



APC plus
Stability, precision and
cost-efficiency in production

Engineering Passion

Krauss Maffei

External factors impair part quality

APC plus cancels out environmental influences

Numerous external factors can negatively affect component quality. Environmental influences such as temperature and air humidity, fluctuating material quality, flow resistance and interventions by the operator all affect the production process.

Possible external factors

Changing environmental conditions

- Seasons
- Day and night
- Fluctuations in temperature and humidity

Fluctuating flow resistance

- Hot runner mold
- Mold cooling and heat-balancing of hot runner
- Shut-off nozzle of non-return valve

Operator

- Availability
- Qualifications
- Start-up after standstill
- Intervention in event of process deviations

Fluctuating material quality

- Batch fluctuations
- Additives (recyclate amount, masterbatch)
- Contamination

Safety reserves for settings

- Back pressure
- Barrel temperature
- Mold temperature
- Cycle time



Cruise control for your injection molding processes

APC plus keeps processes stable

APC plus is comparable with the principle of an automobile cruise control system. Cruise control automatically regulates the fuel supply to the engine to prevent the speed exceeding or dropping below the speed specified by the driver on any gradient. The speed of the vehicle remains constant at all times, even if outside conditions change.

Similarly, APC plus keeps the production process constant, even if parameters change due to external influences. On the basis of the material properties, APC plus precisely regulates the charging of the molding volume. The entire process becomes more robust and the cavity is always completely charged.

Dynamic control

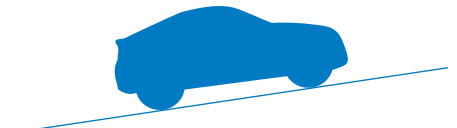
The mold setter configures the ideal process. APC plus detects deviations and continuously adjusts the actual status

back to this target status. Faults are canceled out and you retain consistently high part quality.

Consistent speed = robust process

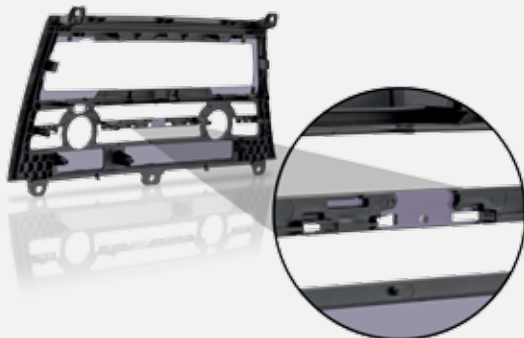


Consistent speed on a horizontal segment

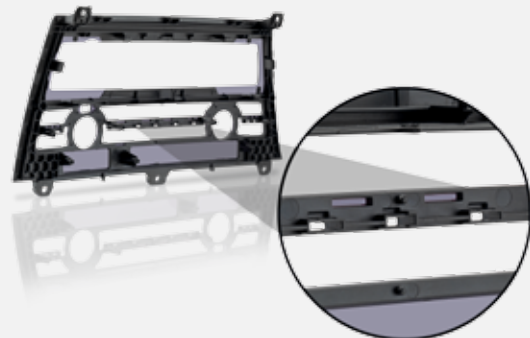


Consistent speed on a slope

APC plus – your path to zero-defect production



Rejects: Defect on a panel.



