



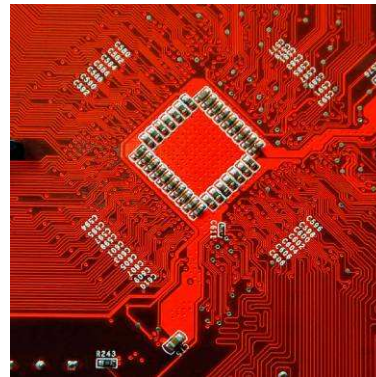
## From productivity to function-integration with injection molding and reaction injection

Oslo, Norway 22 - 23.06.2010

Jochen Mitzler

## Resources- and energy efficiency ... one key factor for 2030

“The world in 2030“



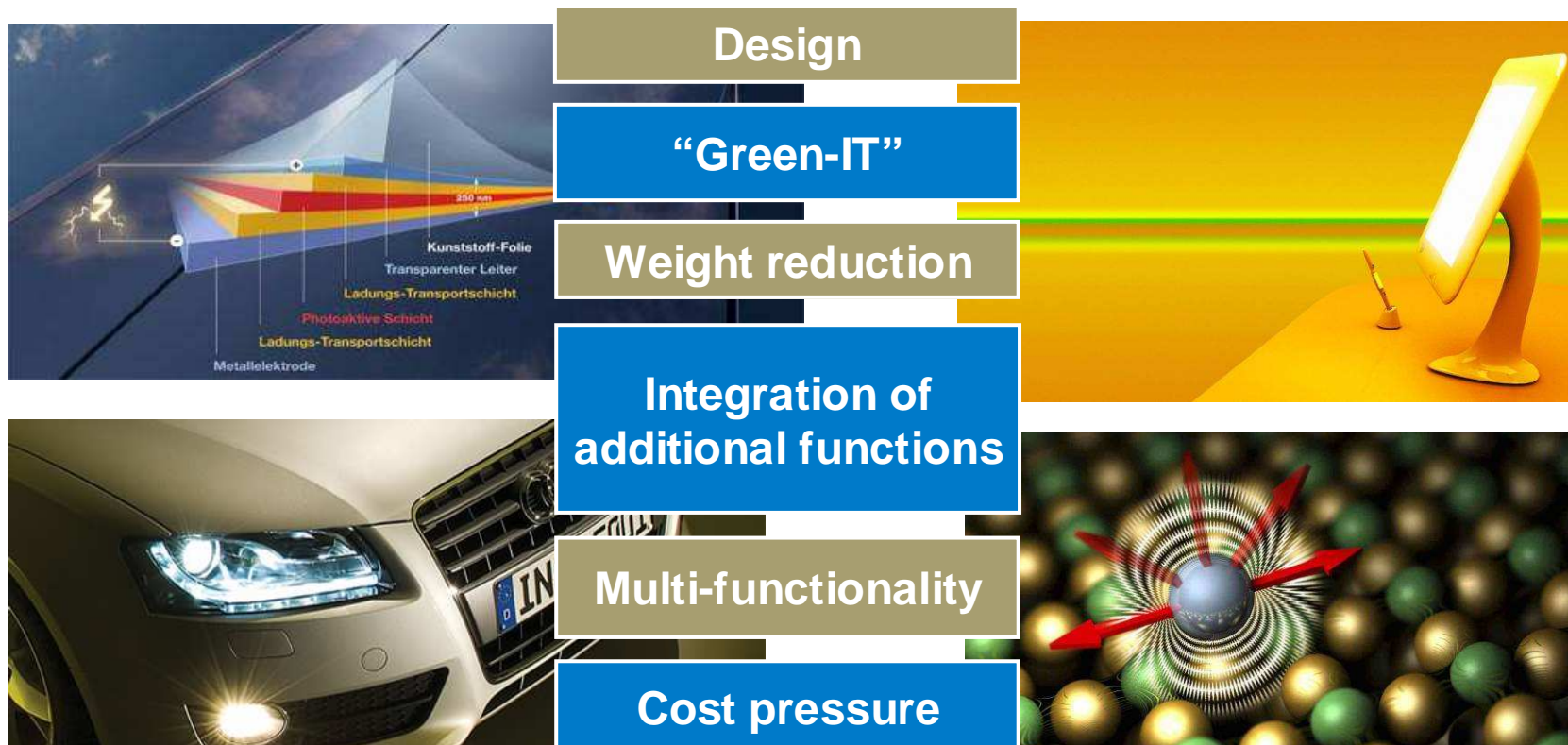
Population growth  
Globalization  
Healthcare revolution  
Accelerating technological change  
**Climate change**  
**Energy shortages**



Source pictures: PlasticsEuropa – „The world in 2030- Summary and Initial Industry Response“

## The Market demands - innovation drivers for future technologies

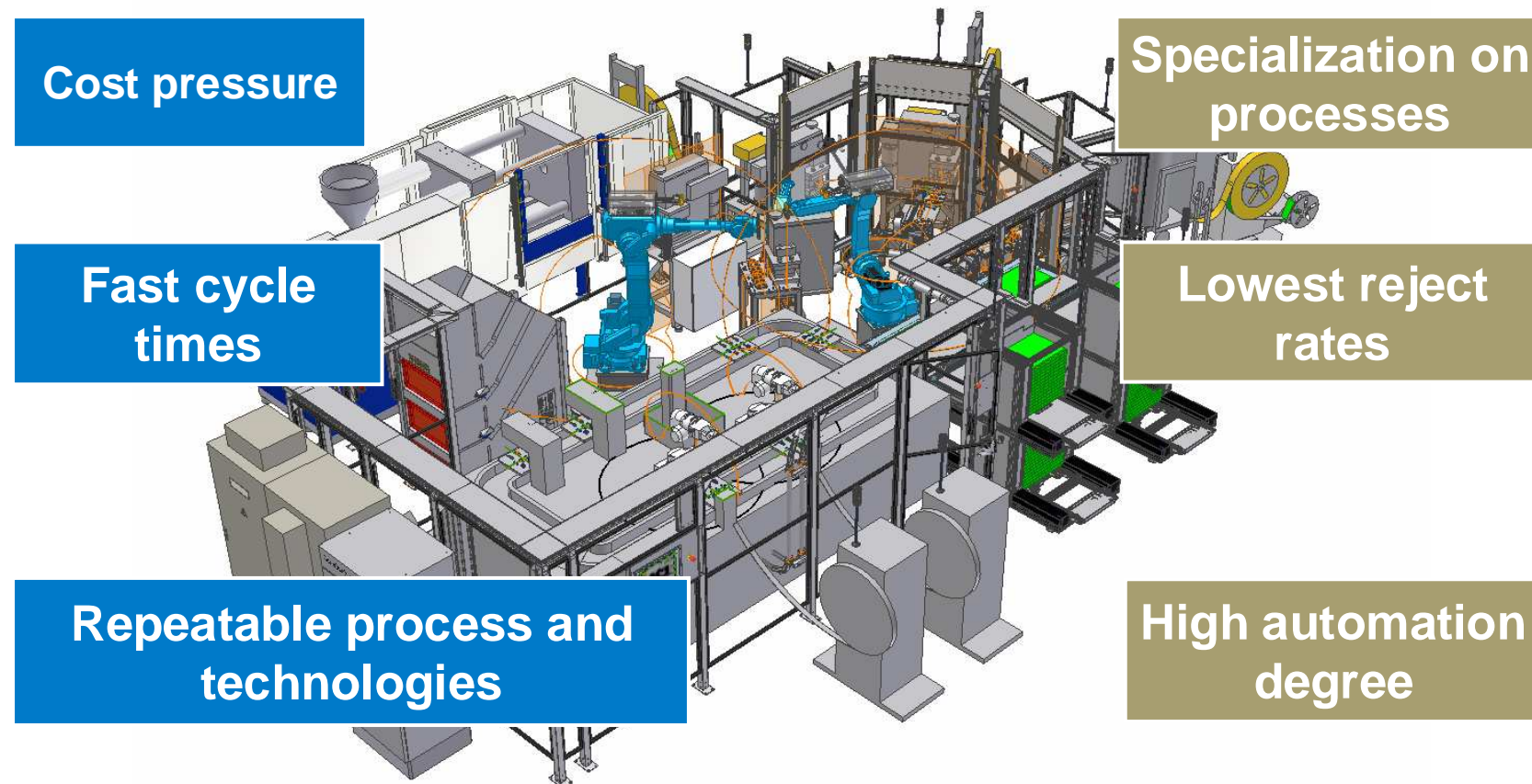
### Trends in the Optics ...





