

# MAGMA ECONOMICS

## Optimized Casting Quality, Cost and CO<sub>2</sub> Footprint



- Comprehensive evaluation
- Upfront achievement of goals
- Informed decision-making
- Environmental impact awareness
- Customized efficiency
- Scalable implementation

# MAGMA ECONOMICS

Optimize your **Casting Quality**,  
**Cost** and **CO<sub>2</sub> Footprint**

## KEY BENEFITS OF MAGMA ECONOMICS:

- **COMPREHENSIVE EVALUATION:**  
Simultaneously assess casting quality, process robustness, and cost/resource considerations.
- **UPFRONT ACHIEVEMENT OF GOALS:**  
Realize quality and cost targets even before the first casting is produced.
- **INFORMED DECISION-MAKING:**  
Access transparent and quantitative technical and commercial information to support better decision-making.
- **OPTIMAL RESOURCE UTILIZATION:**  
Seamlessly integrated with MAGMA's autonomous engineering to identify the best operational conditions and balance resource investment and profitability.
- **ENVIRONMENTAL IMPACT AWARENESS:**  
Understand the direct link between resource consumption and your CO<sub>2</sub> footprint.
- **CUSTOMIZED EFFICIENCY:**  
Tailor the system with custom templates to meet your specific process and business requirements.
- **SCALABLE IMPLEMENTATION:**  
Deploy the solution at the part, department, or corporate level, ensuring adaptability to your organization's structure.

## MAXIMIZE CASTING EXCELLENCE AND COST EFFICIENCY

MAGMA ECONOMICS is a new solution designed to complement MAGMASOFT®, the world's leading technical decision support and optimization tool for casting quality and processes. With MAGMA ECONOMICS, users can seamlessly integrate information automatically provided by MAGMASOFT® with cost and resource consumption data for any simulated engineering solution.

This innovative approach to combining technical expertise with economic insight allows both technical and economic goals to be pursued simultaneously, making MAGMASOFT® a powerful management tool for users and decision-makers alike.

## KEY FEATURES OF MAGMA ECONOMICS

### Comprehensive Planning and Optimization

Leverage MAGMASOFT® to analyze and compare different simulated versions while using statistical tools to derive concrete measures for quality, productivity, material efficiency, and energy consumption.

### Cost and Resource Integration

Bridge the gap between technical simulations and real-world implications by automatically linking MAGMASOFT® information with costs and resource consumption.

### Dual Focus on Technical and Commercial Targets

Simultaneously pursue desired technical and commercial goals. Align simulations with cost and resource data to make informed decisions that optimize both.

### Empowering Management Tool

Transform MAGMASOFT® into a valuable management tool, empowering users and decision-makers to drive quality, productivity, and profitability.

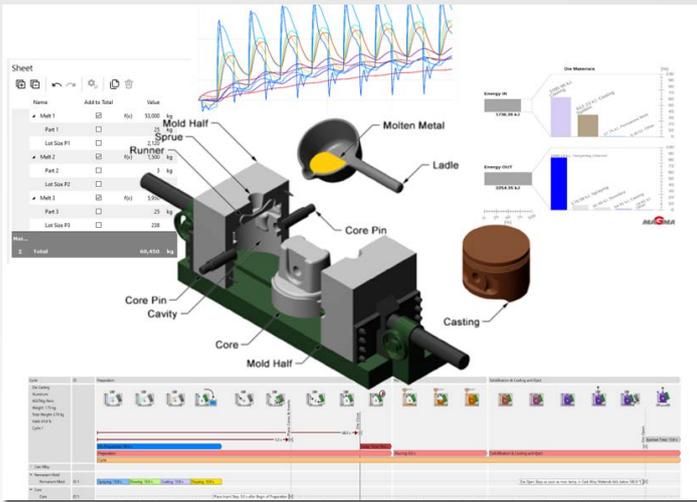
## INFORMATION AVAILABLE FOR MAGMA ECONOMICS

The following essential information available within MAGMASOFT® provides for a comprehensive assessment of cost and resource objectives in MAGMA ECONOMICS while maintaining the required quality:

### Casting Information Centralized

MAGMA ECONOMICS integrates data from various elements of the casting process, including casting/core components, molds/tools, machines, and materials. Quantitative data on volumes, quantities, masses, surfaces, and interfaces provide a comprehensive understanding of the process.