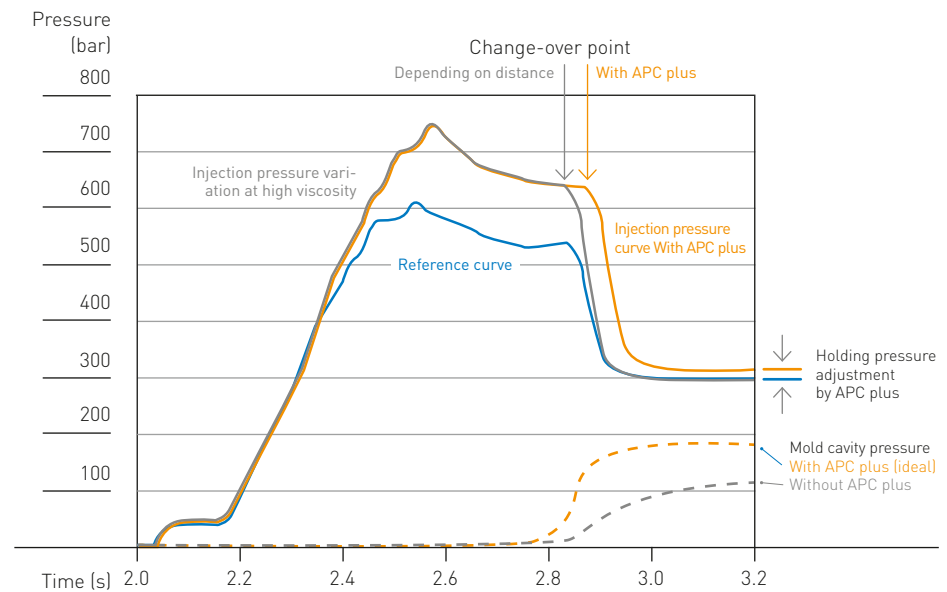
With APC plus: Perfectly charged mold with every shot.

APC plus for consistently high component quality

Intelligent and automatic control

After intensive research and with many years of experience, KraussMaffei has succeeded in reaching the next level in perfectly consistent component quality. The patented APC technology* analyzes and dynamically regulates the injection molding process, and can be used for all thermoplastic series.

Dynamic control for maximum process stability



Good standard

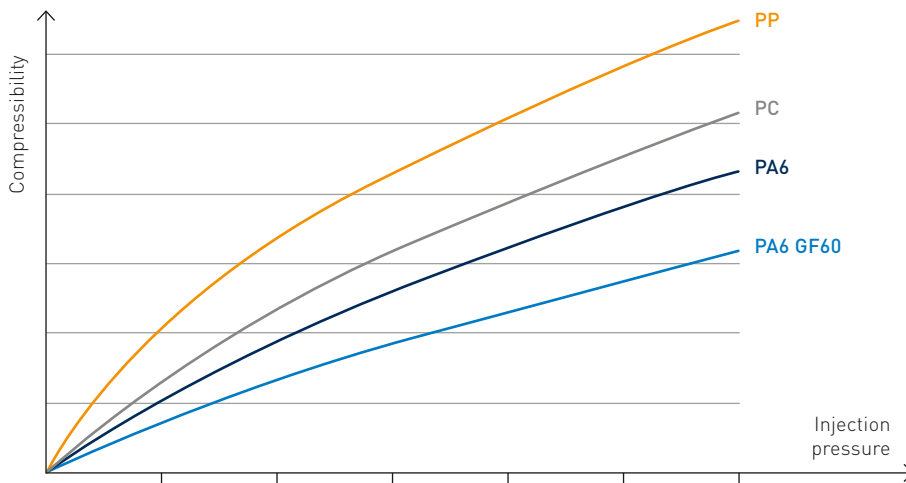
According to the standard, the mold setter defines the change-over point and holding pressure profile as a target state. However, these fixed values are only optimal if there is no interference from external influences. Every fluctuation in viscosity directly and immediately affects the mold charging. This could result in defects in the product; defective parts must be sorted out.

Better with APC plus

Adaptive Process Control (APC) plus analyzes the current process state and continually compares this with the configured target curve (reference curve). The change-over point and the holding pressure profile are automatically adjusted according to the melt pressure.

APC plus directly and automatically executes the necessary corrections for every single shot. All interference parameters are canceled out in real time. This means the mold is completely charged for every shot. The rejects rate tends toward zero.

