WORLD NOVELTY

IMG®

Injection Molding Guide

smart software for mold trials and series processes

... "Software makes an annoying compulsory exercise a quality criterion"...

... "Running series processes optimized with the IMG and production costs reduced"...

... "All staff members are screening immediately"...

"...contain deep process knowledge..."

... "Make the sampling with software even more effective"...

... "standardized one-click sampling process"...

... "Innovation in the plastics processing industry"...

... "The world's first software solution for mold sampling and process optimization"...

... "Faster sample processes feasible with the IMG"...

... "The answer to industry 4.0 in terms of process integration in the company"...

... "Saving expensive employee training through integrated IMG-Guide"...

... "extremely practical"...

... "improves documentation and communication in the company"...

... "The know-how remains with the change of employees in the company"...

... "Everything from a single source over the entire running time of the mold and molded part"...

Intention of the IMG software

Why a mold sampling?
When does a mold sample take place?
What problems are there in the injection molding company?

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„...one step ahead...“

Intention of the IMG software

Why a mold sampling?

While on the one hand the complexity of the plastic components is constantly increasing, on the other hand the project phases from the idea to the final product. For series production ever shorter. Plastics processing companies have to face this challenge every day. The mold sampling phase plays an important role in the later success of series production.

Mold sampling is a complex process because different employees and departments in the company interact with each other. All employees involved must work together at the right time in order to control the sampling process effectively. In addition to ever shorter project phases, this task presents every company with a technical and logistical challenge.

However, in the plastics processing industry companies often regard the sampling processes as a minor matter. Due to unstable processes, many companies waste time resources or struggle with unnecessary quality problems.

Only with a systematic approach can processors design their injection molding processes more efficiently and exploit productivity reserves.

The importance of the mold sampling phase cannot be overestimated and is the cornerstone of every economical injection molding process.

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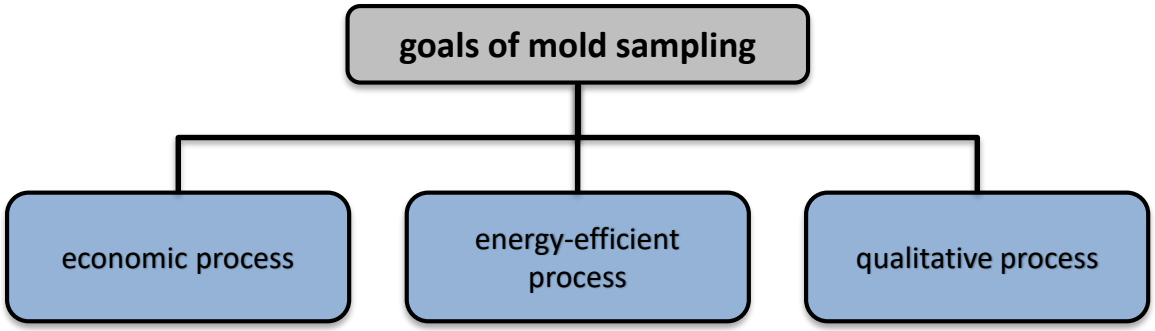
When does a mold sampling take place?

mold sampling takes place in an injection molding company with every new mold, material change, process optimization or process problems or mold correction or mold part change.

The sampling of a mold has the following backgrounds:

- Recognize mechanical defects in the injection mold and correct them in a targeted manner.
- To determine, document and archive the machine setting parameters strategically and analytically.
- To maintain the optically and dimensionally required molded part quality.
- Achieve an optimum cycle time in conjunction with the machine and peripherals used.
- To realize an energy-efficient series production that is gentle on the machine and reduces wear.



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Intention of the IMG software

What problems are there in the injection molding company?

The main problems in practice are...

- complex processes involving many specialist departments
- mostly no standardized processes
- inadequate preparation and lack of information flow
- too many different data or island structures among the individual departments
  → impairment of knowledge repatriation, communication and documentation
- missing time and required machine resources
- lack of digitization in the age of industry 4.0
- lack of skilled workers in the field of plastics technology

As a result, there are negative influences on the ...

…sampling process:

- increased time required for execution (resources)
- no detailed specifications in the company
- no structured and analytical approach
- important work steps are forgotten or skipped
- lack of basis for communication and documentation
- no optimal definition of measures
- more optimization loops necessary up to series production readiness
- no transparency in the implementation of subtasks

…serial production process:

- too long cycle times
- fluctuating part qualities
- higher scrap rates and customer complaints
- no economic and sustainable process
- higher mold wear

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Intention of the IMG software

Don't let them take you down!

For this reason, Ingenieurbüro Schötz Kunststofftechnik GmbH has developed and perfected the **IMG Injection Molding Guide** application from practice for practice in order to solve the problems mentioned in the company.

The world's first software for mold sampling and process optimization offers impressive technical advantages for the resulting injection molding process, which can no longer be achieved with the classic, everyday measures in the company. The technical work of the operator is standardized, digitized and consequently implemented more sustainably for the injection molding company.

Andreas Schötz
Inventor of IMG

“At the pulse of time and with the IMG - Injection Molding Guide even one step further...”

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Insights into the software

Introduction
Base Data
Operational Usage of the IMG
Special Features in the IMG
- Guide-Feature
- Injection Molding Doctor ®

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„...one step ahead...“

Insights into the software

Introduction

The **IMG Injection Molding Guide** is an innovative, modular industry solution. Developed from practical experience for practical use. Tailored to all needs and requirements for companies in injection molding technology.

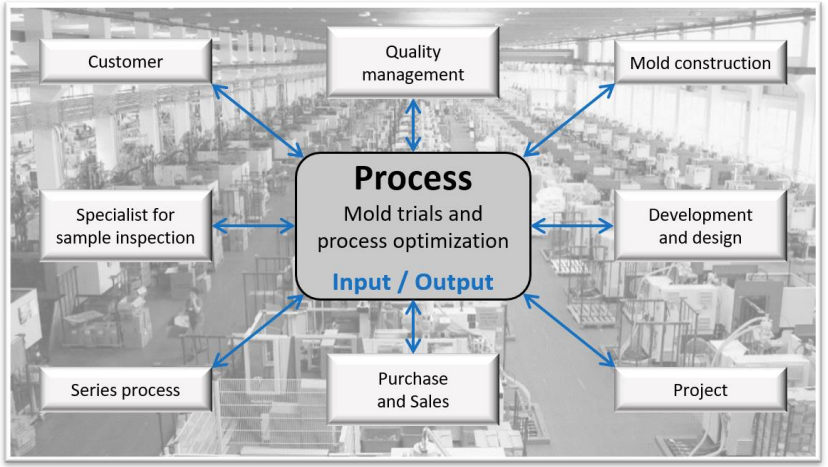
The IMG supports you in the systematic procedure and guides you through the sampling of injection molds and the optimization of injection molding processes.

Employees are guided to a fast and stable process point within as large a process window as possible by means of intuitive user guidance and a guide, checklists and templates.

Information on plastics, machines, peripherals, process data and many other data is stored in an SQL database.

The data, which can be retrieved at any time, enables faster implementation of the sampling processes and reduces costs and time. For security reasons, all internal databases and IMG contents are password-protected against unauthorized users.

The structured and analytical approach of the IMG software enables a seamless workflow and documentation of the sampling and optimization processes in the company. In addition, the IMG can be used by project members for data transfer, communication and other process-optimizing measures and actions.



