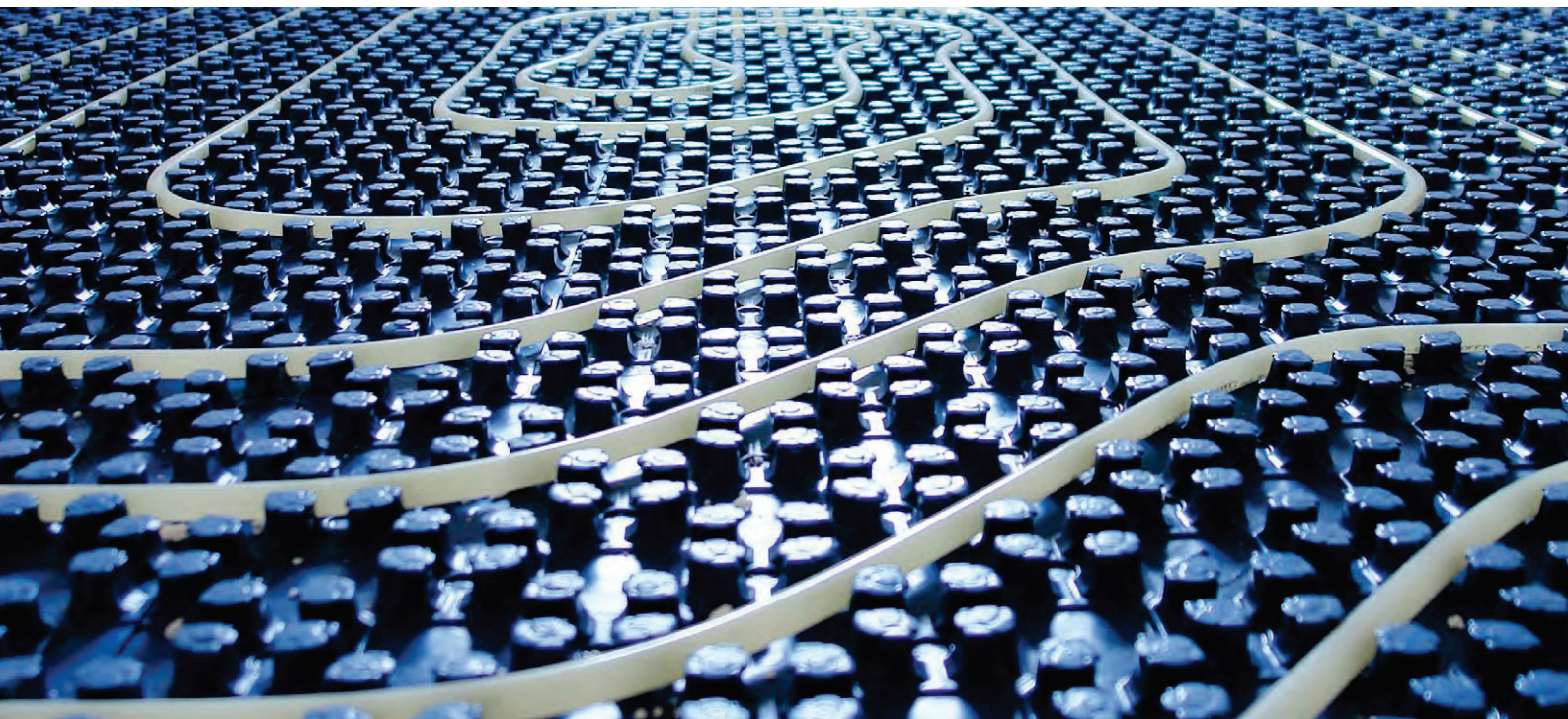
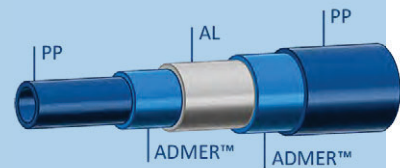
C) PP / PP-GF / PP

