



PLASTICS TECHNOLOGY EXPO 2023

MARCH 28-30, 2023
DONALD E. STEPHENS
CONVENTION CENTER
ROSEMONT, IL



Optimizing Thermal Management In The Molding Process

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Over 80 Years Bringing Standardization & Efficiency to the North American Mold Maker & Molding Industry.



Tyler Boss

Tyler Boss has a B.S. degree in Plastics Engineering from Pittsburg State University (2008) and is a certified Master Molder I & Master Molder II. Today, Tyler works for DME & Milacron as a molding process engineer.

Tyler has 15 years of industry experience as both an educator & practitioner in process engineering & operational management. Through his career, Tyler has been focused on the implementation of systematic molding methodologies & new technologies.



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Mold Design + Molding Process + Lifecycle = Part Value



TEMPERATURE



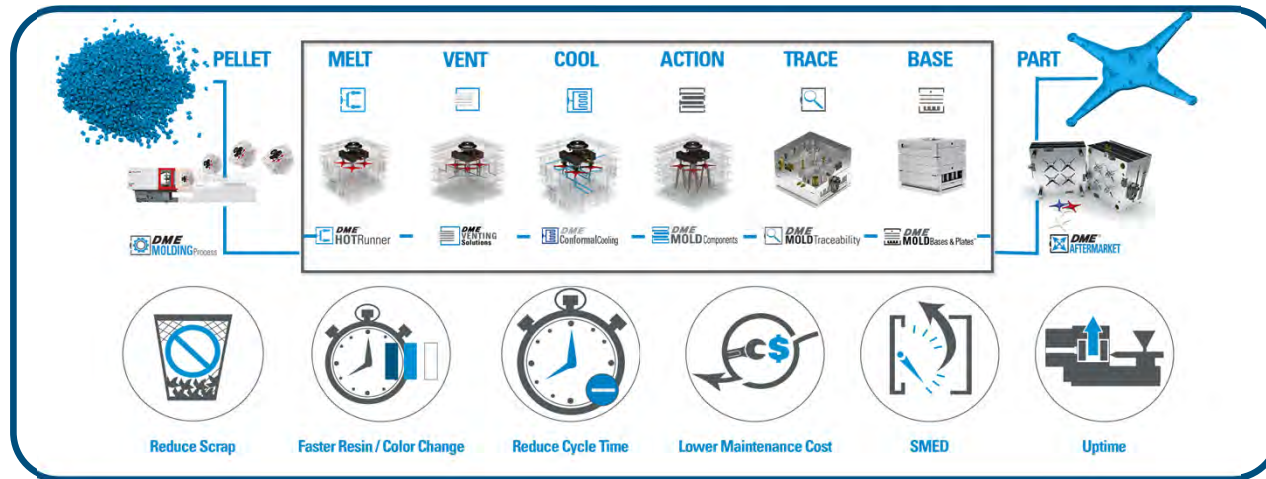
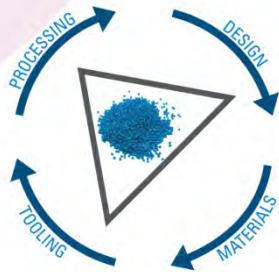
FLOW



PRESSURE



TIME



“Injection molding can be seen as a pressure vessel in which heat transfer takes place.”

