Activating Plastic Surfaces for Optimal Adhesion

Poor adhesion of paints, weak bonds, stickers that come unstuck or burrs that require extensive reworking – these processing problems occur time and again in the processing of plastics. To avoid high costs for reworking and customer complaints, many companies rely on flame treatment.

Matthias Gröll

Flame treatment is a problem solver for many tasks in the processing of plastics. It is used at various stages of the process for different purposes. One focus is on pretreatment.

Paint adhesion before coating

The classic application of flame treatment is the treatment of plastic parts prior to coating in order to activate the surface. This enables optimal paint adhesion. In principle, optimal adhesion is always achieved when the surface energy of the workpiece is higher than that of the paint or adhesive layer. If the surface energy is lower, it can be increased by flame treatment.

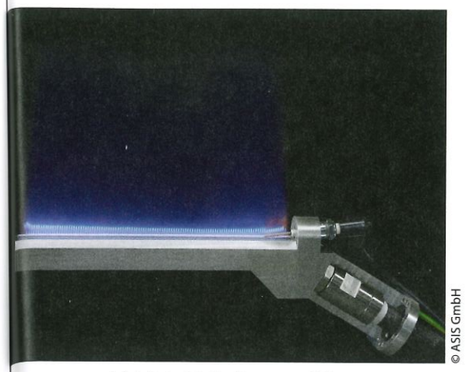
The physical process causes the originally inert and non-polar structure of the surface, which results in poor adhesion of paints, to be converted into a material with a polar structure. The increased surface tension thus created allows for better paint adhesion on the components. This is particularly important for suppliers and manufacturers in the automotive industry who flame plastic parts such as bumpers or door panels to optimize the painting quality. Paint manufacturers also use the system in the laboratory to flame test panels and check the quality of their paints.

© ASIS GmbH

The flame treatment activates the surface of plastic parts and ensures increased paint adhesion.

Adhesion of bonded joints

Flame treatment is also an effective and versatile method of improving adhesion for bonding. By increasing the surface energy, the wettability with the adhesive is improved. Organic contaminants such as oils or fats are burnt off, resulting in a clean and polar surface. The thermal treatment can also lead to microstructuring, a slight roughening of the surface, which also improves the mechanical anchoring of the adhesive. This is used in the assembly of plastic parts in the automotive industry or in the manufacture of medical devices and consumables that are made of plastics that are difficult to bond. Flame treatment is also used for product labeling that is difficult to adhere, such as stickers in the packaging industry or bonding in the electronics industry.

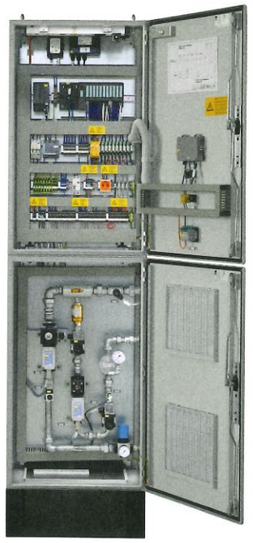


© ASIS GmbH

A fabric inside the burner and the sensor technology ensures a constant flame.

Deburring plastic injection-molded parts

Flame treatment is an effective method of removing fine burrs from injection-molded parts and improving surface quality. The plastic parts are briefly exposed to the flame and the heat melts thin burrs on the surface. Due to the low mass of the burrs, they melt faster than the surrounding material and thus disappear without damaging the main structure of the part. This process can either completely eliminate the need for time-consuming finishing steps such as grinding or significantly reduce them. This is used, for example, on plastic parts in medical technology.



© ASIS GmbH

The separation of mechanics and electrics is a safety feature of the Rob-Flame technology.

Integration into production lines with robotics

The Rob-Flame flame treatment system from ASIS GmbH (Automation Systems and Intelligent Solutions) can be used as a stand-alone solution or integrated into existing systems. In the latter case, it is then clearly displayed in the main control system. This offers a high degree of flexibility and facilitates integration into existing production processes. The burner can either be guided directly by the robot or designed as a stationary burner, past which the parts move or are moved by a handling robot. The latter is particularly advantageous when deburring. The customer can choose between various ASIS burners. Different sizes allow it to be adapted to the component geometry and size, and with the options of internal or external hose guidance to the preferred robot type. A special fabric for distributing the air-gas mixture can be found in all models and ensures an even flame pattern over the entire length. The advantages of robotic solutions are obvious, as they provide consistent and repeatable results. The problems associated with insufficient flame distance or too long/short flame exposure, which occur time and again with manual flame treatment, do not exist with a robotic solution.

Technical structure

Rob-Flame has an advantage over many systems due to its technical design. An important safety feature is the separate construction of the electrical and mechanical systems, which makes it possible to carry out mechanical work independently of the electrical part and vice versa. This increases safety and facilitates maintenance work.

The closed-loop system precisely regulates the flow of the air-gas mixture and ensures an extremely even flame pattern, which improves the quality of the flame treatment. A small, permanently installed panel allows the parameters to be set and the flame to be started or stopped during maintenance.

Continuous product maintenance

The latest product updates include new flow sensors that regulate even more accurately and stably and ensure long-term product support. An exchange kit is available for integrating the new sensors into existing systems. A new ignition transformer ignites the flame, checks that it is curing properly and, with performance level D, safely switches the flame off again, which is crucial in the event of an emergency stop.

Another advantage is the system's compact design. With a control cabinet width of just 60 cm, the system is extremely space-saving. In addition, an experienced service team is available for maintenance and support, ensuring the operational reliability and longevity of the system. A wide range of proprietary burners allows for adaptation to different requirements, while the closed-loop system constantly monitors the status of the system and provides immediate feedback in the event of malfunctions.

Conclusion

Flame treatment is a versatile and cost-effective technique for modifying the surface quality and polarity of plastics to meet specific process requirements. It is very efficient and can be easily automated. Compared to chemical deburring processes, flame treatment produces less waste and does not use any harmful chemicals. ASIS has a test center to evaluate flame treatment on customer-specific parts. In short and free functional tests, a basic evaluation of this technology can be made with regard to modifying surface properties. //

Author

Matthias Gröll
Senior Marketing Manager
ASIS GmbH, Landshut (Germany)
mail@asis-gmbh.de
www.asis-gmbh.de