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Insights into the software

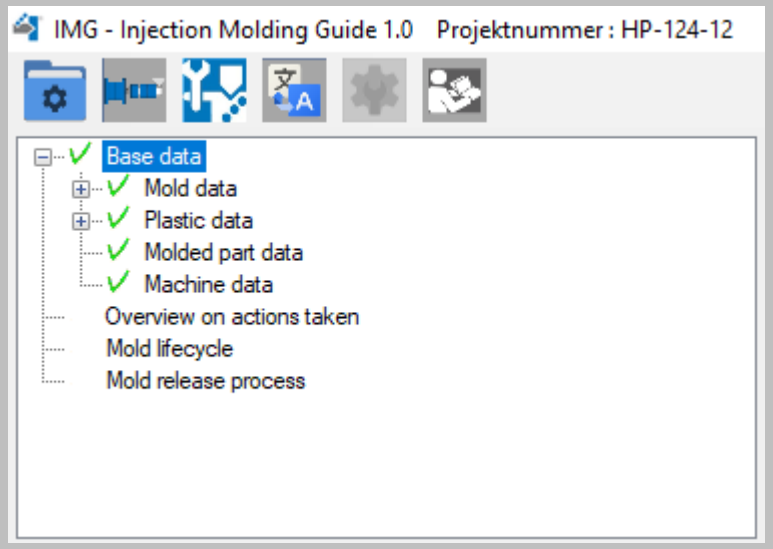
Base Data

With the help of the base data, time resources can be saved in advance.

The IMG offers the following advantages:

- Data can be stored quickly and easily and serve as information and data transfer for the individual specialist departments throughout the entire sampling process.
- With the help of the internal database, all created data such as the plastic to be processed or the injection molding machine used can be saved.
- Documents, templates, images and photos can be integrated and edited.
- Numerous links from the master data later contribute to more effective time-reducing processing of the individual steps in the software.

"All necessary information and data in one software available at one click..."



Structure tree for Base Data

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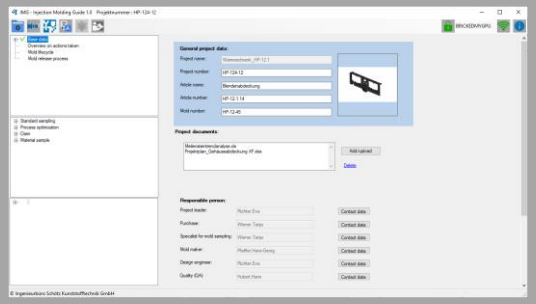
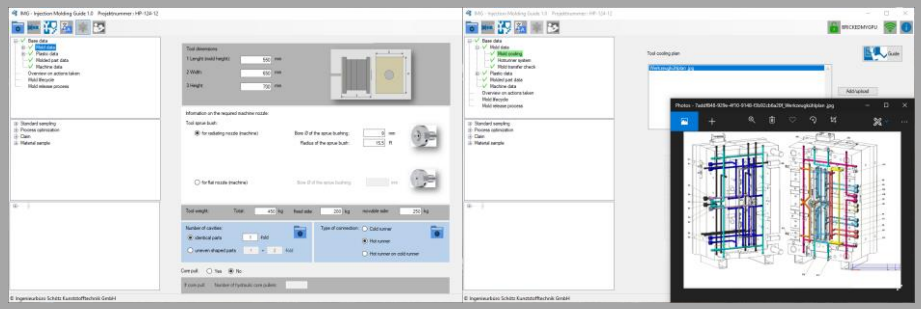
…“Fast exchange of information and data before, during and after sampling from a system saves time and money“…

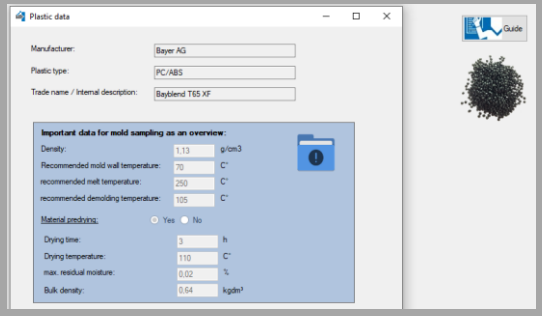
Excerpts from master data



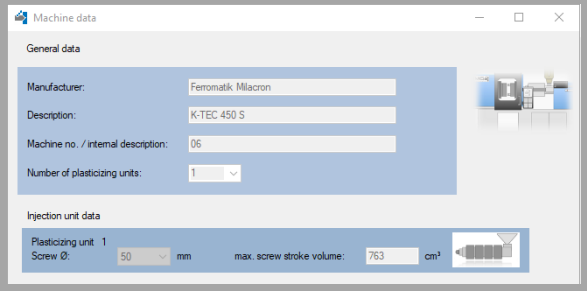
General project information



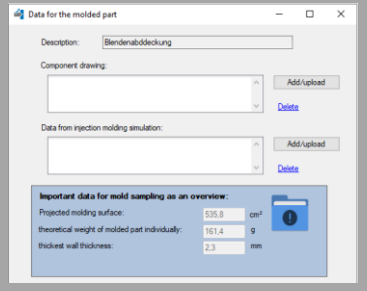
Important mold data and documents



Plastic data



Injection molding machine data



Data for the molded part

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Using the IMG

Once all important background information has been compiled, inserted and saved under master data, the operative part of the machine now follows.

After clicking the button “New mold sampling" (Fig. 1), the user can choose from the following categories:

- initial mold sample
- subsequent mold sampling
- process optimization
- customer complaint
- material samples

Then a structure tree (Fig. 2) opens which leads from top to bottom systematically and structured through the patterning.

... "Managed systematically and in a structured way with the IMG"...