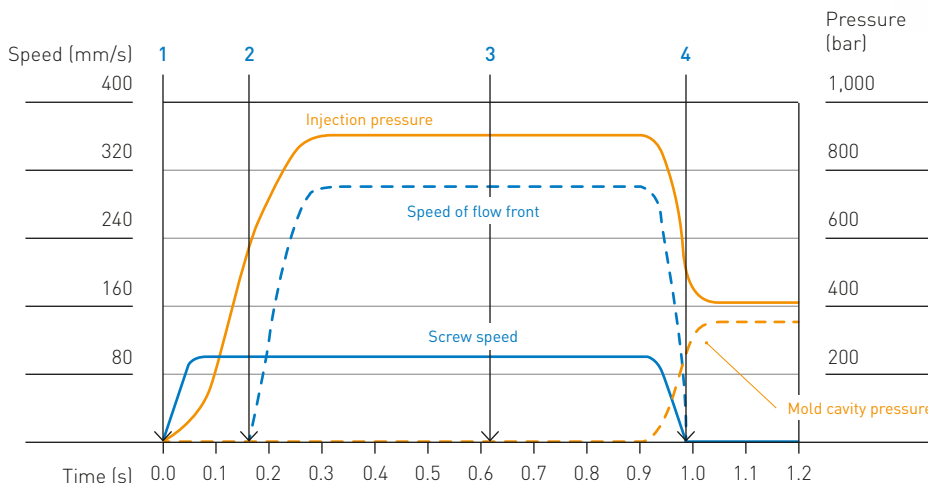
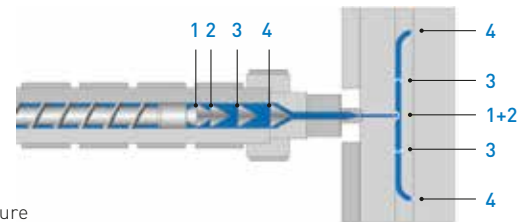
Consideration of the melt compressibility



Plastic materials have different melt compressions, and this has to be taken into account in the process. At high melt pressure, the melt is compressed more strongly and less melt flows into the cavity. The internal pressure within the mold is too low. At low melt pressure, the melt is compressed less and too much melt flows into the cavity. The internal pressure within the mold is too high.

APC plus takes into account the specific compression of the material being processed. On this basis, the system adjusts the change-over point and the holding pressure to achieve a constant volume in the mold at all times.

Compressibility delays the mold charging - Pressures and speeds in the injection process



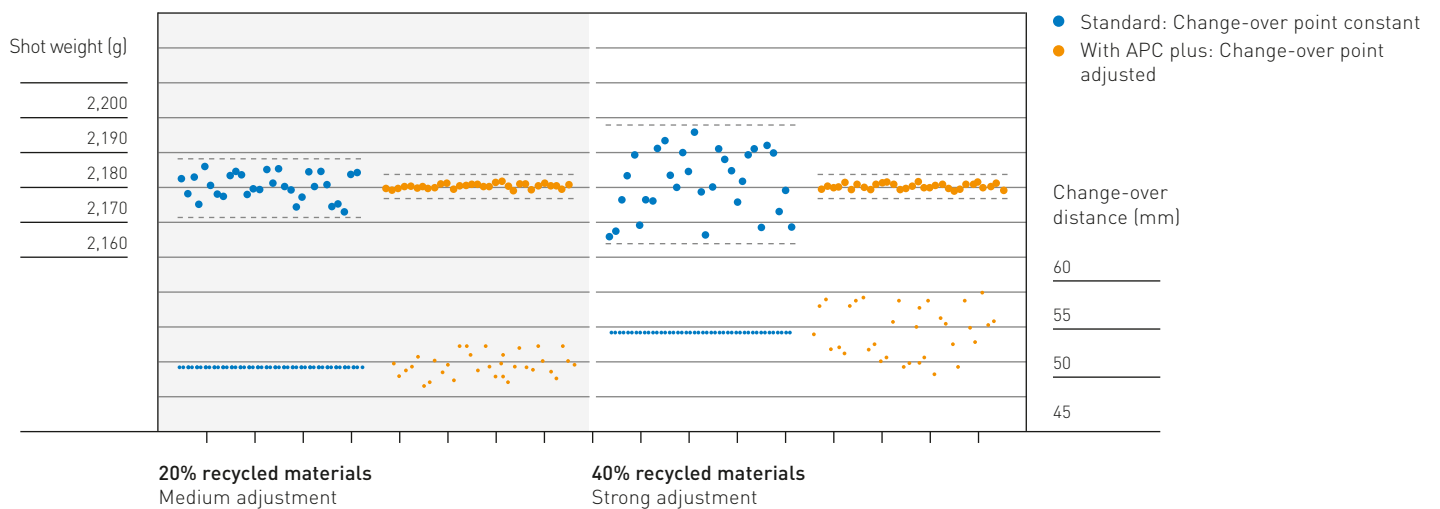
Your benefits:

- Balances out fluctuations in viscosity in real time
- Constant mold charging
- Optimum component quality

Quick start-up and stable processes APC plus guarantees shot weight consistency

APC plus ensures consistent shot weight and component quality under all conditions. In the start-up sequence, during cascade injection molding or working with varying mixtures of recycled materials – even when the door to the hall is open and there is a draft.

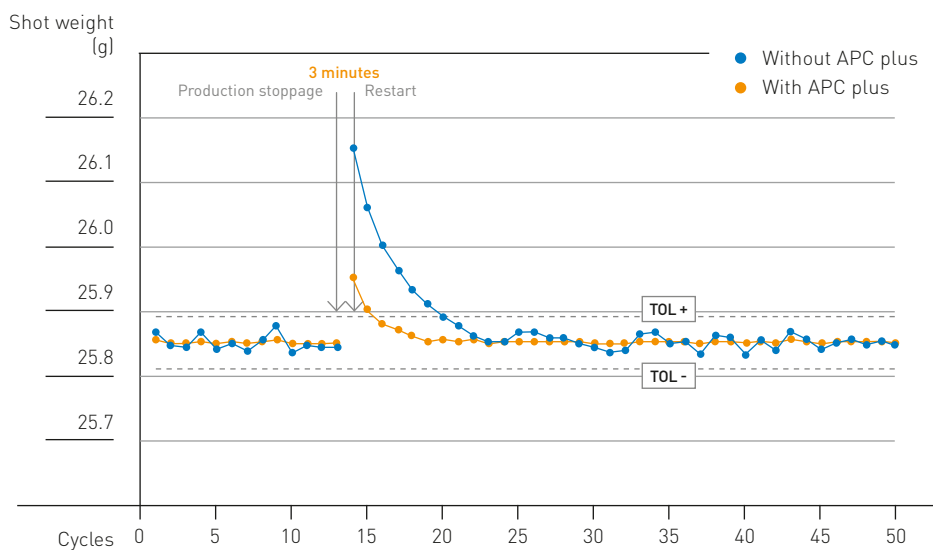
Shot weight consistency: use of recycled materials of 20% and 40% – each with and without APC plus



Regardless of the proportion and the properties of the recycled material, APC plus reacts to fluctuations and reliably stabilizes the component weight.

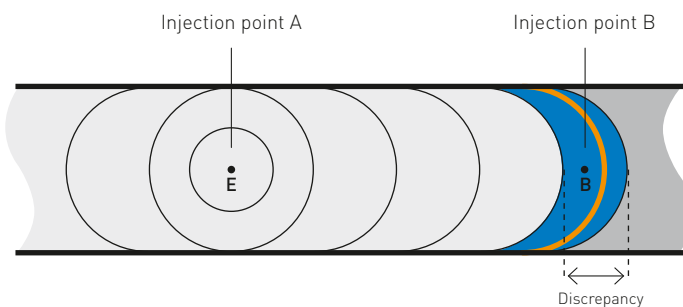
With APC plus you will master sophisticated processes even when using high proportions of recycled materials.

