



Engel

iQ Weight Control – Smart Compensation of Process Fluctuations

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iQ weight control

Smart compensation of process fluctuations

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What is iQ Weight Control?

ENGEL's **iQ weight control** is an intelligent assistance program which regulates the injection process during production.

Real time compensation of process deviations, to ensure the same amount of material is injected into the cavity, keeping the shot weight constant.

The effects of material viscosity and melt volume changes are kept to a minimum.

Increased process repeatability and consistent part quality by compensating for process fluctuations results in a reduction of reject rates.

Smart compensation of process fluctuation

Challenges



Material quality

Deviations in the raw material
e.g. humidity changes



Lack of knowledge

Number of skilled workers are
decreasing



Environmental impacts

Changes in ambient temperature



Temperature

Change of temperature control,
water supply



Production process

Overfilled cavities
Short shots

iQ weight control

Smart compensation of process fluctuation

The ENGEL solution
iQ weight control



Intelligent software
that detects changes
in viscosity and
material quality



Automatic holding
pressure and switch
over correction in real
time



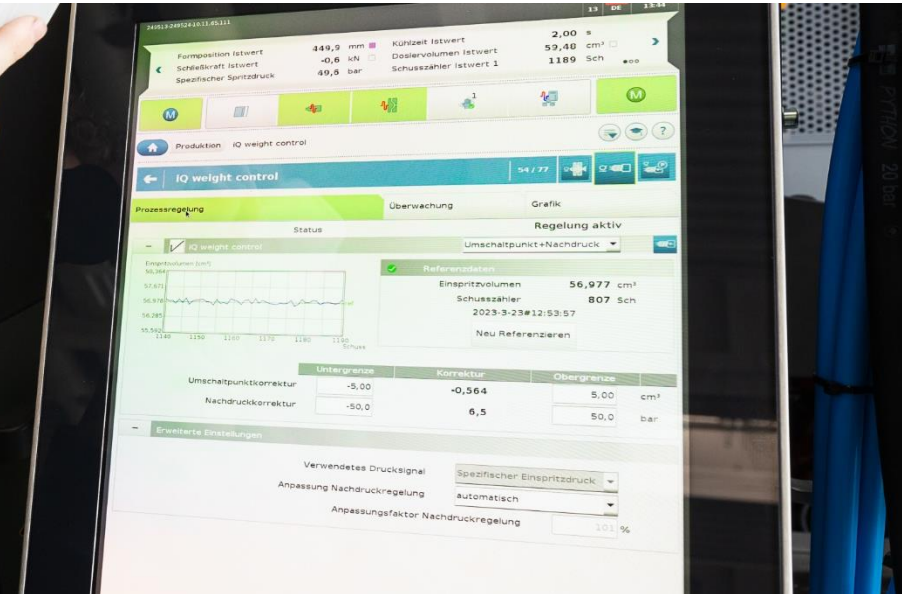
Constant shot
weight and high
repeatability



Significantly
reduced scrap rate



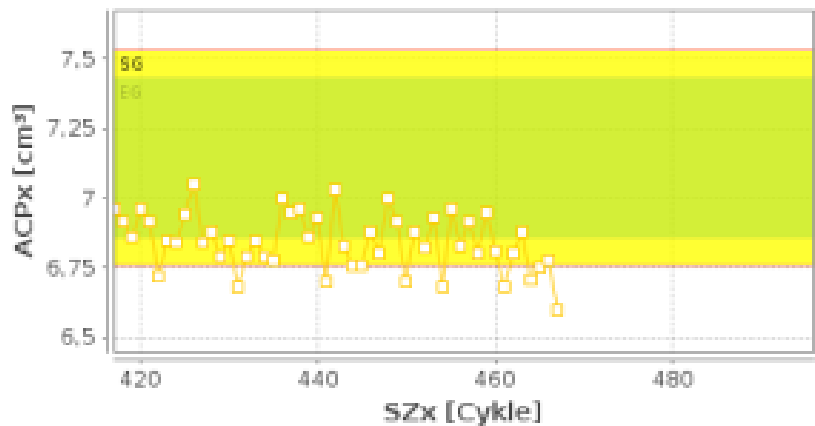
Broad range of
applications for
recyclate



