

**MAKING MORE EFFICIENT USE OF ENERGY AND RESOURCES**

The BluePower program for sustained success

## IN PARTNERSHIP WITH INDUSTRY

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



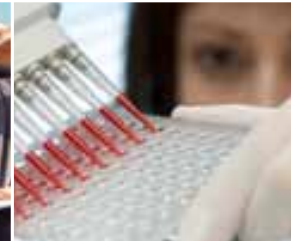
Automotive



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.

## Boost your energy and resource efficiency – With the KraussMaffei BluePower program



Packaging

Our BluePower program encompasses all the modules and measures we offer that boost energy and process efficiency. BluePower modules can be applied to all clamp sizes, models and machine brands and to new and already-installed machines. We are the only manufacturer in the market with multitechnology expertise in injection and reaction molding machinery and extrusion technology. In our drive to improve energy efficiency, we've focused this uniquely broad expertise on three key areas – process optimization, heating and drive systems. We've worked to optimize both entire processes and process details – across all the technologies we supply.

The outcome is plastics and rubber processing with lower energy consumption and more efficient use of resources for at least the same level of productivity.



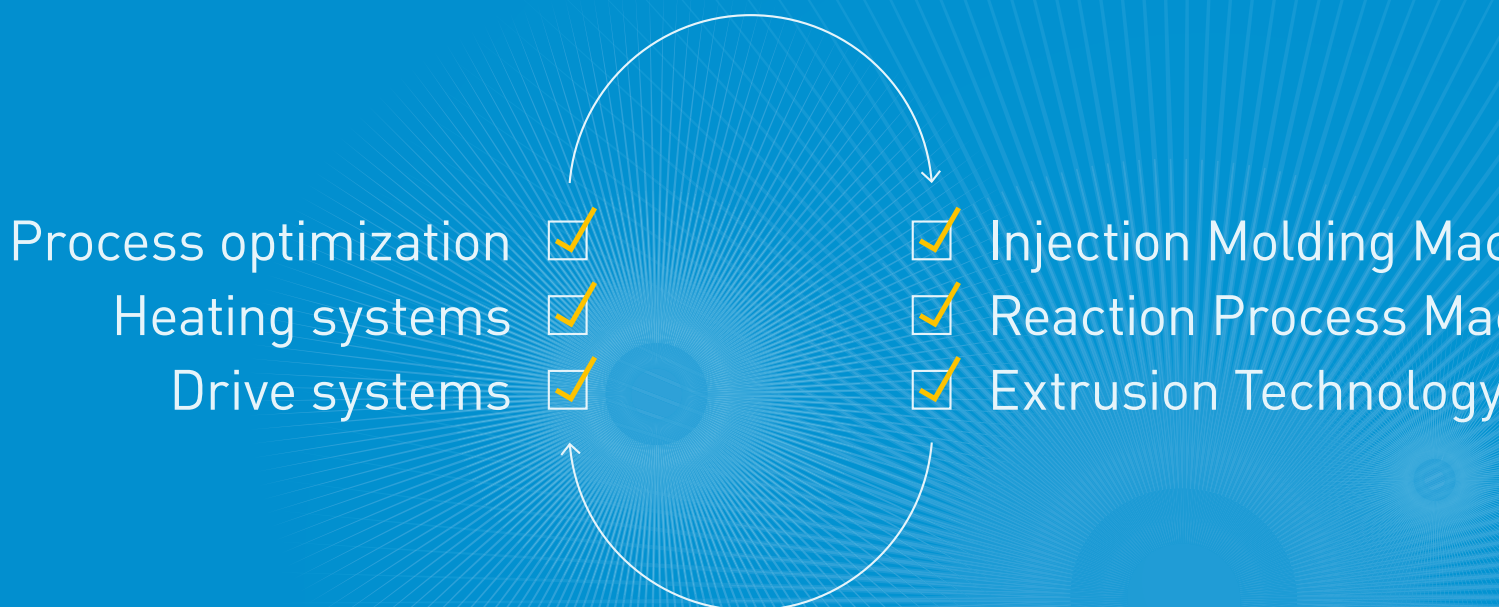
## OVERVIEW

# More energy efficiency – spanning technology boundaries and exploiting synergies.

Anyone determined to improve efficiency and energy efficiency needs to consider the whole picture and identify the greatest source of leverage. With this in mind, KraussMaffei has put the spotlight on three key areas – drive systems, heating technology and process optimization. For our drive systems, we have combined innovative software with state-of-the-art electric and hydraulic drives to deliver application-specific solutions. In heating technology, we have lowered processing temperatures, stopped energy losses where possible, and enabled process heat to be recycled over and over again.

The BluePower program deliberately cuts across technology boundaries, because we know that an approach that spans injection molding, reaction processing and extrusion technology can deliver enormous efficiency gains for users. KraussMaffei can give you comprehensive advice on how to optimize your processes, without any bias towards a particular technology. We work closely with research institutes and industrial partners to implement new developments promptly. We have found that fusing what were formerly discrete process steps into a single process can bring substantial reductions in energy consumption and big gains in productivity.

