

Artificial Intelligence

Applied to

Extrusion Head Engineering

Presented by

Mattia Anconelli

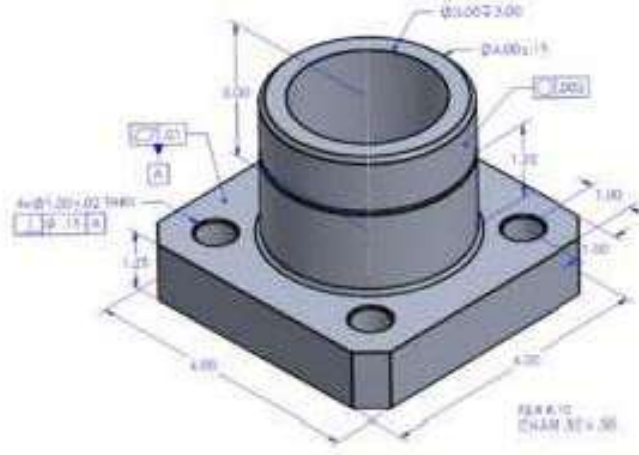
SPE Blow Molding Annual Conference | September 8-10, 2025 | Pittsburgh, PA



TECHNOLOGY MADE IN GERMANY

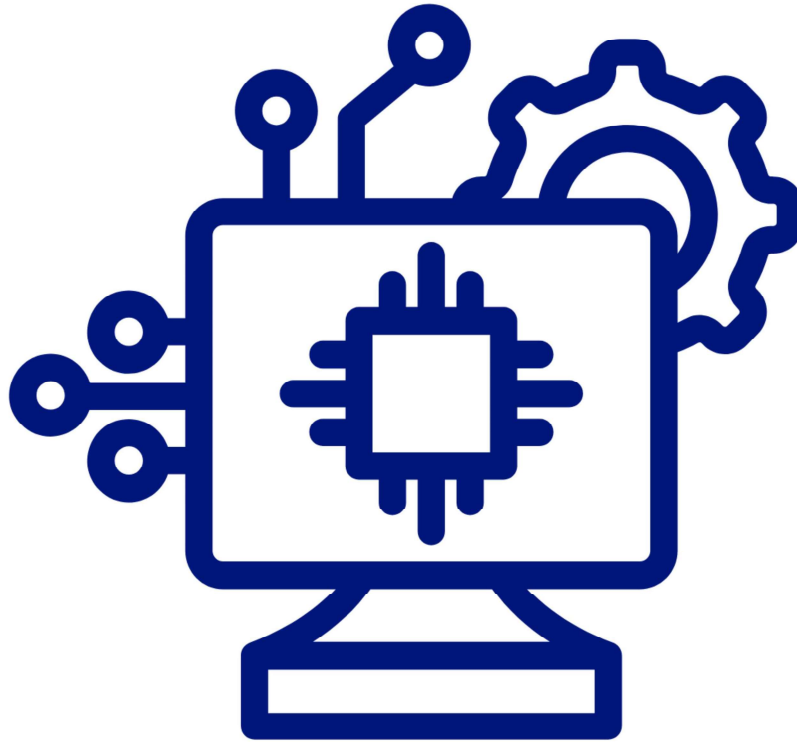
WERTARBEIT

TECHNOLOGY MADE IN GERMANY

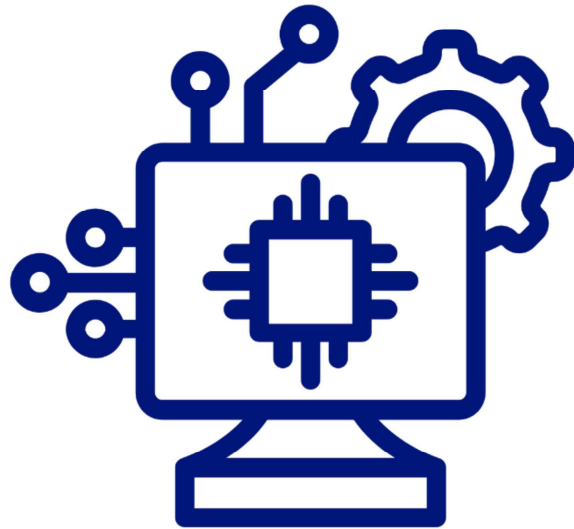


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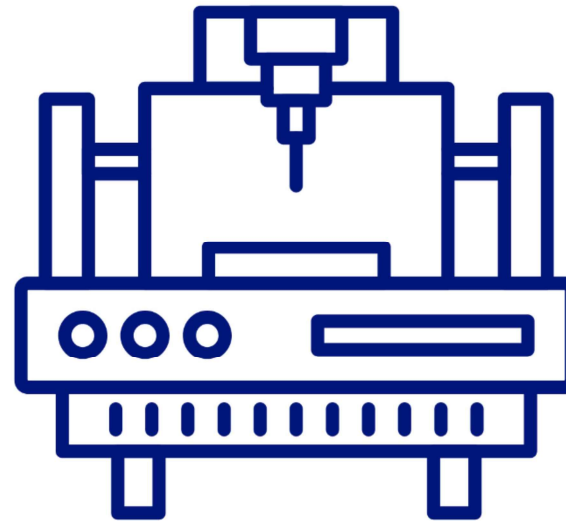
DESIGNING