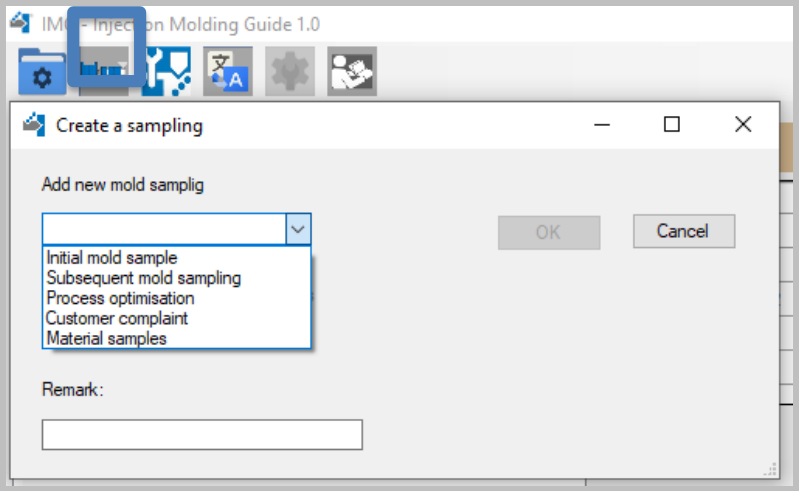

Fig 1: Creating a sampling

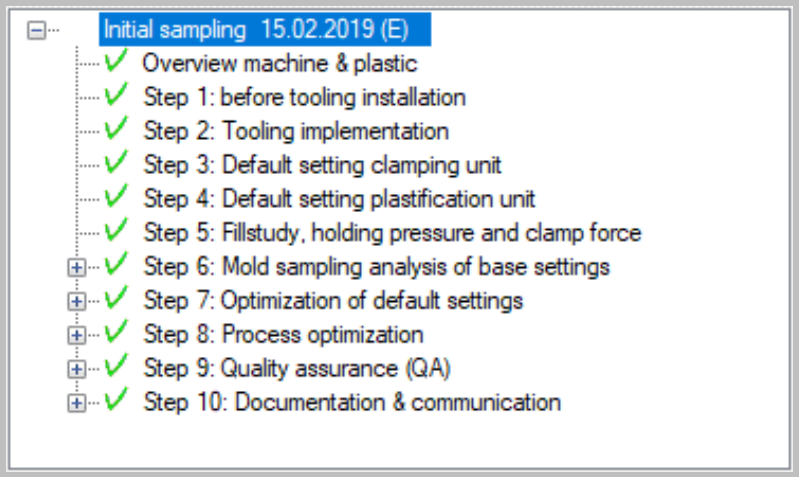

Fig 2: IMG structure tree

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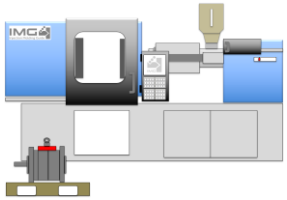
Insights into the software

…“In 10 steps to the successful sampling:

The IMG supports you in the systematic procedure
and guides you through the entire sample inspection..."

1.

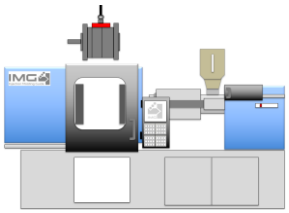


Before
mold installation

Contents:

- checklist
- correct preparation at the machine
- general safety reviews
- optical inspection of the mold
- guide feature

2.

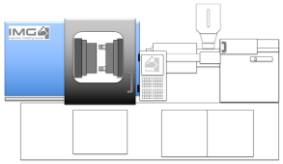


mold installation

Contents:

- checklist
- procedure for mold installation
- connecting the mold to temperature control unit
- guide feature

3.

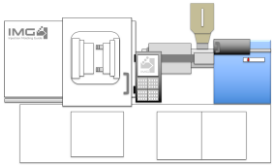


Basic setting of
clamping unit

Contents:

- checklist
- mold movements
- mold safety
- mold temperature
- theoretical locking force
- guide feature

4.



Basic setting of
plastification unit

Contents:

- checklist
- cylinder temperature and
- cylinder temperature profile
- plastification process
- injection process
- theoretical cooling time
- theoretical dosage volume
- guide feature

… “The correct basic settings are the supporting foundation of the further sampling phase"...

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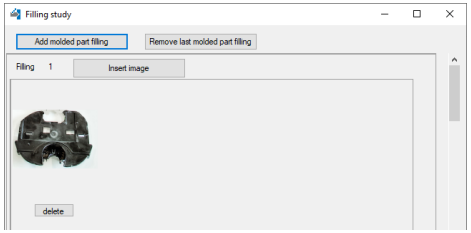
Insights into the software

…“Filling all right? Reprint effective? Locking force optimized?

To further evaluate the process, the mold and the molded part, the filling and holding pressure phase must be set up correctly..."

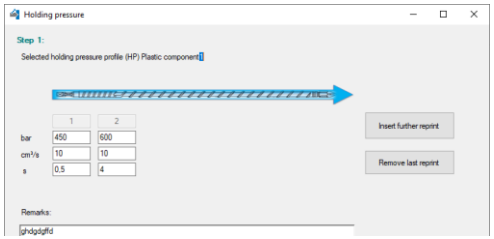
5.



Filling study

Contents:

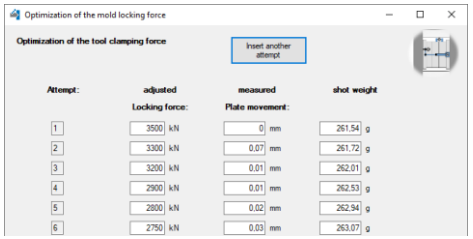
- checklist
- templates
- carry out, evaluate and document filling study
- optimized injection profile
- guide feature
- ...



Holding pressure phase

Contents:

- checklist
- templates
- setting the holding pressure height
- determine holding pressure time via total shot weight or single shot weight
- documentation
- guide feature
- ...



Optimized clamping force

Contents:

- checklist
- templates
- evaluate and optimize locking force
- documentation
- guide feature
- ...

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Insights into the software

6. Sampling analysis of
basic settings

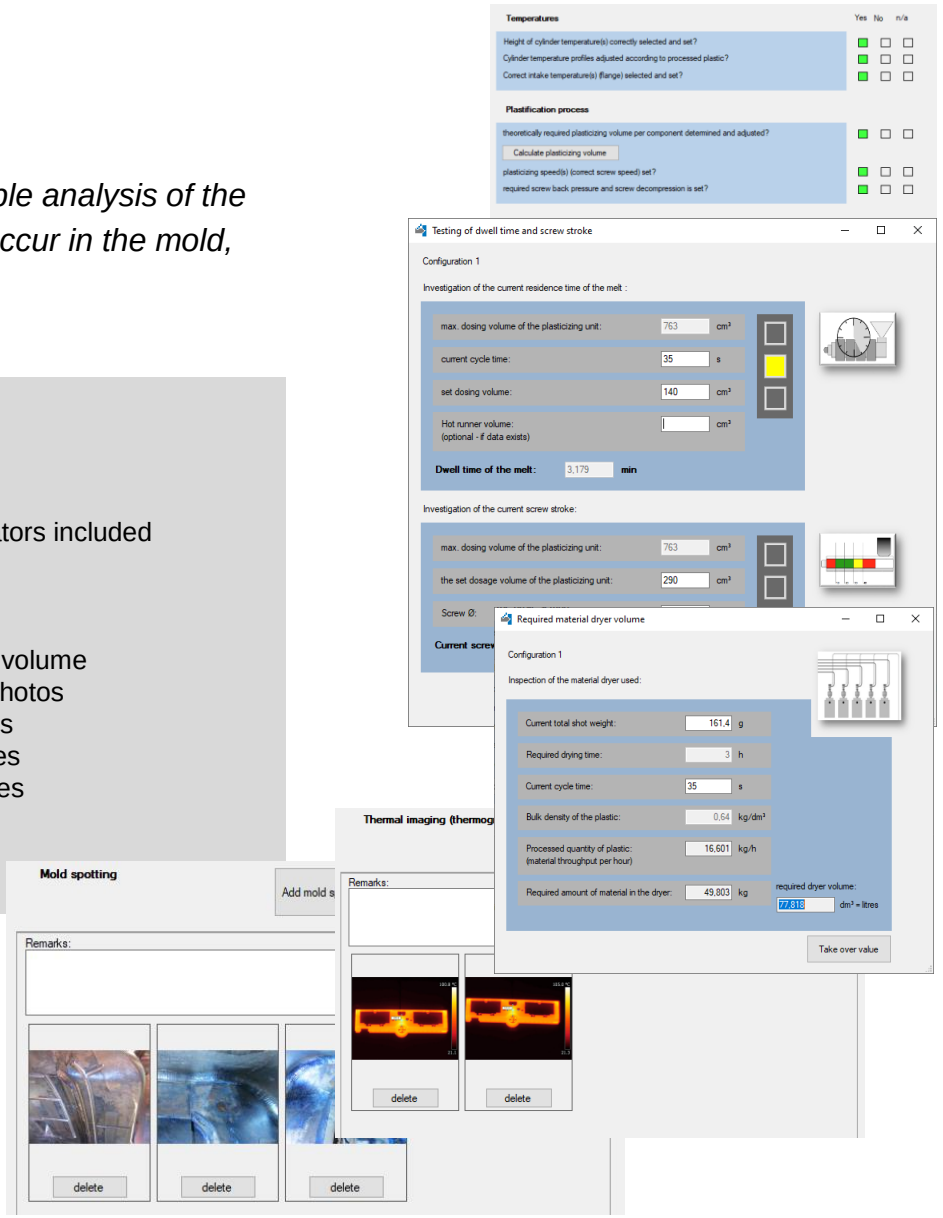
…*“The heart of IMG: With the sample analysis of the basic settings, you will not miss any errors that may occur in the mold, molded part or process…“*