- ⊕ NO BARRIER PROPERTIES
- ⊕ LOW LONGITUDINAL EXPANSION



D) PP // AL // PP

- ⊕ PERFORATED AL FOR BETTER PHYSICAL BONDING OF INSIDE AND OUTSIDE PP LAYERS IF NO BARRIER NEEDED



GRADE OVERVIEW

	MFR (2.16 kg/10 min)	DENSITY (g/m³)	VICAT SOFT. POINT (°C), Load 1 (10 N), Rate A (50 °C/h)	MELTING POINT (°C)	ADHESION PERFORMANCE	ADHERENT TO
ELASTIC FLEXIBLE PIPES (PE)						
NF410E	1,6	0,92	100	121	++	PA ✓ EVOH ✓
NF468E	4,0	0,92	95	120	++	PA ✓ EVOH ✓
ELASTIC FLEXIBLE PIPES (PB)						
QF460E	3,2	0,9	122	148	+	PA ✓ EVOH ✓
NON-ELASTIC FLEXIBLE PIPES (PE) INNER LAYER						
NE072E	2,2	0,915	85	124	+++	AL ✓
NE062E	4,5	0,91	83	122	++	AL ✓
NON-ELASTIC FLEXIBLE PIPES (PE) OUTER LAYER						
NF468E	4,0	0,92	95	120	++	AL ✓
RIGID PIPES (PP)						
QF460E	3,2	0,9	122	148	+	PA ✓ EVOH ✓ AL ✓
QF551E	5,0	0,89	115	147	+++	PA ✓ EVOH ✓ AL ✓

ALUMINUM PANELS FOR BUILDING EXTERIORS

Modern buildings are often designed with aluminum panels that dress the outer front as these claddings are aesthetic, cost-efficient and light weighted. They are usually made of multilayer structures of aluminum and PE.

TYPICAL STRUCTURE:

⊕ AL/ADMERT™/FILLED PE/ADMERT™/AL

CABLE SHEATH

Electrical cables are made of several materials like metals and polymers to guarantee water protection. Thus, a proper bonding between the different materials is required.

TYPICAL STRUCTURE:

⊕ CU/ADMERT™/TPE OR TPV

Agriculture

MULCH FILMS

The use of fumigant gases, like pesticides and fungicides, is widely spread in agriculture to ensure growth of high quality vegetables, fruits or flowers. Co-extruded multilayer mulch films are designed for keeping these ozone depleting gases in the soil and for assuring better crop growth by suppressing weeds, reducing water evaporation and creating optimized conditions which stabilize or extend the growing season. Besides this, mulch films provide maximum tear resistance and optimized on-field duration.

As, however, fumigant gases may cause health risks to field workers and residents, the fumigation process needs to be optimized to minimize human and environmental damage. To keep the harmful gases in the soil and to reduce the emission rates, high-barrier films are designed:

VIF – VIRTUALLY IMPERMEABLE FILM:

5 –LAYER STRUCTURE WITH PA

- ⊕ significant improvement of gas retention; permeation is **virtually** blocked to keep fumigants in the soil

TIF – TOTALLY IMPERMEABLE FILM:

7-LAYER STRUCTURE WITH EVOH

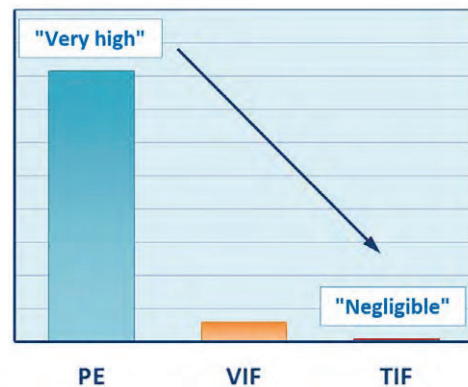
- ⊕ significant improvement of gas retention; permeation is **totally** blocked to keep fumigants in the soil

MULCH FILMS – FEATURES:

- ⊕ improved gas retention due to virtually/ totally blocked permeation; fumigation gases are kept in the soil
- ⊕ water conservation
- ⊕ tear resistance
- ⊕ on-field duration

TYPICAL STRUCTURES IN/OUT:

- ⊕ LLDPE+BLACK/LLDPE+ADMERTM/EVOH/LLDPE+ADMERTM/LLDPE+BLACK



Relative permeability of fumigant gases through polyethylene (PE), virtually impermeable film (VIF) and totally impermeable film (TIF)

GRADES

- ⊕ AT2235E
- ⊕ NF642E
- ⊕ NF498E
- ⊕ NF518E



SILAGE

The storage of grain, maize or other agricultural products can be managed in a (cost) effective way close to the production or the feeding ground with the help of silage films. They assure high-quality feed for the duration of storage. A multilayer barrier film is used to preserve natural nutritional values while being impermeable to water and while having a slow permeation rate of oxygen. Furthermore, some special films avoid UV degradation. Different color combinations are designed to protect the fodder against extensive heating and to avoid unwanted fermentation.

(AGRO) CHEMICAL BOTTLES

As chemical substances may lead plastics to swell, soften, elute or deform, (agro) chemical bottles are made of multilayer structures as they need a barrier like EVOH or PA that is resistant to chemical agents to avoid evaporation of chemical substances. Hence, they need a solid tie layer which bonds the barrier and the polymer.

TYPICAL STRUCTURES IN/OUT:

- ⊕ PA/ ADMER™/ PE
- ⊕ EVOH/ ADMER™/ PE
- ⊕ EVOH/ ADMER™/ REGRIND/ PE
- ⊕ PET/ REGRIND/ ADMER™/ EVOH/ ADMER™/ PE
- ⊕ GRADES: NF408E, L2100

AGROCHEMICAL BOTTLES - FEATURES:

- ⊕ no swelling, softening or deformation of the bottle
- ⊕ strong resistance to agricultural chemicals, solvents, gasoline acids et al.
- ⊕ slow permeation rate of chemicals
- ⊕ superior gas barrier properties

Further Applications

INTERMEDIATE BULK CONTAINER (IBC)

Co-extruded multilayer Intermediate Bulk Containers feature outstanding barrier properties for sensitive bulk material, like orange juice/cola concentrate or chemicals. As permeation leads to gradual changes of the filling products, intermediate bulk containers, with an integrated EVOH barrier, offer efficient and long lasting protection against quality loss during transport and storage. Thus, the shelf life of the filling is prolonged.

TYPICAL STRUCTURE:

- ⊕ PE/ADMERT™/EVOH/ADMERT™/PE
- ⊕ GRADE: NF448E

IBC - FEATURES:

- ⊕ Reliable permeation protection for the bulk material
- ⊕ Barrier against oils and greases
- ⊕ Barrier against solvents such as toluene, xylene, MEK, benzene
- ⊕ Protection against the penetration of gases such as O₂, N₂, CO₂
- ⊕ Odour and flavour barrier
- ⊕ Protects the filling goods from oxidation, vitamin loss and microbial infestation
- ⊕ Additional protection against light and UV radiation



PHOTOVOLTAIC BACKSHEET

To reduce the weight and costs of photovoltaic modules, functional plastic backsheets are used. Besides the reduction of weight, plastic backsheets offer good puncture resistance as well as a membrane for possibly emerging decompositions from the cross-linked encapsulant. Special ADMER™ grades have been developed to reach these sophisticated requirements.

INDUSTRIAL COMPOSITES

ADMER™ can be used as compatibilizer or coupling agent for various types of composites. It is used to promote interfacial adhesion between materials that are otherwise immiscible, like wood and plastic.

- ⊕ WPC – WOOD PLASTIC COMPOSITES
- ⊕ CFRP – CARBON FIBER REINFORCED
- ⊕ GFRP – GLAS FIBER REINFORCED



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ADMER™ RESINS ARE THE MISSING LINK FOR YOUR MULTILAYER INNOVATIONS!