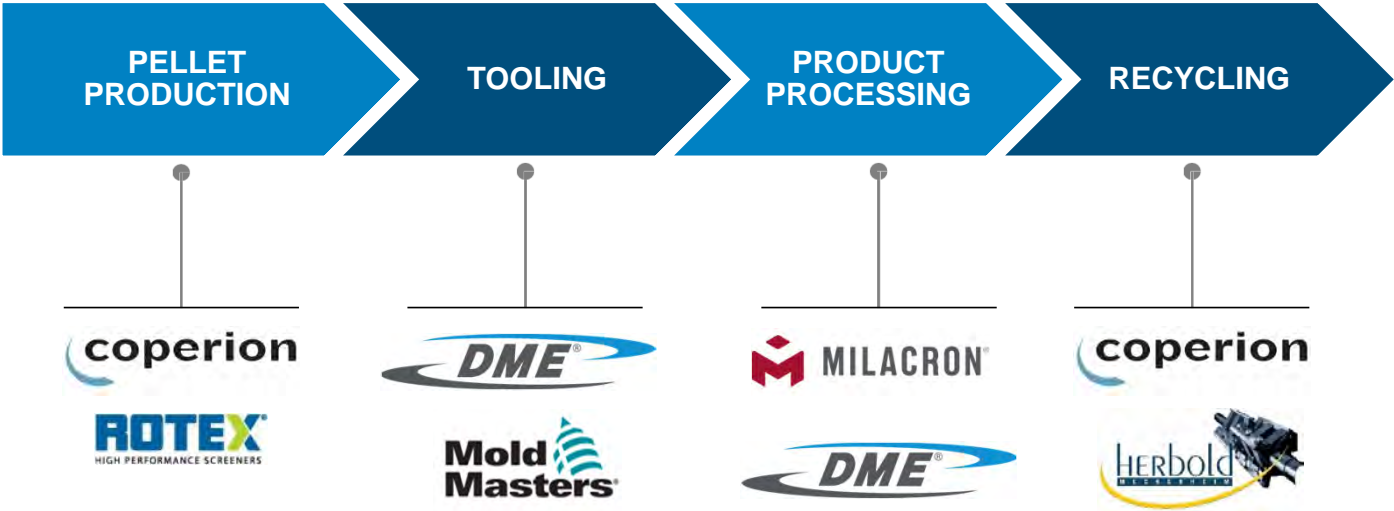


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PLASTICS VALUE CHAIN



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Optimizing Thermal Management in the Molding Process



VS.



Designing Your Tool & Molding Environment As You Would Your Own Home

Image Source: <https://www.thisoldhouse.com/heating-cooling/21018992/read-this-before-you-install-central-air-conditioning>
Radiant Floor: https://wateractionhub.org/media/files/2020/09/23/Elston_Senor_Pex-1_packet.pdf

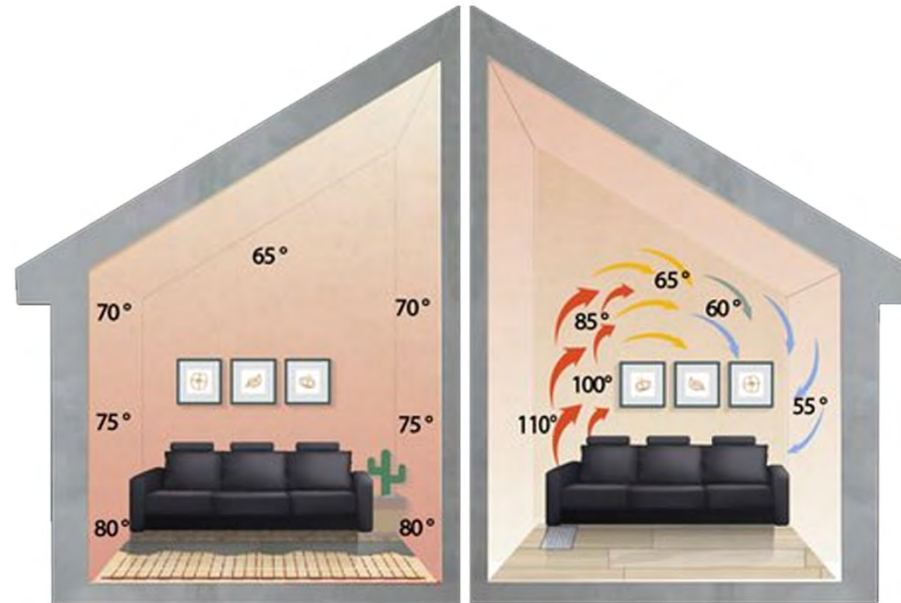


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Variation in Performance



Reduced variation through tool design and processing control

Image Source: <https://www.warmlyours.com/en-CA/posts/discover-the-comfort-of-having-electric-heated-floors-in-your-home>



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Foundation of Thermal Transfer

The control of heat flowing from higher temperature regions to lower temperature regions.