Key features:

- process assessment
- optical/thermal testing of the molded part
- optical/thermal testing of the mold
- functional evaluation of the mold
- cavity pressure
- evaluation of the basic setting

Contents:

- checklist
- templates
- specialized calculators included
  - flow rate
  - dwell time
  - screw lift
  - material dryer volume
- integrate images/photos
  - thermal images
  - pressure curves
  - spotting pictures
- documentation
- Guide feature
- ...



…*“Most important basis for finding all necessary measures“…*

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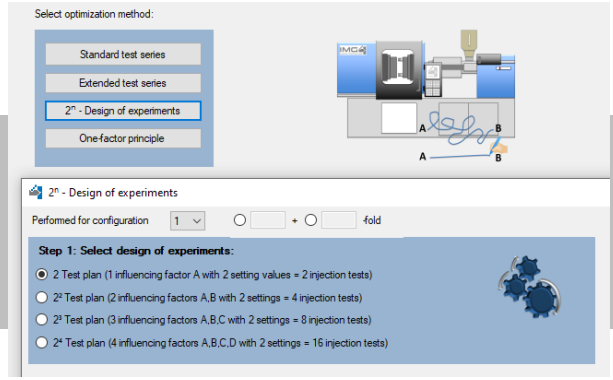
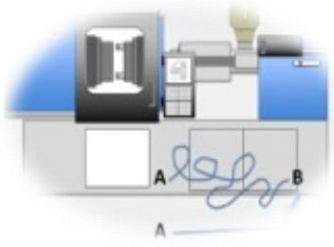
Insights into the software

7. Optimization of the basic setting



Key features:

- choosing the right optimization strategy
- optimization methods
- perform test series
- evaluation of the test series

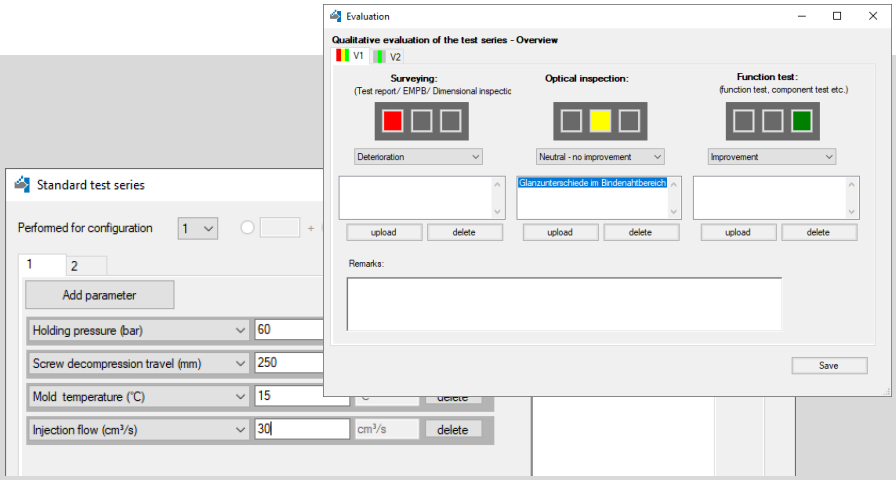


…“Systematic troubleshooting:

Optimize all occurring errors quickly and efficiently with inclusive evaluation at the machine…“

Contents:

- checklist
- templates
  - standard series
  - extended test series
  - 2x - Design of experiments
  - one factor principle
- integrated documentation and test evaluation
- photos, measurement reports and documents can be integrated
- Guide feature
- ...



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Insights into the software

IMG Injection Molding Guide

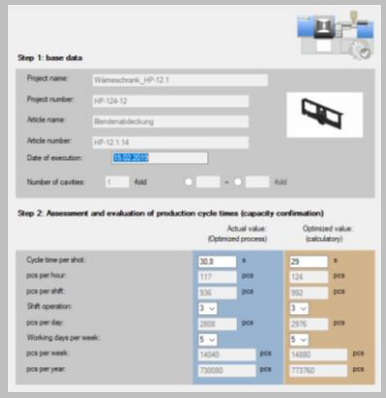
8. Process optimization

…“*Save resources, time and money:*

Get the most out of your injection molding process…“

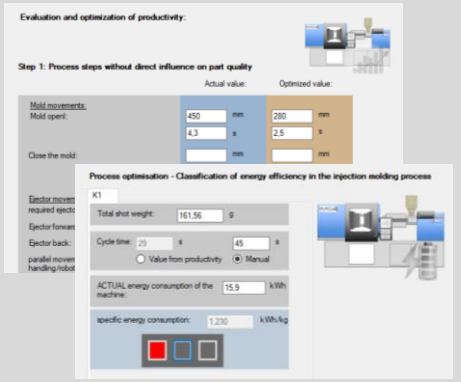
Key features:

- optimization of
  - productivity
  - economic efficiency
  - energy efficiency



Contents:

- checklist
- templates
- optimization steps
- documentation
- Guide Feature



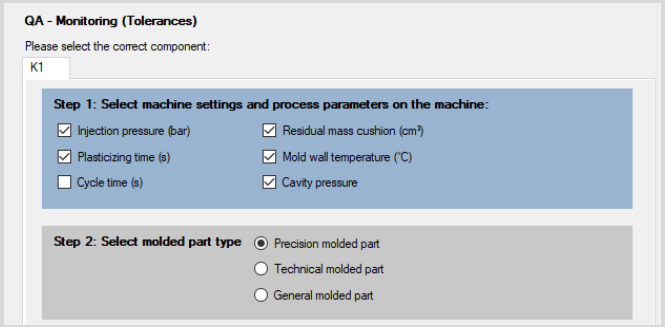
9. quality assurance

Key features:

- quality monitoring on the machine
  - Monitoring of the machine setting and process parameters to be monitored
- internal quality management
- process audit/validation

Contents:

- checklist
- templates
- Selecting and setting the correct monitoring tolerances
- Incl. tolerance calculator
- documentation
- integrate, edit and save internal QA documents
- guide feature



…“*Quality begins with sampling…“*

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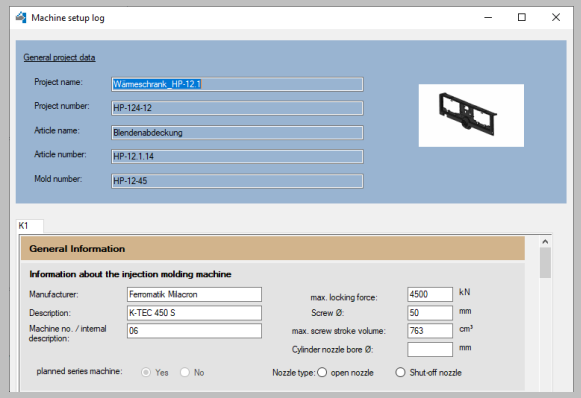
Insights into the software