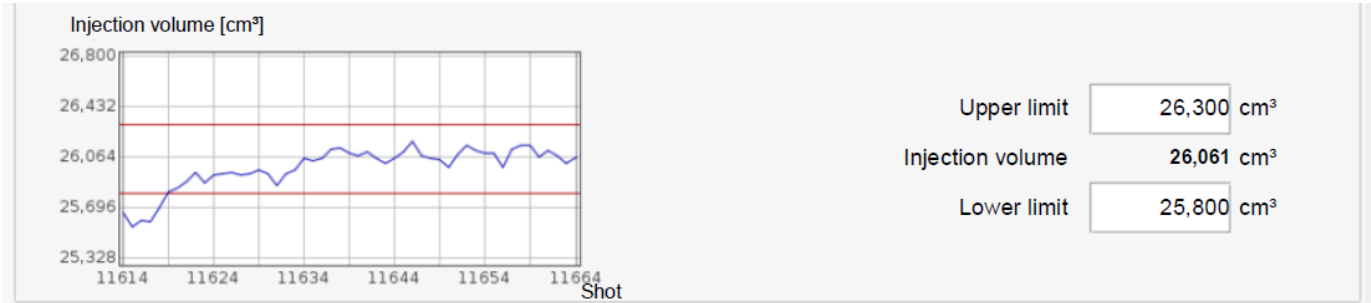
iQ weight control

A mindset change?

Past: quality parameter -> cushion volume



Future: quality parameter -> Injection volume, shot weight

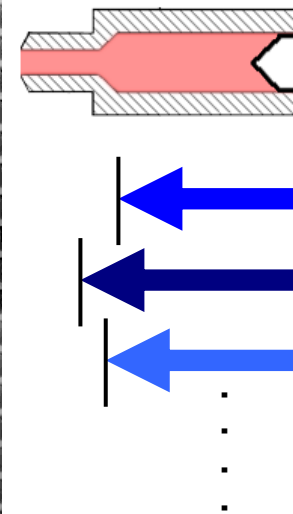
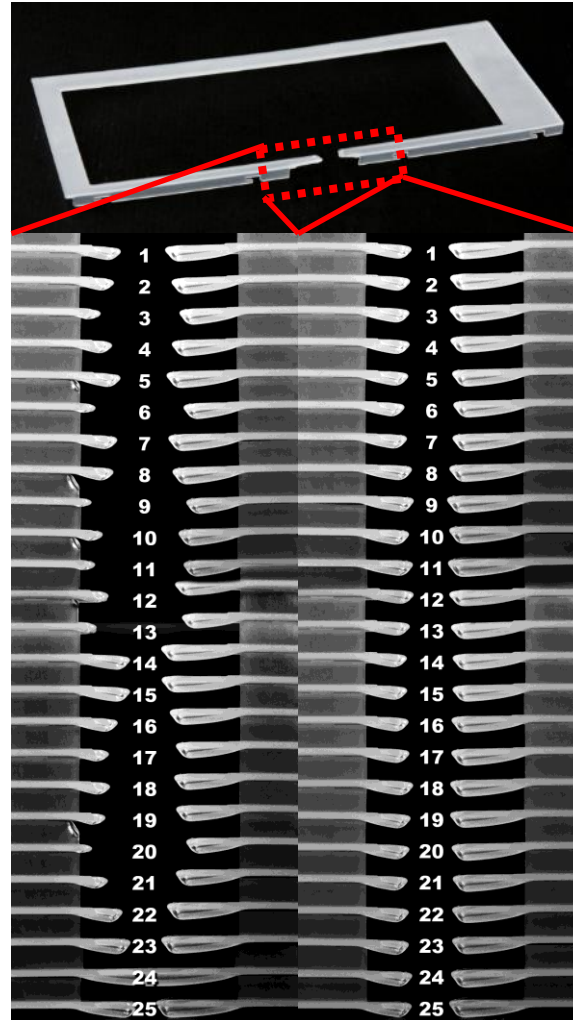
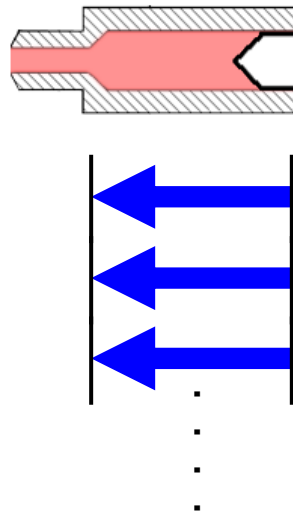


Injection volume

- material: PP
- LCD-bezel
- partial filling

conventional

- injection speed and switch-over are the same each cycle
- external influences affect fill state of cavity