Name	Value	Scenario (2)
Casting Weight	18.2935 kg	18.2935 kg
Mass of Casting All IDs	8.9152 kg	8.9152 kg
▶ Mass of Feeder All IDs	5.5457 kg	5.5457 kg
Mass of Casting System	9.3783 kg	9.3783 kg
▶ Mass of Runner All IDs	2.123 kg	2.123 kg
▶ Mass of Core All IDs	27.806 kg	27.806 kg
Mass of Sleeve	0.3241 kg	0.3241 kg
Mass of Chill	0.7812 kg	0.7812 kg
Mass of Permanent Mold All IDs	178.8564 kg	178.8564 kg
Castings per Mold	2 pcs	2 pcs
Yield	81.5808 %	81.5808 %
Molds per Hour	75 Molds/hr	265 Molds/hr
Grinding per Hour	75 pcs/hr	75 pcs/hr
Casting Scrap	4 %	4 %
Melt Loss	8 %	8 %
Adjusted Mold Weight	48.7472 kg	48.7472 kg
Burden or Other Expenses	9 %	9 %
▶ Material Costs	40.9237 €	6.9197 €
▶ Melting Costs	5.8497 €	5.8497 €
▶ Core Costs	3.8308 €	4.5723 €
▶ Molding Costs	7.7189 €	2.1846 €
▶ Cutting cost	2.3528 €	4.7055 €
▶ Shot Blast Costs	1.4635 €	1.4635 €
▶ Finishing Rm Costs	1.2351 €	1.2351 €
▶ Shipping Costs	0.4756 €	0.4756 €
Scrap Costs	2.4439 €	0.908 €
Burden Costs	5.7187 €	2.1248 €
Casting Cost	69.2598 €	25.7333 €
<b>CURRENT CASTING COST</b>	<b>21.7368 €</b>	<b>21.7368 €</b>
Estimated Annual Units - EAU	80,000 pcs/yr	80,000 pcs/yr



Each MAGMASOFT® simulation project offers quantitative information about used material, energy and the entire process timeline.

### Process Insights

MAGMA ECONOMICS considers essential process data such as time-related metrics, media usage and consumables. This comprehensive view helps to optimize decision-making.

### Unique MAGMASOFT® Output

MAGMASOFT® generates technical information that serves as the basis for evaluating economic factors in MAGMA ECONOMICS. This output includes casting times, feeding requirements, required cycle times (including shake-out/ejection times, cooling times, and curing/drying times) as well as quantities of heat and energy consumption within the system.

### FLEXIBLE AND FULLY INTEGRATED WITH MAGMASOFT®

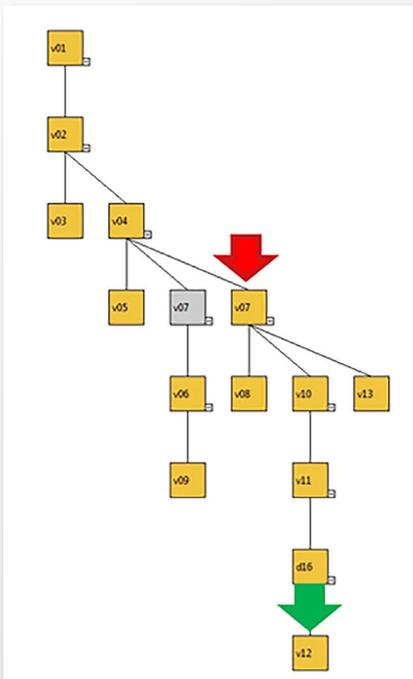
MAGMA ECONOMICS can be customized to the needs of your organization and is fully integrated with MAGMASOFT®. This allows you to create value for stakeholders at all levels of your organization that use or benefit from simulation results.

Name		Value
▲ Casting Inputs		0
Mass of Cast Alloy		119.7325 lb
Mass of Casting ID 1		47.666 lb
Castings per Mold		1 pcs
Molds per Hour		265 Molds/hr
Grinding per Hour		75 pcs/hr
Casting Scrap		4 %
Estimated Annual Units - EAU		80,000 pcs/yr
Adjusted Mold Weight	f(x)	130.1441 lbs
Yield	f(x)	39.8104 %
CO2 Emissions per KWh		0.58 lb
Annual CO2 Emissions per Person in US		30,159.24 lb
▲ Core Inputs		0
Mass of Core ID 1		6.8147 lb
Core ID 1 Scrap		2.5 %
Core ID 1 Cycle Time		180 s
Core ID 1 Cavities per Box		4 pcs
Core ID 1 Produced per Hour	f(x)	80 pcs
Mass of Core ID 2		7.3274 lb
Core ID 2 Scrap		4 %
Core ID 2 Cycle Time		210 s
Core ID 2 Cavities per Box		12 pcs
Core ID 2 Produced per Hour	f(x)	205.7143 pcs
▲ Casting Cost - \$/lb Based	f(x)	34.2556 \$
Casting Cost per Pound	f(x)	0.7187 \$/lb
▲ Casting Cost - Dept. % Based	f(x)	34.2556 \$

Built-in templates can be easily modified to fit individual customer and process needs.