DESIGNING

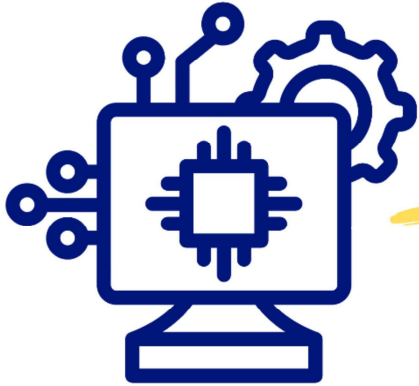


MANUFACTURING

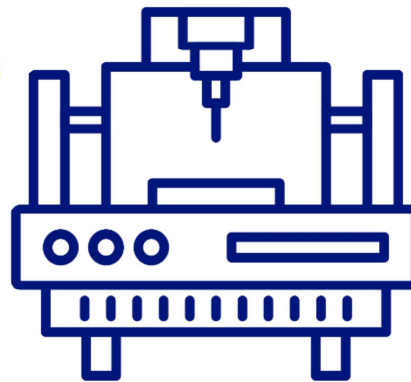


ENGINEERING PROCESS – TESTING PHASE

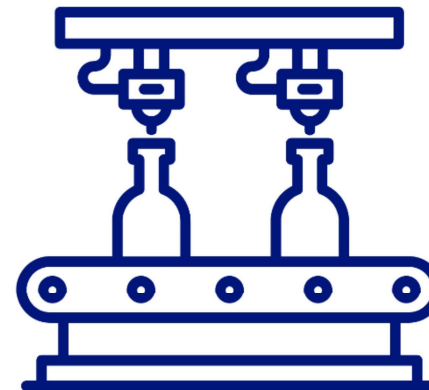
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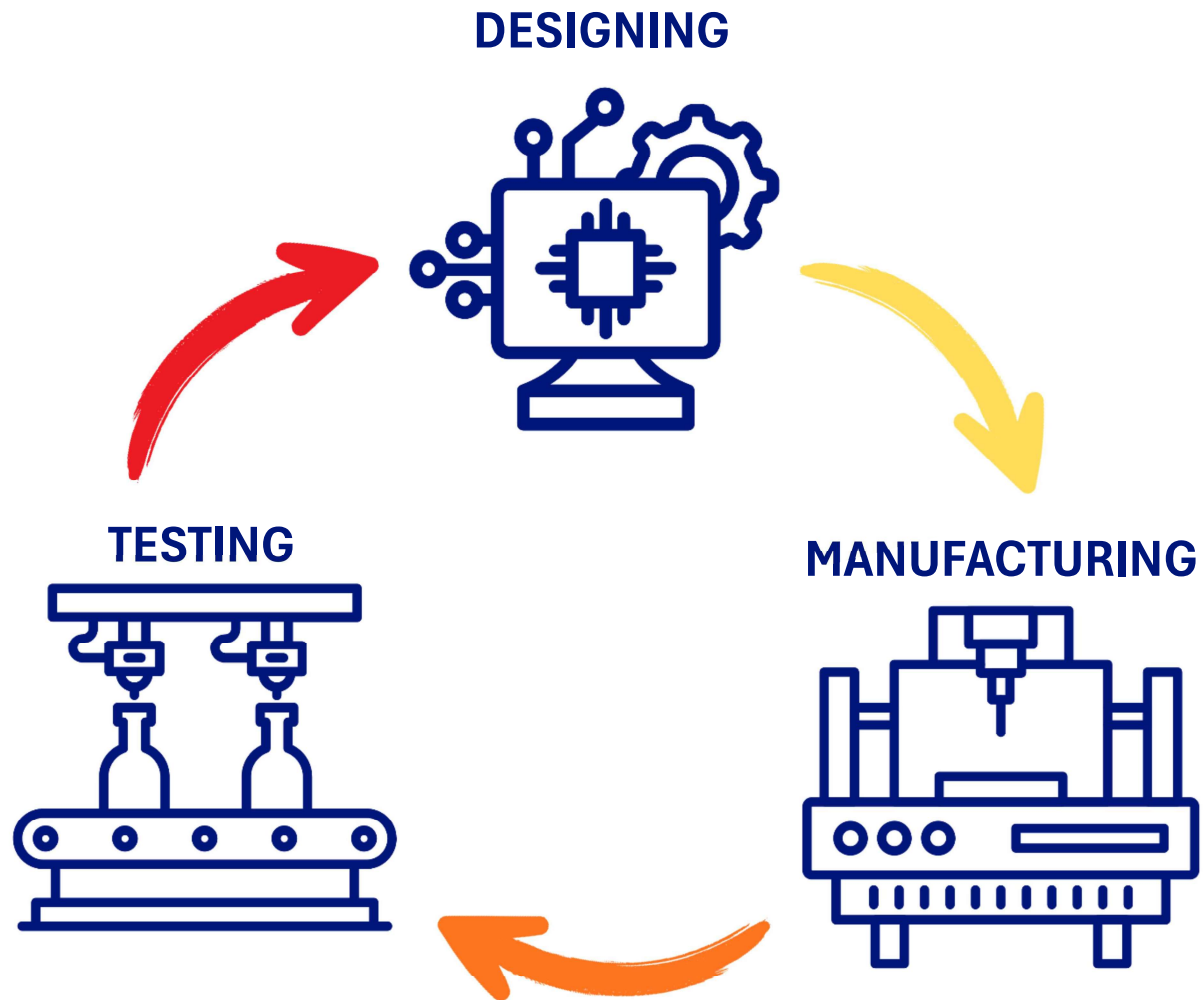
MANUFACTURING