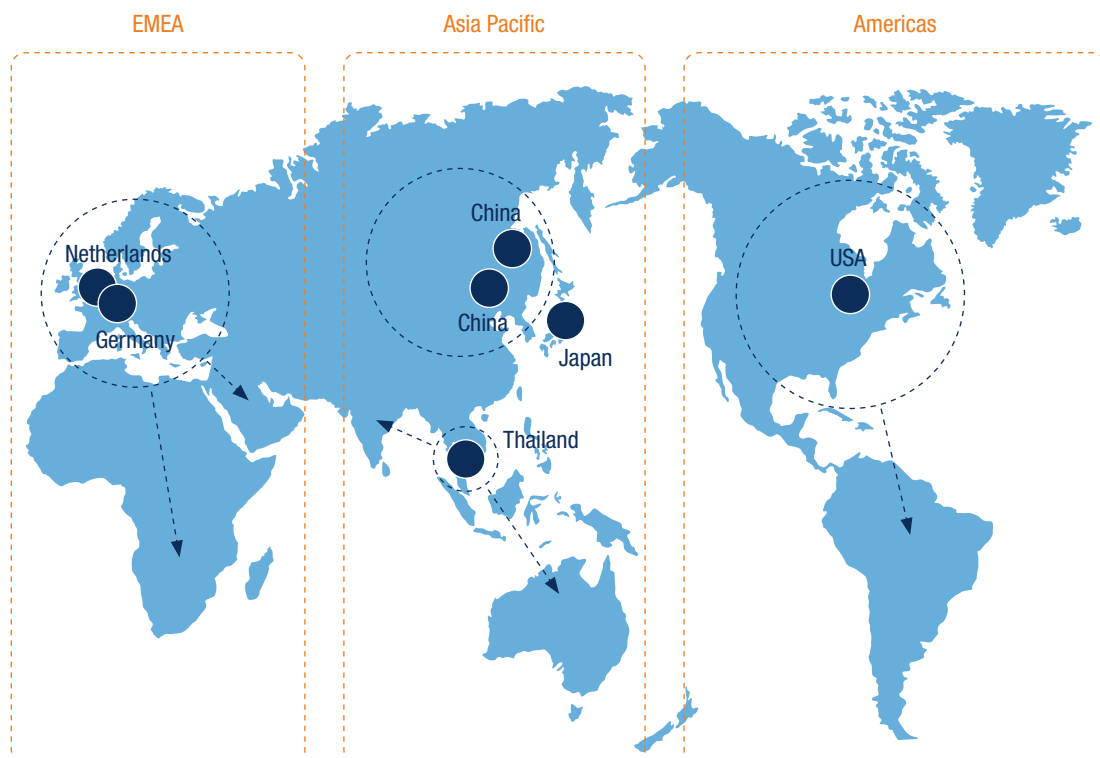
ADMER™ Production



ADMER™, the global market leader in extrudable tie resins, is produced in Europe, Asia and America – hence, worldwide availability is assured. The European market is served from our production sites in Germany and the Netherlands.

GLOBAL SUPPLY CAPABILITY OF ADMER™

Global Market Coverage from 3 Regions



Packaging Units

Dear Sarit,

Please allow me to compliment your company, as agent for MITSUI, and Mitsui themselves, for the excellent service provided to us. No other agent nor supplier manages to supply as you and Mitsui do.

With 25 years in Plastopil, in import, I do have with what to compare! – and can only thank you and Mitsui; and let you know that your excellent customer service is much appreciated.

Best regards,
Barbara Hazan | Imports
Plastopil Hazorea Company Ltd.

25 kg PE-bags on CP1 wooden pallets;
Pallet dimension in m:
1.10 × 1.30 × 1.80
(width × length × height)



1,000 kg net pallet weight big bags or delivery in silo truck (bulk) available on request.