Heat Generation



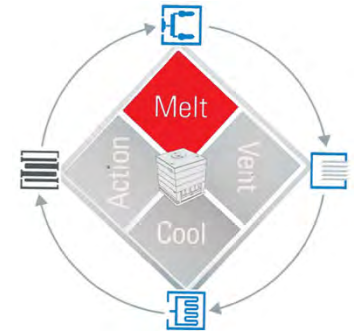
ΔT



Heat Removal



Optimization



Maintenance

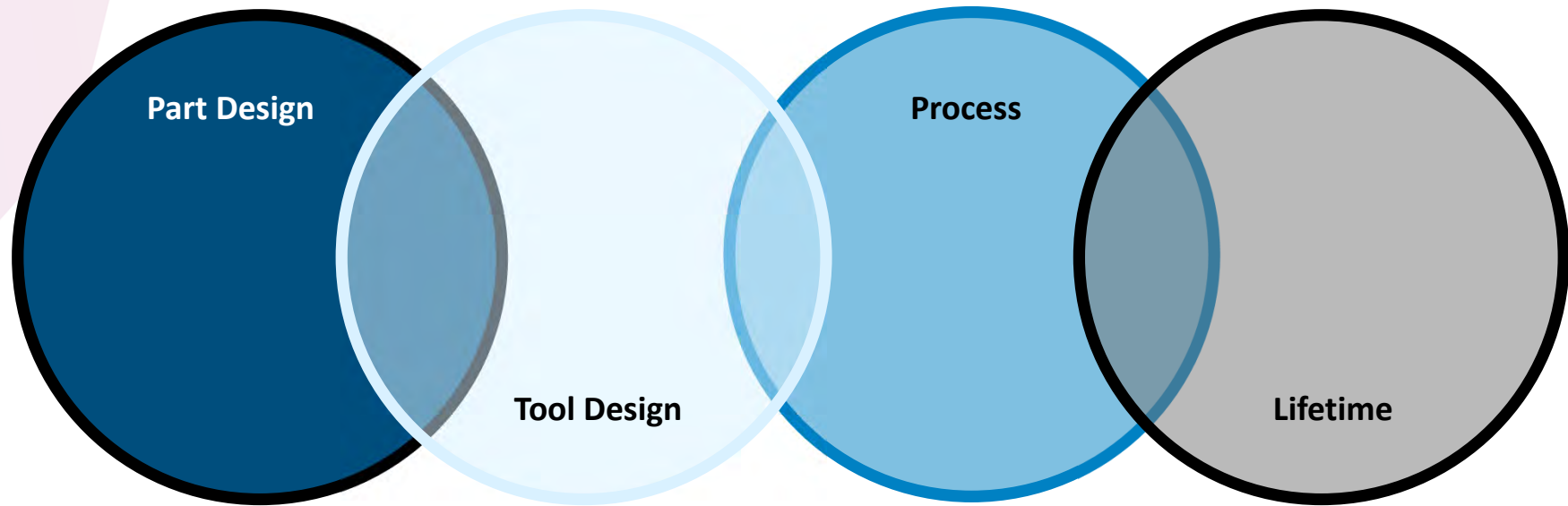
An Opportunity for
Continuous Process Improvement.