TESTING



ENGINEERING PROCESS – OPTIMIZATION PHASE



PREDICTABLE RESULTS THANKS TO SIMULATIONS



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FAST COLOR CHANGE WITH MINIMUM WASTE OF MATERIAL



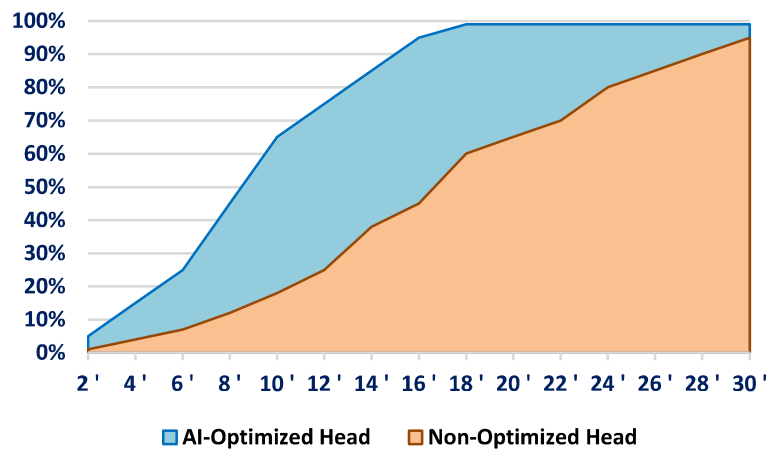
TECHNOLOGY MADE IN GERMANY

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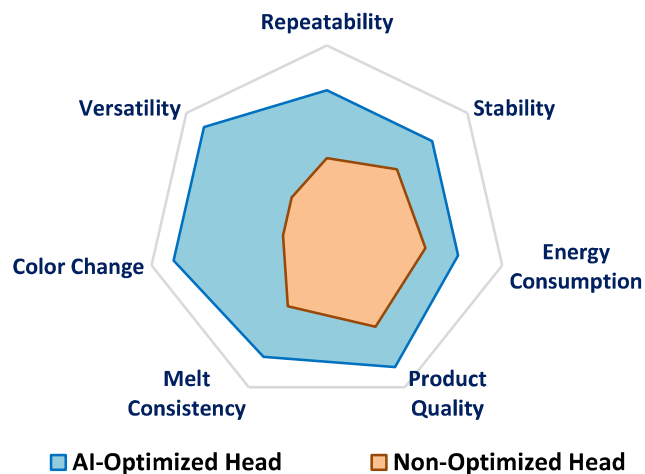
INCREASED PRODUCTIVITY AND REDUCED COST PER UNIT

TECHNOLOGY MADE IN GERMANY

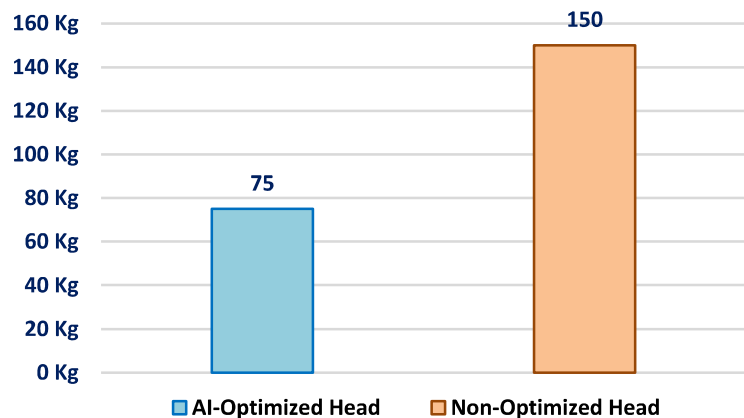
QUALITY PRODUCTION AFTER COLD START



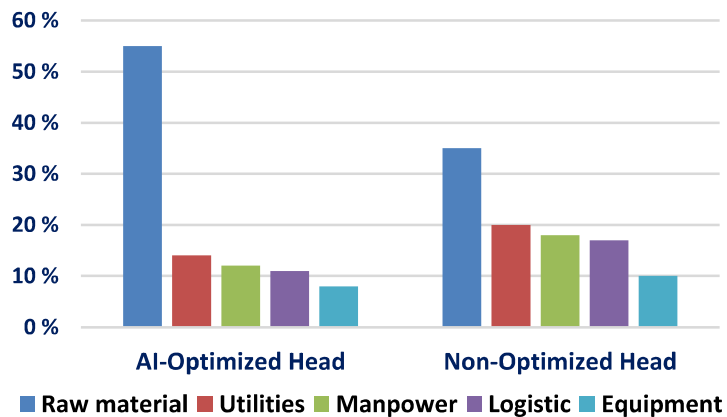
OVERALL HEAD PERFORMANCE



COLOR CHANGE MATERIAL REQUIREMENT



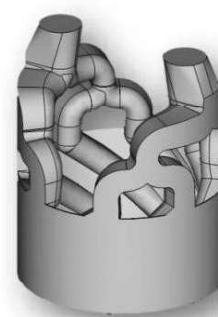
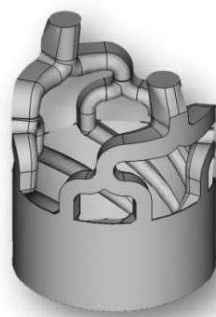
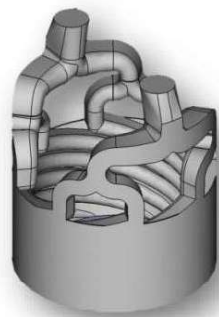
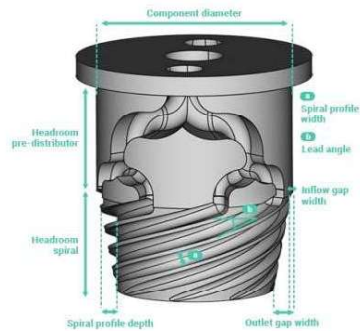
COST PER UNIT COMPARISON