## Changes in Production ... To grow with plastic business

### Trends in Automotive

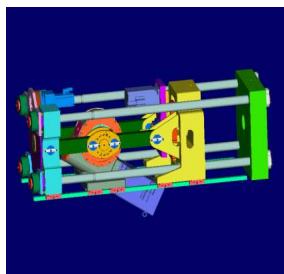


## An efficient, fully electric precision instrument ...

### Highlights of the EX series

#### Unique clamp concept: Z-toggle

- EXTREME DYNAMICS
- EXTREME HIGH AVAILABILITY



Krauss Maffei  
EX

#### Clean Clamp

- NO CONTAMINATION
- LOW MAINTENANCE

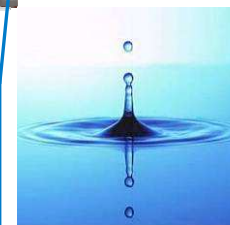
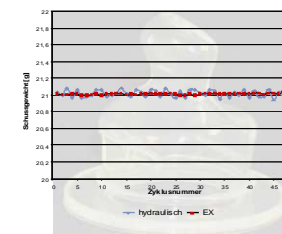


#### Water cooled motors and transformers

- EXTREME HIGH CAPACITANCE
- REGENERATIVE BRAKING

#### High-torque direct drive

- ABSOLUTLY REPRODUCIBLE
- LOW MAINTENANCE



## Application references

### Packaging

#### Application:

- Margarine cup (400ml)
- 2 cavities; PP; Flow length / wall thickness = 300
- <3,9 sec

#### Innovation:

- Fully-electric injection unit (Ultra) for high injection dynamics
- Fully-electric machine concept with clean clamp system (Z-toggle)
- Fast demoulding with SR-High-Speed robot system

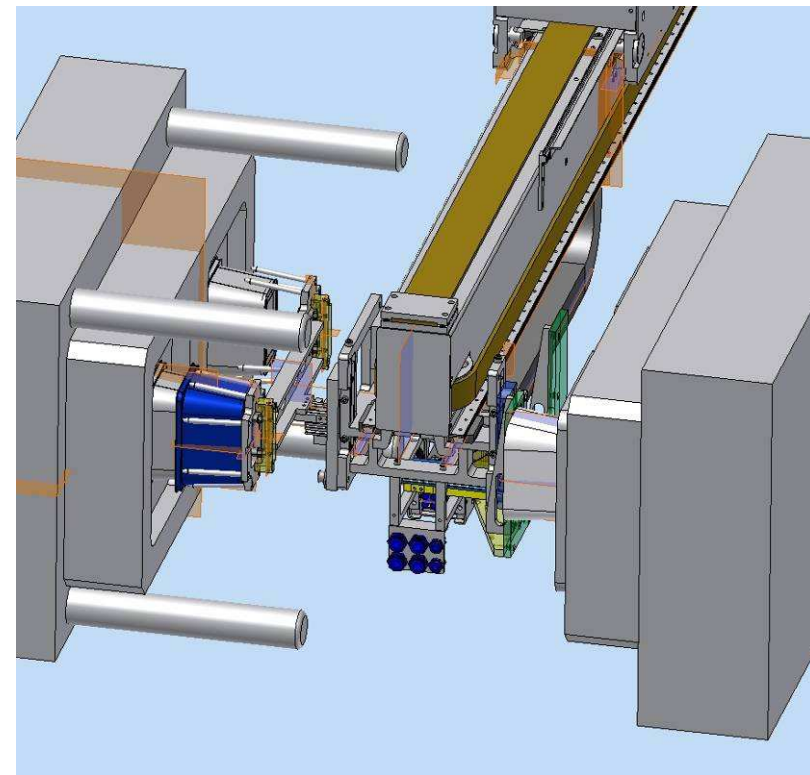
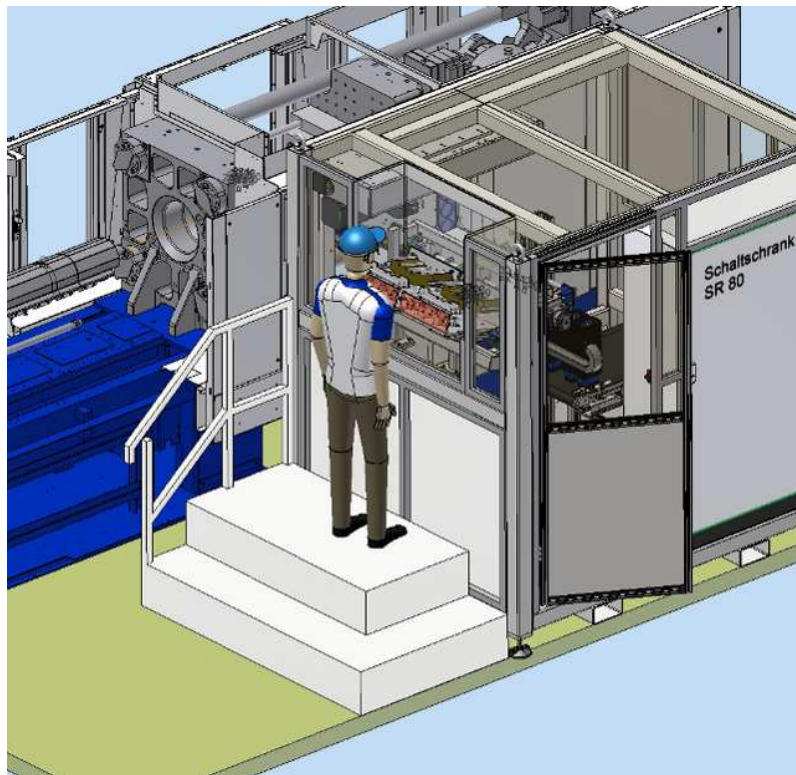
#### Value:

- High injection speeds
- High system dynamics
- Very clean production cell



## Automation concept for IML applications

SR – Side entry high speed robots



## Full Power for high throughputs

### EX injection unit “Ultra”

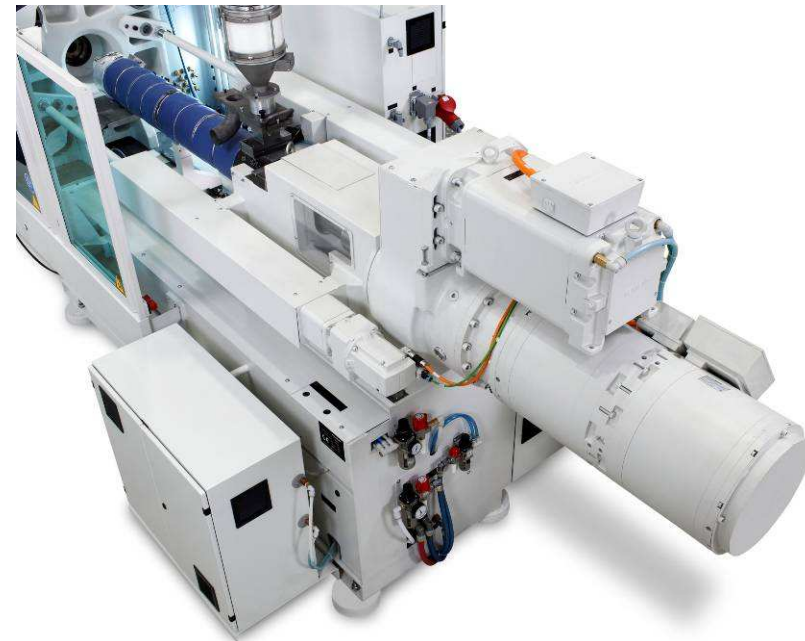
High-torque drive for plasticizing and injection