### BluePower – synergies for saving energy





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# Targeting optimization with on-line analysis

Analyzing, thinking outside the box, devising innovative, integrated solutions and acting on improvements – at KraussMaffei we draw on our expertise and the experience we've gained across our different core technologies and apply this knowhow to your specific situation in order to devise the optimal solution for you. We can offer innovative software and hardware solutions that will help you to strike the perfect balance between energy efficiency and productivity.

### **Energy Analysis Tool detects which modules consume what, and when**

All optimization commences with a detailed analysis to get a clear picture of the energy consumption of individual consumers. The KraussMaffei Energy Analysis Tool (EAT), integrated into the switch cabinet and the machine controller, plays an essential role here. A module integrated in the switch cabinet measures the energy consumed by each machine function. Measurements are carried out on-line and the EAT immediately displays the impact that any changes to machine settings have on energy consumption. The Energy Analysis Tool provides invaluable support for the operator in determining the best energy settings for the machine. Effective optimization can yield savings of up to 10%.

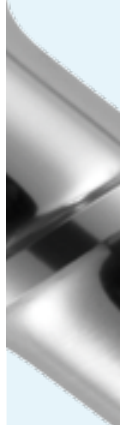
### **Simple optimization from the outset – melt processing**

Injection molding machines fitted with new BluePower HPS screws lower the melt temperature by reducing heat input into the polymer melt. HPS

screws produce a more homogeneous melt than a standard screw and they subject the melt to less stress. This makes mixing in masterbatch in the injection molding machine more efficient, allows changes to be readily made and shortens the cooling periods needed for demolding. KraussMaffei supplies BluePower HPS screws – and the HPS-M variant – in the same lengths as standard screws. They are drop-in replacements for your standard screws since there is no need to change the barrel.

### **Economiser: same performance, lower power consumption**

By their very nature, electric drives generate reactive current in addition to the required active power. This places a strain on the electrical infrastructure and often generates additional costs. The KraussMaffei Economiser compensates for the reactive current, both locally and dynamically. Purpose-built for injection molding machines, it acts as a temporary store for the reactive current, and releases it again to the machine when needed. The KraussMaffei Economiser is retrofittable and is mounted directly on the injection molder. It reduces the load on the electrical infrastructure for very little capital outlay. Motors rated at up to 30 kW also feature an integrated active motor management system. This reduces the supply voltage of the motors in phases of low machine utilization, thereby additionally reducing power losses.



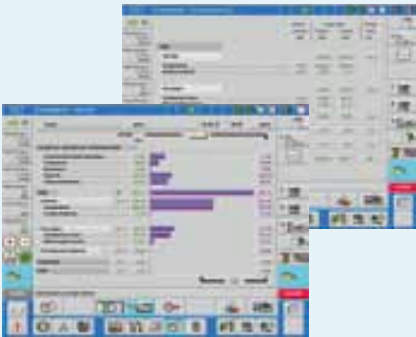
# 10%

## SAVINGS POTENTIAL

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10% potential savings on specific overall energy consumption.

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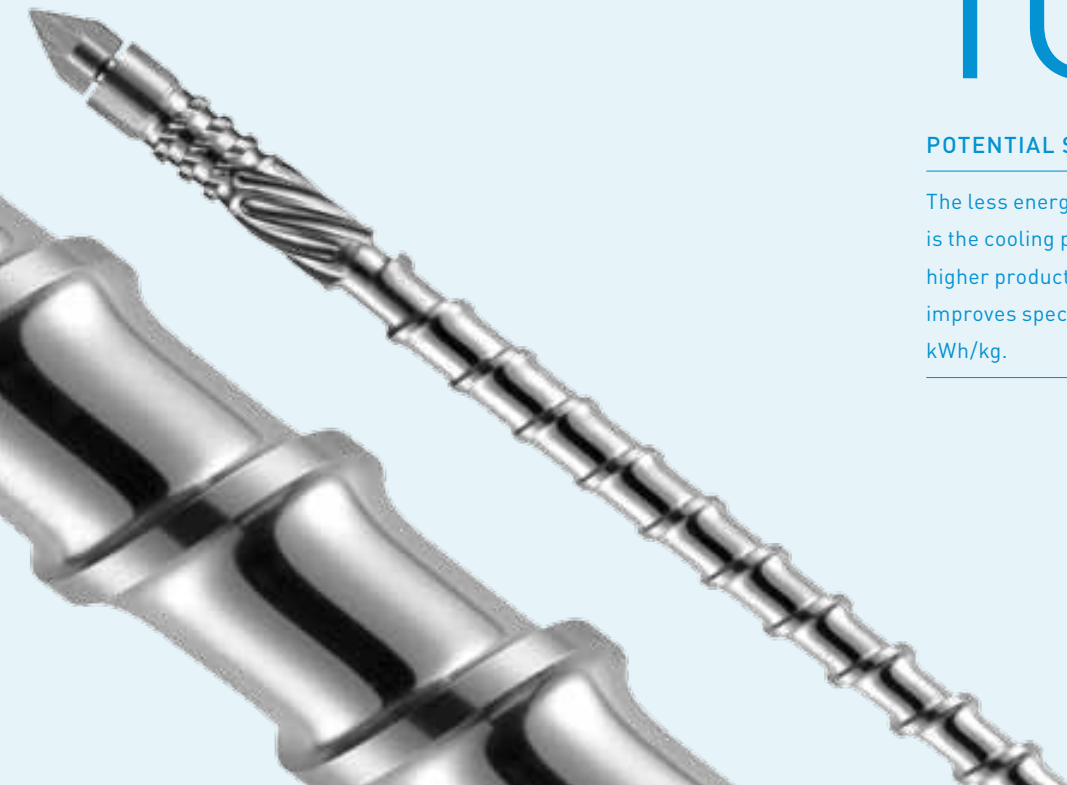
# 10%