Quick restart after production stoppage



The viscosity of the material in the cylinder changes during a production stoppage. After the restart, the required shot weight consistency is only attained after a certain number of cycles. APC plus reduces this startup time to a minimum because it immediately reacts to changes in viscosity.

Perfect cascades



- **Without APC plus:**
The flow front varies from one shot to the next, cascades open, depending on the screw distance without knowledge of the actual melt front
- **With APC plus:**
Cascades open at the right moment, behind the flow front

APC plus ensures perfect component quality, even with cascade injection molding

Depending on the melt pressure, APC plus calculates the progression of the melt front for every shot on the basis of melt compression. This allows the cascade opening points to open at exactly the right time.

Your benefits:

- Shot weight consistency with high proportion of recycled material
- Quick restart
- Consistently high quality for cascade injection molding
- Environmental influences canceled out

Revolutionize your manufacturing process

Advantages that speak for themselves



Consistently high quality is a vital factor in maintaining good customer relations. With APC plus, you can protect this important commitment

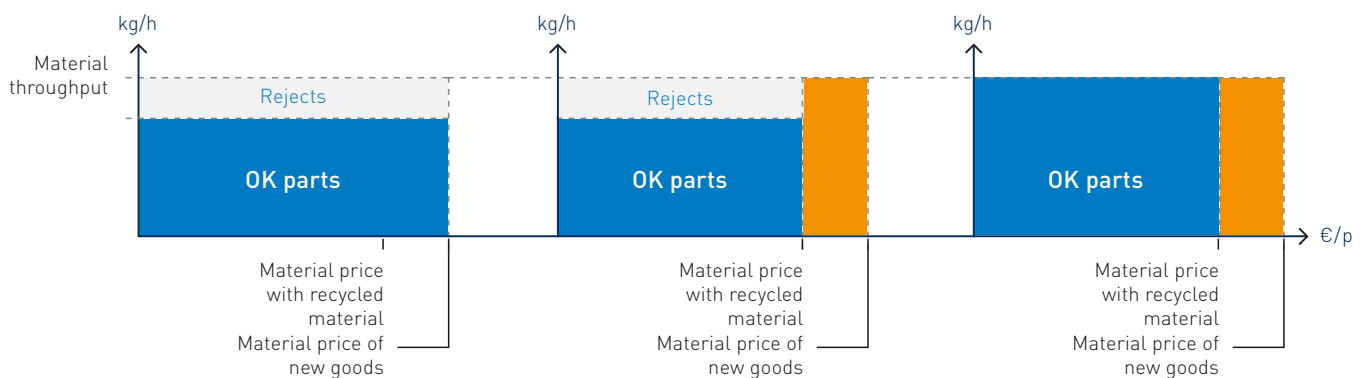
Zero-defect production

Efficiency and stability of the process are of decisive importance for a high margin and large quantities. APC plus prevents component defects such as overmolding or sunk spots. Based on exact knowledge of the pressure-dependent melt behavior and taking into account external influences, APC plus automatically adjusts the change-over point and holding pressure level for every shot. This means you always achieve the required volume in the mold.

Your benefits:

- Substantially lower scrap rates
- Consistently high component quality
- Lower quality assurance costs
- Enormous cost reduction possible
- Proportion of recycled material can easily be substantially increased

Reduce costs with APC plus



Cost situation without APC plus

Rejects and material costs define the unit price of the good parts. Cost reductions and increases in margins represent major challenges for every organization.

Cutting material costs

APC plus allows a higher proportion of recycled materials to be used, reducing material costs drastically.

Reducing rejects

APC plus improves process stability and thus reduces scrap rates. More good parts are produced for a given material consumption. The costs are also reduced by less material loss.



Easy handling

The demands placed on modern manufacturing are constantly increasing: it must be flexible and as cost-effective as possible. Therefore, downtimes, lengthy start-ups and fluctuations in production must be reduced to a minimum.