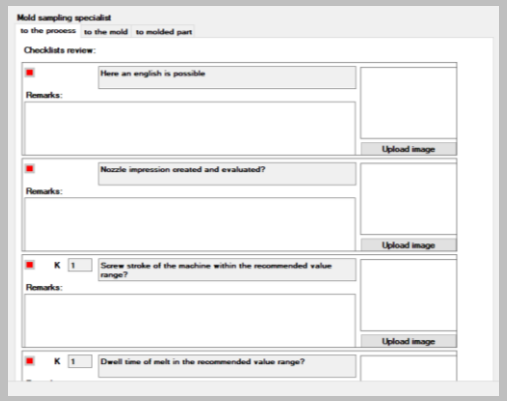
10. Documentation and communication

…“Improved Documentation & Communication…“

Key features:

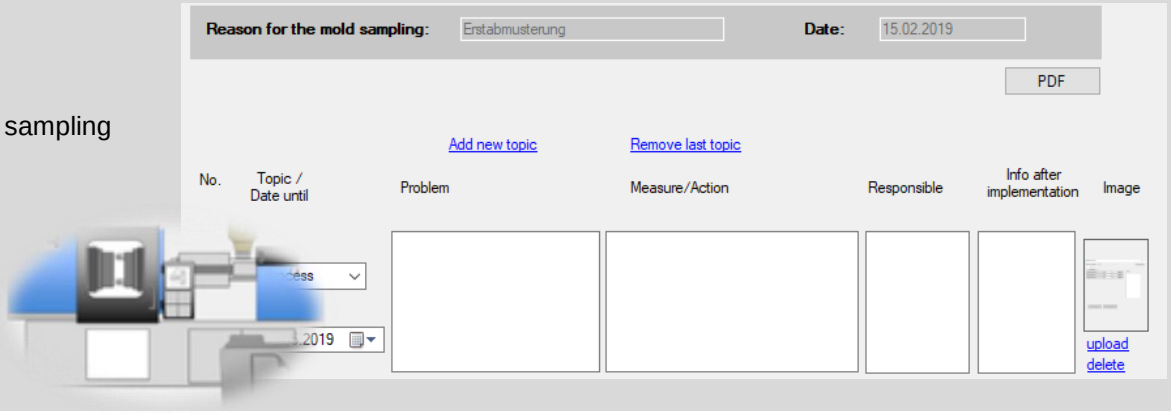
- sampling report and definition of measures
- log optimized machine settings
- further documents:
  - setup and start-up instructions
  - pin assignment of the mold temperature control
  - test, packaging and work instructions





Contents:

- checklist
- templates
- document the findings and results of the sampling
- short meeting of all employees involved
- define measures
- insert, edit and save internal documents
- guide feature
- ...



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Insights into the software

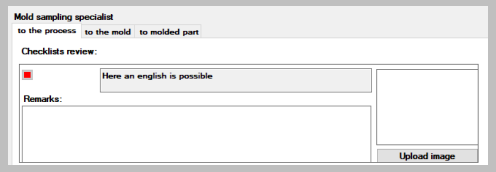
Special Features in the IMG

Intelligent software design

The program stores all integrated data and documents on the internally protected SQL database of the IMG. This allows you to quickly access your own internal and externally protected database for further sample inspections.

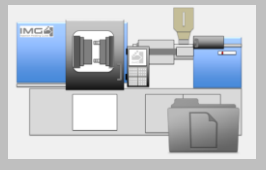
Checklist Review

If No is checked in one of the checklists, the IMG automatically documents this under Mold, Part or Process.



Integrated document management

Save all important documents / data formats. Existing document templates, e.g. in quality assurance, can be quickly and easily transferred and edited and saved in the IMG.



German / English

The software can be quickly and easily converted from German to English for international projects.

...“The IMG works against you with numerous background features:

For example, you are through with all steps, so the complete documentation in the sample report is automatically created for you...“

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Insights into the software

Guide-Feature

If the user needs more background information, e.g. for the setting strategy of the basic setting of machine setting and process parameters, during the running sample inspection or process optimization, the integrated guide with numerous instructions, graphics, tables, photos/images guides the user through all sample inspection or optimization steps.

Guide - Basic setting of the plastification unit

Temperature control:

- Cylinder temperature and cylinder temperature profile
- Feed in temperature (flange)

To Do:

Set plastification process:

- Theoretical plastification volume
- Plastification speed
- Screw back pressure and screw decompression

Set injection process:

- Injection pressure
- Injection speed profile
- Injection profile

…"A well-founded expertise of the employees in the company is the basis for economic success…"

Guide - Effects of plasticizing speed:

Too high plastification speed:

More frictional heat may lead to a thermal and mechanical damage of the meld. This can be e.g. a reduction of the mechanical stability of the molded part.
A deterioration of the melt homogeneity due to a non-optimal melting of the material.
An increased wear of the screw and the back-flow valve in case of reinforced materials, e.g. with glass or carbon fibers.
Increased shear stress to the reinforcing fibers in the melt (fiber breakage and shortening of the fibers may lead to a reduction of the mechanical stability of the molded part).
An increase in energy.

Too low plastification speed:

Longer molding injection cycle.

Back

Guide - Plastification speed

- The time needed for plastification or dosing of the thermoplastic material is called **plastification speed.**
- The plastification speed is measured either by **rotational speed of the screw (1/min)** or the **peripheral screw speed**

Important for setup the right plastification speed:

- The peripheral screw speed should not be under 0.06 – 0.08 m/s.
  → Else no optimal homogenization of the melt possible
- For thermoplastics, if otherwise not recommended by the raw material supplier, a peripheral screw speed of 0.33 – 0.6
  → Else thermal and mechanical damage of the melt are possible

Formula for calculating the peripheral velocity of the screw [m/s]:

$V_u = n \times \pi \times d$
n = set screw speed [1 / min]
d = screw diameter [mm]

Table: Conversion of speed at peripheral speed

Practical tip 1: In general, the plastification speed should be set up that the plastification time is completed **approx. 10–20%** before the residual cooling time is finished.
Practical tip 2: It is better to work only the peripheral screw speed (m/s) because this allows a direct comparison of machines with different screw diameters regarding the effectiveness of the plastification.

"To Do" refers to all operational activities of the employees, for example on the injection molding machine.

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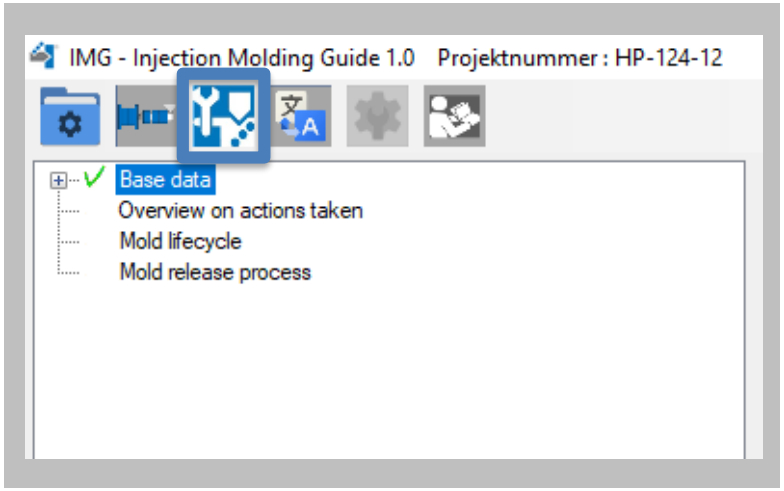
Insights into the software

Injection Molding Doctor®

The **Injection Molding Doctor® (IMD)** is a great support for error detection and the targeted definition of measures for optimization.