## POTENTIAL SAVINGS ON HEATING

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The less energy put into the melt, the shorter is the cooling period. This, combined with the higher productivity of the HPS screw, also improves specific energy consumption in kWh/kg.

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# Concentrating and utilizing heat – maximizing energy efficiency.

The bulk of the energy consumed in plastics and rubber processing goes toward heating the material up to processing temperatures followed by defined cooling for the product. Some simple energy-saving measures of the kind adopted in the home can work wonders here.

### **EcoPac insulating sleeves: concentrate heat and avoid losses**

KraussMaffei EcoPac insulating sleeves go a long way toward preventing band heaters from radiating heat to the environment. They can be wrapped around individual standard bands or around all or part of the whole plasticizing unit. Overall, the retrofittable EcoPac insulating sleeves cut consumption of heating energy by up to 40%, while reducing unproductive warm-up times by up to 30%. They also promote even heat distribution inside the barrel, and improve control and responsiveness. Even running a low temperature, low throughput process, the savings made from the second year of operation outweigh the one-time capital costs.

### **Variothermal process control: separate hot and cold in the mold**

KraussMaffei's proprietary Dynamic Mold Heating (DMH) system (patent DE 102 21 558 A 1) separates the temperature control circuits inside molds. This innovation minimizes the mass of the material in the mold halves whose temperature needs to be controlled and prevents the heating and cooling liquids from mixing. Variothermal temperature control allows the mold's basic temperature to be reduced, resulting in a reduction of up to 40% in radiant heat loss to the environment. The outcome: much faster temperature changes in mold parts in contact with the melt, and a substantial reduction in energy consumption. Aside from energy savings, DMH can help processors meet stringent requirements on surface quality, because, being a variothermal process, it supports complex compression molding techniques.

# 30%

## POTENTIAL SAVINGS

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EcoPac insulating sleeves can cut warm-up times by up to 30%

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# 40%

## POTENTIAL SAVINGS

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Up to 40% savings on heating energy thanks to more even heat distribution in the barrel

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# Targeted efficiency – as much force as necessary, as little consumption as possible.

The drive system of an injection molding machine is one of the most important factors in achieving higher energy efficiency. The BluePower program from KraussMaffei boasts numerous innovations that slash energy consumption all along the drive trains of the most diverse machines. Our solutions are as varied as the applications themselves.

### Servo pumps: savings in every cycle

BluePower Servo Drive Technology optimizes the energy requirements of hydraulic drives by using the high dynamics of servo motors to instantaneously adapt the speed of the fixed-delivery pump for the hydraulics to current needs. Slowing down the pump, for instance during cooling periods, without altering the dynamics, keeps idling losses close to zero. As a result, hydraulic units fitted with servo pumps consume up to 50% less energy than previous solutions (the exact saving depends on the application and machine type).

### Hybrid units: the best of both worlds

Combining the advantages of different drive technologies is a winning formula for creating energy-efficient system solutions. KraussMaffei's CX-hybrids, for instance, combine a hydraulic clamp with an electric injection unit. Electrically driven injection units that have a high power density can inject at speeds of up to 300 mm/s, with high repeatability from shot to shot. The outcome is lower consumption and more performance. CX hybrids with servo pump assistance are notable for their higher energy efficiency. They are ideal all-rounders for the electronics and medical sectors and for other applications where high precision and efficiency are essential.