APC plus uses Intelligent process adaptation to automatically balance out process discrepancies and disruptions. Even after a restart, the machine immediately produces components with the usual high quality from the very first shot.

Other benefits:

- Learn with various change-over procedures
- Choice of several learning cycles as reference
- Automatic holding pressure correction
- Drop-down menu with choice of 20 plastics and eight fillers
- Input of up to five user-specified materials and fillers possible
- Extended range of use (cascade injection molding and thin-wall applications)



The MC6 control system boasts optimal user-friendliness.

Plastics 4.0

Digital networking for flexible and intelligent production



Self-optimizing machine

Adaptive Process Control for continuous analysis and dynamic control of injection molding processes. Machines operated with APC plus are self-optimizing. They automatically take appropriate countermeasures in the event of process fluctuations – for constant, outstanding component quality.



Transparent processes

Deep and extensive insight into the processing operations are made possible by the KraussMaffei DataXplorer data collection and analysis system. Signals relevant to the process are recorded and compared. Exported data are professionally analyzed on a PC.



Interactive service

All relevant machine data are made available to the customer centrally via the KraussMaffei Group websites. This has the effect of accelerating frequent service processes. An individually designed, neatly arranged instrument panel gives the user a 360-degree view of the machine parameters. The information is immediately available, allowing a smooth flow of communications with After Sales Service and fast remote service.

KraussMaffei

A strong brand in a unique global group

Cross-technology system and process solutions

Whether in Injection Molding, Reaction Process Machinery or Automation – the KraussMaffei brand stands for pioneering and cross-technology system and process solutions in plastics processing worldwide. For decades, our expertise, innovative ability and passionate commitment to plastics engineering have been your competitive edge. As a cross-industry system provider, we offer you modular and standardized systems as well as solutions customized to your needs.

There for you around the world

With our worldwide sales and service network, we offer our international customers an excellent basis for a successful business relationship. Due to the close proximity to our customers, we are able to answer your individual inquiries very quickly. We work out the best possible technical and economical solution for your product and production requirements together with you. Test our machine technology for your applications and let our experts put together an individualized service package for you.

Individualized service

Our employees from customer service, application technology and service help you with your questions and needs on every topic dealing with machines, systems and processes – around the globe, quickly and with a high level of expertise. We have developed an extensive customized service spectrum with our lifecycle design, which accompanies you throughout the entire lifecycle of your machines and systems. Take advantage of the personal interaction and flexibility we offer in our practically oriented seminars. We carry out customer-specific trainings either at your location or at our sales and service locations.

You can find additional information about KraussMaffei at: www.kraussmaffei.com

KraussMaffei Group

Comprehensive expertise

Unique selling proposition Technology³

The KraussMaffei Group is the only provider in the world to possess the essential machine technologies for plastics and rubber processing with its KraussMaffei, KraussMaffei Berstorff and Netstal brands: Injection Molding Machinery, Automation, Reaction Process Machinery and Extrusion Technology.

The group is represented internationally with more than 30 subsidiaries and over ten production plants as well as about 570 commercial and service partners. This is what makes us your highly skilled and integrated partner. Use our comprehensive and unique expertise in the industry.

You can find additional information at: www.kraussmaffeigroup.com



The KraussMaffei Group has a global presence. Countries with subsidiaries are marked in dark blue. In the white-colored regions, the Group is represented by over 570 sales and service partners.

APC plus

Stability, precision and cost-efficiency in production

APC plus from KraussMaffei ensures that disruptive fluctuations and environmental influences in the production process are quickly and precisely canceled out. The automatic control system always guarantees that the cavity is properly filled, shot by shot. Maximum precision, minimum scrap rates and straightforward use of recycled materials are standard with APC plus. APC plus also guarantees perfect components with constant molding volume in cascade injection molding and on thin-walled articles.

APC plus is available exclusively for all KraussMaffei series, also for retrofitting.