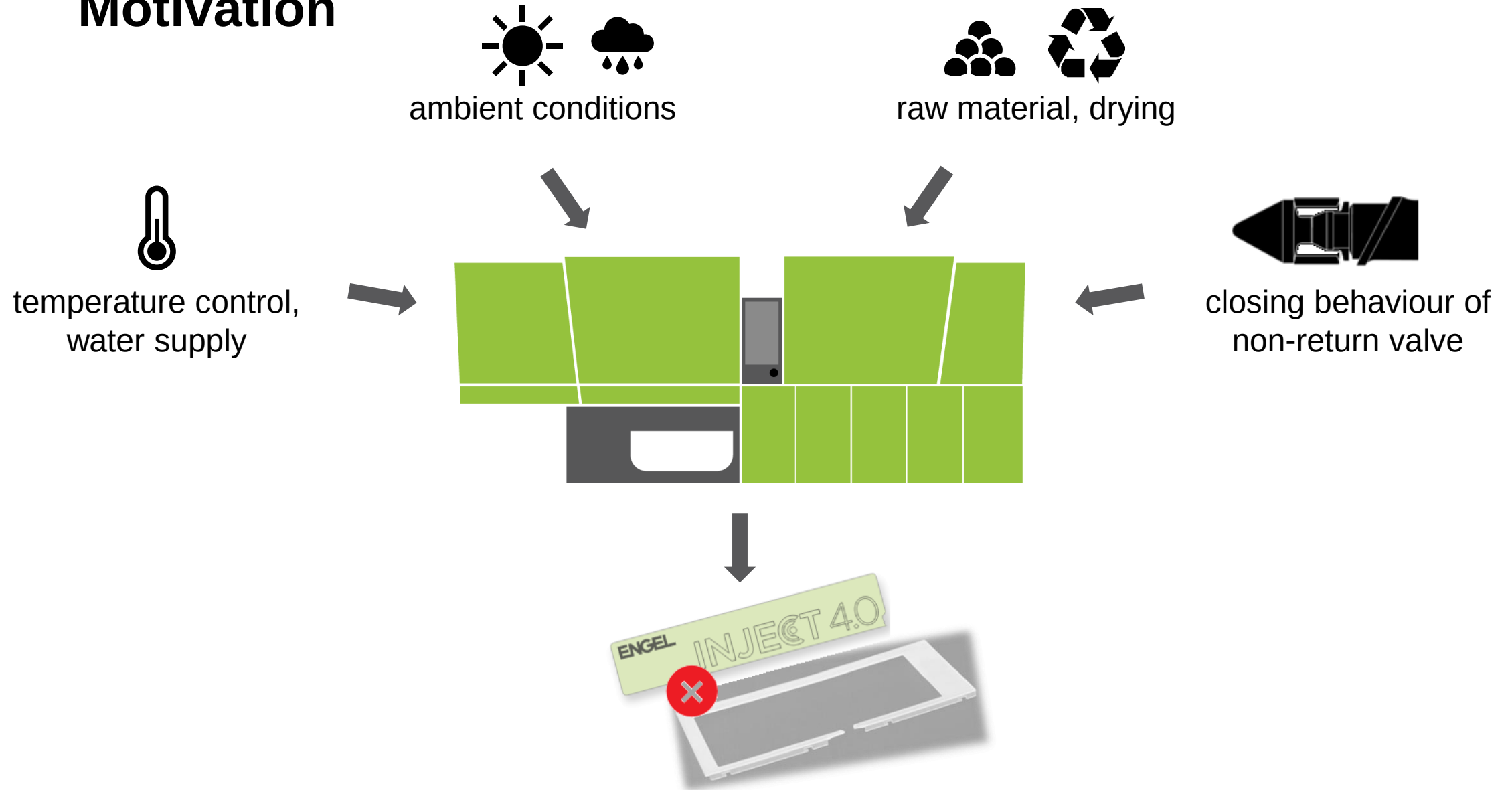
iQ weight control

- injection speed profile and switch-over point are adapted in each cycle
- deviations due to external influences are compensated for

iQ weight control

Basic information

Motivation



iQ weight control

smart machine

Customer situation

- Raw material batch variations
- Moisture fluctuations
- Changes in ambient temperature