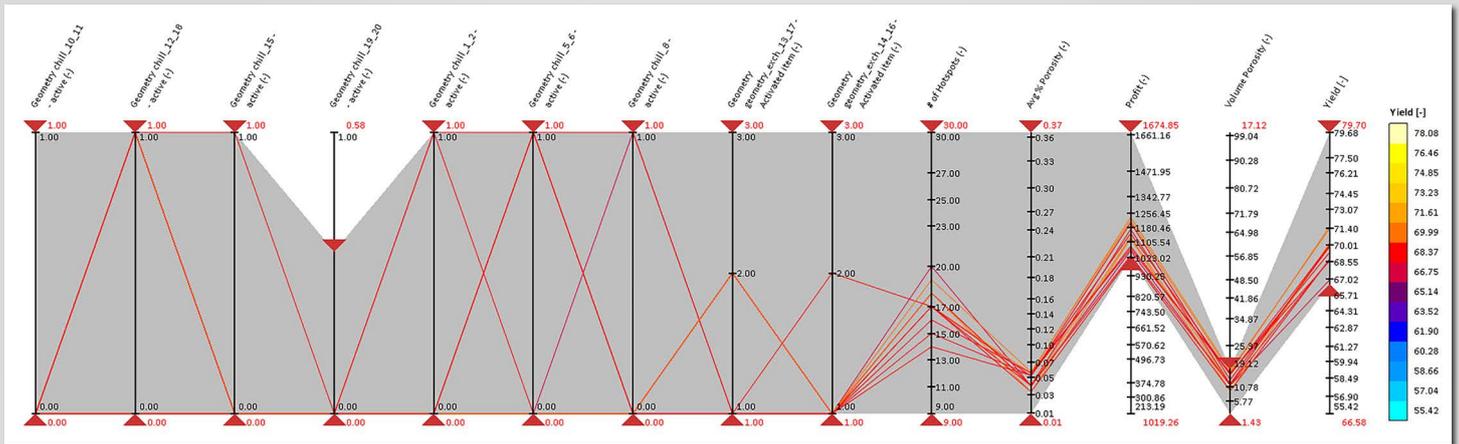
### Evaluate Casting Designs and Virtual Test Plans

Explore different simulated casting designs, virtual test plans (DoE), and optimizations and evaluate them in terms of technical feasibility and quality as well as with respect to resource and cost targets. Gain valuable insight into the economic impact of different design choices.



Name	Add to Total			Econ Sheet
▲ Process Information	<input type="checkbox"/>			
Sand Loss Unmixed	<input type="checkbox"/>	0.3 %		0.3 %
Sand Loss Mixed	<input type="checkbox"/>	0.1 %		0.1 %
Adjusted Core Weight	<input type="checkbox"/>	f(x)	3.571 lb	3.571 lb
Shooting Time	<input type="checkbox"/>		3 s	3 s
Gasging & Purging Time	<input type="checkbox"/>		50 s	25 s
Core Extraction Time	<input type="checkbox"/>		20 s	20 s
Total Cycle Time	<input type="checkbox"/>	f(x)	73 s	48 s
Cores per hour	<input type="checkbox"/>	f(x)	49.3151 Cores	75 Cores
Hours per Shift	<input type="checkbox"/>		6 hrs	6 hrs
Cores per Shift	<input type="checkbox"/>	f(x)	295.8904 Cores	450 Cores
Scrap	<input type="checkbox"/>		5 %	5 %
▶ Adjusted Sand Total Cost per lb	<input checked="" type="checkbox"/>	f(x)	0.2357 \$/lb	0.2357 \$/lb
▶ Total Additive cost per core	<input type="checkbox"/>	f(x)	0.0036 \$	0.0036 \$
▶ Total Cost of Catalyst	<input type="checkbox"/>	f(x)	0.0107 \$	0.0107 \$
▶ Total Binder Cost	<input checked="" type="checkbox"/>	f(x)	0.055 \$	0.055 \$
Scrubber Acid Cost per lb of Sand	<input checked="" type="checkbox"/>	f(x)	0.0013 \$	0.0013 \$
▶ Total Labor Cost per Core	<input checked="" type="checkbox"/>	f(x)	1.3649 \$	0.8974 \$
▶ Production Costs	<input type="checkbox"/>		0 ---	0 ---
▶ Efficiency per Shift	<input type="checkbox"/>	f(x)	75 %	75 %
Mal...				
Σ Total			3.4328 \$/lb	2.3629 \$/lb

