

Krauss Maffei

PEOPLE FOR PLASTICS



BACK INJECTION AND COMPRESSION MOLDING WITH SENSITIVE DÉCOR MATERIALS

DecoForm® technology

IN PARTNERSHIP WITH INDUSTRY

KraussMaffei is a premium partner for the plastics and rubber processing industries worldwide



Automotive



White Goods



Construction



Life Sciences



Electrical/Electronics

Whatever you aim to achieve in plastics or rubber processing, KraussMaffei is your partner. We are the only company with intensive expertise across the three main engineering fields. And we have a strong track record in integrating this expertise to develop new processes and systems.

Ready for any challenge

Our **Injection Molding Machinery Division** supplies machinery and systems from 35 to 4,000 tonnes for standard applications and for all processing variants, together with fully automated solutions. We have a strong customer base in all the relevant industries worldwide.

Our **Reaction Process Machinery Division** supplies machines and complete systems for processing polyurethanes and other reactive materials.

Completing our product portfolio, **Automotive Component Systems** supplies foam molds, cutters and routers. Our customer base is wide, with a focus on the automotive, construction and white appliances industries.

Our **Extrusion Technology Division** supplies machinery and systems for compounding, for pipe, profile and sheet extrusion, physical foaming, and the production of technical rubbers and intermediates for tire production. Machinery from the company's range – from single extruders to

complete extrusion lines – is used in many industries, including chemicals, pharmaceuticals, automotive, construction, furniture and packaging.

People for Plastics

We are the “people for plastics”. We are your partners from the first exploratory discussion, through development to commissioning, servicing and operating your system, and final disposal. At all times, you are assured of outstanding competence in planning and engineering, as well as reliable and fast spare parts, service and support.

Adding value for customers

We put our expertise to work for your success. With machine ranges engineered for modularity, we can deliver application-specific solutions based on our wide range of standard modules and specially engineered solutions. This strategy offers customers technical and cost advantages.

Close to customers around the world

As an international company, KraussMaffei has a presence in all the major markets for the plastics and rubber processing industries and employs around 3,000 people worldwide. Our sales and service network keeps us close to all our customers around the world.

DecoForm® – the efficient way to mold fabrics and other décor materials onto plastic substrates



Packaging

KraussMaffei's DecoForm® manufacturing cells are engineered for fully automated production of plastic moldings with fabric or film surfaces, including handling the delicate décor materials. With this patented process, even the most delicate décor films and fabrics can be precisely positioned in the mold, back-injected in a controlled process and molded into shape. All the parameters governing the positioning and forming of the decors can be adapted to the décor for an optimal result.

THE TECHNOLOGY IN DETAIL

DecoForm® – innovative production technology for premium quality decor elements

Operating in a highly competitive market, automotive companies strive to achieve maximum model differentiation under intense cost pressure. This situation challenges components suppliers to adopt innovative, cost-cutting production methods for high-quality molded parts. It drives the rapid advances in production technologies for each new generation of cars. The automotive industry leads the way, but other sectors are quick to follow. The same techniques deliver quality

and cost advantages in aircraft and train interiors and seating, and for the furniture industry.

KraussMaffei's DecoForm® system are high-performance production units with an outstanding track record. Supported by our expertise in these applications, they deliver high quality moldings and low unit cost. Modular and upgradeable, DecoForm® systems are also ready for the future.



DecoForm® technology for efficient, cost-effective production

- Flexibility
- High process integration cuts the number of process steps
- High productivity, small footprint
- Functional elements can be integrated in moldings
- Environmentally-friendly (no solvents or adhesives)
- Recycling-friendly products (all PP)
- High repeatability, stable process
- Good for the bottom line
(15-30% lower costs than conventional laminating processes)





DecoForm manufacturing cell for automotive door trim elements (installed with PeguForm)

DecoForm®

Back injection and back compression molding – the differences

DecoForm® back injection molding

DecoForm® back injection is recommended especially for narrow, elongated parts, like pillars or door trim sections. A film or fabric insert is placed in the mold. The mold is closed and the resin injected onto the insert using cascade technology. The flow front shifts from one cascade to the next as cascade blocks are rapidly opened and shut under the control of the MC5 software. Each needle shut-off nozzle is independently controlled. Precisely regulating their activation eliminates the problem of folds forming in the décor material. Pressure and temperature damage to sensitive material can be minimized by the right number of cascades. With the DecoForm® module, clamp-force build-up during injection can be gradual, following a preset profile which allows the mold to breathe (depends on mold design). After the holding pressure phase, the clamp force can also

be released in stages. This eliminates the risk of cavity pressure damaging the décor insert.