This results in

- Short shots
- Overloaded cavities



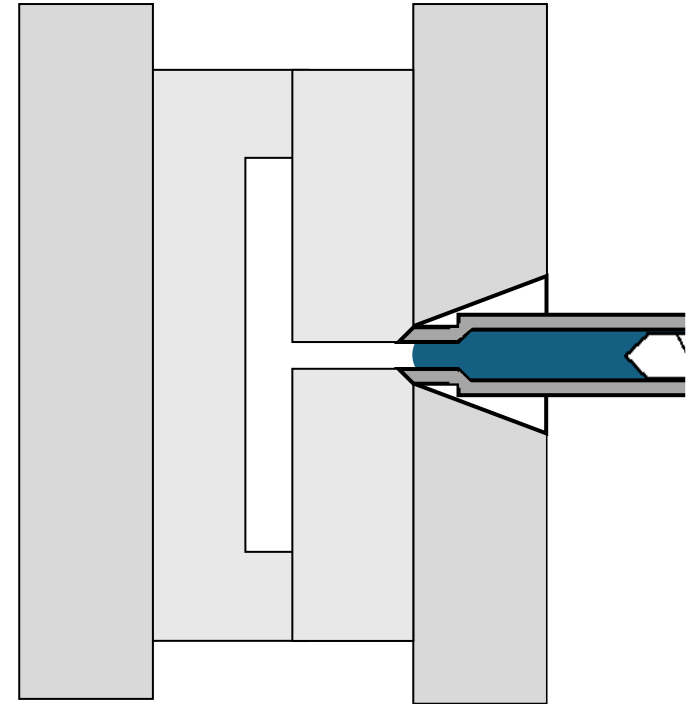
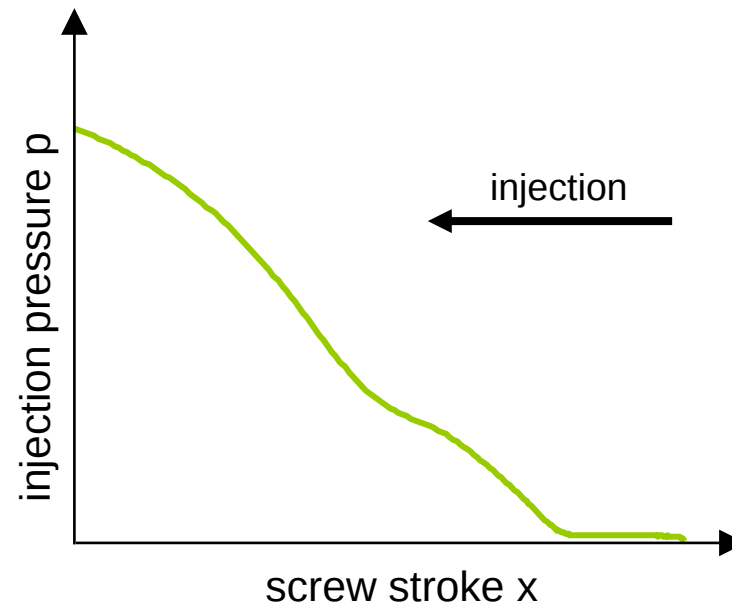
Benefits of an automatic control of injection



- Significantly lower scrap rate → higher productivity
- Faster ramp-up after machine downtime
- Constant injection volume → Improved process stability
- Produce independently of environmental influences

How it works

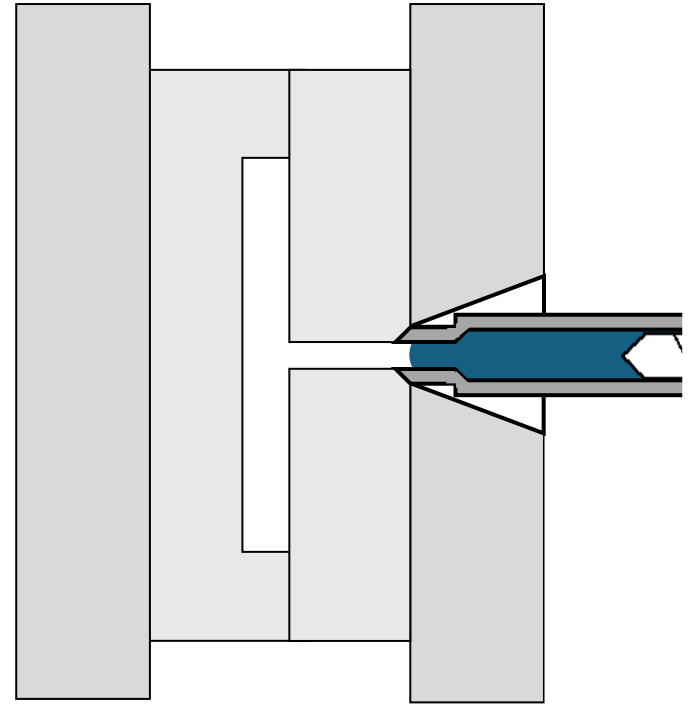
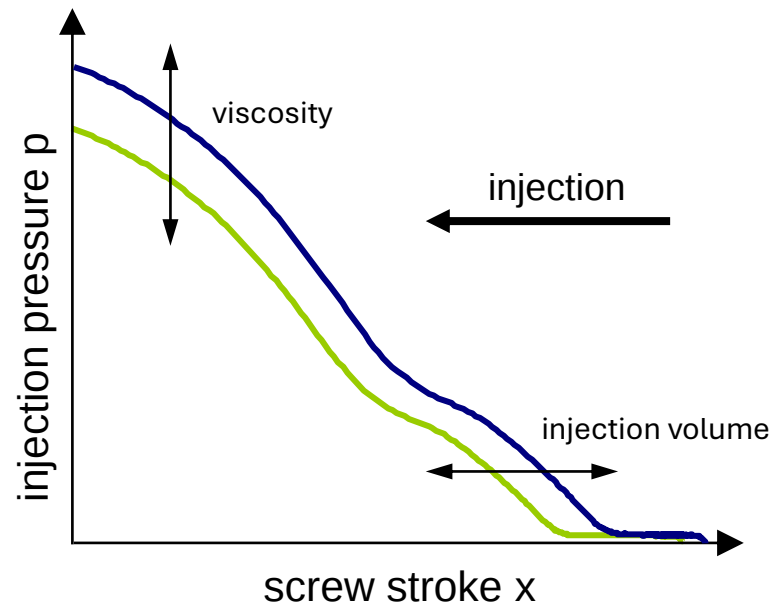
Pressure over screw stroke is recorded during injection



