

Large-format Class A surfaces directly from the injection moulding machine:
Surface Innovation Days 2026 at INEVO demonstrate the economic viability of ENGEL clearmelt technology for exterior components

Schwertberg/Austria, July 2026

From 29 June to 2 July 2026, the ENGEL Surface Innovation Days 2026 took place at mould maker INEVO in San Polo di Piave. Over 300 trade visitors from around the world travelled to northern Italy for the event. The focus was on the economically viable flooding of components with polyurethane in the ENGEL clearmelt process, which produces scratch-resistant, self-healing Class A surfaces for large-format exterior components directly in the injection mould, without downstream painting or coating steps. Expert presentations by INEVO, ENGEL, Borealis, Mankiewicz and DNP, together with a multi-hour live demonstration on an ENGEL duo 4000 combi M two-platen injection moulding machine with 40000 kN clamping force, illustrated the high level of industrial maturity the technology has now reached for bumpers, bonnets, doors, roof modules and front and rear modules.



Image 1: Over 300 trade visitors from around the world came to the ENGEL Surface Innovation Days 2026 at INEVO's technical centre in San Polo di Piave. They learned about economically viable solutions for the integrated surface finishing of large-format exterior components, which replace downstream painting processes and reduce unit costs.

Flooding components with polyurethane directly in the injection mould produces high-quality, scratch-resistant, UV-resistant and weather-resistant surfaces in a single process step. The PUR systems used also show a high resistance to chemicals. Their self-healing effect causes smaller, non-abrasive scratches to disappear again even at room temperature. Downstream painting, coating and polishing processes are eliminated, as are capital-intensive and energy-intensive painting lines. The reject rate is also significantly lower than with conventional painting processes. This reduces unit costs, and CO₂ emissions fall by up to 60 %. Additional advantages include a high degree of design freedom and the ability to integrate functional films, for example for LiDAR and radar transparency or lighting functions, directly into the component. Colour and decor changes can also now be implemented during ongoing production far more easily than in a conventional painting line.

“The clearmelt technology has reached a decisive level of maturity in recent years,” said Dr. Clemens Kastner, Head of Business Development Mobility at ENGEL. “Machine technology, mould making, metering technology and materials have developed to a point where large-format Class A surfaces can now be produced economically in series production. With the ENGEL clearmelt Competence Center, we are pooling the necessary know-how and assuming overall responsibility for our customers, from the initial feasibility assessment through to series production.”

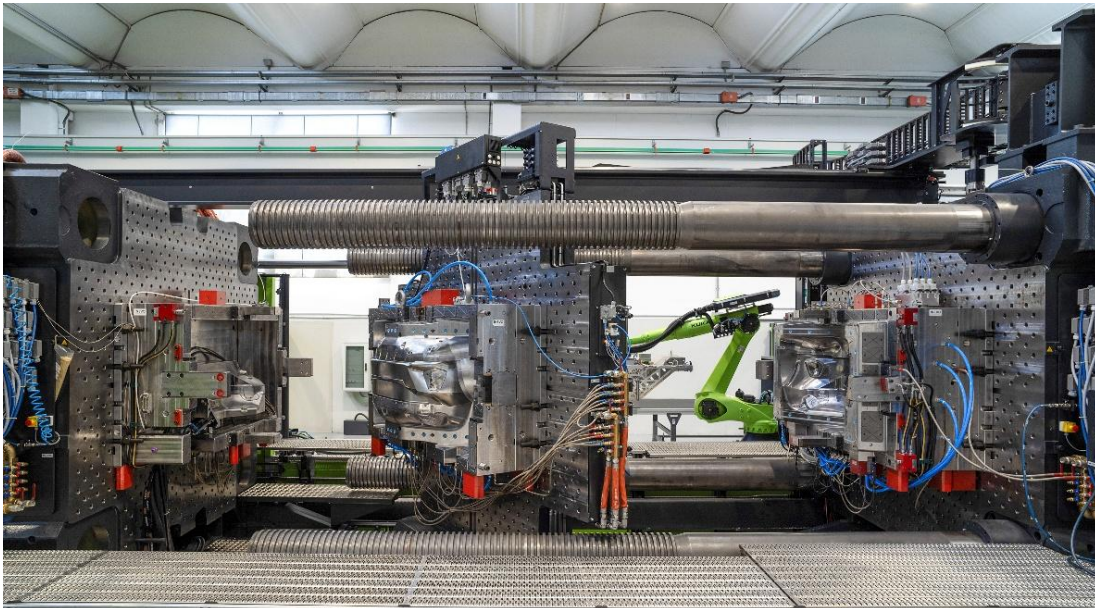


Image 2: A view into the mould area of the ENGEL duo 4000 combi M with 40000 kN clamping force. The turning-platen design allows several processes to be combined in a single mould, from film back-moulding to flooding with polyurethane. For processors, this means shorter process chains and lower unit costs in the production of large-format exterior components.

