gwk integrat 4D-System

As a mould maker you know that the most important part in the process chain of producing plastic products is the injection mould. Nowadays, ordinary drilled cooling systems are hardly able to meet the requirements in terms of cycle time and quality.

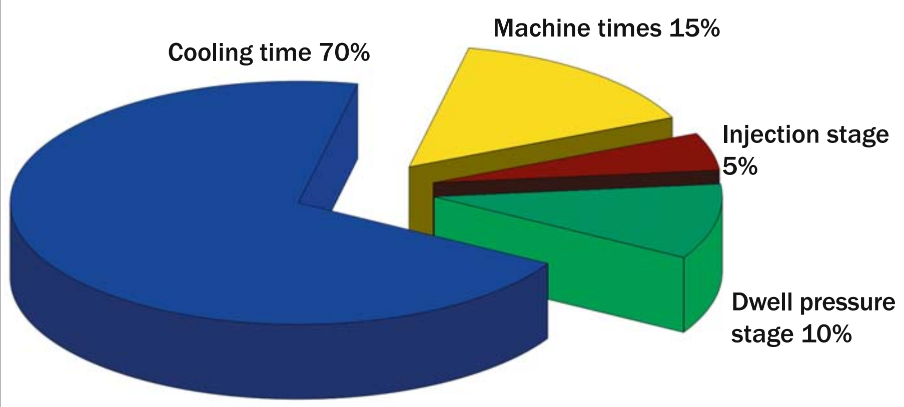
The gwk integrat 4D system is the rational answer to the economic cooling process.

For technical parts, the cooling time is 2/3 of the overall cycle time, thus the largest cost-factor; therefore the greatest potential for rationalization lies in a correctly dimensioned cooling process.

Through close-to-cavity and segmented allocation of the cooling surfaces and the water quantities and temperatures necessary to do so it is possible

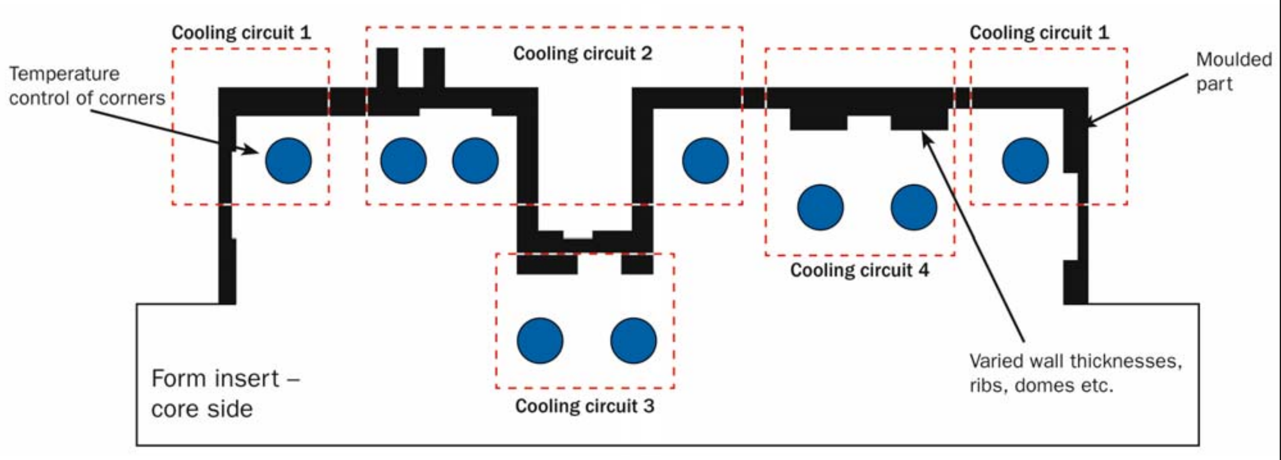
to reach the shortest cooling time,
while at the same time achieving the best possible mould quality
as well as reducing the reject rate considerably,
and realizing a stable production process.

Segmentation of overall cycle time for technical parts



General sketch: Close-to cavity and segmented mould temperature control

Varied heat output from mould – Objective: An even mould wall temperature



The closer the cooling channels are to the cavity and the more even the water distribution is realized, the more homogeneously heat can be transferred, which allows a faster cooling process.