DecoForm® back compression molding

Compression molding is the method of choice for large-format parts with heat- and pressure-sensitive décor materials. Typical products are door trim and instrument panel elements, seat-back shells, boot trim sections and floor mats. To keep cavity pressure as low as possible, the clamp moves during the injection phase. Field trials have shown that compression gaps as big as 60 mm are sometimes necessary. Gap width is governed by the type of décor, the thermoplastic substrate and the gating pattern. Conventional injection compression molding cannot fill the mold with repeatable precision, because, under the influence of gravity, the melt flows downwards as it is injected. To achieve a repeatable filling



C pillar, VW Golf

Door trim panel, Peugeot 307

Door trim panel, VW Golf

Instrument panel,
DaimlerChrysler Crossfire



Door trim panel, Seat Ibiza



NCV 2 door trim panel,
DaimlerChrysler

Complex design of a boot trim element
for a new car generation

profile, KraussMaffei developed a special compression process. The décor film is positioned in the mold and preformed when the mold closes. As the melt is injected, the mold opens to the preset compression gap. Once switchover point is reached the mold closes again completely and the melt cushion and décor are molded into shape. The flow front speed is controlled by the machine's control system according to a preset profile. KraussMaffei holds the patent on this process (EP115 5547B1) and makes it available to customers.

THE TECHNOLOGY IN DETAIL

DecoForm® machine features

DecoForm® clamp unit

Cavity pressures in the DecoForm® process are far lower than in normal injection molding. This makes it possible to produce large-format parts with relatively low clamp force. Typical of the application-specific DecoForm® clamps are the extremely large platens and generous opening widths. The all-hydraulic clamp unit allows pressure build-up in the four cylinders to be precisely synchronized. This eliminates the risk of platen deflection. Pressure and speed profiles can be programmed with a high degree of precision and synchronized with the injection phase.

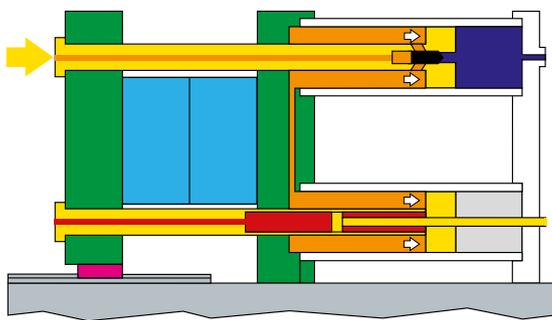
All-hydraulic clamp guarantees premium quality

The ideal machine for back injection and back compression molding has an all-hydraulic, 2-platen clamp unit. This is the only system capable of guaranteeing precisely repeatable processes through very tight control of position

and pressure throughout the mold closing and compression sequences.

DecoForm® technology for standard KraussMaffei machines

KraussMaffei's DecoForm® module is the ideal hardware upgrade for standard C and MX Series machines. It's an option that gives you more flexibility and better capacity utilization for a better return on your investment. One keystroke calls up the DecoForm® software module for full access to all functions.



Design and operation of the 2-platen clamp



Big MX Series machine with DecoForm® module producing automotive door trim panels with sensitive décor materials





KM 350-1900 DF manufacturing cell for automotive door trim (Johnson Controls)

DecoForm® modules for standard injection molding machines

- DecoForm® module for KraussMaffei injection molding machines
- DecoForm® clamping frame
- DecoForm® gripper control



Décór prewarming unit integrated in the automation system



Floor mat (Volvo)



Door trim (Volvo)



Seat component (Jaguar)

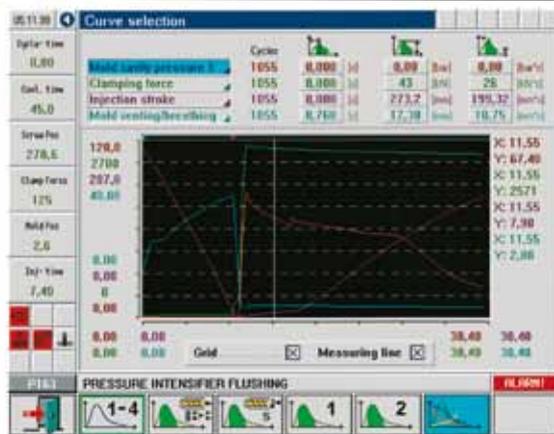
Systematically engineered for uncompromising quality

DecoForm® module – a dedicated system for perfect results

The superior technology of the DecoForm® system sets quality benchmarks.

