

Acrylonitrile-Butadiene-Styrene (ABS)

Superior Surface Properties Combined with Engineering Plastics Properties Going Aesthetics

The China market demand determines the global ABS growth. Despite the actual market slowdown, further growth is expected in coming years. Driving force will be the global emerging middle class with increasing demand for household goods and electric/electronics articles. New developments include bio compatible glass fiber-reinforced grades and highly efficient white coloring.

ABS type polymers belong to the class of engineering thermoplastics, featuring a balance between heat and chemical resistance, high stiffness/toughness and excellent processing behavior. ABS is frequently used in general purpose (GP) and high heat (HH) applications. The grades are customized for specific purposes, for example: transparent ABS (MABS), flame retardant ABS, ABS for excellent surface properties in electroplating processes or ABS with low gloss surface. ABS can be processed via major routes, e.g. by extrusion and/or injection molding.

Before mentioned behavior makes ABS a highly robust plastic, suitable for many applications of our daily lives requiring exceptional aesthetic quality. Compared to other thermoplastics, ABS has a high surface polarity, resulting in excellent printability and paintability. ABS is well miscible with other polar

thermoplastics, such as polyamide (PA) and polycarbonate (PC).

A typical field of use is the automotive interior, for example in pre-colored, but also painted or in decorative, electroplated parts. General purpose and high heat grades are frequently used for consoles, instrument panel carriers. ABS/PC is used in interior applications that require enhanced impact strength

and/or improved high heat resistance. ABS is also used in automotive exterior applications, such as grilles, rear and headlamp housings. Due to its inherently poor UV-stability, most exterior applications require coating/painting.

ABS is most suitable for electroplating. Applications range from knobs, decorative parts of housings. A new Cr(VI) free etching is under development, fitting »



An Indian 2-wheeler producer uses ABS types with very good paintability for the trim components of a new scooter series

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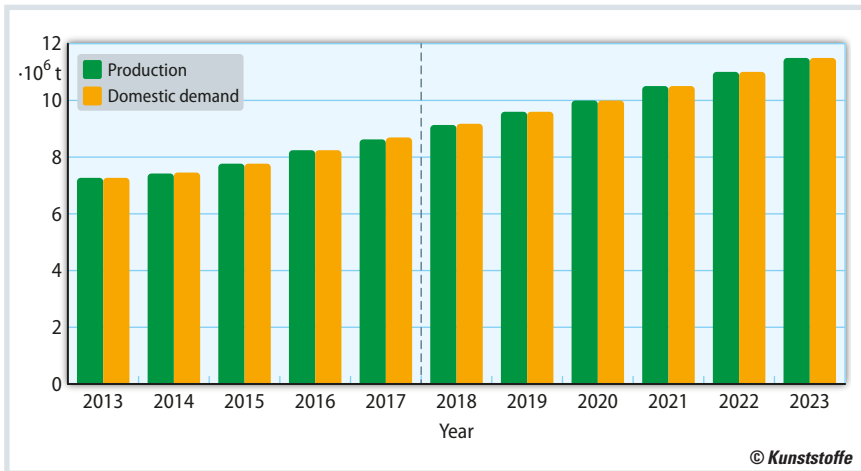


Fig. 1. Global ABS production and demand with historical data and forecast (as for: spring 2019, source: IHS)

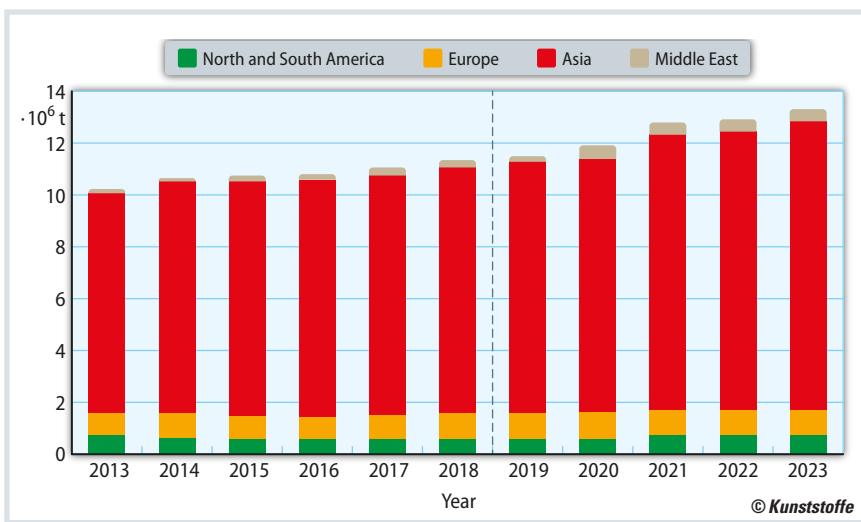


Fig. 2. The global ABS capacity development shows the strong percentage growth in Asia and the Middle East compared to the rest of the world (source: IHS)

well in existing value chains (*Kunststoffe international* 02/2018, p.10). Other ABS applications comprise refrigerator inliner, extruded and thermoformed multilayer sheet for pool and spa. Transparent ABS is often used e.g. in healthcare applications, such as connectors for infusion sets, but also in household, e.g. in fridge trays.