500 kg octabins (cardboard boxes) on CP3 wooden pallets;
Pallet dimension in m:
1.15 × 1.15 × 1.20
(width × length × height)



Handling Procedure



Store inside



Keep dry



Keep out of sun

STORAGE

ADMER™ resins are supplied in the form of small, free flowing pellets and can be easily handled with commercially available equipment.

As long as ADMER™ is stored under good conditions, it does not require any special care in storage. Precaution should be taken in opening the package to avoid contamination by foreign materials.

DRYING

Since ADMER™ is a non-hygroscopic material, it absorbs less moisture than non-polyolefinic polymers. Therefore, ADMER™ does not require drying prior to processing.

DISPOSAL

ADMER™ can be re-used, recycled or incinerated with energy recovery. We do not recommend to dispose of ADMER™ on a landfill. ADMER™ should not be dumped into the environment.

Prior to using ADMER™ products, please read carefully its Product Group Safety Information Sheet according to Article 32 of Regulation (EC) No. 1907/2006 (REACH). Safety Data Sheets according to Article 31 are not required for ADMER™.



Processing Parameters

PROCESSING

The recommended temperatures for ADMER™ are as follows:

PE-BASED GRADES					
C1	C2	C3	C4	AD	Die
180 - 200 (°C)	180 - 200 (°C)	200 - 230 (°C)	200 - 230 (°C)	200 - 230 (°C)	200 - 230 (°C)
PP-BASED GRADES					
C1	C2	C3	C4	AD	Die
200 - 230 (°C)	200 - 230 (°C)	200 - 250 (°C)	230 - 250 (°C)	230 - 250 (°C)	230 - 250 (°C)

- ⊕ MAXIMUM TEMPERATURE: 300°C
- ⊕ TEMPERATURES ABOVE THE UPPER LIMIT OR LONG RESIDENCE TIMES OF MOLTEN RESIN MAY LEAD TO DECOMPOSITION OF THE POLYMER.
- ⊕ DECOMPOSITION PRODUCTS MAY BE CARBON MONOXIDE, CARBON DIOXIDE, HYDROCARBONS AND WATER.

SHUTDOWN

The following procedure is recommended whilst the extrusion process is either interrupted or terminated.

- ⊕ **LESS THAN 2 HOURS:** SCREW ROTATION CAN BE STOPPED MAINTAINING TEMPERATURE.
- ⊕ **MORE THAN 2 HOURS:** PURGE OUT AND SHUT DOWN IN ACCORDANCE WITH COMMON PROCEDURE.

PURGING

Below you will find the recommended purging materials and their extrusion temperatures for a permanent shutdown.

	MATERIALS	TEMPERATURE (°C)
PE-based grades	Polyethylene*	200 - 230
PP-based grades	Polypropylene	230 - 250

*Low density polyethylene (LDPE) is recommendable.

Regulatory Compliance

⊕ COMPLIANCE WITH REACH:

All ADMER™ monomers and additives subject to registration have been registered either by MCE or our suppliers.

ADMER™ is in compliance with the requirements of Annex XVII of the REACH Regulation (EC) No. 1907/2006.

Substances listed on the REACH Candidate List of SVHCs are not contained in ADMER™ concentrations at or above 0.1% by weight. (Status 16.07.2019)

⊕ COMPLIANCE WITH FURTHER LEGISLATION RELEVANT TO ELECTRICAL AND ELECTRONIC EQUIPMENT:

- * Directive 2011/65/EU as amended (RoHS2)
- * Directive 2012/19/EU as amended (WEEE)

⊕ FOOD STATUS:

EU: ADMER™ is intended for use as an adhesive in multilayer structures. Following the definitions given in Commission Regulation (EU) No. 10/2011 and the Union Guidance to this Regulation published in November 2013, ADMER™ is a non-plastic intermediate for which a Declaration of Compliance as described in Annex IV to Commission Regulation (EU) No. 10/2011 does not have to be issued. To support our customers in their compliance work we provide adequate information for that purpose.