### All-electric: for standard and high-end applications

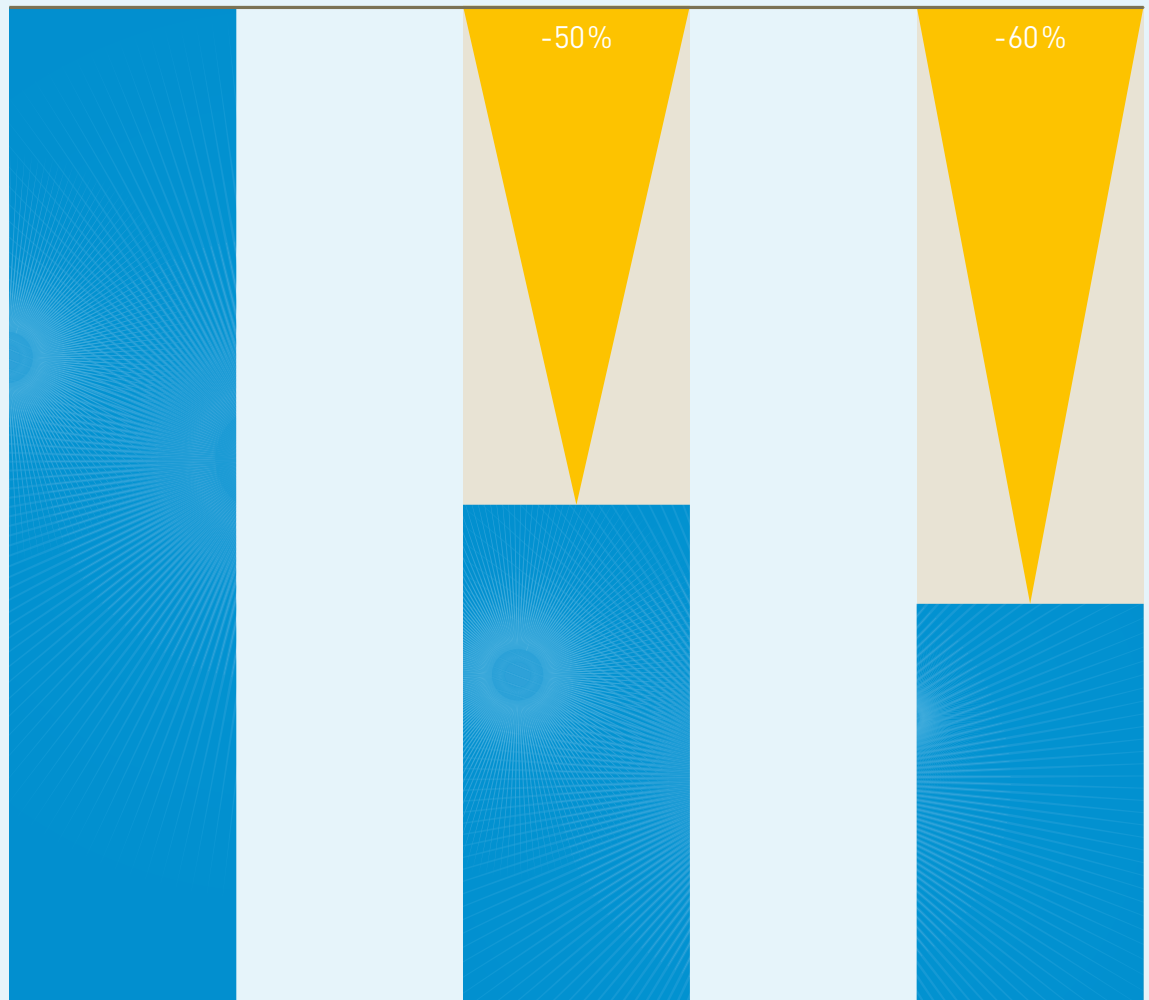
All-electric machines are inherently energy efficient. Theoretically, they are 60% more efficient than hydraulic machines. But for maximum savings, it is important to choose the machine to match the performance requirements. AX machines are ideal for standard applications. They are designed for maximum power density and the lowest possible energy consumption. With their energy-efficient double-toggle design, efficient servo motors and smooth-running mechanical systems, AX series machines are the embodiment of efficiency for ambitious standard injection molding; they achieve savings of up to 60%. By contrast, the EX series is engineered for high-spec and clean applications. These machines combine high performance with the fastest dry cycle times in the industry. They have the unique Z-toggle to thank for this. This clamp concept is what makes KraussMaffei's EX the series of choice for applications where only the best is good enough – including the medical, electronics and packaging industries.



Conventional hydraulics  
(standard)

Machine with servo pumps

Electric machine



Conventional hydraulics  
(standard)