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PARAMETRIC DESCRIPTION – MUTATION OF THE DIGITAL TWINS

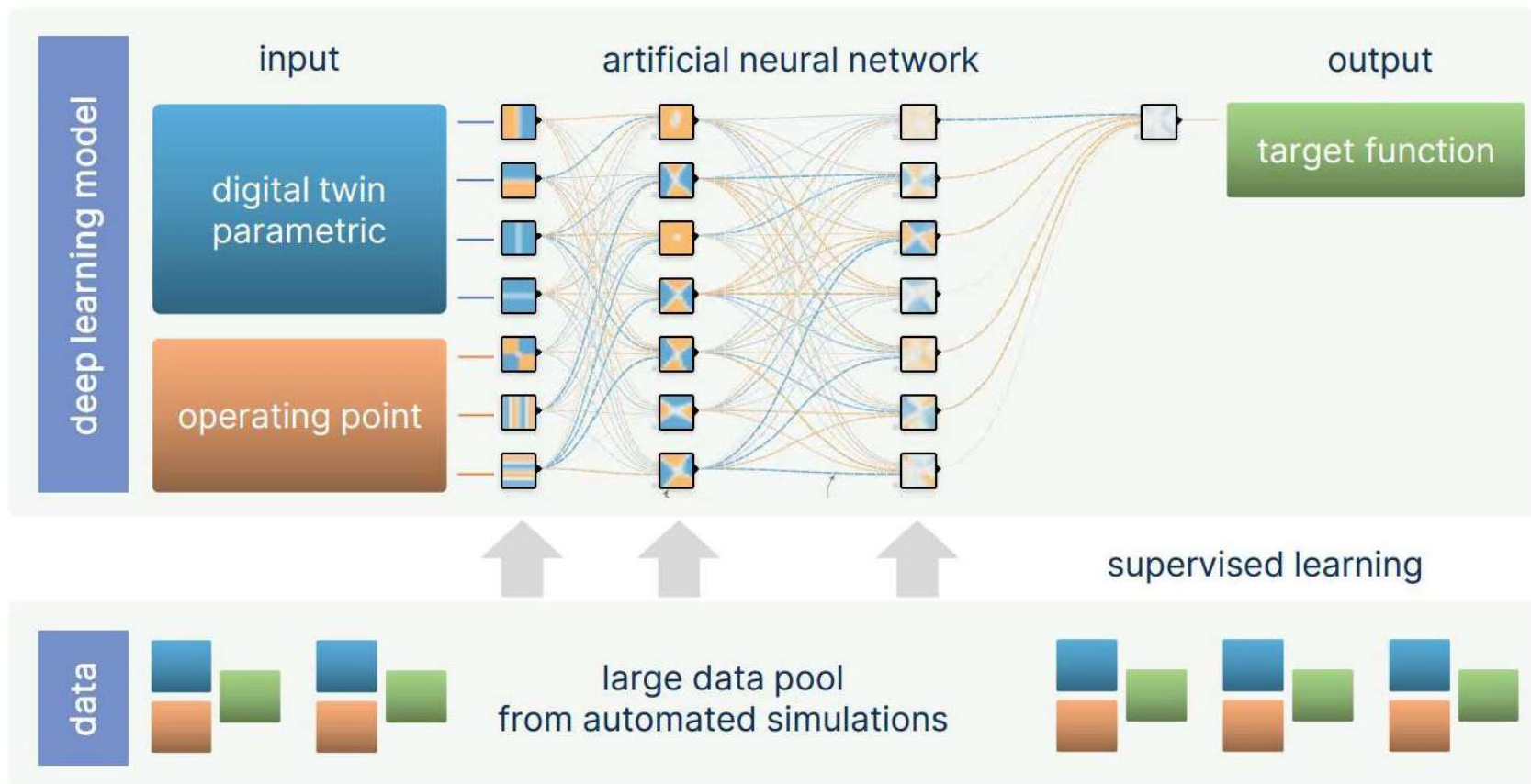
	case 1	case 2	case 3
Lead angle [°]	16	45	45
Spiral profile width [mm]	15	16	25
Spiral profile depth [mm]	25	20	25
Outlet gap width [mm]	20	20	30
Headroom spiral [mm]	100	100	100
...	...	...	...



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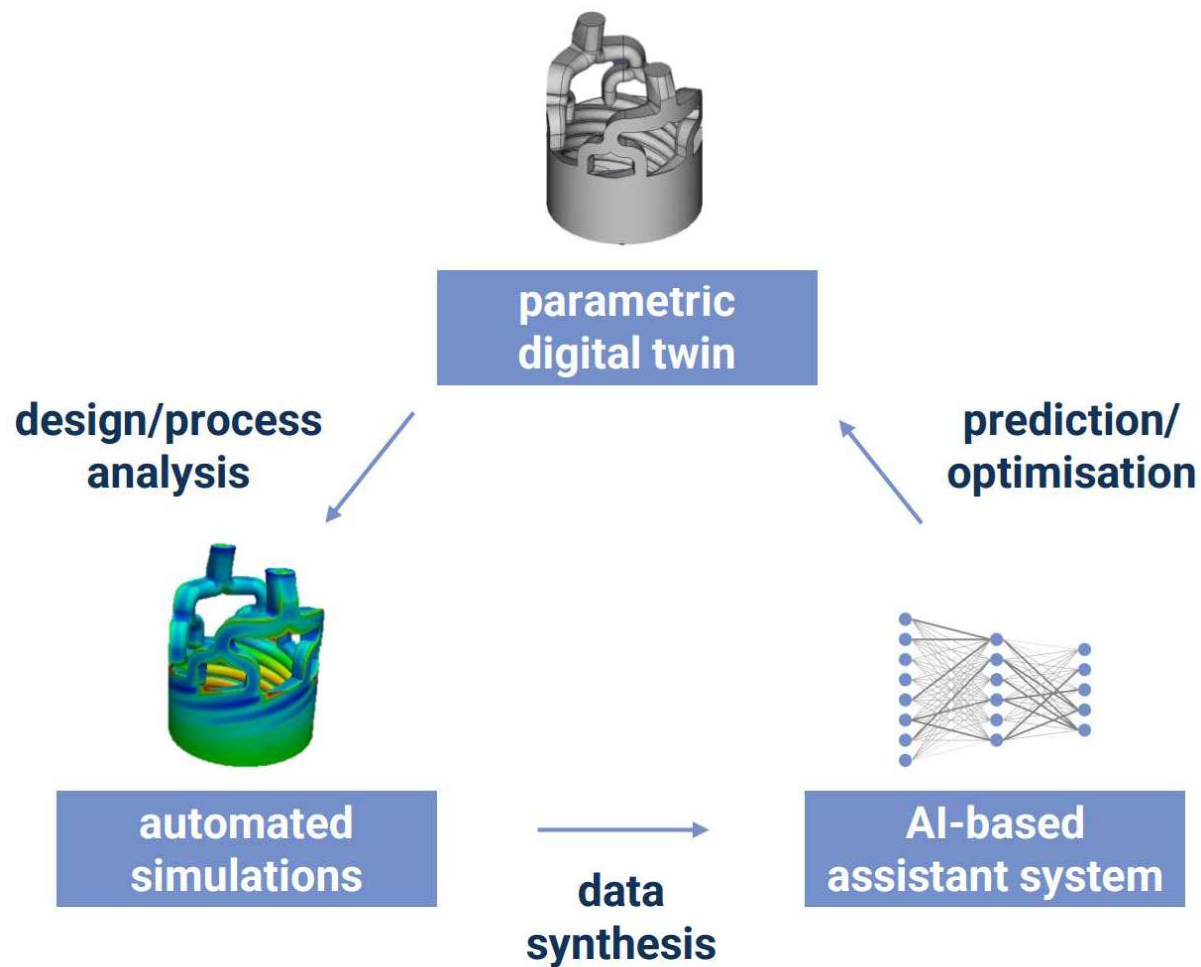
DATA ANALYSIS – SURVIVAL OF THE FITTEST