For technical parts, the gwk-system may decrease **cooling time** by **ca. 30 - 50 %.**

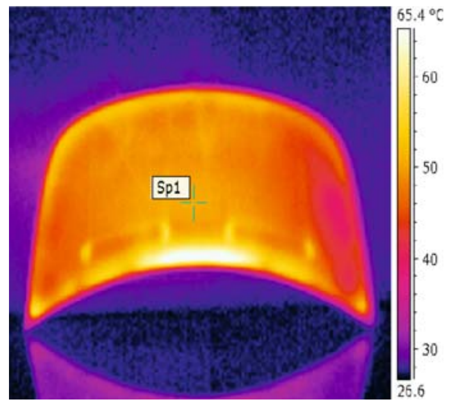
As a result, the **overall cycle time** is reduced by between **20 - 30 %.**

The possibilities of reducing cycle times in such a way while at the same time maintaining or even improving the quality of the mould is certainly the greatest financial advantage for the west European injection mould industry, as her production costs per hour are the highest.

Project study gwk integrat 4D-System

The project study includes the following performance features:

- Evaluation of the moulded part on the basis of the article data (article drawing, material data, mould drawing or form insert drawings)
- Calculation of cooling time and thermal consideration
- Allocation of water distribution in the mould insert to the heat input of the moulded part –> Determination of the segmented cooling
- Determination of the mould data (material, size, hardness, separating levels etc.)
- Economic efficiency calculation through cost-benefits analysis
- Offer generation *(of course free of charge for you)*

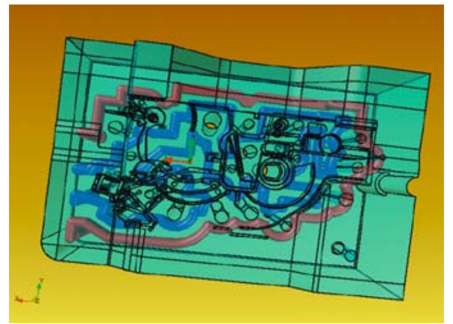


Heat-technology analysis

- Generation of a moulded part – and mould thermography by means of an infrared camera during production without interrupting the production process. The infrared analysis reveals the thermal problem areas in the moulded part as well as the mould and shows potential for optimization.

Material

- We produce our blanks for the inserts from highly solid steel types: 1.2343ESU, 1.2344ESU, M333 (as a replacement for 1.2083), 1.2379ESU, 1.2767ESU, W400 and, if required, SPM. Use of other steel types must be considered individually upon request.

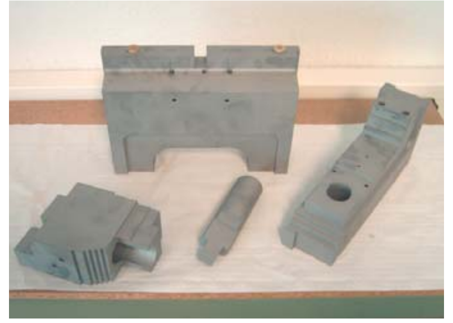


Development

- Arrangement of the cooling channels according to project study and constructive calculations
- Determination of the insert structure (offset data, size of the blanks, separating levels)
- Consideration of ejector drill holes, pins, connections for cooling channels, alignment surfaces etc.)
- Generation of the engineering drawing and release by customer
- Generation of the production drawing and the CNC-programs

Metal cutting treatment

- Positioning of the multi-dimensional cooling channels into the separating levels of the mould insert plates by means of CNC-controlled treatment centres (milling, lathing, drilling)
- Positioning of the ejector drill holes, ejector gaps, other openings, fastening threads, threads for cooling connections, alignment drillings/ surfaces and drillings for e.g. feed bushes.



Rough treatment of the mould insert (contour)

- Pre-treatment of the contour before the mould insert is hardened by 2D-treatment (stages) or, if required, also 3D-treatment. The blank offset situation is determined in agreement with the customer.