The **IMD** differs from all existing error catalogs & action plans on the market in print form or as an app by the following content features:

- In addition to the classical optical error images, the possible thermal error sources are also treated in detail with the help of thermal images.
- In three steps, the user is instructed on the machine in a practical, fast and effective manner.
- Additional info buttons for targeted cause analysis and troubleshooting provide further background information, recommendations and more precise assistance.
- Under "Picture catalogue" of a respective error picture own photos can be inserted and stored.
- Texts, explanations, pictures/graphics are kept short and easy to understand.
- Due to its didactic structure, the IMD can also be used specifically for employee training with regard to error patterns that occur during injection molding.



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Insights into the software

…“Faster finding of the right solution strategy at the machine: *Whether thermal, optical or functional problems, the Doctor helps in a structured way…“*

Every employee can carry out systematic and structured fault detection up to the definition of measures and optimization strategies in three quick and effective steps on site at the machine.

For effective troubleshooting, it is crucial that the faults occurring on the molded part are correctly localized and defined so that the cause can ultimately be identified (see step 2).

Localization and definition means first of all to recognize the location of the defect and then to assign it to a known defect image, e.g. a sink mark on the molded part.

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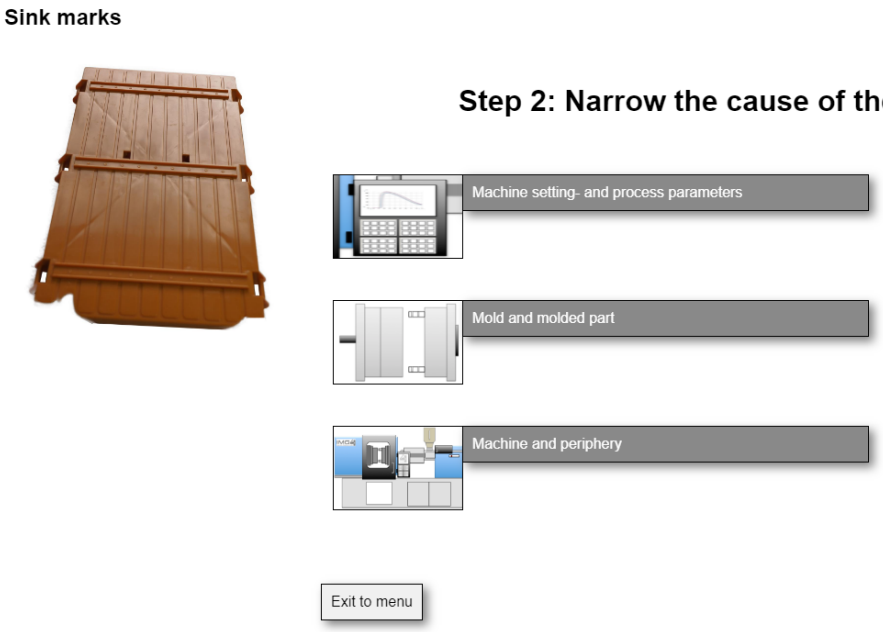
Insights into the software

In this second step, the error must be assigned to possible error causes. This is the only way to exclude many possible error causes at an early stage.



*…"With the **Injection Molding Doctor®**, you can more effectively narrow down your possible causes of error …"*

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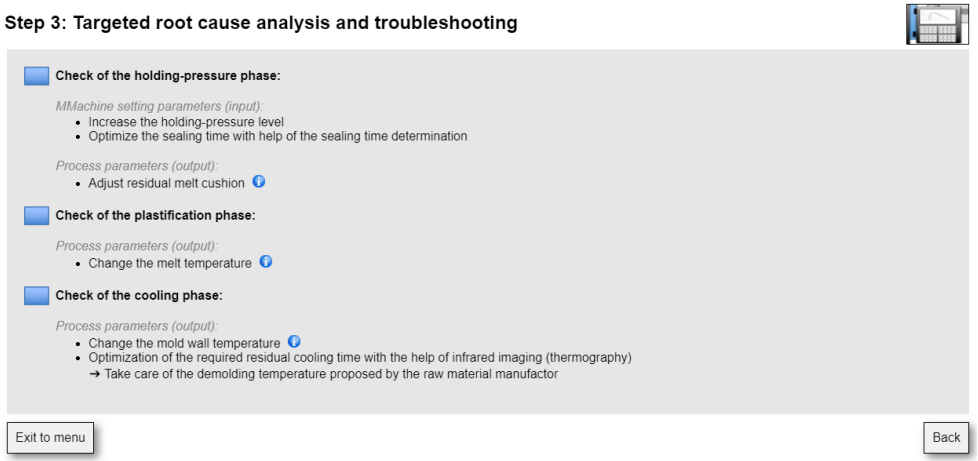
Insights into the software

The example in the Machine Setting and Process Parameters category shows the individual process phases in which the respective influencing factors of the machine setting parameters (e.g. holding pressure, screw back pressure, etc.) have an influence on the error that occurs.

In addition, the process parameters relevant to the error that occurs (e.g. cavity pressure, residual mass cushion, etc.) are specifically checked. This is followed in the instructions by systematic troubleshooting of the injection molding machine.



Another highlight offered by the **Injection Molding Doctor®** is an integrated info button for selected measures. This leads the user to further background information and possible troubleshooting strategies.

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Benefits and advantages in the company

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„...one step ahead...“

Benefits and advantages in the company

Standardized process completely finished and ready for use

- ✓ problem, time and cost reduction of the entire sampling process
  → reduction of throughput times up to series production
  → saving of resources
  → faster execution of a single mold sampling
- ✓ improvement of communication and documentation among the specialist departments
- ✓ improving the productivity, economy and energy efficiency of every injection molding process
- ✓ clear, transparent and structured process

Digitized process compact in one software package

- ✓ faster information exchange and data transfer possible before, during and after mold sampling
- ✓ parallel work of all departments involved in the project before, during and after mold sampling saves resources, time and money.
- ✓ intelligent document management
- ✓ mobile with tablet, laptop to carry out the sampling process at external suppliers (e.g. first mold commissioning at mold making in China)

Loose papers

Excel lists

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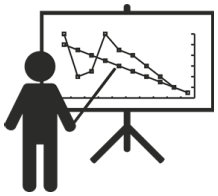
Benefits and advantages in the company



Guide-Feature

Injection Molding Doctor®

Promotion of education and training via integrated help molds

- ✓ every employee works on the same necessary high level, no matter if skilled or semi-skilled employee.
- ✓ **Guide feature** provides detailed instructions and assistance at every stage of the sampling process
- ✓ large database with solution strategies for the elimination of optical and thermal part defects through the integrated **IMD- Injection Molding Doctor®**
- ✓ integrated knowledge management
- ✓ contents serve as internal teaching aids
- ✓ saving of external cost-intensive training courses
- ✓ rapid training of new skilled workers or semi-skilled specialists

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Benefits and advantages in the company

Mold sampling / process optimization at the injection molding machine carried out at the highest level…

- ✓ No loose foliage or Excel solutions as documents
- ✓ Consistent and simple operability
- ✓ Fast information and data transfer to the molded part, plastic, mold and machine via stored master data (SQL database) at the machine
- ✓ The guide leads through a complete technical sequence with documentation at very little expenditure of time.
- ✓ integrated arithmetic operations support the operator in process assessment and optimization
- ✓ With its checklists, the IMG can be extended to meet your individual requirements.
- ✓ Own already existing documents/templates can be easily integrated, edited and stored
- ✓ Images, photos, text and notes can be inserted quickly

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IMG Software Information

What implementation options are there for your company?
What licensing models are available?
What maintenance service can you expect?