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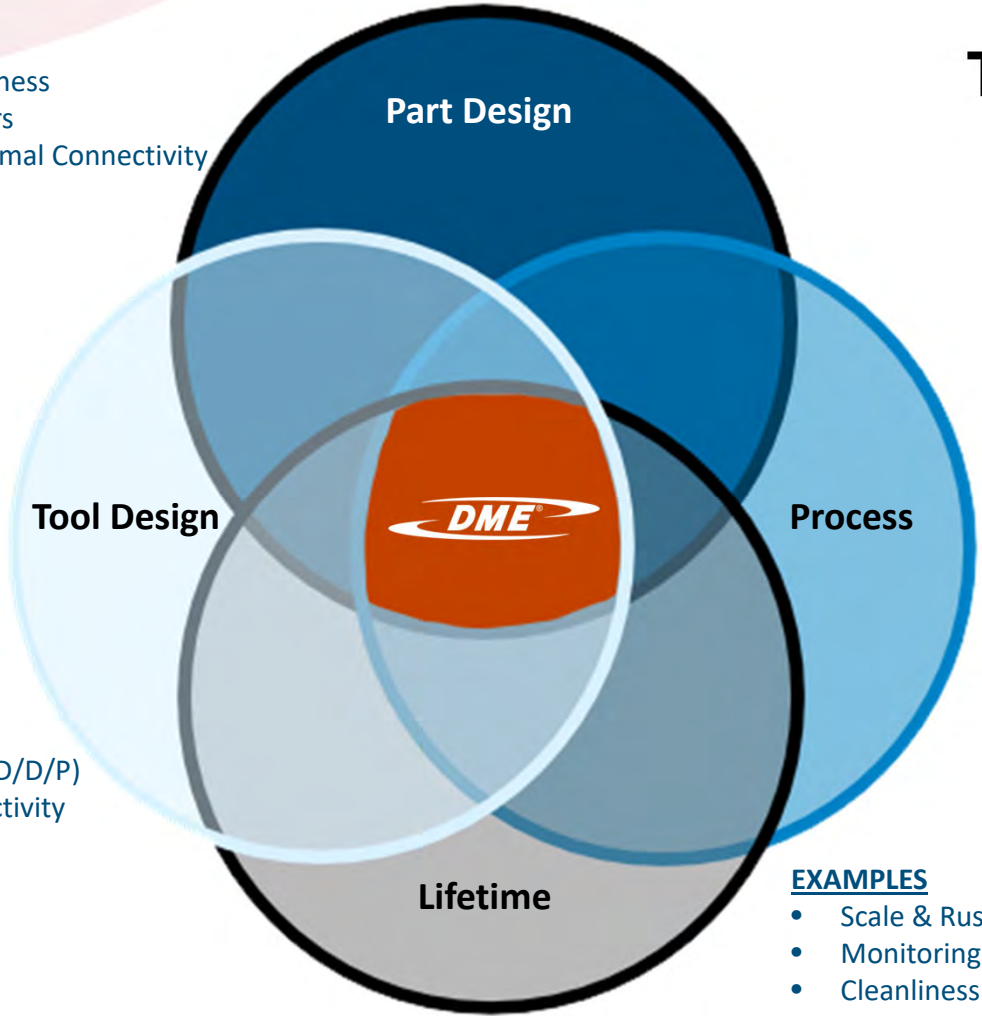
Traditional Approach to Thermal Management



Start With The End in Mind

EXAMPLES

- Wall Thickness
- Resin Fillers
- Resin Thermal Connectivity



EXAMPLES

- Melt Temperature
- Filling Rates
- Coolant Temperature
- Cycle Time

EXAMPLES

- Coolant Circuit Layout (D/D/P)
- Tooling Thermal Connectivity
- Steel Temperature

EXAMPLES

- Scale & Rust Build Up
- Monitoring
- Cleanliness



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Risk Reward Considerations

Risk

- Post Mold Issues (Shrink, Crystallinity, Warpage)
- Part Design – non optimal
- Decaying mold conditions
- Mold Design – non optimal

Reward

- Part Quality
- Cycle Time
- Profitability

Investment

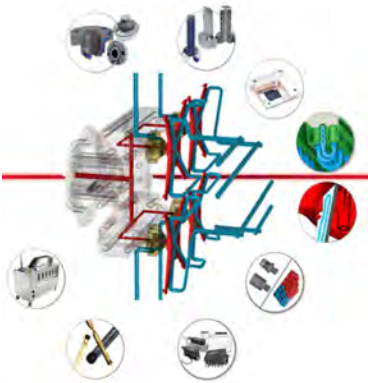
- Simulations – Part & Tool
- Water Monitoring & Control
- Active Preventative Maintenance

Thermal management must be optimized upfront and throughout.



DME Recommends Design For Minimal Thermal Variation

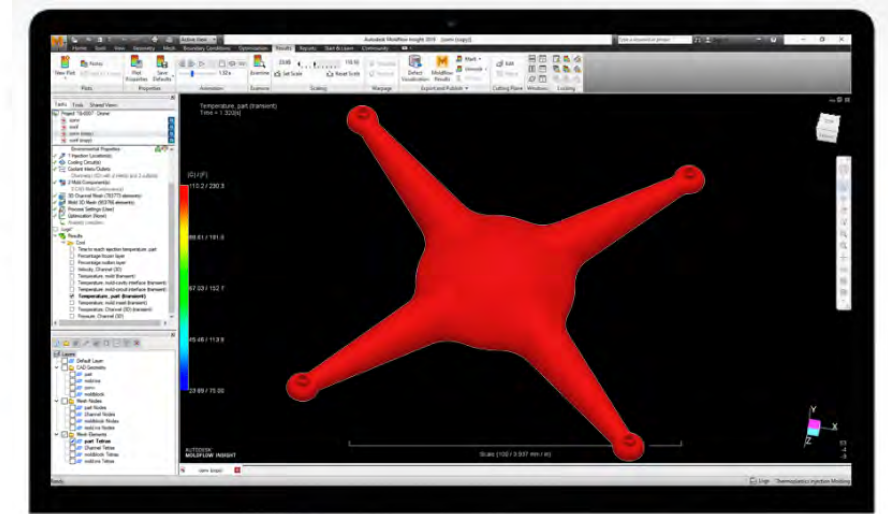
- Maximizing part design flexibility
compromising between theoretical versus practical
- New technologies open the door for improvement
- DME's holistic approach widens the thermal management design window