How it works

Pressure over screw stroke is recorded during injection

iQ weight control compares the **current pressure curve** with a **reference curve**

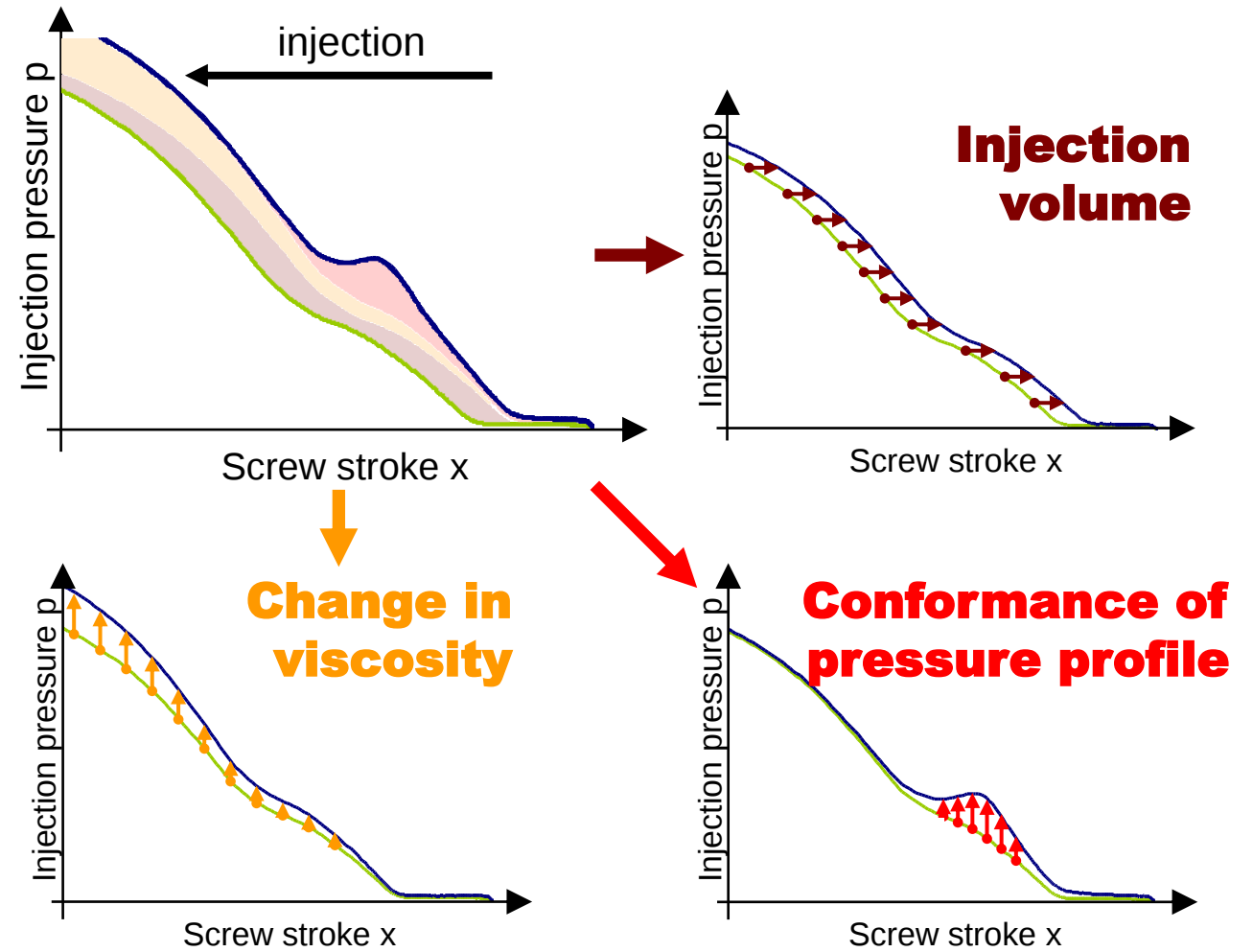


How it works

iQ weight control **compares** the **actual pressure curve** with a previously stored **reference curve**