All simulated designs can be easily linked to process-relevant templates and can directly be compared in terms of cost.



Along with a virtual design of experiments, the impact of different design or process variables on quality, cost and resources can be investigated.

### Assess the Impact of Cost Drivers

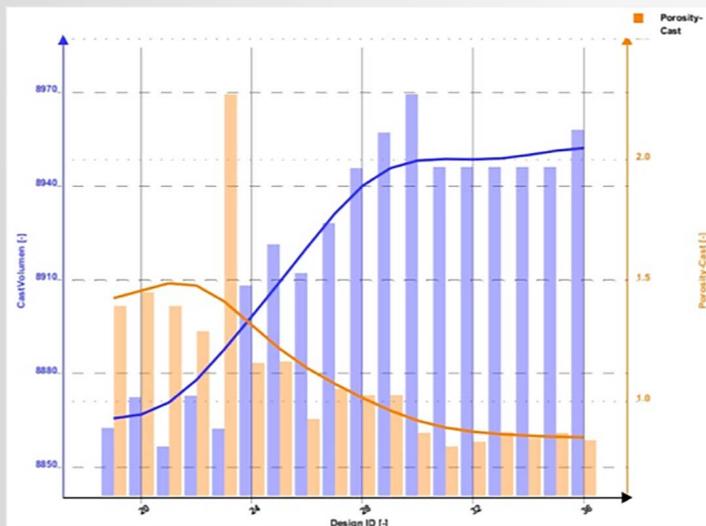
Analyze the impact of different cost drivers on existing projects without the need for further simulations. MAGMA ECONOMICS allows you to evaluate and optimize cost parameters offline or inline, enabling you to make informed decisions based on real-time cost analysis.

### Customizable Templates for Different Needs

Choose from a variety of templates offered by MAGMA ECONOMICS and customize them to meet your specific process requirements and tasks. Whether your focus is at the part, department, or corporate level, you can adjust the level of detail and granularity to meet your objectives.

### Easy Communication

The information provided by MAGMA ECONOMICS can be easily displayed in MAGMAinteract®, providing a user-friendly display for the shop floor or for management purposes. Keep all stakeholders informed and involved in the optimization process.



MAGMA ECONOMICS enables the tracking of quality and cost targets over the course of the project.

## UNLOCK YOUR POTENTIAL WITH MAGMA ECONOMICS – THE KEY TO CASTING PROCESS OPTIMIZATION, COST EFFICIENCY AND RESOURCE CONSERVATION IN ONE TOOL.

### APPLICATIONS USING MAGMA ECONOMICS

- **Quality vs. Yield**  
Balance quality requirements with production cost considerations.
- **Cycle Time and Productivity vs. Energy Consumption**  
Find the most efficient path between productivity and energy consumption.
- **Natural Feeders vs. Exothermic Sleeves**  
Determine the most cost-effective feeding solution that meets your casting requirements.
- **Chill Use vs. Additional Feeding**  
Evaluate the cost-effectiveness of using chills versus additional feeders to achieve the quality you need for your castings.
- **Mold Design and Gassing Rates**  
Optimize your core gassing process to minimize costs and improve overall casting performance.
- **Core Box Heating vs. Gas Flow**  
Explore the trade-off between core box heating and gas flow through the core for inorganic cores.
- **Pattern Plate Design and Production Time**  
Find the optimum between annual cost savings and production efficiency.
- **Production Volumes and Cost per Part**  
Gain insight into the cost dynamics at different production levels and optimize your operations accordingly.
- **CO<sub>2</sub> Footprint Analysis**  
Quantify the carbon footprint for different production volumes. Understand the environmental impact of your casting processes and identify opportunities for sustainable improvements.
- **Cost Savings vs. Simulation Effort**  
Make informed decisions about the amount of simulation effort required for achieving your cost targets.