Reducing complexity in clearmelt projects and assuming responsibility from a single source

This bundled responsibility was the subject of a highly sought-after presentation by ENGEL at the event. Under the title “One Partner, One Solution: A New Era of Polyurethane Surfaces with ENGEL and the CCC”, the company outlined how machine, mould, material and metering technology for

clearmelt applications can be brought together within a single organisation. The background to this is a market situation that has historically often been organisationally fragmented. Processors had to coordinate injection moulding machine manufacturers, PUR metering system suppliers, material suppliers and mould makers in parallel. This resulted in considerable coordination effort and additional interface risks.

With the clearmelt Competence Center (CCC), ENGEL assumes overall responsibility as a system supplier. Processors thus have a single point of contact throughout the entire project, from the concept phase through feasibility assessments and mould sampling to series production. This shortens coordination loops, reduces technical risks and accelerates time-to-market. The CCC operates internationally. Teams in Europe, North America and Asia collaborate across locations on applications, test planning and system design. For trials, a broadly equipped range of systems is available in St. Valentin alongside an ENGEL duo 5500 with 55000 kN clamping force, supplemented by additional capacities in Schwertberg as well as at partner mould makers and material manufacturers, including in Asia and North America. Trials can thus be placed flexibly, depending on component size, material system and logistical constraints. Enquiries to the CCC are channelled directly through the ENGEL sales organisation, so that processors receive an initial feasibility assessment and a suitable solution proposal within a short time.



Image 3: OEMs, ENGEL, INEVO and other partners used the event's networking formats for professional exchange. The ENGEL clearmelt Competence Center, which brings systems, moulds, materials and metering technology together under one roof and offers processors shorter coordination paths and a faster time-to-market, was also a topic.

Producing large-format exterior components reliably in a single process

The live demonstration in INEVO's technical centre showed just how far the industrial maturity now extends. On an ENGEL duo 4000 combi M configured as a turning-platen machine, a generic demonstrator component was produced over several hours: a bumper with an integrated front module that combines several previously separately manufactured components in a single part. The example

illustrates the dimensions in which large-format exterior components can today be produced reliably and in a single continuous process.

The process chain combines several processes in one mould. First, an easix articulated robot places a 2D film in the vehicle body colour into the cavity. Infrared emitters integrated into the gripper heat the film, which is then thermoformed in the cavity. A second film bearing the brand emblem is then inserted and formed in a shallower contour. Both films are back-moulded together with polypropylene. After turning the centre platen, the front panel area is flooded with polyurethane in the second station. For processors, this continuous process integration means fewer components, less assembly effort in vehicle production, a shorter process chain and lower unit costs, with consistently high reproducibility of surface quality.