The deviation from the reference curve is split up into **three contributions**

Each contribution forms one of the **new iQ weight control process parameters**

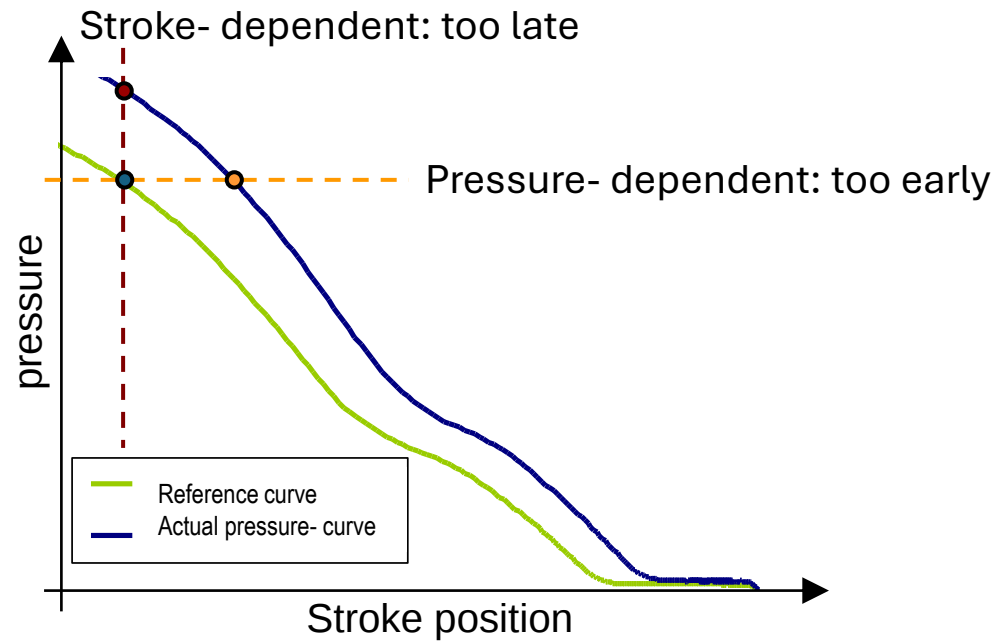


iQ weight control

How it works

None of the usual switch- over possibilities are optimal

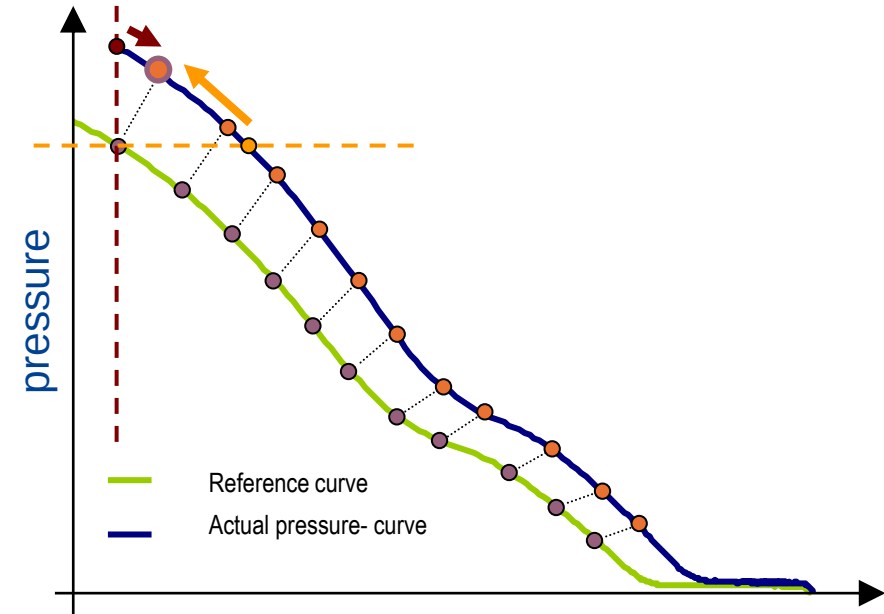
- Volume and viscosity more than in reference cycle



How it works – why position and pressure dependent?

Injection process control

- Adjustment of the injection profile to the actual filling quantity during the filling process
- Adaption of the switching point to the current conditions
 - Compensates for differences in material volume.
- Consistent mold filling when switching to holding pressure
 - Fluctuations in material viscosity is compensated by adjusting the holding pressure.

