35 Years of ENGEL Tie-bar-less Technology: **The Evolution of One of the Injection Moulding Industry's Pioneering Innovations**

Schwertberg - Austria, July 2025

When ENGEL first unveiled a tie-bar-less injection moulding machine at the K trade fair in Düsseldorf in 1989, the reaction was mixed: technical fascination on one hand, open scepticism on the other. At that time, few would have predicted that this "revolutionary" design would evolve into one of the most successful technologies in injection moulding machinery. Today, 35 years later, ENGEL looks back on more than 85,000 tie-bar-less machines delivered worldwide – and continues to drive this innovation forward with a consistent focus on customer needs. At this year's K 2025, ENGEL is presenting a world première: a new electric tie-bar-less injection moulding machine.

Customer Benefit as the Starting Point

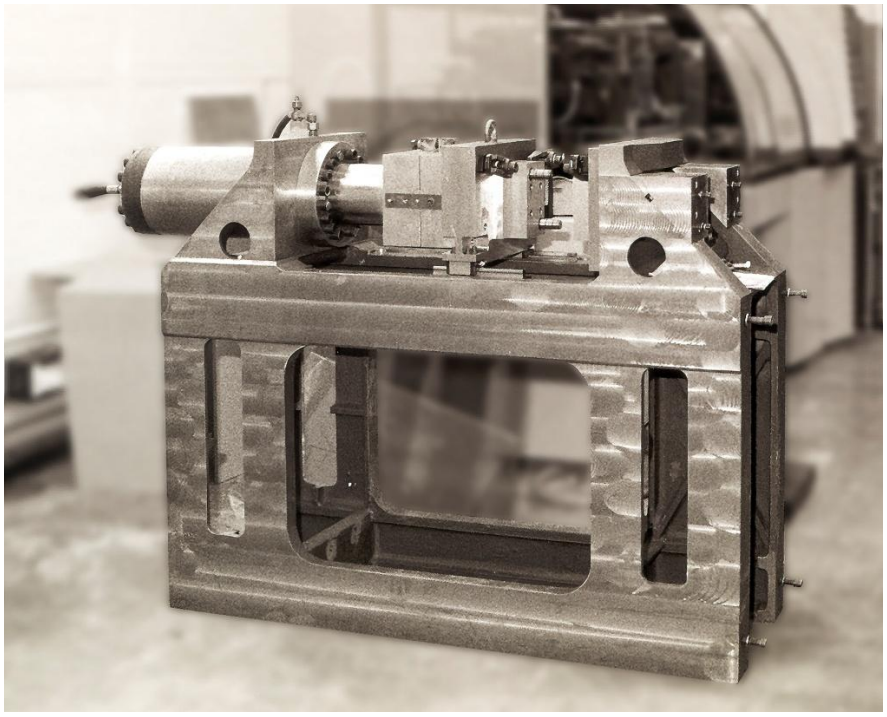

Image 1: The first tie-bar-less frame in the laboratory. A revolutionary concept that became a global success thanks to its significant customer benefits.

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The impetus for developing a tie-bar-less machine came from practical experience: A customer told ENGEL how much the four tie-bars interfered with mould set-up and how much easier mould changes would be without them in the way. The development department at ENGEL picked up on this idea and examined whether it would be possible to design the clamping unit of an injection moulding machine entirely without tie-bars. A simple idea – yet a major leap in design. Up until that point, it was regarded as an unshakeable principle in mechanical engineering that an injection moulding machine had to have four tie-bars, regardless of size or application. The tie-bar-less clamping unit marked a radical new beginning in engineering.

Technical pioneering work from Upper Austria

The breakthrough was achieved with a novel joint principle that compensates for the asymmetry of force application in the C-frame. Instead of guiding the platen over tie-bars as previously done, the mould is clamped via a solid frame – with a freely movable bending-bar joint between the moving platen and the clamping piston. This Flex-Link element, now patented and further developed under the name Force Divider, ensures that the mould halves remain absolutely parallel. It also provides for an even distribution of clamping force across all cavities of the platen and thus over the entire mould surface. This marked the birth of a new generation of machines that not only impressed technically but also opened up new freedoms in mould design. The first complete series went into production in 1990 – the name *victory* became the official product name in 2000.

Experience and evolution across four generations

What began with a lever pin in the prototype has been systematically developed over several generations. ENGEL has continuously refined the joint system of its tie-bar-less machines, evolving from manually lubricated slide bearings to today's Flex-Link with decentralised force application. At the same time, the machine series has been progressively expanded and enhanced with new drive technologies.

Today, the tie-bar-less machine portfolio from ENGEL comprises three variants:

- **Hydraulic**, under the victory line, for flexible and universal use in technical moulding
- **Hybrid**, under the e-victory line, featuring an electric injection unit for technical parts requiring higher precision
- **Electric**, under the victory electric line, designed for particularly demanding applications such as high-volume precision components

These three variants all share the advantages of the tie-bar-less clamping unit: maximum utilisation of the mould mounting surface, faster mould changes, ergonomic access to the mould area, and flexible automation concepts.