- No coupling, direct apply of force
- Less moving elements, small moving masses
- **Injection speeds up to 450 mm/sec on SP 1000 with 50mm screw**

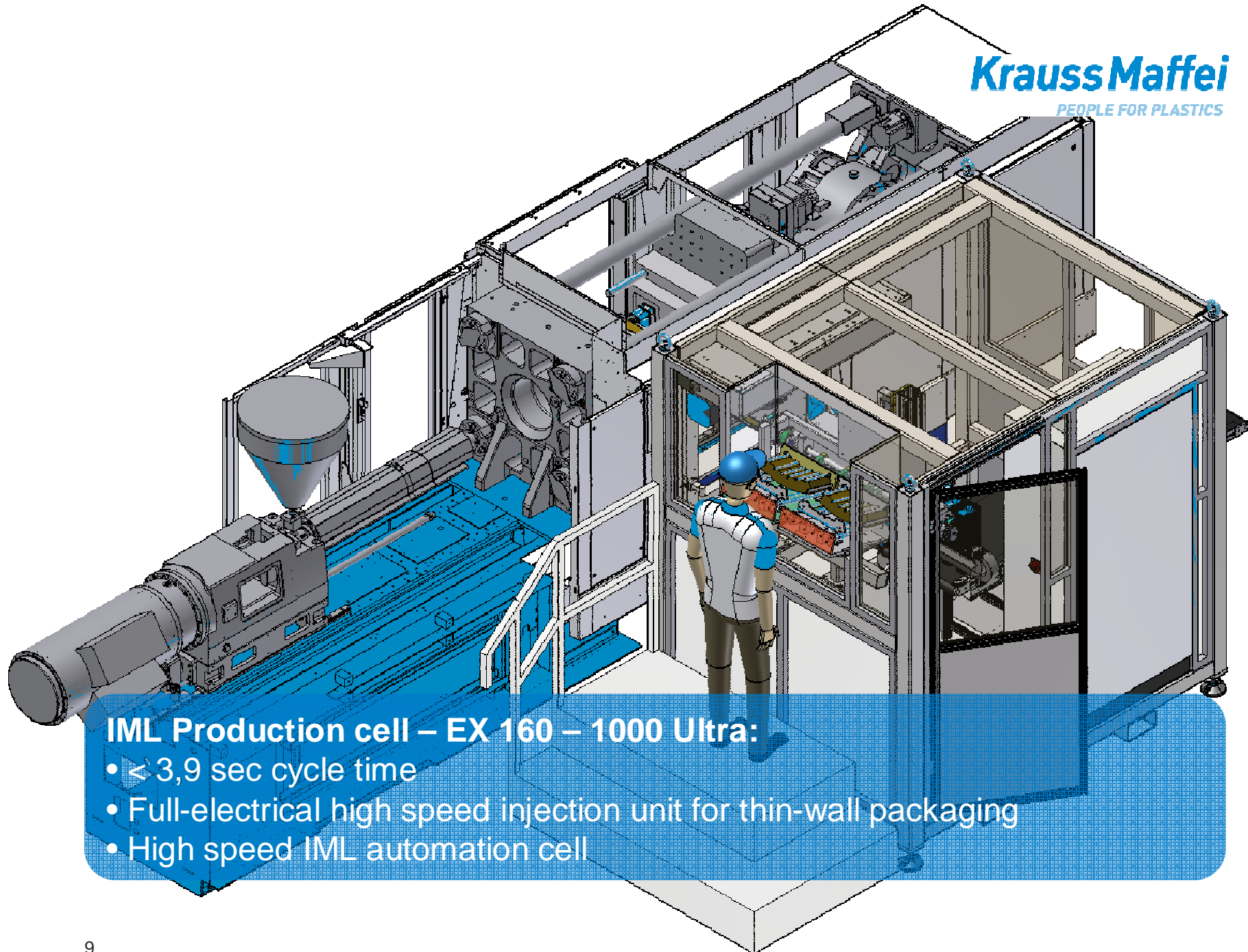
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#### Benefit:

- High performance, but less strain
  - Short cycles also with lower MFI resins
- 







**IML Production cell – EX 160 – 1000 Ultra:**

- < 3,9 sec cycle time
- Full-electrical high speed injection unit for thin-wall packaging
- High speed IML automation cell