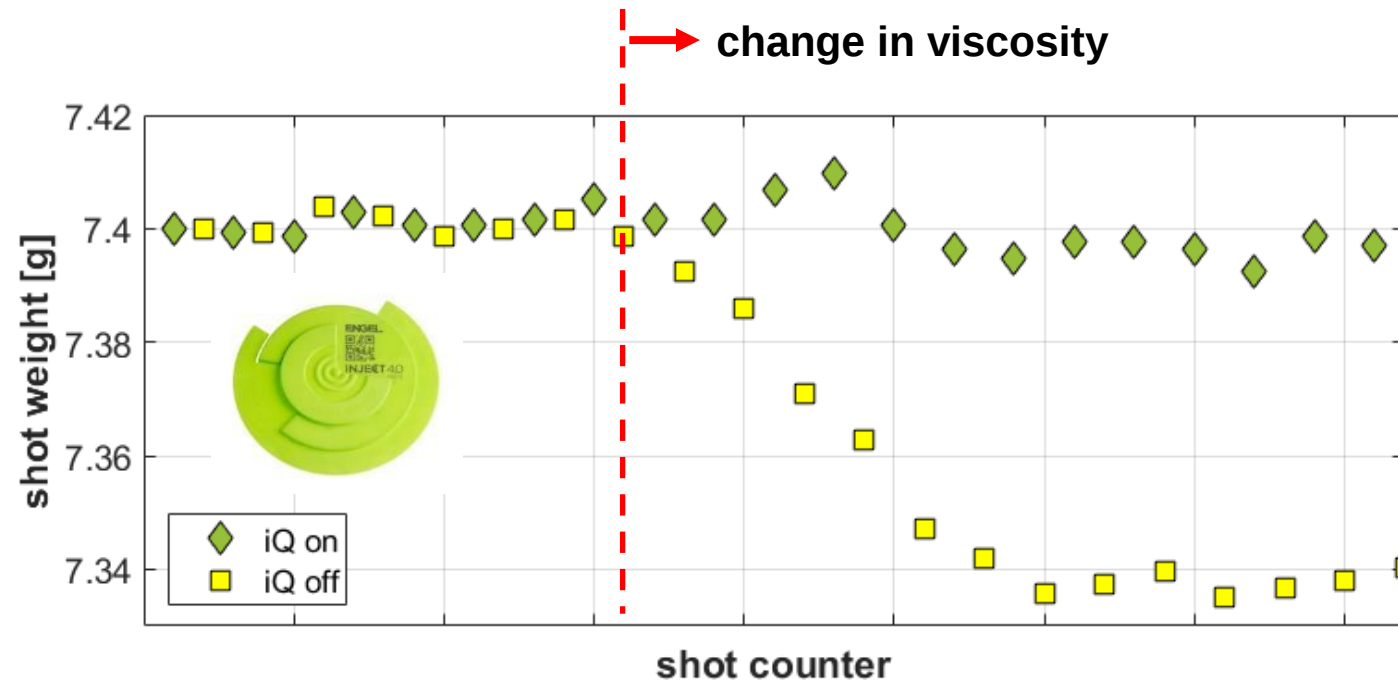


iQ weight control

Changes in viscosity

constant filling under changing conditions

- machine: EM 170 / 80 TL
- material: ABS
- inject 4.0 demo part

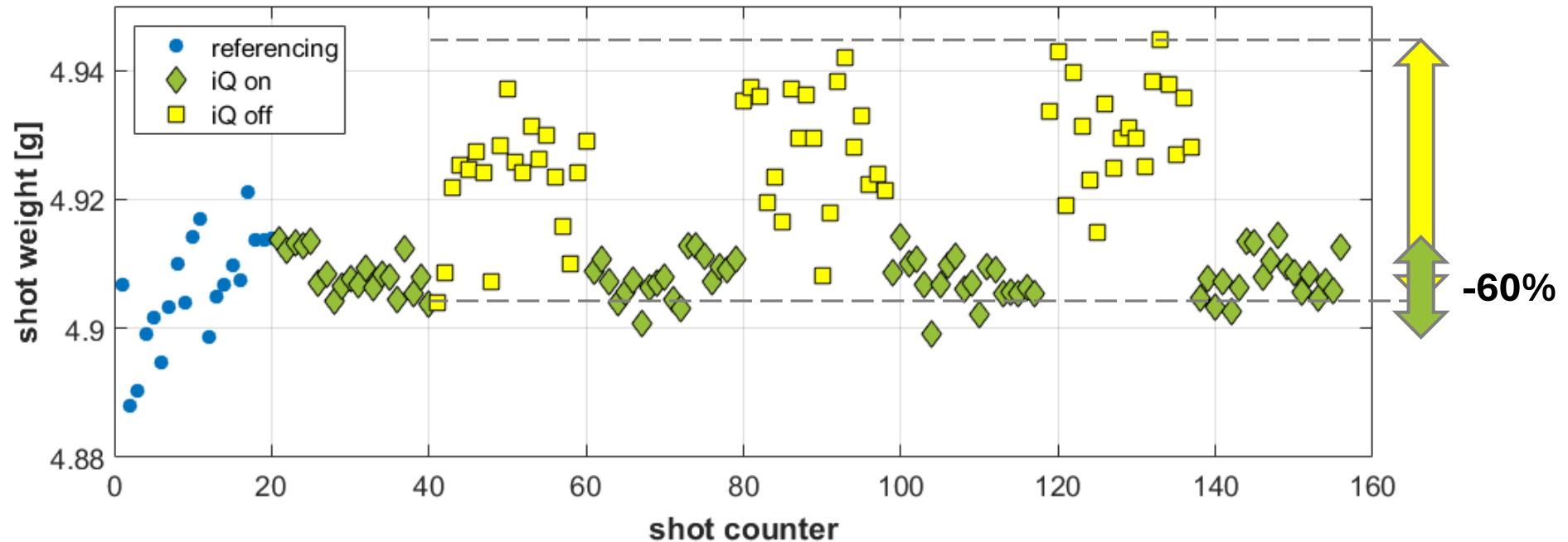


iQ weight control

For hydraulic injection units

compensates for deviations in the running process