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„...one step ahead...“

IMG Software Information

License models and maintenance

IMG – Full License	▪ Contains all full functionalities and possibilities for the conversion of a mold sample
IMG – Team Licence	▪ Departments involved in the sampling (e.g. project managers, team leaders, employees in mold making, design, QM/QS or controlling) ▪ License offers full functionality to read projects and edit master data.
IMG- Service und Produktsupport	***... always up to date with the latest updates…*** Performed by our IT partner Computer Komplett ASCAD GmbH – Upgrades from new features – Troubleshooting (Updates) – telephone support (weekdays 07:30- 17:30) – Maintenance contract (duration: 12 months)

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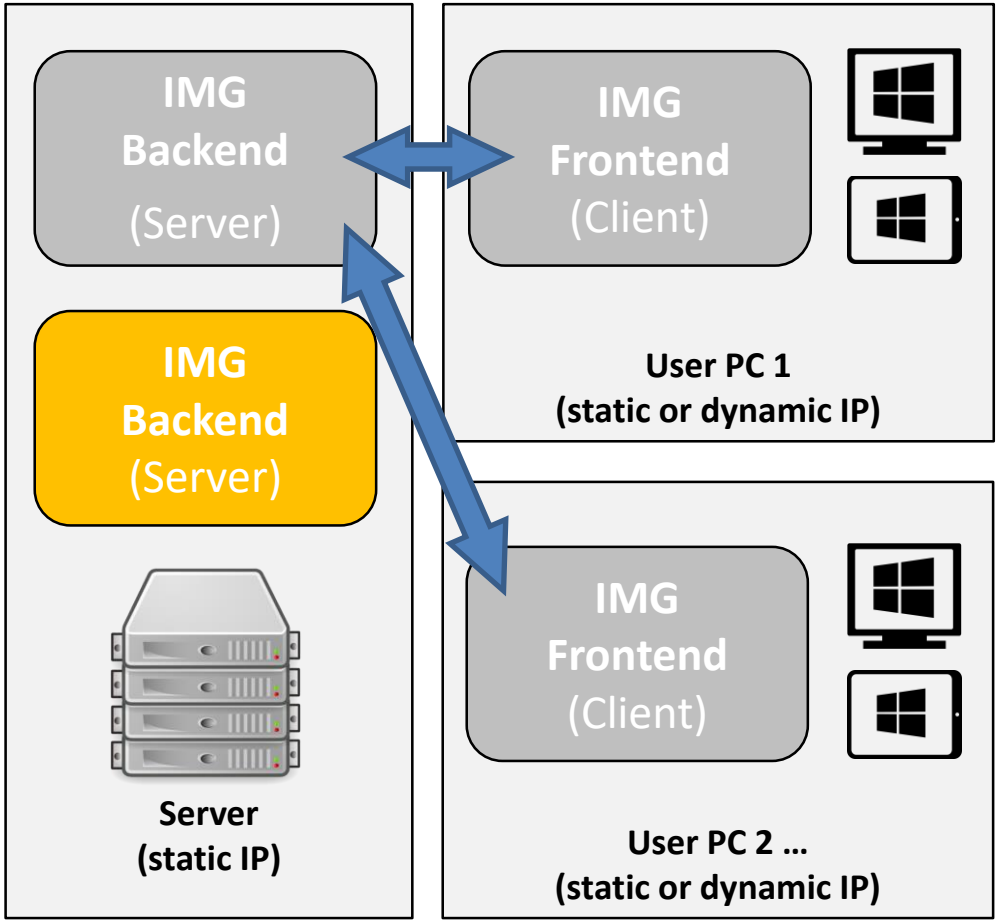
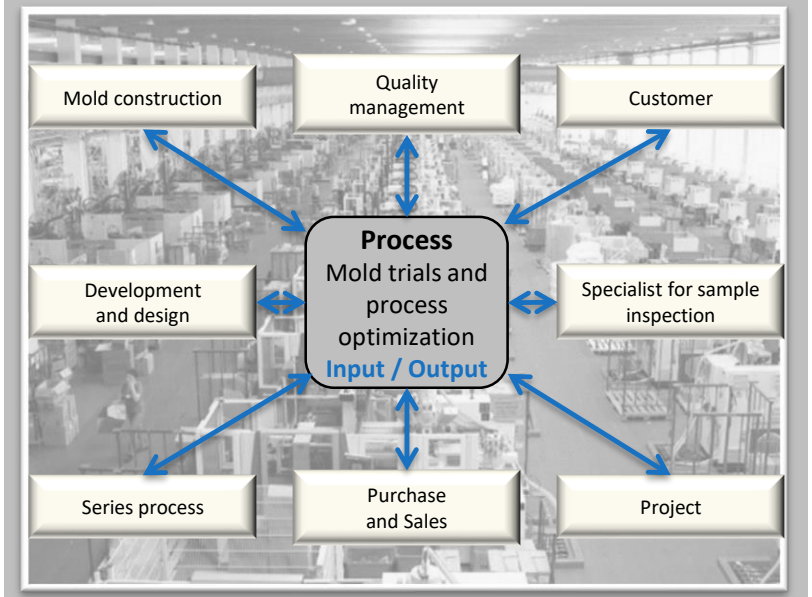
IMG Software Information

Functionality: Client/Server implementation



"...The optimal solution for the injection molding company..."