# One step ahead in efficiency for packaging products

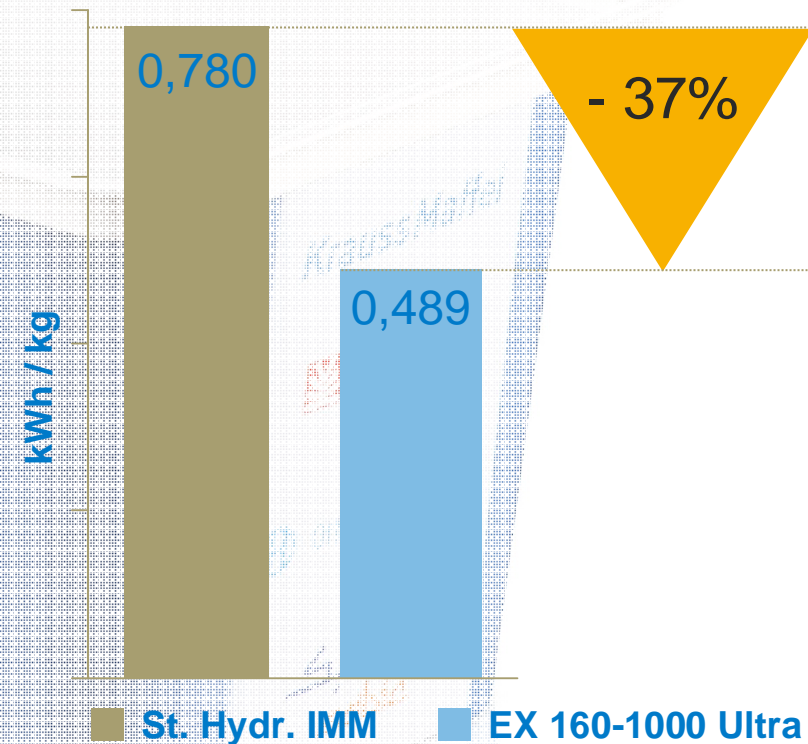
## Exhibit EX 160-1000 Ultra

### Application:

- IML container – two face
- Shot weight: 33,2 g
- Cycle time: <3,9 sec

### Savings:

- 37% less energy
- 5.675 EURO / year

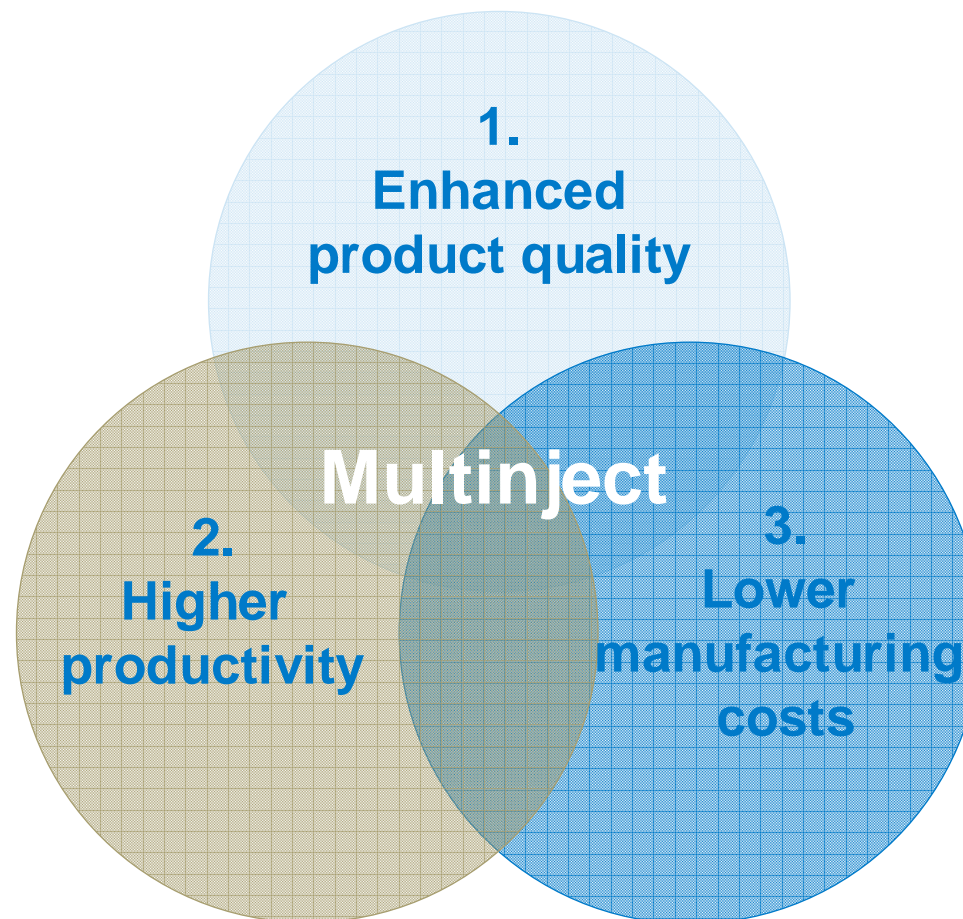


\*) Assumptions: Cycle time: 3,9 sec, throughput: 29,5 kg/hr, electricity cost: 11 €cent/kWh; 6.000 working hours/year

\*\*) Energy consumptions are calculated in comparison to a conventional hydraulic injection moulding machine.

## The right material mix ... lower manufacturing costs

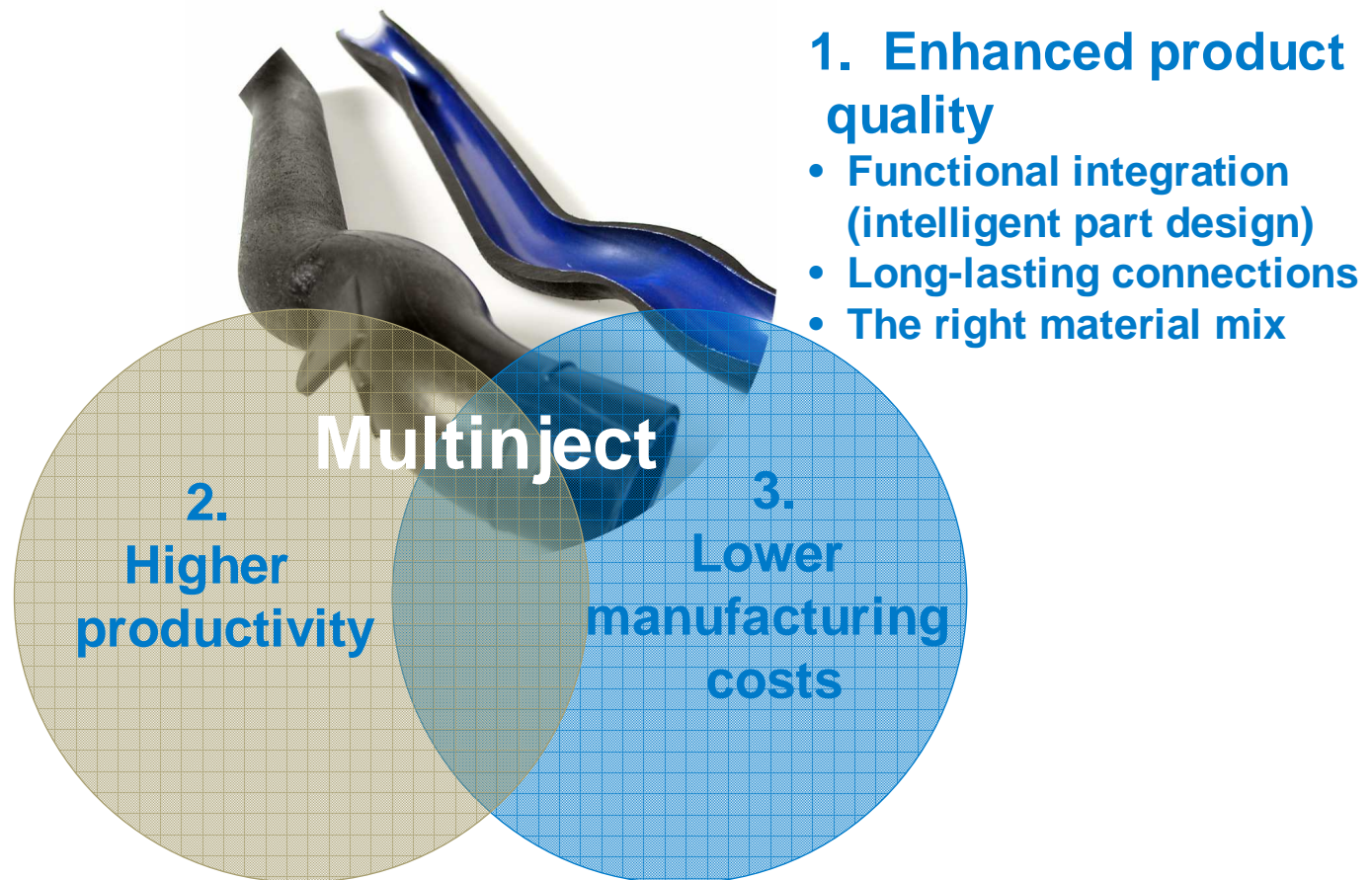
### Multicomponent – Basic facts





## The right material mix ... lower manufacturing costs

### Multicomponent – Basic facts



## The right material mix ... lower manufacturing costs

### Multicomponent – Basic facts

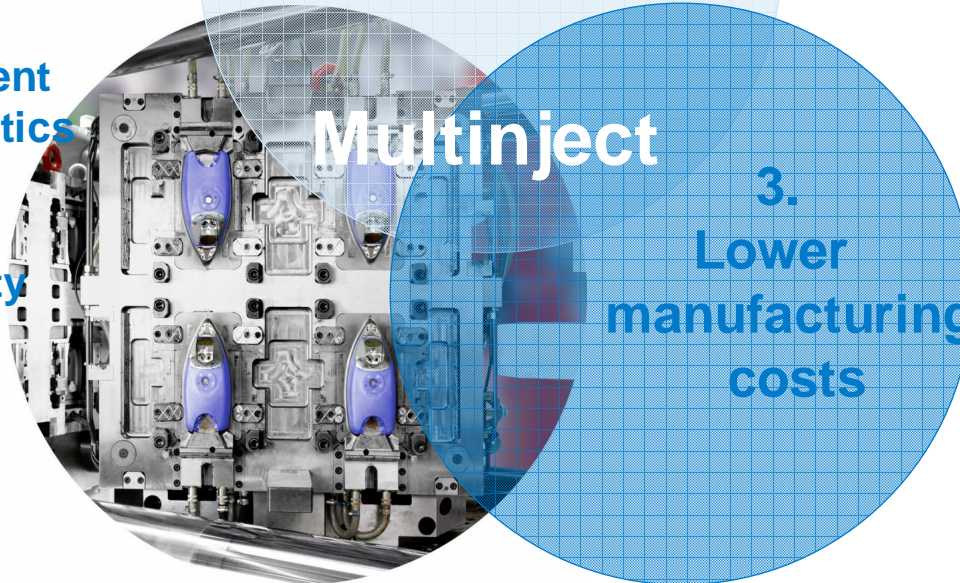
#### 2. Higher productivity

- Eliminates assembly errors
- Lower component count and logistics effort
- Double production capacity with SpinForm