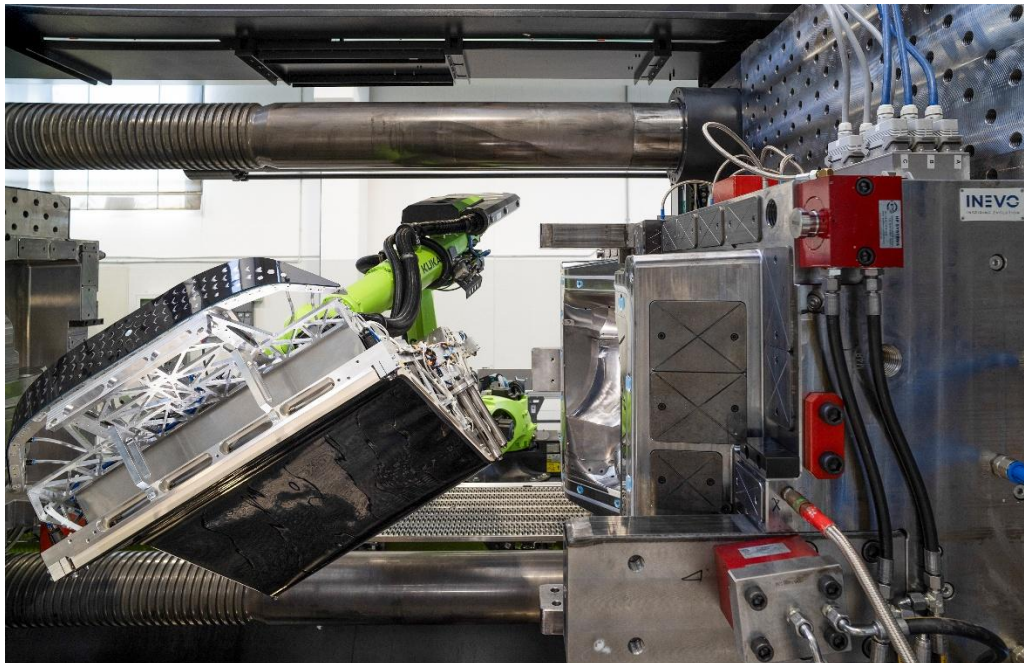


Image 4: On the ENGEL duo 4000 combi M, an ENGEL easix articulated robot handles the entire part handling. This fully integrated automation allows processors to operate the combined process chain of film back-moulding and PUR flooding as reproducible series production of components with Class A surfaces in short cycle times.

“Functional integration ranks high on the agenda in new automotive projects. Several individual parts become one highly integrated component,” said Andreas Popp, Managing Director at INEVO Germany. “With the ENGEL duo 4000 combi M in our technical centre, we are specifically expanding our component range to include large-format exterior components such as bonnets, bumpers and roof modules. The decisive factor for us was that the system combines the full range of processes required for this, from film back-moulding to flooding with polyurethane.”

With this machine, INEVO is also creating a joint testing facility with ENGEL. Processors and OEMs can qualify new component concepts and mould designs under realistic conditions before series

production begins. The high demand for the test capacities in San Polo di Piave shows that interest in integrated surface solutions extends well beyond the established European markets.

Replacing painting lines and integrating functions directly in the component

The Surface Innovation Days also highlighted the market context in which this development is taking place. Painting lines account for a significant share of the CO₂ footprint in vehicle production and are both cost-intensive and maintenance-intensive. At the same time, functional integration in exterior components is increasing. The conventional bumper is evolving into a component that accommodates air intakes, headlamp housings, sensors and grilles. clearmelt surfaces meet the optical and mechanical requirements of such integrated components and in many applications replace painting entirely.

Material development is supporting this transition. Polypropylene as a substrate material is gaining importance in exterior applications because it offers cost advantages and supports requirements such as pedestrian protection. Borealis presented new material solutions for the combination with clearmelt at the event. PUR layer thicknesses have also been continuously reduced, which further lowers material costs and CO₂ footprint. The kidney grille for the BMW iX marked the first large-scale series application in exterior a few years ago. Roof modules, front structures, doors and accent components are now among the most frequently requested new applications.



Image 5: The ENGEL duo 4000 combi M in INEVO's technical centre is available to processors and OEMs for mould sampling and pre-series trials. It maps the entire clearmelt process for large-format exterior components.

Preparing the entry into clearmelt in a structured manner

For processors considering a transition from painting to clearmelt, the starting position has improved considerably. With the CCC, ENGEL provides the industrial framework to approach this step in a structured manner and with manageable risk. Early trials under realistic conditions deliver a robust data basis on component quality, cycle time and unit costs before processors commit to a series investment. This allows requirements, mould concept and system design to be aligned during a phase in which changes can still be implemented efficiently. Processors thus safeguard their investment decisions and shorten the path to stable series production.

Images: ENGEL

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ENGEL is one of the global leaders in the manufacture of injection moulding machines. Today, the ENGEL Group offers a full range of technology modules for plastics processing as a single source supplier: injection moulding machines for thermoplastics and elastomers together with automation, with individual components also being competitive and successful in the market. With eleven production plants in Europe, North America, Mexico and Asia (China, Korea and India), and subsidiaries and representatives in more than 85 countries, ENGEL offers its customers the excellent global support they need to compete and succeed with new technologies and leading-edge production systems.

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