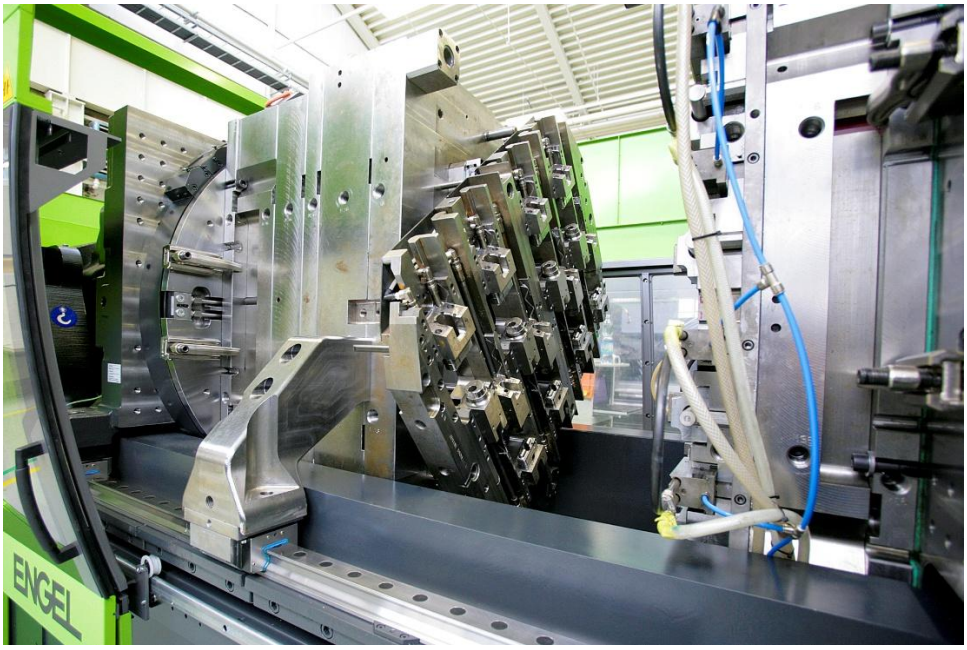

Image 2: Thanks to their tie-bar-less technology, the ENGEL victory series provides ample space for large moulds and extensive automation. The generously sized platen often eliminates the need to invest in a larger machine.

Another economic advantage of the large, open mould area is that it allows the use of very large and complex moulds on machines with comparatively low clamping force.

Success through Consistency of Principles

ENGEL's continued unique position in the field of tie-bar-less technology is not only due to its early lead in technology. The company has also secured its position through continuous development and comprehensive patent protection. It became clear early on that the benefits go far beyond simplified mould changes. Especially for high-cavity moulds with a small projected area, the tie-bar-less design allows for the use of smaller machines with significantly lower energy consumption and reduced investment costs.

Energy Efficiency by Principle

A milestone in the development was the introduction of the ecodrive servo-hydraulic drive technology, which reduces the energy consumption of hydraulic machines to the level of all-electric ones. In combination with the tie-bar-less clamping unit, this results in an ideal solution for

demanding applications with high requirements for energy efficiency. Today, ENGEL equips all hydraulic and hybrid injection moulding machines with ecodrive as standard.

Forward-Looking: Modular, Integrated, Future-Proof

The fact that the tie-bar-less machine technology remains as relevant today as it was 35 years ago is evident above all in its adaptability. Whether for cleanroom applications, multi-component technology, or highly automated production cells – ENGEL's tie-bar-less injection moulding machines can be configured in a modular and needs-based way. In doing so, they stay true to their core principle: maximum efficiency through functional simplification.

Outlook for K 2025: Next Stage of Evolution with a World Premiere

Image 3: At K 2025, ENGEL will unveil a world premiere with the new generation of electric tie-bar-less injection moulding machines.

At the K 2025 trade fair, ENGEL will present the next evolutionary stage of its electric tie-bar-less technology for the first time. The focus is on design advancements that create additional benefits for users. The goal is to address customers' specific requirements even more precisely – just as it was 35 years ago, when a simple question led to a completely new machine concept.

Visit us at K 2025 in Düsseldorf, Hall 15, Stand B42 & C58

Images: ENGEL

ENGEL AUSTRIA GmbH

ENGEL is one of the world's leading manufacturers of plastics processing machinery. Today, as a single-source provider, 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, but also individual components which are competitive and successful in the market. With ten production plants in Europe, North America and Asia (China and Korea) as well as subsidiaries and representatives in more than 85 countries, ENGEL offers its customers worldwide the optimum support which they need to compete and succeed with new technologies and leading-edge production systems.

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