Comprehensive Part Design Can Improve Operations

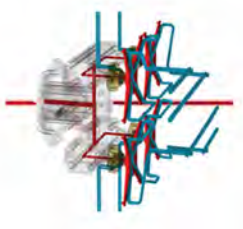
The plastic part is a living structure that must perform through its lifecycle in terms of **Form, Fit, Function & Aesthetics**

.....while keeping energy use and thermal controls in mind



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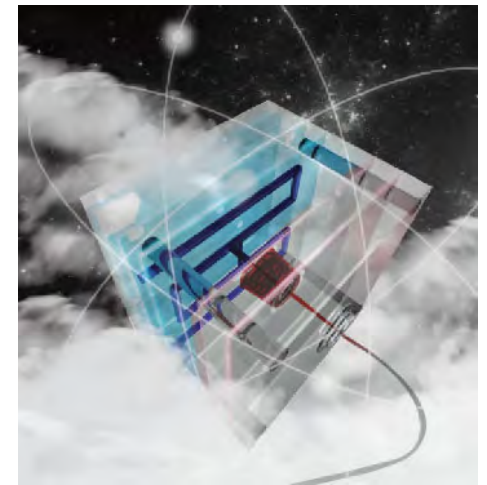
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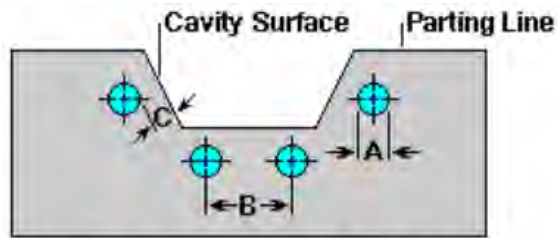
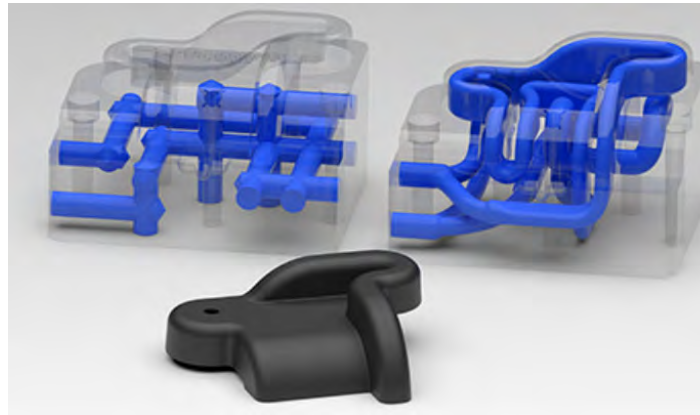
Optimal Tooling Design Approach

Hybrid Engineered Approach

Conformal Cooling



Conventional Cooling



SIDE VIEW OF CAVITY STEEL



Will fixing thermal transfer in the tool design ensure lifecycle efficiency?



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Control Your Destiny: Coolant Conditions