General purpose ABS grades are frequently used for telephone, computer and printer housings. Flame retardant ABS grades are used for example in game consoles, in plugs and in some housings for electrical parts. Extrusion ABS is used for example in building and construction, such as drainage piping and comparable applications, being not directly exposed to UV light. ABS is used for toy building blocks, in housings for lawn mowers and for lightweight, impact resistant travel baggage.

Growth Expected despite Actual Weak Demand

The ABS market is expected to grow further in coming years. New production capacities are planned mainly in Asia and Middle East, but also in Europe. Major driver for the continuing growth of ABS is the emerging middle class in some of the Asian, Middle East and South American countries (Figs.1 and 2). Growth will be strong in electrical and electronics applications, and in household appliances. As an example: the per capita consumption of ABS in China is predicted to grow from 3.4kg (today) to approx. 4.4 kg in 2022. This strong growth is due to replacement of existing appliances, in combination with new demand coming from the growing urban population (source: IHS). In the household appliance sector we see a continuing interpolymer competition,

for example between ABS on one side, and polystyrene (HIPS) or even polypropylene (PP) on the other side. Wherever the technical specification allows the use of these and other polymers, it is a combination of raw material price and process cost that determined the material choice. ABS excels here by a combination of high throughput/short cycle times, superior surface quality and excellent decoration behavior (by printing, foil lamination, coating).

The transport/automotive segment will see a growth of more than 2% worldwide in coming five years. The global automobile production growth will most likely fatten out a bit; nevertheless we will continuously see an increased use of plastics in the automobile sector, plus an ongoing strong growth in 2-wheeler production, especially in emerging societies such as India.

A successful example for high quality ABS applications are painted parts for 2-wheeler (Title figure). The India based producer TVS Motor was searching for ABS with excellent paintability, high impact strength and durability as key requirement for its new series. The demanding part comprises lamp housing, battery casing and side panel/fender. Absoloc DP29 M Q633 was developed by Ineos Styrolution India and Ineos Styrolution Group GmbH just for this ambitious specification, featuring an innovative surface modification to make this ABS even better regarding paintability and surface quality, at excellent dimensional stability.

From Door Panels to Bio Compatible Glass Fiber-Reinforcement

Especially for the upper interior trim, an ABS grade Novodur H 801 was developed (Fig. 3). The grade features high heat properties, combined with low emission of volatile organic compounds (VOC). Another novelty, especially designed for automotive applications as well, is Novodur Ultra4255. This material combines ductility at low temperature (100% ductility at -30°C), high heat properties, low emission of volatile organic compounds (VOC) with good flow and benign processing behavior.

A new application was reported to substitute magnesium metal by a semi structural part, including long glass fiber reinforced ABS. This part is positioned in



Fig. 3. A new ABS Novodur grade with high heat resistance and impact strength was developed especially for the requirements in the upper interior automotive trim (© Ineos Styrolution)

the middle of the front console and requires high stiffness and very high dimensional stability. The new LGF-ABS contributes to further weight savings, compared to the metal (*Kunststoffe international* 03/2019, p.29).

ABS finds increasingly use in the healthcare sector. One example is the HandiHaler by Boehringer Ingelheim GmbH, Ingelheim am Rhein, Germany. Novodur HD M203FC is used for the housing, due to its mechanical property profile and its general suitability for healthcare applications. Also glass fiber-reinforced ABS is used in healthcare. Recently, Novodur HD M203FC G3, having a biocompatibility certificate, was introduced as material for infusion set spikes. Good mechanical properties, combined

with consistent recipe over a defined time, plus relevant certificates for medical/healthcare applications are crucial success factors for ABS and other styrenics in this important segment (*Kunststoffe international* 04/2018, p.50).

New White, Circular Economy

ABS developments are not only targeting new applications. Producers are constantly aiming to maintain a high quality level and to reduce complexity for their customers (e.g. molders) as well. As an example, manufacturers of white goods are aiming at meeting the color coordinates of their specific white color as accurately and consistently as possible. For this purpose, the producer of Terluran developed a white

pre-colored grade, including white pigments and UV stabilizer. This concept allows the molders of white parts to use only small amounts of pigment masterbatch, creating the respective corporate white color right "on the spot" during injection molding with a suitable dosing unit and mixing ring. Terluran GP-35 white is a high flow, multi purpose ABS grade especially for white, thin-walled parts.

Especially in household and electronics segment, we find more often the use of post-consumer recycled ABS. While the eco profile of such a product is positive, it is inevitable to have a strict lot-to-lot control of composition and impurities of the used post-consumer ABS. Besides recycling, customers aim to reduce their products' energy and CO₂ footprint by using more and higher flow ABS grades. With high flow ABS, having low viscosity but standard heat resistance, the cycle time of injection molded parts can be efficiently reduced and hence more parts per time/energy can be produced. Additionally, the amount of material can be reduced.

Another recent trend is again related to recycling-ABS: due to the vast progress in computer-based waste sorting technologies, it is now possible to identify specifically colored ABS from post-consumer waste. Flipside of the coin is the slight deterioration of impact resistance due to the thermal history of processed ABS. This disadvantage can be "healed" by the use of suitable impact modifier, designed to exactly fit the requirements of the mold. ■

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Fig. 4. The „HandiHaler“ inhaler with good haptics and an ABS Novodur grade that was specifically developed for this segment (© Ineos Styrolution)

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