All monomers and additives of ADMER™ are listed as authorized substances in Annex I of Commission Regulation (EU) No. 10/2011 as amended. Please refer to our Food Status Certificates regarding substances restricted by SMLs. Some ADMER™ grades contain a Dual Use Additive subject to a restriction in food.

USA: All ADMER™ grades conform to FDA 21CFR, §175.105 (Adhesives) for indirect food contact. Some grades are also suitable for direct food contact.

Please contact us for further details or the food status of ADMER™ in other countries.

⊕ PIPE APPLICATIONS

Approval for the usage of certain ADMER™ grades in pipe applications must always be obtained by pipe manufacturers. We will support customers in the pipe sector in that approval process by directly disclosing the required information to authorized testing laboratories on request.

Evidence of ageing resistance of ADMER™ pipe grades according to DVGW W542 and ISO2578 has been obtained.

⊕ MEDICAL DEVICES

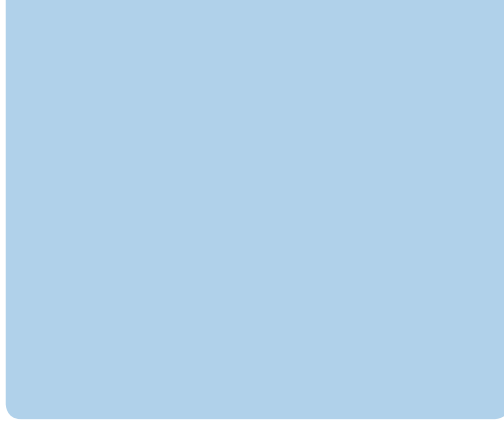
ADMER™ is a product dedicated to food packaging, automotive and industrial applications. We do not recommend to use ADMER™ in medical applications. It is the sole responsibility of the manufacturer of medical devices to ensure the suitability of raw materials for the intended application. We are willing to support our customers in approval processes after receiving prior written information on the details of such applications.

Mitsui Chemicals Europe GmbH cannot assume any liability regarding the use of ADMER™ in medical applications or medical devices.

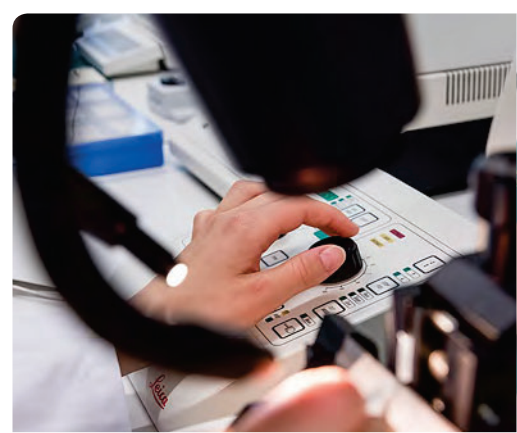
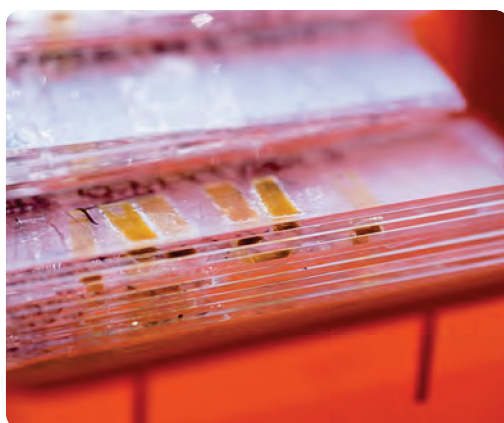
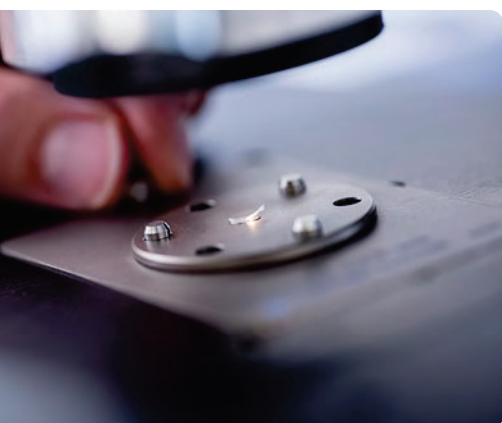
⊕ FURTHER LEGISLATIVE COMPLIANCE