Cores with high thermal conductivity

- In small mould ligaments, where a water-conducting cooling channel is technically/mechanically not possible or justifiable cores with high thermal conductivity are inserted into the mould insert in a high-vacuum procedure.
- Thermal conductivity is increased by 15 to 20 times, compared to mould steel.
- The cores with high thermal conductivity have direct access to the cooling channel in order to ensure best possible heat dissipation.

Joining technology

- By means of a special preparation procedure, the individual mould levels are joined together at their separating levels in a high vacuum procedure which protects the joints.
- Mechanical properties (firmness, stiffness, wear resistance) are equal to those of a conventionally produced form inserts.

Hardening

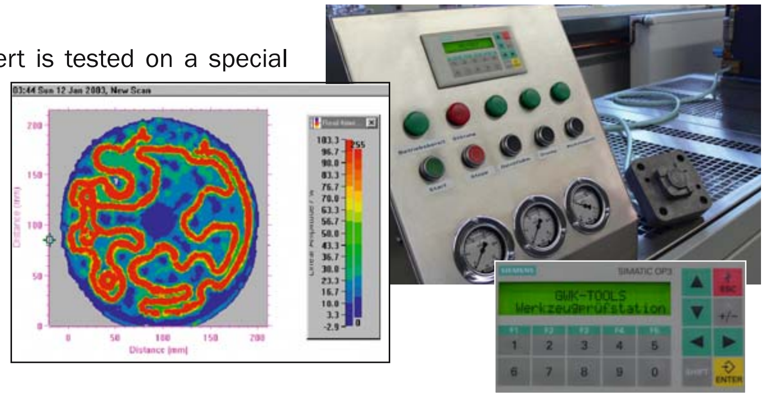
- Immediately after the joining procedure, the mould inserts are heat-treated depending on their steel specification, so that they acquire the desired hardness. To check the surface the hardness of each insert is measured by means of a surface testing procedure, which is documented.

Corrosion protection of the cooling channels

- To protect the cooling channels from corrosion we recommend optionally our special channel coating. It prevents the thermal conductivity of the cooling channels from becoming impaired by corrosive media.

Quality test

- After the joining process each mould insert is tested on a special test facility for leaks (pressure test up to 25 bar) and flow (l/min); all tests are documented.
- In an ultrasound procedure, each mould insert is tested for continuous joining of the joining levels; all tests are documented.



Vacuum sealing of mould inserts (conventional and close-to-cavity)

During production mould inserts may form fissures due to thermal and mechanical use (e.g. incorrect, uneven use). *Upon consultation* of gwk it is possible to seal the inserts in a special high vacuum procedure (rather than producing new inserts).

Process-engineering advice

Another key activity we provide is technical advice as regards to all questions of injection moulding for thermoplastics. We support our customers at their location by helping them set process parameters and removing faults in moulded parts.

In addition, together with our customer we undertake systematic matching procedures in order to achieve the best possible result in terms of **the quality** and **cycle time of the moulded part.**

Economic efficiency calculation through cost-benefits analysis

When projecting / optimising moulds of an overall considered moulded part we conduct a cost-benefits analysis on the basis of our cooling time calculation and with regards to experience values.

In our analysis, the **gwk integrat 4D system** (close-to-cavity cooling channels) and the **segmented mould temperature control** of conventional technology are compared.

The customer is shown the considerable potential for economisation due to reduction of cooling time / quality improvement brought about by the **gwk integrat 4D system.**

The cost-benefits analysis may also be conducted for individual critical areas to be optimized with close-to-cavity cooling channels.

To do so, the remaining area processed with conventional drilled technology (according to our information), must have sufficient temperature homogeneity (an even mould wall temperature).