Machine with servo pumps

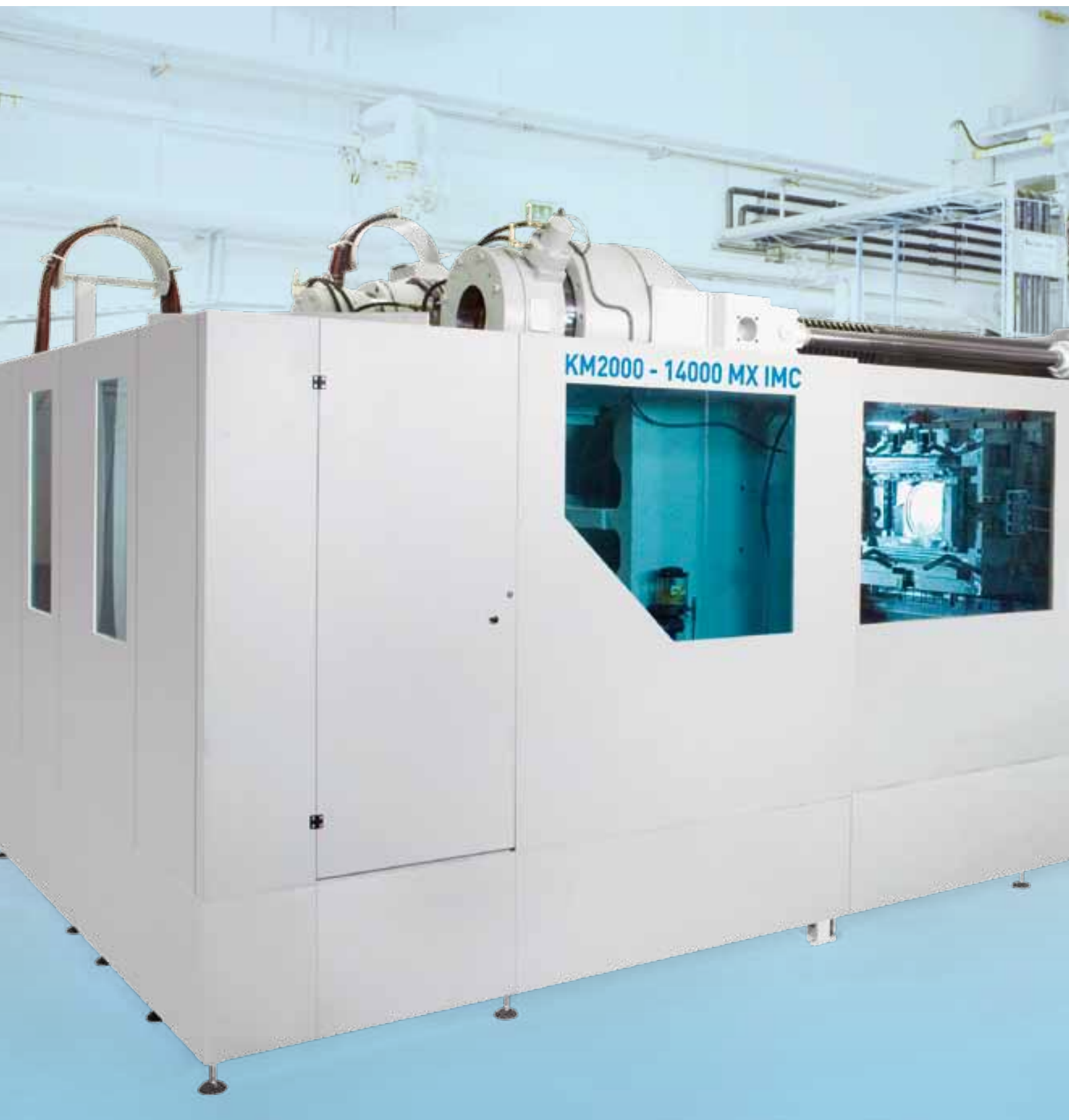
Electric machine



# 50%

## POTENTIAL SAVINGS

Up to 50% savings on overall energy consumption for a typical production cycle for technical parts.





# 40%

## POTENTIAL SAVINGS

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40% reduction in specific overall energy consumption through heating the material once only without intermediate cooling and reheating. Plus efficient plasticizing in the twin-screw processing unit.

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## Continuous energy savings

**Extrusion, too, benefits if the KraussMaffei BluePower program is applied to process optimization, heating and drive systems. Not only does BluePower reduce energy consumption, it also cuts CO2 emissions and conserves valuable resources.**

### **Keeping heat in the system to re-cycle it repeatedly**

EcoPac insulating sleeves, which can be retrofitted to installed systems, are an effective way of making immediate heat savings. Combined with convection flaps they can decrease heat losses by up to 45%. Users can retrofit almost all machines and installations with the sleeves at minimal cost, and be sure of recouping these costs in the second year of operation.

### **An eye for the whole process**

There is additional scope for savings by viewing the process as a whole and exploiting KraussMaffei's "Efficiency to the Power of Three." Optimized screw geometries cut energy consumption, and improve melt homogeneity, pressure stability and throughput.

### **AC servo motors with synchronous technology**

Continuous extrusion processes benefit greatly from the use of energy-efficient drives. KraussMaffei Berstorff extruders employ synchronous AC servo motors rated at up to 100 kW, which reduce energy consumption at every turn. AC drives produce

immediate savings of 7-15%. These drives can also be installed on existing systems. When a DC drive is operated under partial load, the motor efficiency falls below 80%, a level which is no longer acceptable for energy-conscious production.

### **Less scrap conserves resources**

For pipe extrusion, KraussMaffei Berstorff has solutions which sharply reduce material waste, especially for small runs. KraussMaffei's patented QuickSwitch technology for push-button dimension change makes it possible to change diameters and wall thicknesses without stopping production. Your production becomes more flexible, your costs drop due to less scrap and you get more pipe per kilogram of material.

### **WPC: direct extrusion is more economical**

We offer customized, technology-fusion solutions for processing natural-fiber-reinforced plastics such as wood plastic composites (WPCs). These solutions are energy efficient and conserve resources. A co-rotating twin-screw extruder is an economical solution for direct extrusion of WPCs when moisture content is no higher than 12%. In addition, compounding and extruding natural-fiber-reinforced products in a single process without intermediate cooling and reheating consumes around 40% less heating energy than conventional two-stage processes.