#### 1. Enhanced product quality

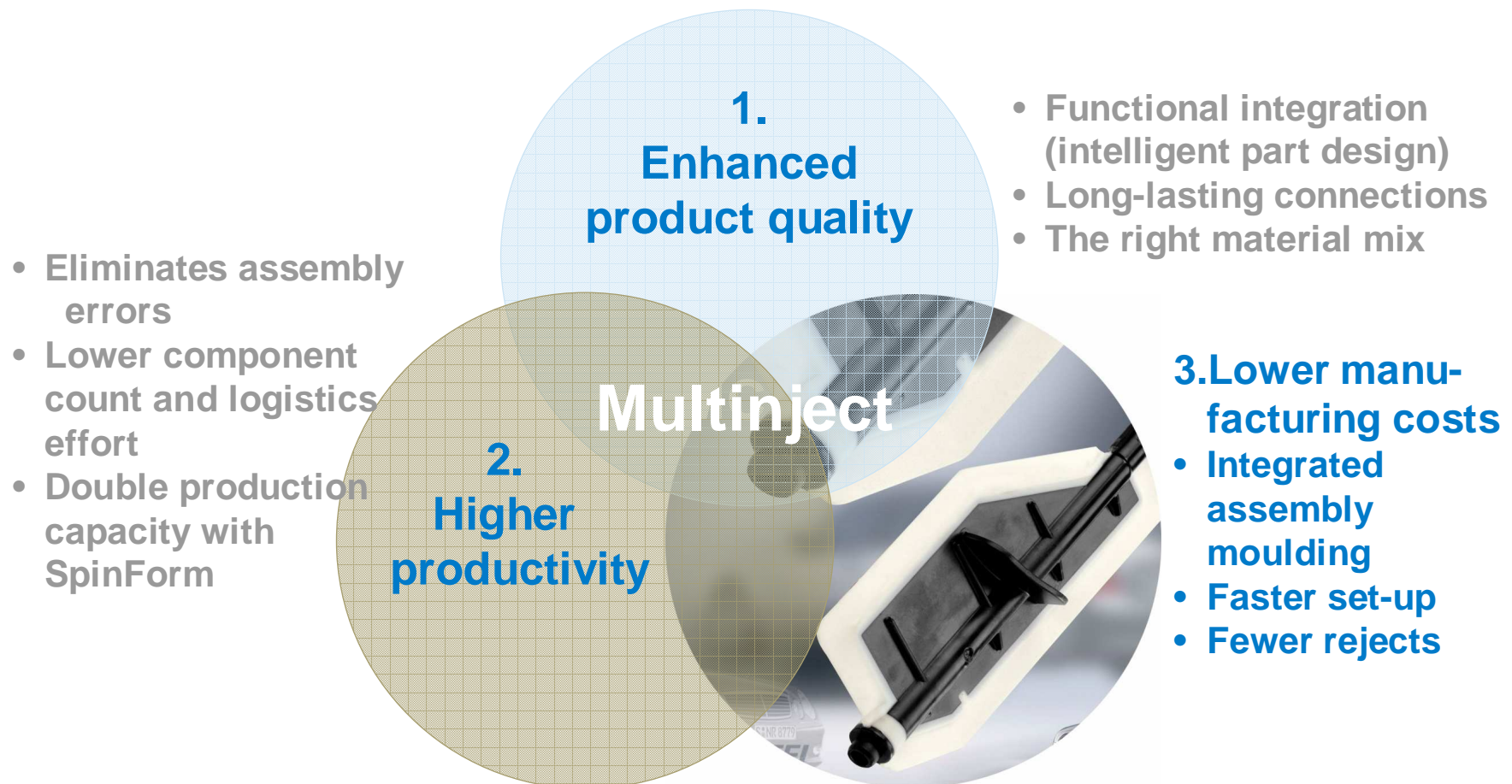
- Functional integration (intelligent part design)
- Long-lasting connections
- The right material mix