flow



temperature



pressure



ΔT

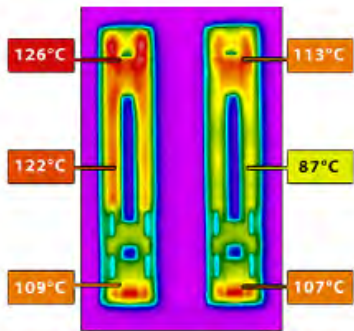
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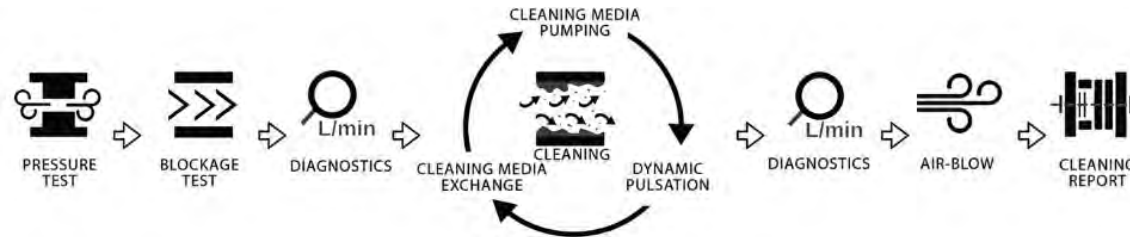
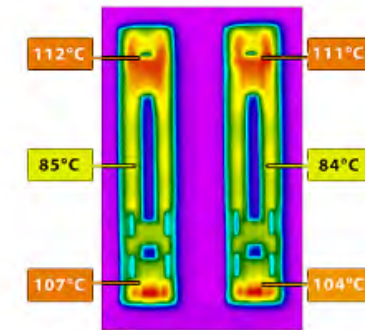
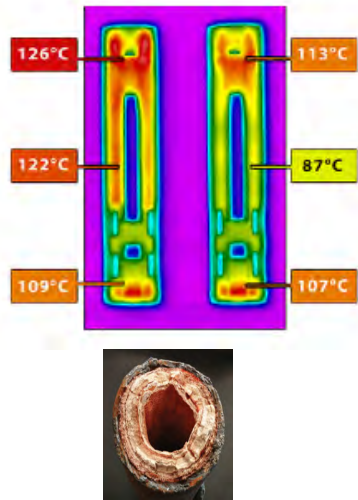
Reactive Maintenance Is Time & Labor Intensive



Traditional methods of preventative maintenance can restore the coolant system.
Additional steps and data collection required to confirm the restoration



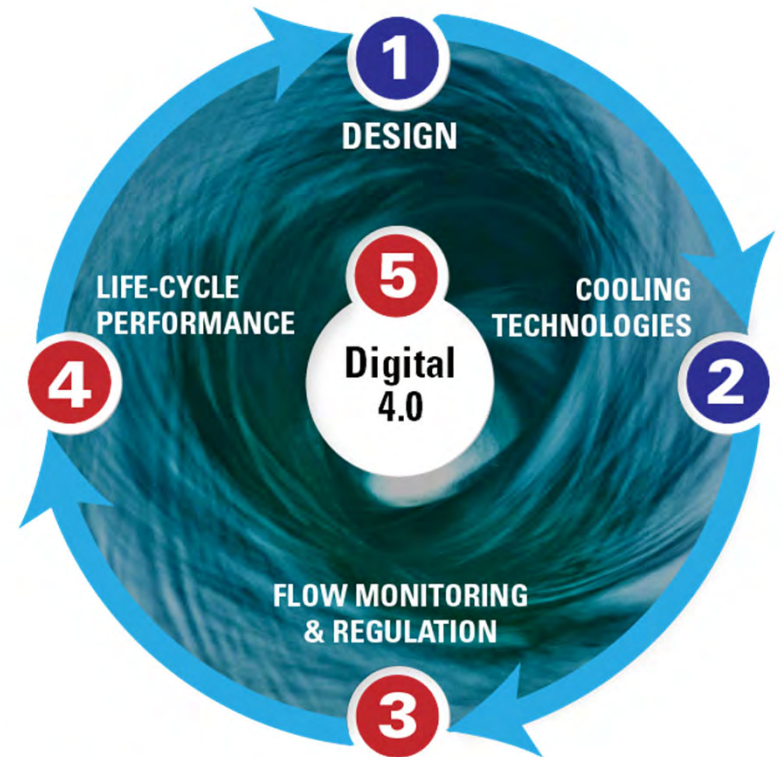
Automate & Record Preventative Maintenance



DME 5-Step Thermal Management Process

Plastic Part Is the Place to Start

- ✓ Early and holistic design pays dividends.
- ✓ Monitoring and control helps ensure consistency of process.
- ✓ New maintenance solutions keep the original design intact.



.....Improving Your Overall Equipment Effectiveness



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Thank You Q&A



www.DME.net/OptThermMgt/

For a copy of today's presentation



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