# 10%

## POTENTIAL SAVINGS

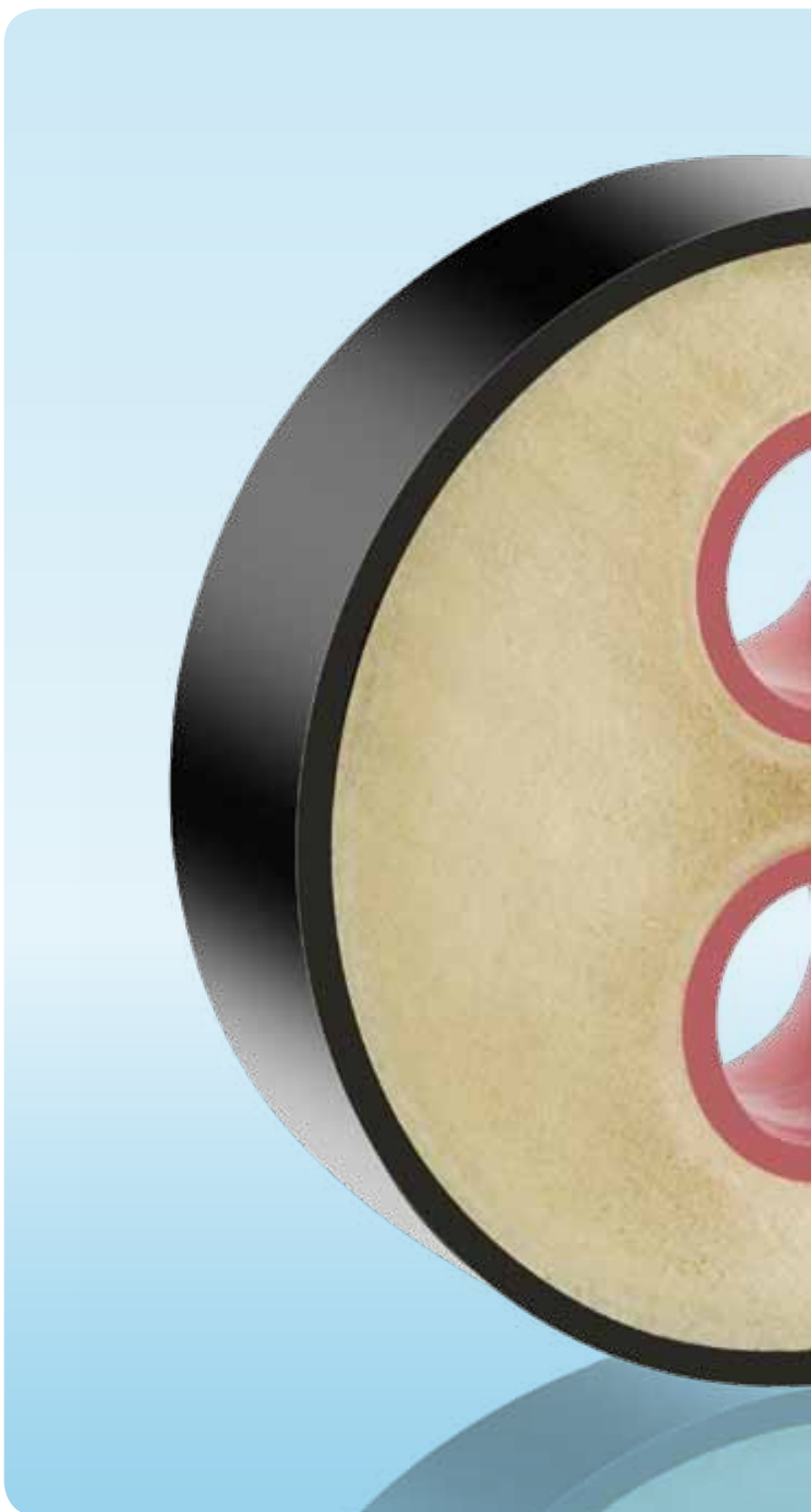
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Although savings vary with the number of dimension changes, QuickSwitch technology is capable of shaving 10% off material costs, relative to a conventional pipe extrusion line.