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AI-POWERED OPTIMIZATION PHASE

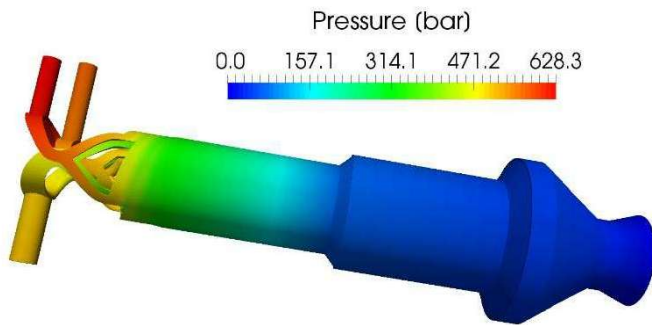


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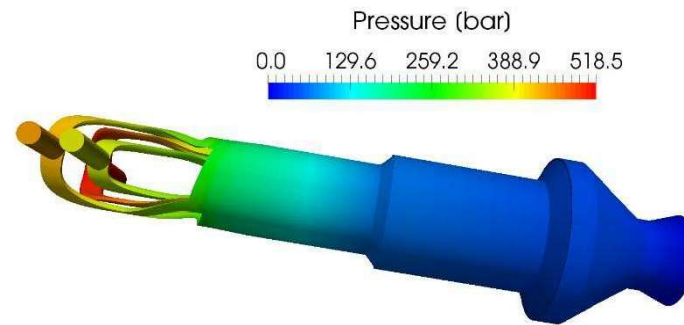
OPTIMIZED TOOLS – REDUCED PRESSURE

BEFORE Optimization



Pressure Drop	
Inner	559,9 bar
Middle	502,5 bar
Outer	628,3 bar

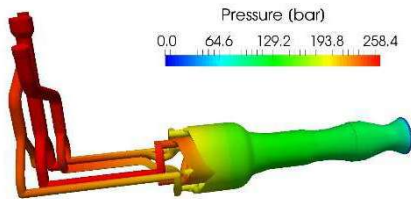
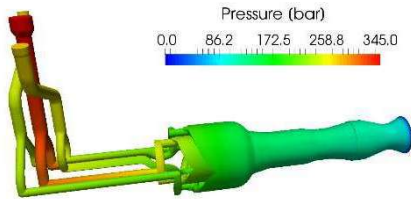
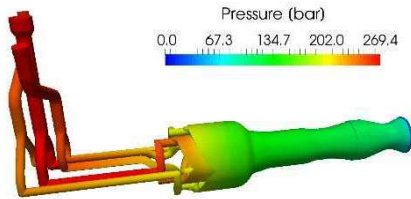
AFTER Optimization



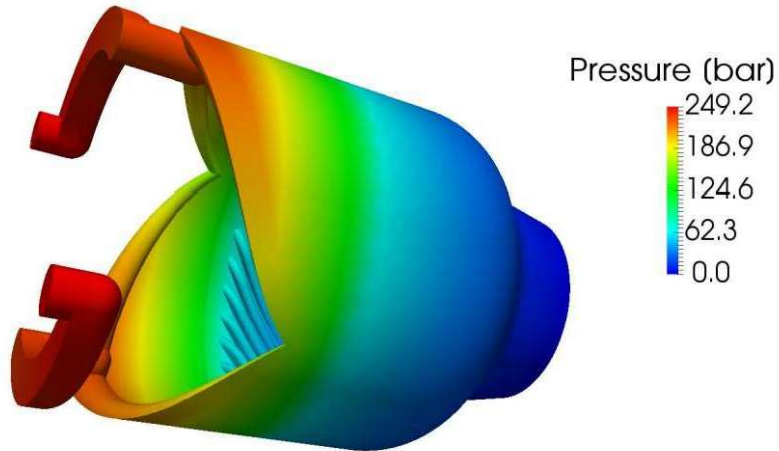
Pressure Drop	
Inner	380,2 bar
Middle	518,5 bar
Outer	431,5 bar