Productivity
Cost-benefits calculation

Piece number/year	900000	
Cavitation	4	
Cooling time gwk	10	sec
Cycle time gwk	20	sec
Cooling time conventional	20	sec
Cycle time conventional	30	sec
Machine hour rate	35	Euro/h
Total costs close-to-cavity use	12500	Euro

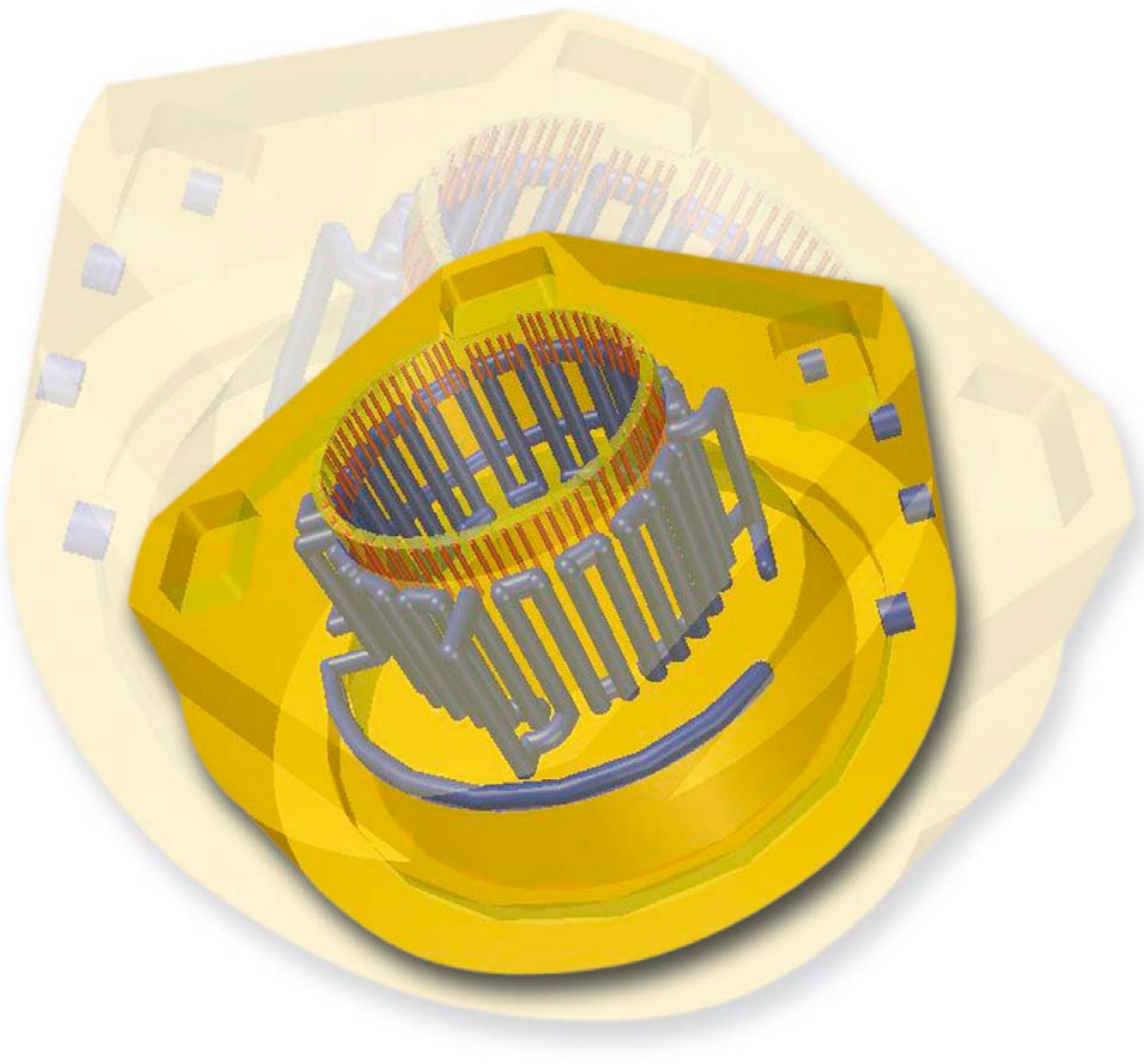
Shots/year	225000	
Number machine hours gwk	1250	h
Number machine hours conventional	1875	h
Machine hours saved	625	h
Cycle time saved	33	%

Machine costs saved	21875	Euro
Costs amortisation	3750	Euro
Savings after 1 year	18125	Euro

Amortisation time	2.06	months
Savings in each following year	21875	Euro

integrat 4D-System

Successful in global competition with more powerful injection moulds – through close-to-cavity mould temperature control by gwk.



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Mould Maker Information

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