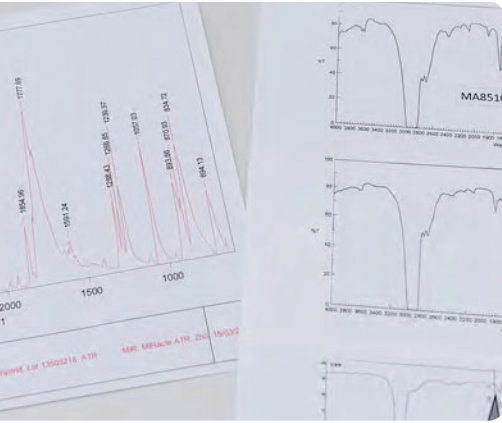
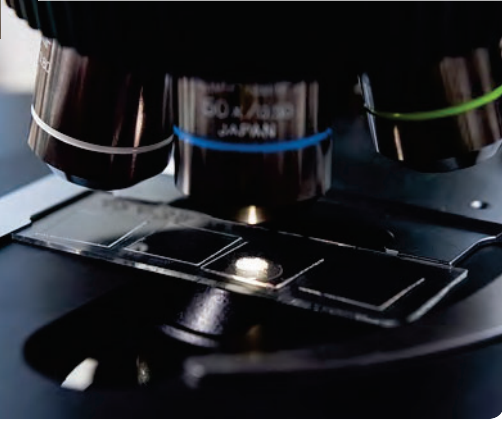
- * DIN EN 71-3 on Toys
- * Cosmetic Products Regulation (EC) No. 1223/2009
- * California Proposition 65 (Status 28.06.2019)

Status: August 2019

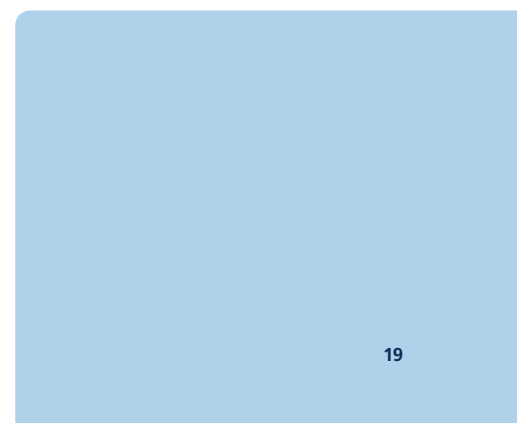
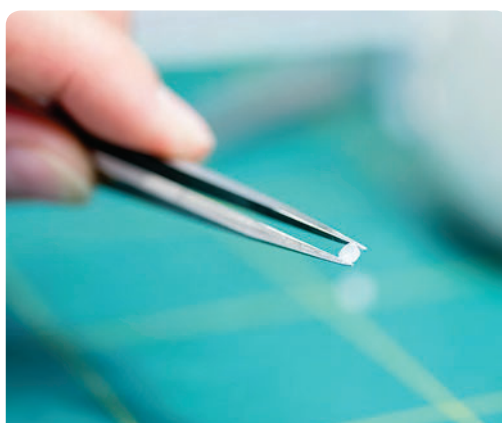
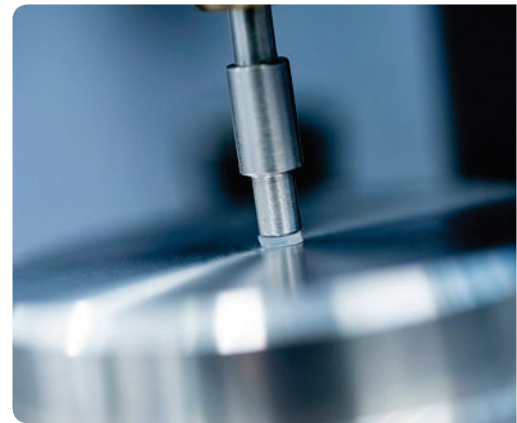