OPTIMIZED TOOLS – IMPROVED MELT FLOW

BEFORE Optimization

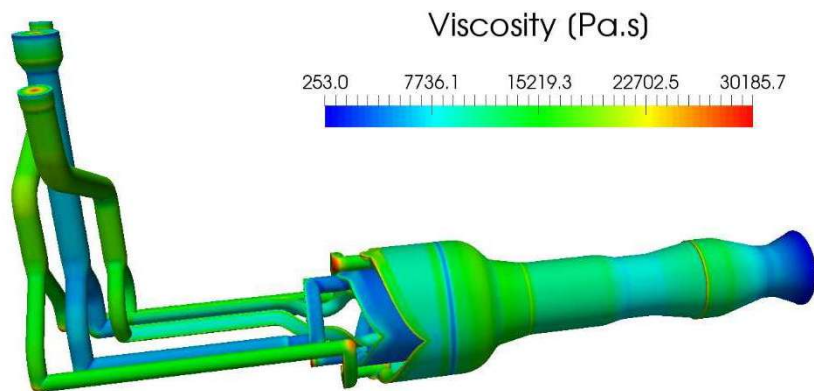


AFTER Optimization

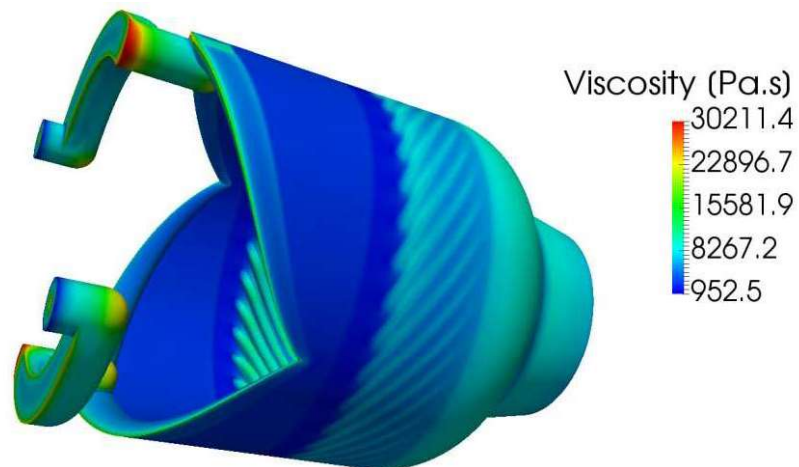


OPTIMIZED TOOLS – VISCOSITY IMPROVEMENT

BEFORE Optimization



AFTER Optimization

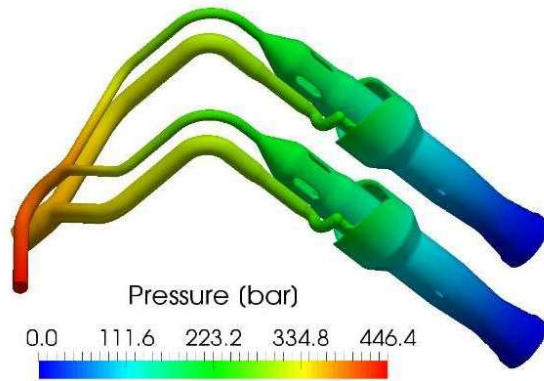


TECHNOLOGY MADE IN GERMANY

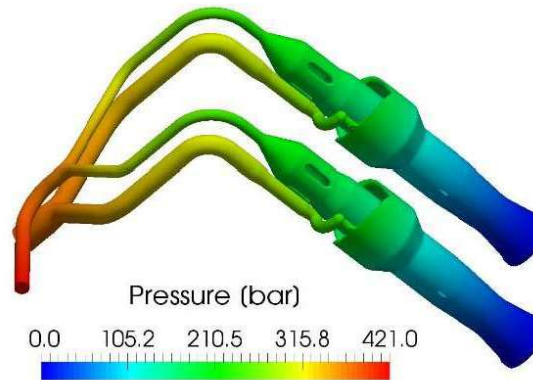
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OPTIMIZED TOOLS – MULTILAYER TECHNOLOGY

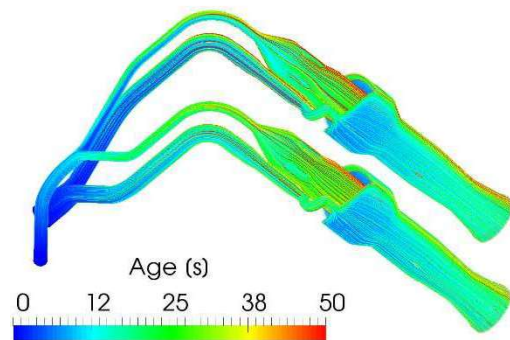
BEFORE Optimization



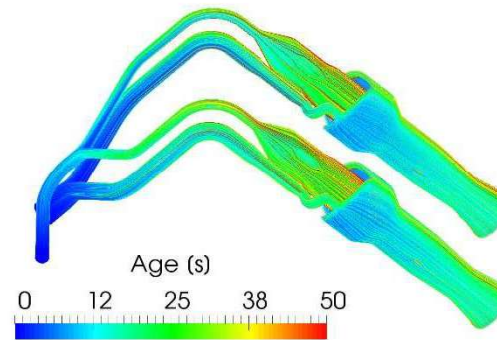
AFTER Optimization



BEFORE Optimization



AFTER Optimization



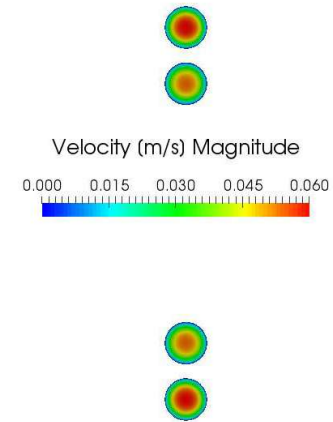
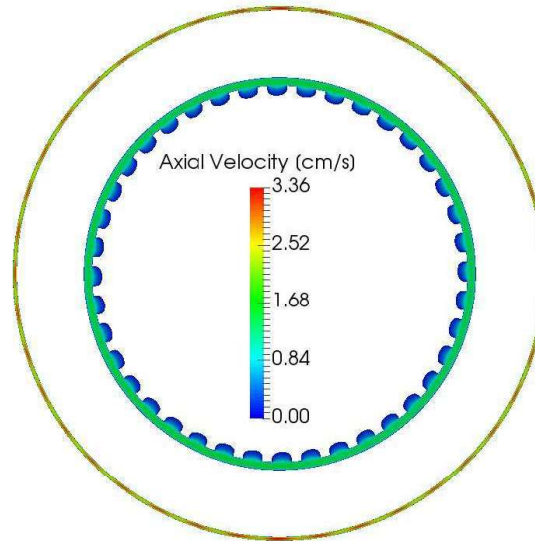
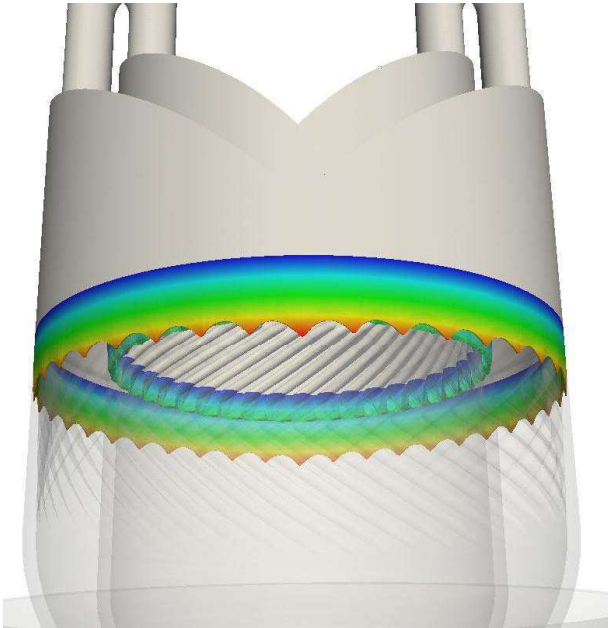
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OPTIMIZED TOOLS – MULTILAYER THROUGHPUT SPEED