#### 3. Lower manufacturing costs



## The right material mix ... lower manufacturing costs

### Multicomponent – Basic facts





## Multi-components are distributed in all branches

### Multinject development trends

Production



## Positioning options for plasticizing units

### Multinject series

**Vertical  
position**



**Piggyback  
position**



**L-position**

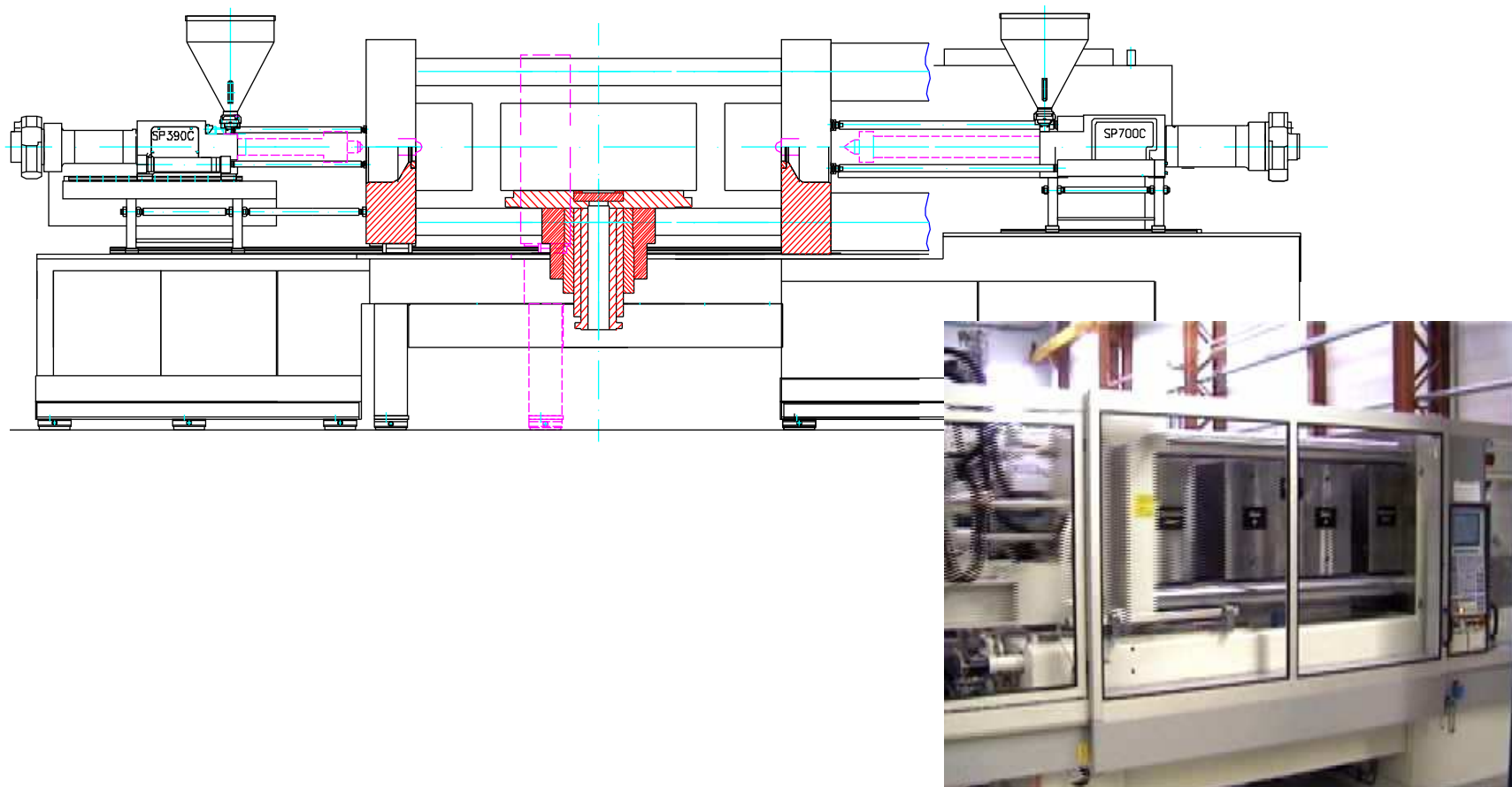


**SpinForm**



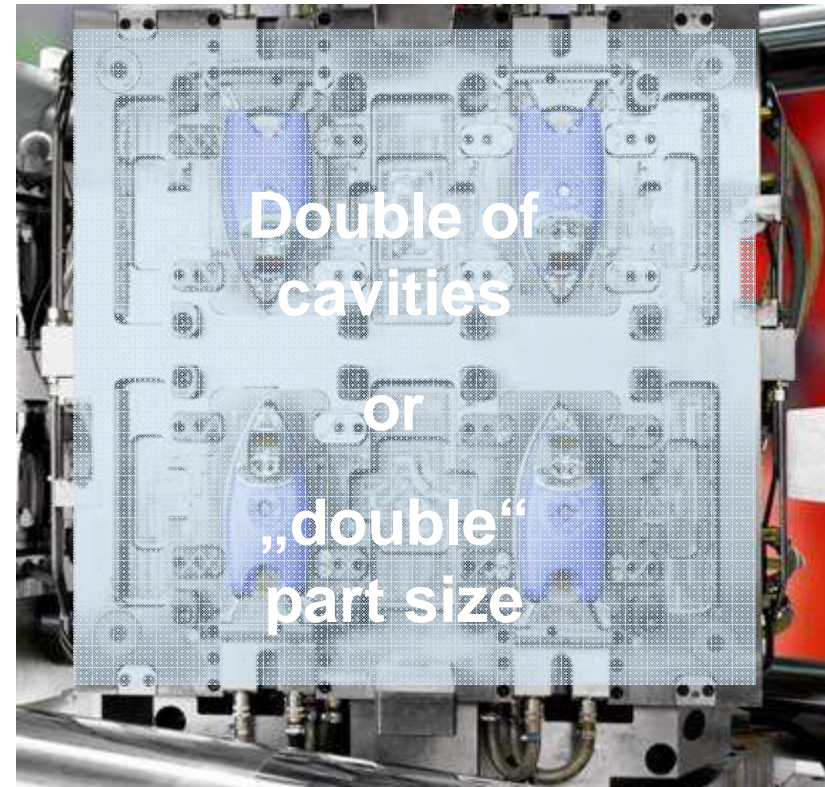
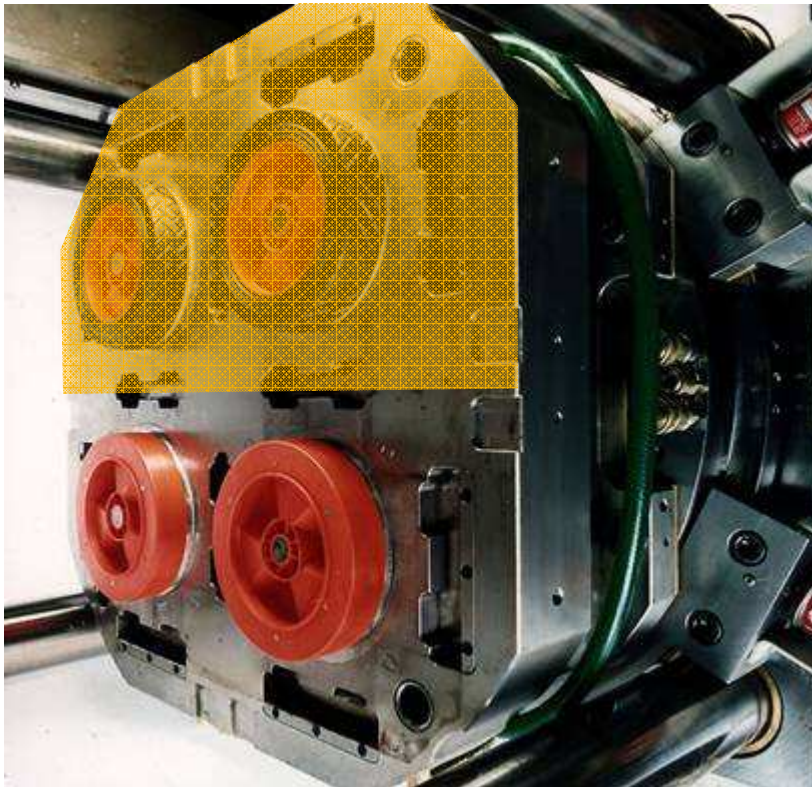
## Concept for swivel platen ... extra unit on the moving platen

### SpinForm series



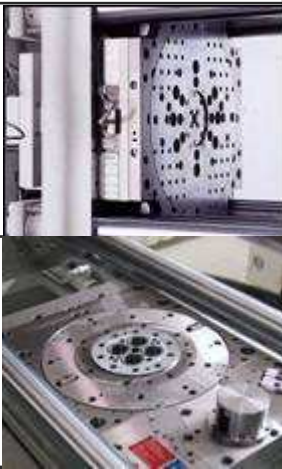


## Double machine productivity... SpinForm with a great future Turntable vs. swivel platen



## 6.5 x better cooling performance with SpinForm

### C-SpinForm cooling performance

	Diameter in inches	Cross-section in mm <sup>2</sup> (inch <sup>2</sup> )	Output in m <sup>3</sup> /h (gal/h)	
<b>Turntable application</b>	0,75	285 (0.13)	<b>2,05 (541)</b>	
<b>SpinForm application</b>	2	2026 (3.14)	<b>14,59 (3854)</b>	

#### Your benefits:

- Faster cycles and higher productivity



A photograph of a Krauss Maffei industrial machine, specifically a Multinject system, used for plastic injection molding. The machine is white and green, with a prominent red robotic arm in the center. The arm is positioned over a conveyor belt that is moving several white plastic parts, which appear to be automotive components like air vents. The machine is enclosed in a green safety cage. The background is a blurred industrial setting.

**Krauss Maffei**  
PEOPLE FOR PLASTICS

**Rowenta Germany:**

- Multinject
- KM 650 – 1900/1900 C W SpinForm



## Applications

### Home Care

#### **Application:**

- Disposal razor handle (PS / TPE) with approx. 8,5se
- 24 + 24 cavities

#### **Innovation:**

- Spinform machine concept
- Electrical Spin-Unit for heavy mold weights
- Double output compared to turn-table

#### **Value:**

- Small and compact footprint / output performance
- 6,5 x higher cooling capacity
- Fast and precise turning of Spin-Unit



## Applications

### Automotive

#### Application:

- Sliding roof – Smart ForFour
- PC 8500 g with an area approx. 0.9 m<sup>2</sup>

#### Innovation:

- Krauss-Maffei ClearForm with SpinForm concept
- Special PC plasticizing unit
- Injection compression molding on SpinForm

#### Value:

- Lower part weight
- Stress-free parts
- Developing technology – new market segment

**KRAUSSMAFFEI**



## SpinForm Technology for big parts too ...

### MX Series SpinForm

SpinForm for tonnages from:

- 180 to 5400 t (1800 kN to 54000 kN) C and MX series

Machine engineering based on successful C and MX series designs

Sectors:

- Automotive, packaging,
- Electrical and electronics,
- Household and consumer goods



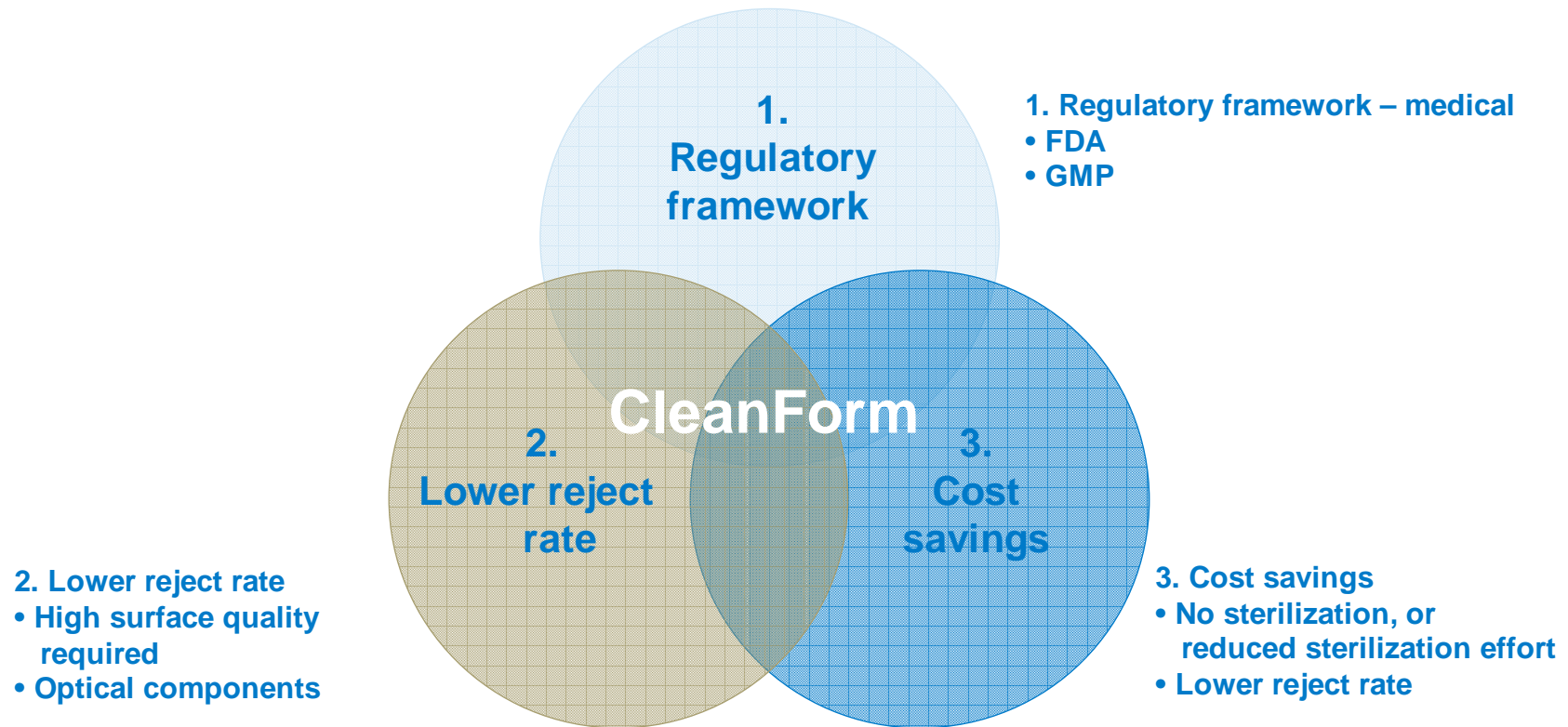
#### Applications:

- Closures, irons, door side trim, decor strips, glazing
- Thermoplastic / rubber components



## Advantages of a CleanForm production system

### CleanForm core benefits



## Under tight control: production and ambient conditions

### CleanForm process engineering

#### Injection process under control

- Cycle time
- Consistent shot weights
- Consistent product quality



**Injection  
molding**

#### Ambient conditions under control:

- Particle count
- Colony forming units (CFUs)
- Temperature
- Humidity
- Positive pressure in cleanroom

+



**Cleanroom**

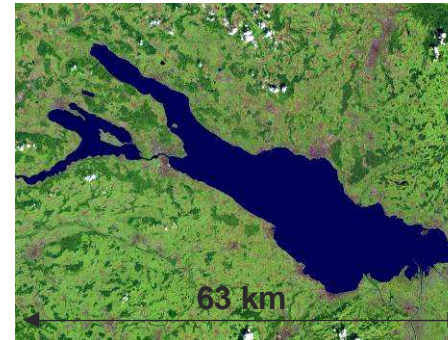
**= CleanForm**

## Basic principles of CleanForm production

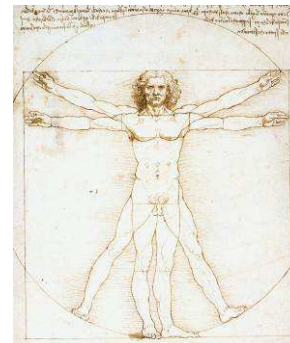
### CleanForm – the basics

#### The guiding principle in cleanroom engineering:

Reduce the number of machines and people deployed in the production area to the absolute minimum and avoid high complexity .



Think of it this way:  
Class ISO 5 (US 100)  
is equivalent to **170 peas**  
( $\varnothing$  approx. 7 mm)  
in the **volume of Lake Constance**  
(approx. 48.5 km<sup>3</sup>)



Think of it this way:

Particles ( $\leq 0.3 \mu\text{m}$ ) emitted by a person per minute during these activities:

Sitting quietly	100,000
Sitting and moving hands	500,000
Walking slowly	5,000,000
Climbing stairs	10,000,000



KM 150 – 520 C2+  
C – range





**KraussMaffei**  
PEOPLE FOR PLASTICS

**KRAUSSMAFFEI**  
cleanroom - mac  
KM150-520C2

RM150 CR

**STÄUBLI**  
LUBRICATION

KM 150 – 520 C2+  
C – range





KM 150 – 390 – 160 CX Z  
CX – range





**GE, Bergen op Zoom, the Netherlands Glazing Centre of Excellence:**

- KM 1600 – 8100 / 2700 MX W
- SpinForm, CleanForm, Glazing



## The CleanForm technology in use

### Overview on possible CleanForm applications





## Application

### Automotive

**Krauss Maffei**  
PEOPLE FOR PLASTICS

#### Application:

- Lid for electronic device box Crossfire
- Moulded part from glass filled PP
- PUR- Sealing