- machine: VC 330/120 TECH
- material: PP
- LCD-bezel
- partial filling

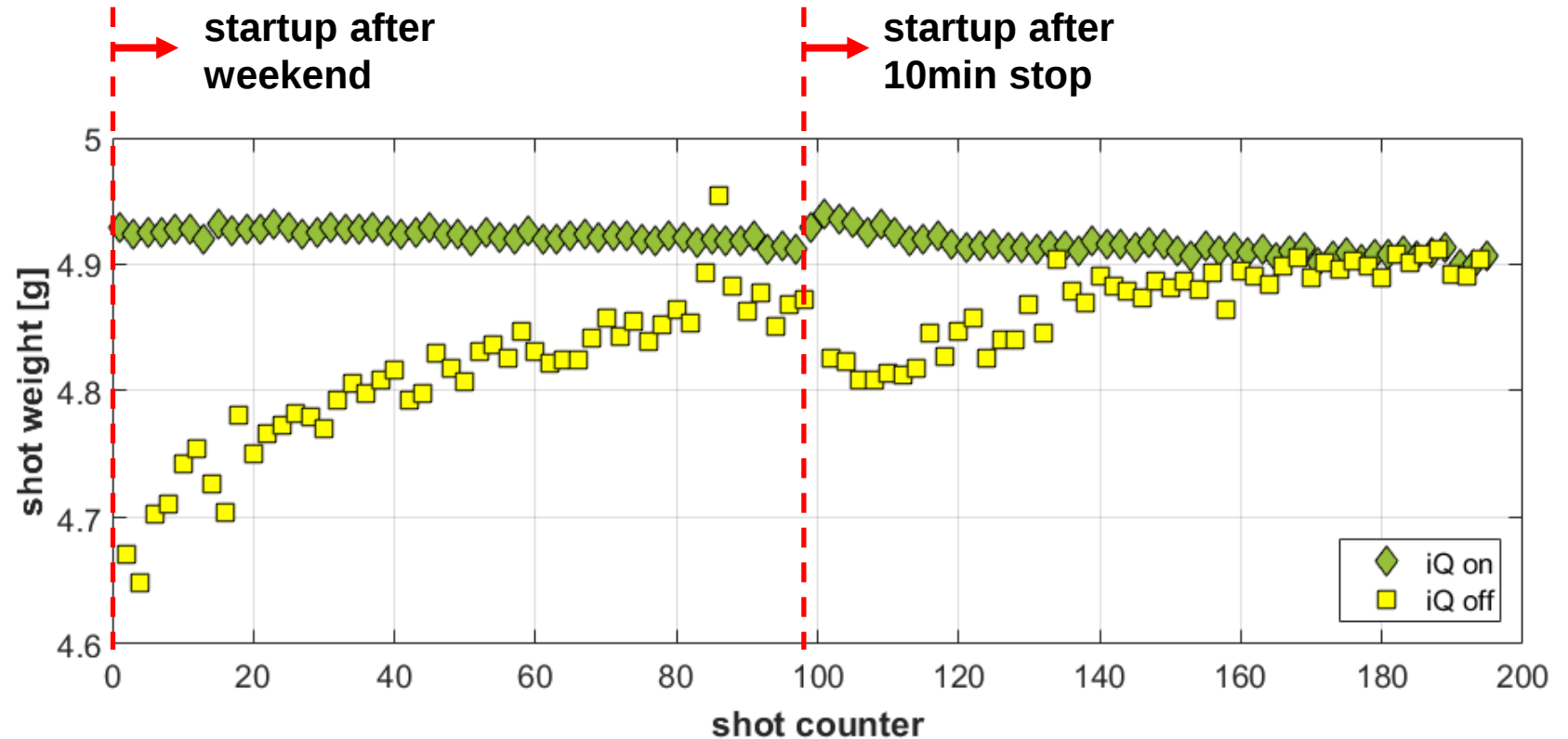


iQ weight control

For hydraulic injection units

significantly faster machine startup

- machine: VC 330/120 TECH
- material: PP
- LCD-bezel
- partial filling



iQ weight control

The display of the touch screen