Laboratory





Our customer service laboratory is designed to evaluate and rate our customers' products. We are well equipped for microscopic, mechanical, thermal and physical evaluations of plastic products from the packaging, automotive and industrial sector, e.g. films, tubes, bottles, fuel tanks and pipes. Some of our standard evaluations are: Adhesive strength measurement, determination of layer thicknesses, structural analysis of multilayer films, gel analysis and thermal analysis.



Our Quality Policies

More than 40 years experience in adhesive technologies and an outstanding expertise in various industries make us a competent partner for your business. ADMER™ resins for Europe, Middle East and Africa (EMEA) are produced in Germany and the Netherlands. The production in the heart of Europe assures highest quality standards, which are reflected by the following certifications:

CERTIFICATIONS

- ⊕ **IATF 16949:2016** (QUALITY MANAGEMENT SYSTEM)
- ⊕ **OHSAS 18001:2007** (OCCUPATIONAL HEALTH- AND RISK MANAGEMENT SYSTEM)
- ⊕ **ISO 14001:2015** (ENVIRONMENTAL MANAGEMENT SYSTEM)
- ⊕ **ISO 9001:2015** (QUALITY MANAGEMENT SYSTEM)
- ⊕ **DIN EN ISO 50001:2011** (ENERGY MANAGEMENT SYSTEM)

CHEMICAL MANAGEMENT

Mitsui Chemicals sets to achieve its long-term chemical management goal, which is in line with guidelines set by the World Chemical Summit for Sustainable Development (WSSD), by 2020.

To contribute to a sustainable society, Mitsui Chemicals will establish LCIA technology for assessment of environmental impact of its economic activities and establish sustainability indices to support development of environment friendly products while staying in harmony with the global environment.

To contribute to a safe society, Mitsui Chemicals will employ product stewardship concepts to assess risks of its products and share this information with its stakeholders.



ENVIRONMENT

- ⊕ Contribute to environmental preservation through new products and technologies.
- ⊕ Assess and reduce the environmental load of products through their entire life cycle from research and development to final disposal.



QUALITY

- ⊕ Supply high-quality products and services that earn the trust and satisfaction of customers so that they feel confident when using them.



OCCUPATIONAL HEALTH & SAFETY

- ⊕ Give priority to safety, and aim for accident and injury-free operations.
- ⊕ Promote the formation of an appropriate work environment and support a proactive health program for employees.
- ⊕ Implement safety measures and procedures for handling chemical substances to prevent injury or harm to workers and others associated with those activities on site and in distribution, as well as customers.



PROMOTING SELF-MANAGEMENT

- ⊕ Strive for continuing improvements in environmental measures, occupational health and safety, and quality, beginning with compliance with applicable laws and regulations based on voluntary adherence to RC principles.

Mitsui Chemicals around the World



OVERSEAS SITES

- Offices
- Manufacturing Sites
- R & D Facilities



Company Name

Mitsui Chemicals, Inc.

Established

October 1, 1997

President & CEO

Tsutomu Tannowa

Head Office

Shiodome City Center, 1-5-2 Higashi-Shimbashi
Minato-ku, Tokyo 105-7117 Japan
Telephone: +81-3-6253-2100
Facsimile: +81-3-6253-4245
www.mitsuichem.com

Paid-in Capital

125 billion yen

Employees

17743 (Consolidated / As of March 31, 2019)

Subsidiaries & Affiliates

135

Domestic Manufacturing Sites

6

Domestic Sales Offices

Head Office and three branches

Number of Shares

1,022,020,076

Business Groups

Functional Chemicals
Functional Polymeric Materials
Polyurethane
Basic Chemicals
Petrochemicals
Film / Sheets

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GmbH**

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