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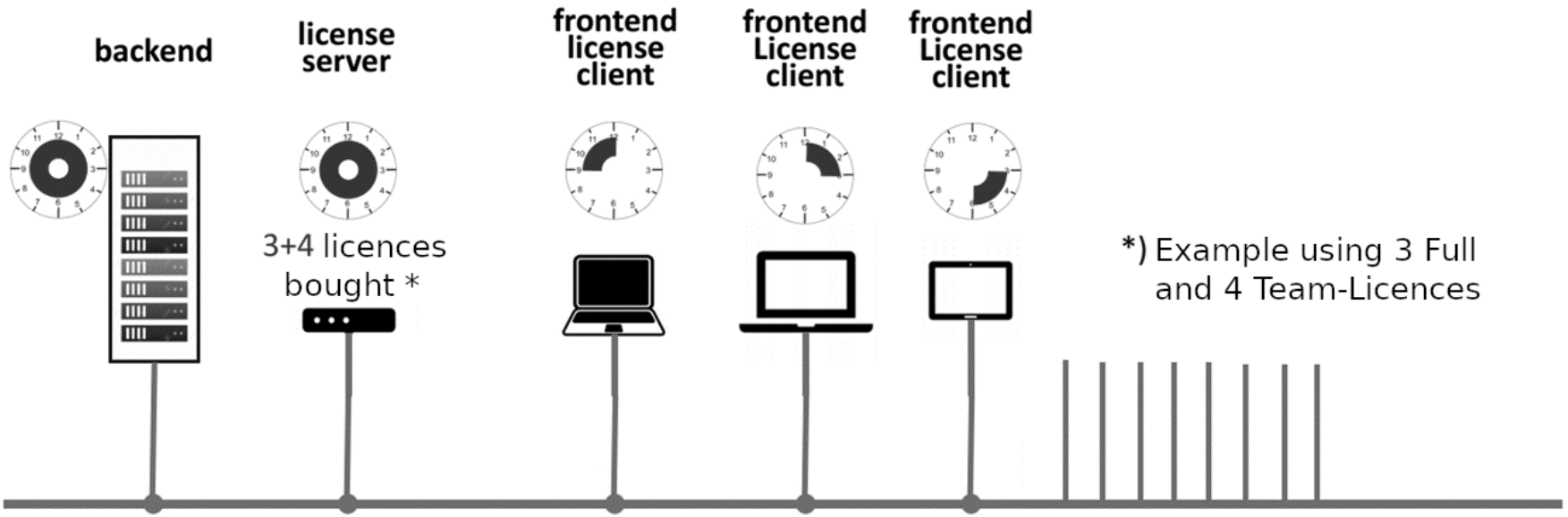
Floating Licenses



License server with seven concurrent licenses makes them available in the network

Each frontend workstation can get a free license and blocks it until it leaves the application again. In the example, the three workstations shown use only one license, which they access with a time delay.

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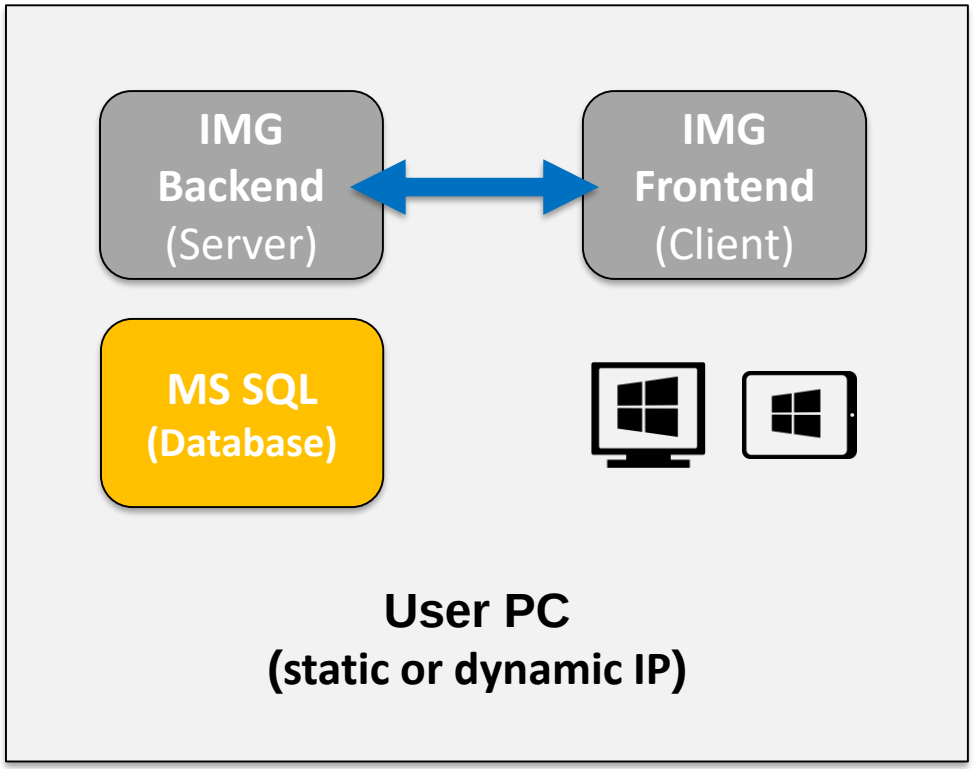
IMG Software Information

Possibility of Single PC implementation



…"The optimal solution for your external sample inspections…"

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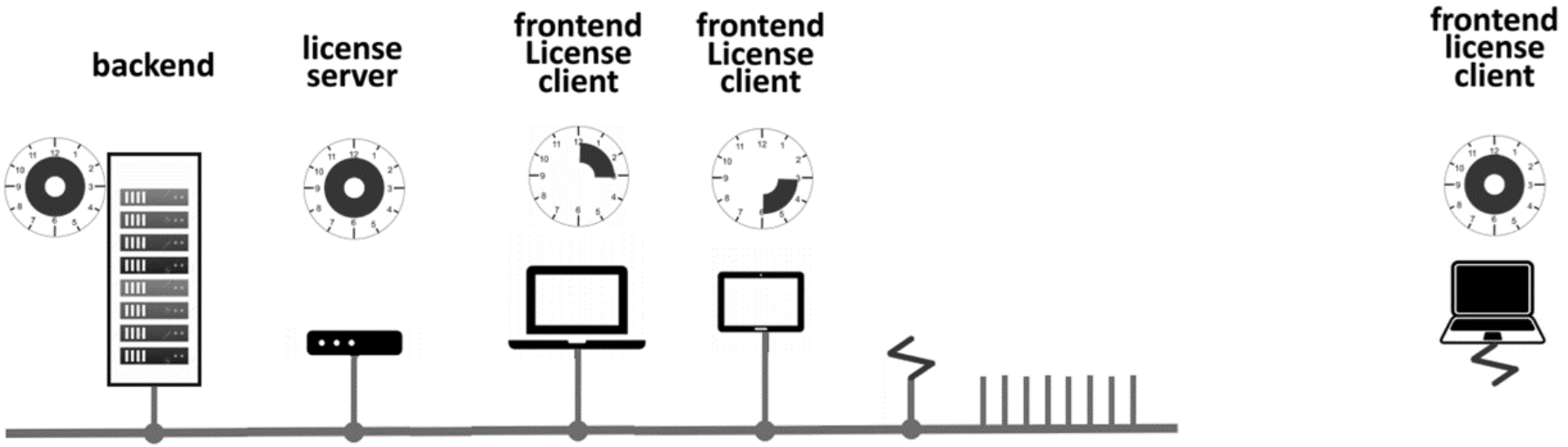
License borrowing



License server containing two concurrent licenses makes them available via network

Before going offline the Notebook will reserve a license on the Licence server. There is now one license available to the network

The offline notebook will keep its license until the borrowing duration is exceeded or until the netbook comes back into its companies' network.

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smart software for mold trials and series processes

…“The operating software for mold samples“…

…“Saving of sampling cycles“…

„…Series processes can be designed more efficiently…“

…“very good practical implementation of the individual steps“…

…“time-reduced preparation for one click“…

…“Innovation in matters of internal interfaces and communication problems“…

…“All employees involved work in the same system“…

…“many different documents in the run-up could be omitted“…

…“with the IMG, both internally and externally“…

…“Simple and intuitive user guidance at a high professional level“…

…“Series processes run more consistently and economically according to standardized sampling processes“…

…“know what was 14 days ago“…

…“More detailed task definitions based on the IMG“…


WORLD NOVELTY
IMG®
Injection Molding Guide