Greater design flexibility with the DecoForm® clamping frame module

The hydraulically controlled clamping frame is precisely positioned in the mold. It holds the décor in position as the mold closes preventing slippage and folds forming.



Display selected process parameters

In combination with the DecoForm® module, the clamp frame module opens the way to very wide freedom and flexibility in part design.

More quality for your money

DecoForm® delivers outstanding quality at a competitive cost thanks to

- In-mold forming of decor material
- Highly repeatable process
- Perfect for sensitive décor materials (TPO/PP foambacked film and carpets)
- Simplified logistics
- High productivity and a small footprint



KM 650-5700 DF manufacturing cell for automotive pillar trim (Montaplast)



KM 350-1900 DF manufacturing cell for pillar trim (Johnson Controls)



Automated transfer to laser trimming unit



Laser edge trimming for pillar elements

Customer benefits

- High-precision mold positioning during closing, compression and opening
- Freely selectable compression force
- Multi-stage profiles for clamp force and closing, compression and opening movements
- Freely selectable clamp force build-up and clamp speed profiles in synchrony with injection phase
- Graphical display of all main processing parameters with tolerance range monitoring, for example, compression force, screw stroke, mold breathing and cavity pressure





SERVICE WORLDWIDE

Service, support and spare parts – when you need them, where you need them

Rely on us for a fast and competent response to all your service needs anywhere in the world. Whatever you need – from troubleshooting and training to spares or repairs – we're on the job.

We're dedicated to supplying service quality on a par with the outstanding quality of our machines and systems. We offer far more than spare parts and hotlines. We'll work with you to choose the best and most cost-effective solution for your operation. We'll help you test new applications and we'll plan customized service packages.

All-round service

Our service offering is broad. We'll configure your system, install and commission it, train your staff, plan measures to minimize your downtime risk and maximize productivity, and carry out maintenance, repairs and upgrades. You'll find us fast, reliable and competent. Our hotline is manned by highly-trained and experienced service technicians. If necessary, we'll get a technician to you quickly. Remote diagnosis, interfacing directly with your machine's control system, can be a practical alternative. Spares for all important wear parts are available at short notice. We're continuously expanding our service network to speed up spare parts shipment. Talk to us about the right service solution for your business.

Customer trials and prototyping in our test lab

The Injection Molding Division operates a test lab fitted with the latest machinery and equipment. We can run trials, produce prototype parts and fine-tune processes on your behalf. We can work with you to test and evaluate processes, machines and equipment in order to identify the best approach for a particular project. Our highly-qualified application engineers are there to help you.

Training with high hands-on content

Courses are held in our lab and training centre, or, optionally, on your premises. We offer clearly-structured basic and advanced training in operation, process control and maintenance for KraussMaffei injection molding machinery. On request, we'll plan and hold special courses on topics of your choice. All participants spend a high proportion of their training working hands-on with original KraussMaffei machines. A well-structured training program produces skilled operators and technicians, which will positively impact your up-time and productivity.

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At your service worldwide



How to contact us

Apart from email you can contact us on the service hotline or by post at this address:

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KraussMaffei is a premium partner for the plastics and rubber processing industries worldwide. KraussMaffei machines and systems are used wherever plastics and rubber are converted into products. As a knowledge-driven technology company, we build on many decades of experience and a strong commitment to research and development.

Increasing environmental awareness is leading to a resurgence of interest in solvent-free methods of adding décor films and fabrics to plastic substrates. With **DecoForm®**, KraussMaffei offers complete solutions for this application, including fully automated handling of the décor inserts in the injection molding cycle. In this patented process, even the most delicate décor films and fabrics can be precisely positioned in the mold, back-injected in a controlled process and molded into shape. All the parameters governing the positioning and forming of the decors can be adapted to the décor and the part design for an optimal result. DecoForm® makes it possible to produce decorated parts on injection molding machines in a fast, repeatable and cost-effective process.

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