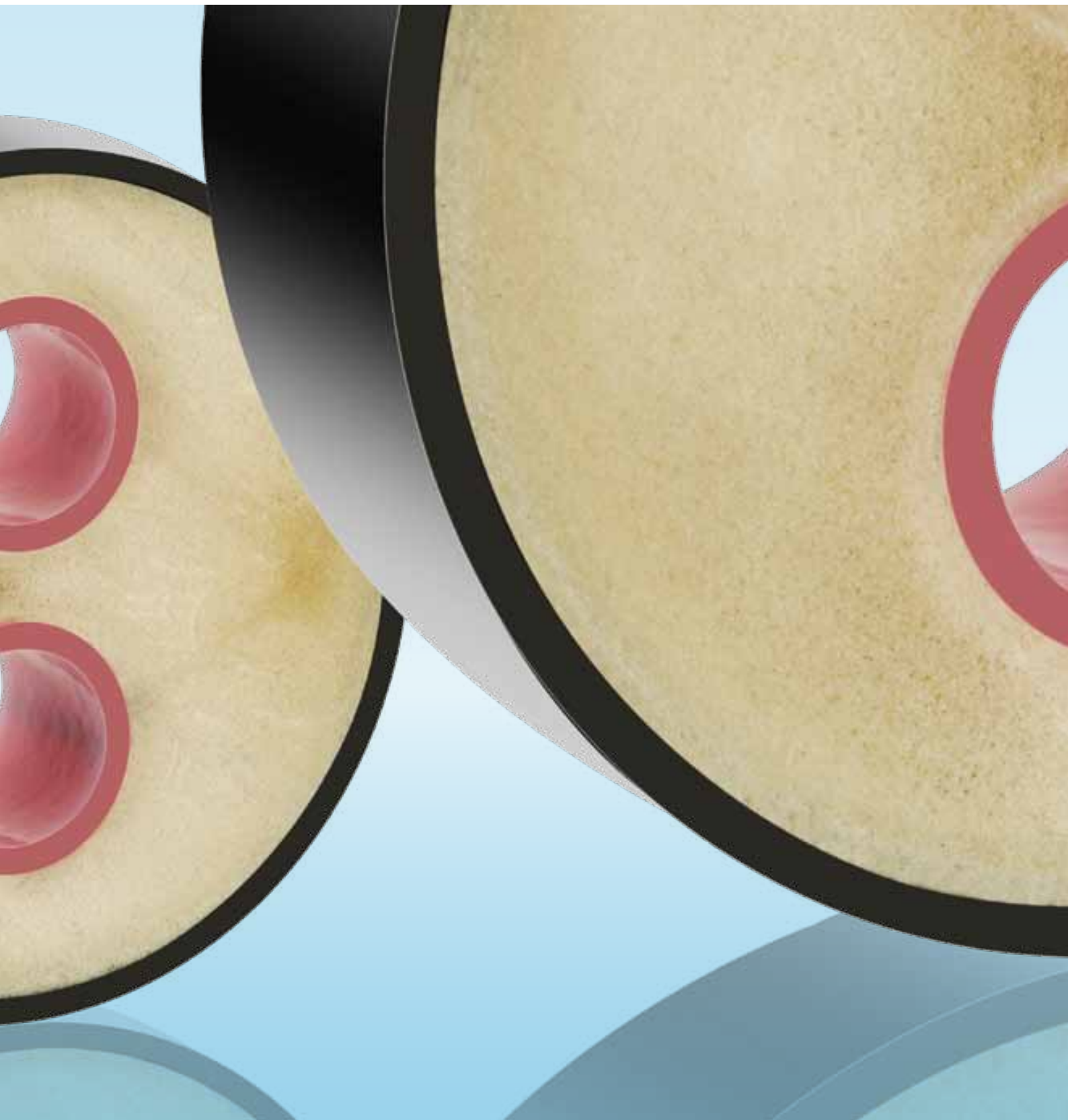
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## EXTRUSION AND REACTION TECHNOLOGIES

We supply efficient systems capable of applying functional layers to different substrates in a single-sequence process – pipes encapsulated in PUR insulating foam are just one example of KraussMaffei expertise in multitechnology solutions.







## More components with less energy.

Reaction processing is becoming an increasingly popular way to make complex multicomponent parts. To do this and reduce energy consumption as well, it's important to look at process integration – after efficient drive engineering and heating systems.

### **Saving electricity the easy way.**

In its reaction process machines, KraussMaffei is increasingly replacing hydraulic drive systems with efficiency-optimized electric motors. Prime examples here are piston metering and electric mold carriers. The latter, for instance, consume 2.5-30 times less energy than their hydraulic counterparts. Carefully scaled options enable KraussMaffei to provide all types of machines with exactly the right amount of power and dynamics while simultaneously minimizing energy consumption.

### **Heating systems: getting the balance right**

Precise temperature control in reaction processing is achieved with high-pressure heat exchangers. They provide exactly the heat required to bring the necessary volume of material to the correct temperature just before it is processed. No heat is wasted keeping large amounts of material at process temperature over long periods. This not only saves energy but also improves the quality of the end product.