LAYERS THROUGHPUT RATIO

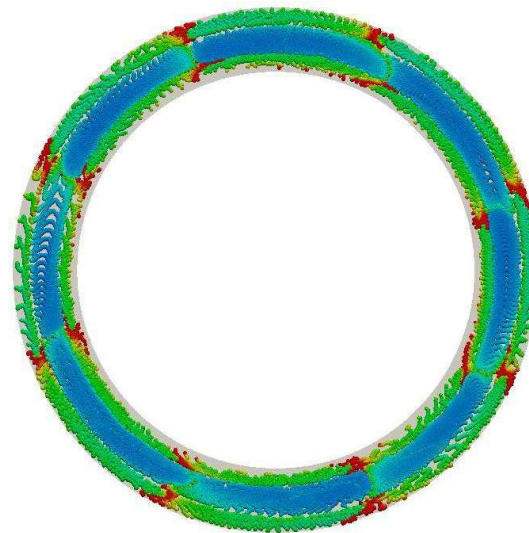
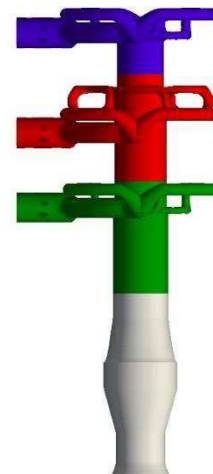
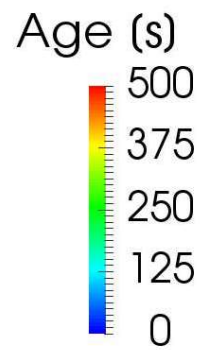
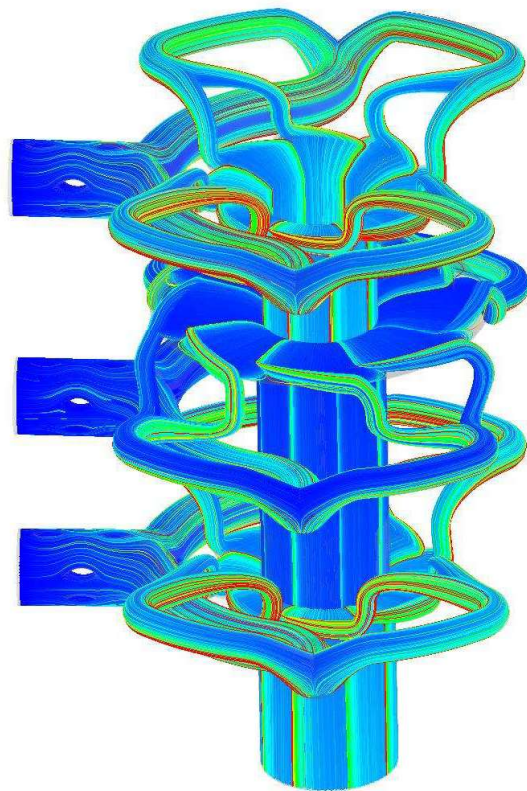
- Outer $\sim 53\%$
- Inner $\sim 47\%$



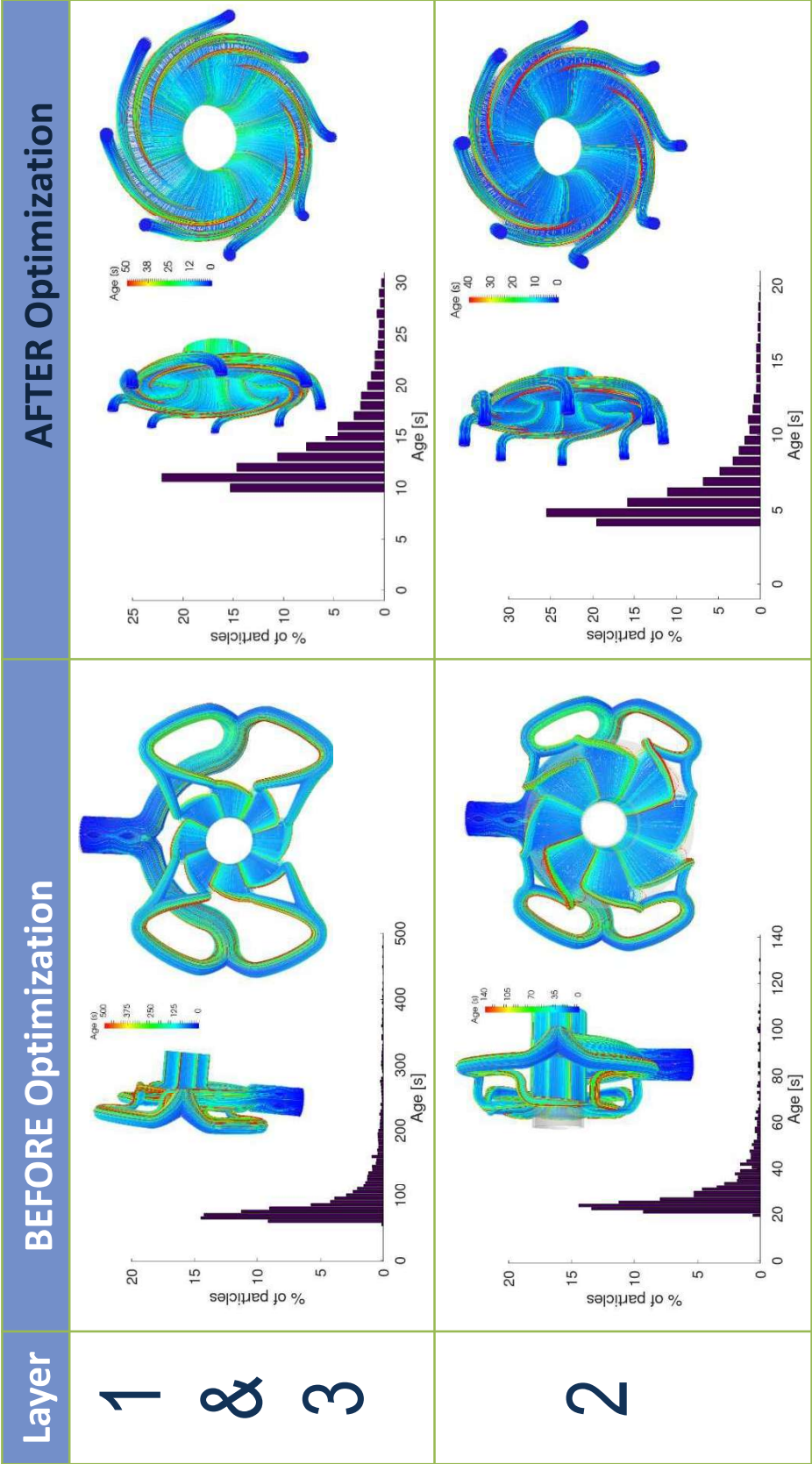
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OPTIMIZED TOOLS – FLUSHING TIME