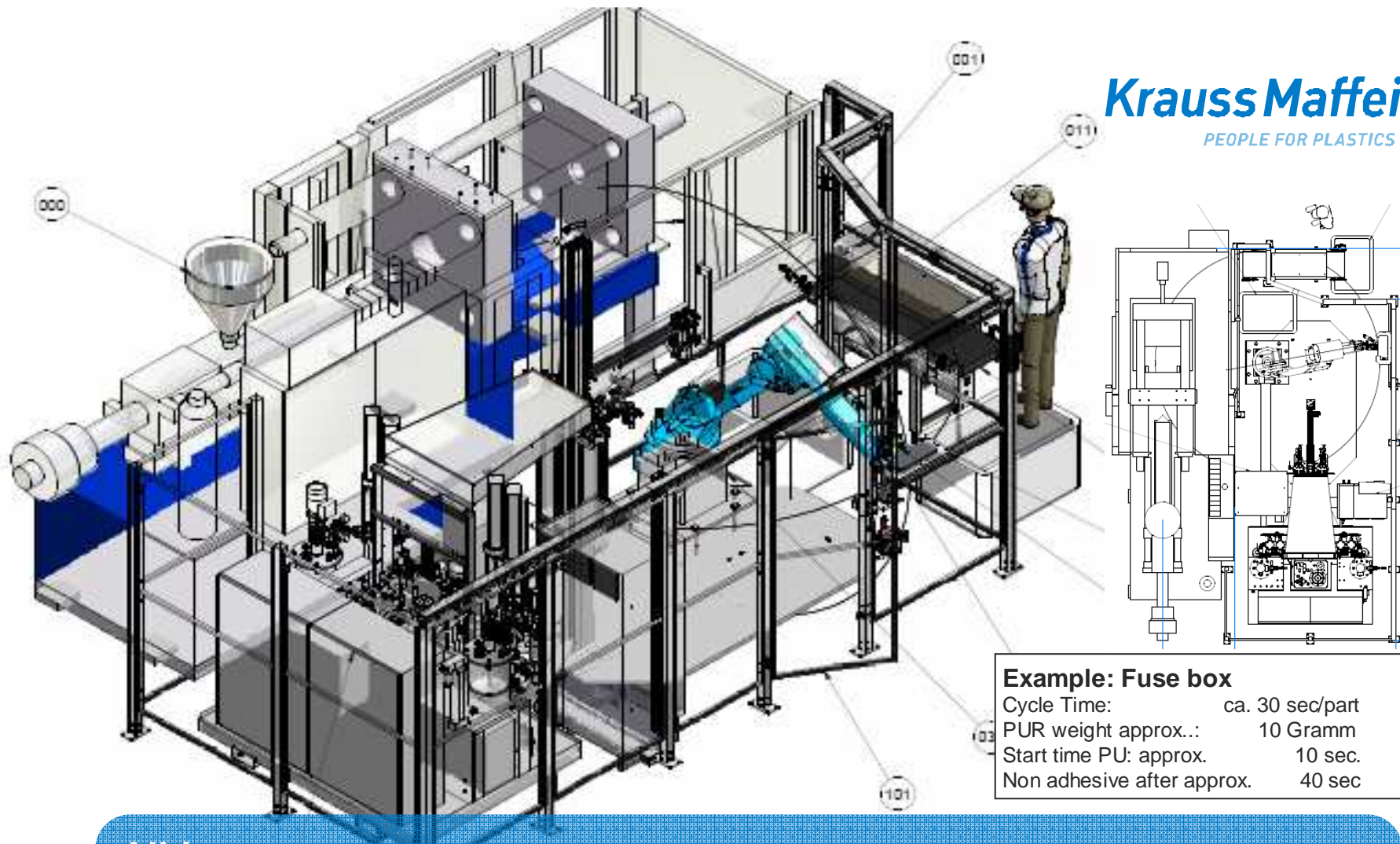
#### Innovation:

- PUR- High pressure technology for C.A.S.E. applications
- Direct linking of PUR-machine with injection moulding machine
- Fully automated production cell

#### Benefit:

- High productivity through short cycle and reaction time
- Small footprint, no intermediate storage needed
- System solution out of one hand





**All-in-one:**

- Production cell for integrated PUR Sealing system
- Combination of PUR and IMM
- Automation with Plasma Surface Treatment



**All-in-one:**

- Production cell for integrated PUR Sealing system
- Combination of PUR and IMM
- Automation with Plasma Surface Treatment



A photograph of a complex industrial automation system. In the foreground, two white robotic arms are positioned over a conveyor belt, working on small electronic components. In the background, two blue robotic arms are also visible, handling similar components. The setup includes various mechanical fixtures, sensors, and a control panel. The overall environment is a clean, well-lit industrial facility.

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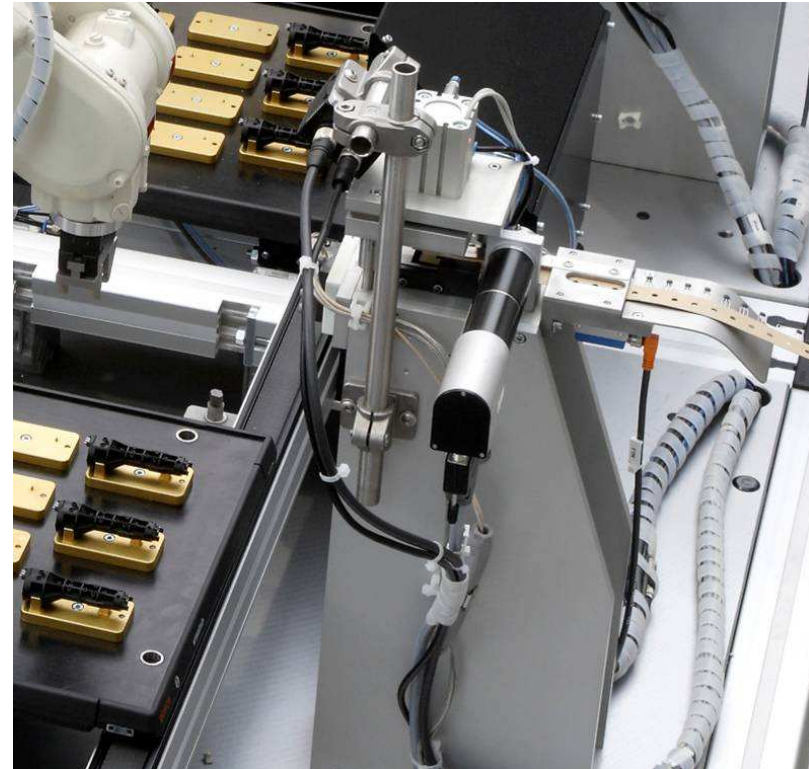
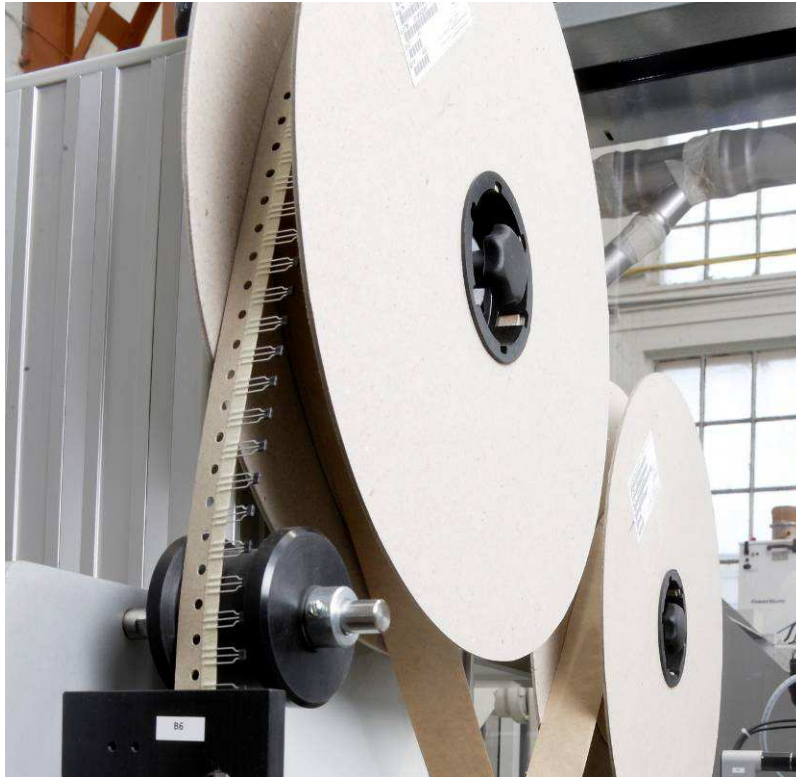
### **Complex Automation for E&E industries:**

- Separation
- Fixation
- Insertion and demolding
- Integrated quality check
- Placement into transport units



## Feeding of contacts (metal coil) and automated assembly

Complex automation – with linear robots





## **From productivity to function-integration** with injection molding and reaction injection

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