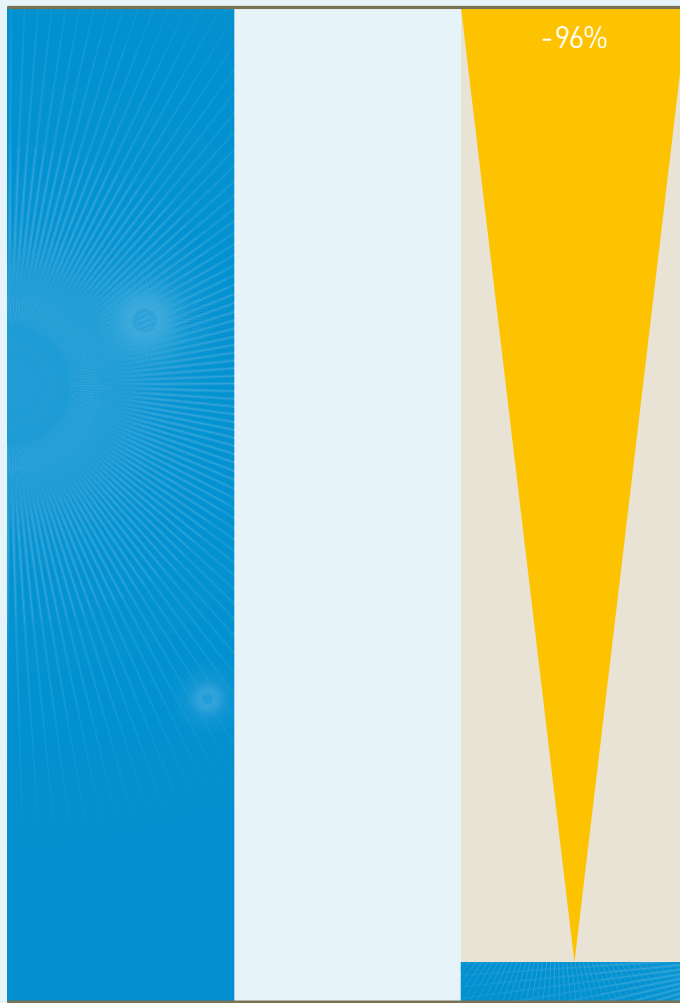
### **Integration saves energy**

Optimizing mixing heads and feed lines to minimize pressure losses ensures maximum conversion into mixing energy. Reducing pressure losses can save 15 to 17% of the energy required for the pumps. The modular engineering of KraussMaffei machines and their perfectly matched interfaces, make it a simple matter to dock reaction process modules onto injection molding machines to configure single-vendor, multiprocess solutions. Process integration delivers substantial energy savings and extra productivity gains. Instead of complex logistics that eat up floor space, KraussMaffei's multitechnology solutions are compact systems that produce assembly-ready multicomponent parts in a single process sequence.



Hydraulic mold carriers

Electric mold carriers



Hydraulic mold carriers

Electric mold carriers

96%

#### POTENTIAL SAVINGS

With electric mold carriers, drive energy demand can be reduced by up to 96%.

# Working for tomorrow today – PRIMUS bundles the power of innovation generated by applied research.

KraussMaffei has unrivaled expertise that enables us to boost efficiency across processes and technologies. But for this very reason, we are also aware of the productivity gains that can come from exchanging ideas and discussing concepts with customers, suppliers and researchers. That is why KraussMaffei constantly seeks out collaborative ventures where, together with industrial partners and researchers around the world, we can advance the current state of the art to the next level and implement the latest developments in application-specific system solutions.

### Energy efficiency is more than a business goal

We work closely with material manufacturers, mold and coating specialists, and with prestigious university faculties and research institutes. In this way, we have built up a global network that channels innovations from many directions to drive the BluePower program forward. Everyone involved is agreed that greater energy efficiency is more than an economic necessity. The plastics and rubber processing industries are well aware that they must slash consumption of energy and resources for the sake of the environment. With our program of “Efficiency to the Power of Three” as embodied in BluePower, this can be achieved without loss of time.

### Collaborative ventures worldwide: translating innovative ideas into action – quickly

The tight links which KraussMaffei has forged within the plastics sector and the international scientific community have a multiplier effect on the number of ideas and resources geared towards further innovation. The results feed directly into current and future machines and installations. The BluePower program also includes equipment that can be retrofitted to existing machinery at relatively low cost to help users to cut energy consumption.

### Pick-and-mix processes

While no-one would argue about the importance of machinery and hardware, there is a growing emphasis on process optimization. KraussMaffei expertise and modular machinery result in the smooth integration of several discrete process steps into single-sequence processes and in highly successful multiprocess solutions. These lead to significant gains in both energy efficiency and productivity. Processors know that they can trust KraussMaffei solutions to give them the head-start they need for achieving energy-efficient production – namely Efficiency to the Power of Three!







# Service, support and spares – worldwide and round the clock



## All-round service

Our service offering is pretty broad. We'll configure your machine or system, install and commission it, train your operators and maintenance staff, plan measures to maximize up-time and productivity, maintain and service your machine and, if need be, overhaul and upgrade it.

## Hands-on training

We train your operators and technicians in our Training Centers or on your premises anywhere in the world. Our graded course program ranges from basic to advanced training in operation, process control and maintenance. We will also hold special courses on customer-specific topics.



**Talk to us about the best options  
for your business**

Tell us about your project. You can count on our expert support from the start; we'll work closely with you to identify and deliver the best solution.

**Service hotlines**

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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.

## **KraussMaffei accepts a responsibility to support the prudent use of scarce resources by engineering energy-efficient production solutions**

for plastics and rubber processing.

Our BluePower program encompasses efficient drive technology, efficient use of heating energy and multitechnology process optimization. The result is Efficiency<sup>3</sup>. Production solutions from KraussMaffei for injection molding, extrusion and reaction processing help to save energy and reduce resource consumption in order to shrink our customers' carbon footprint.

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