OPTIMIZED TOOLS – FLUSHING TIME



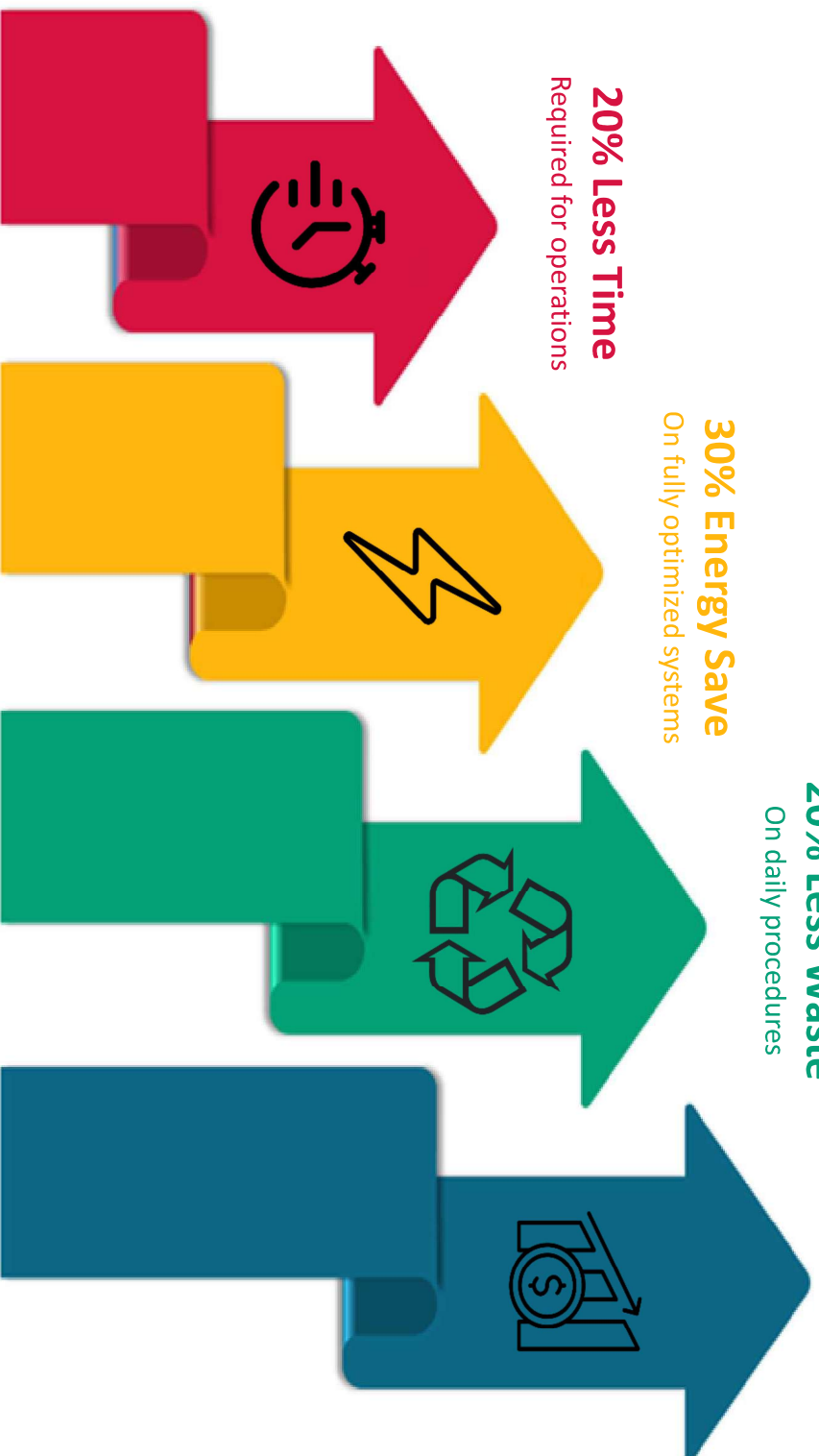
CONCLUSION

10% Cost Reduction
Running cost and operations

20% Less Waste
On daily procedures

30% Energy Save
On fully optimized systems

20% Less Time
Required for operations





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