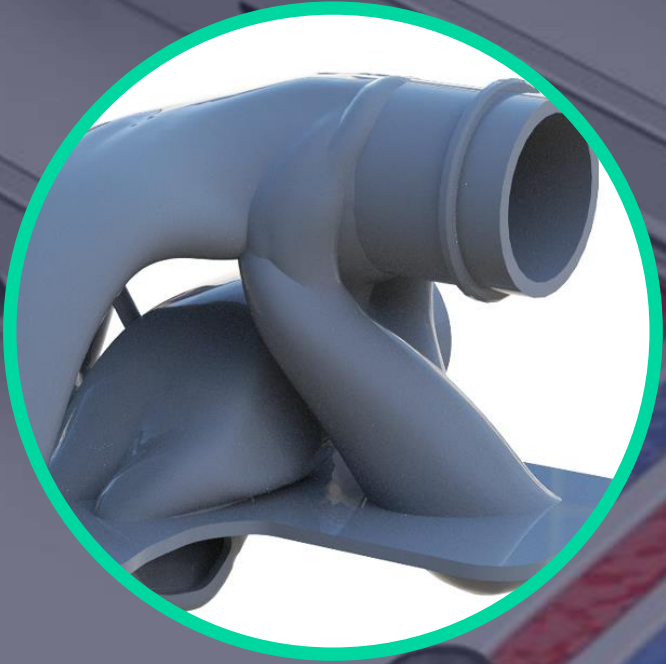


Additive Manufacturing Fact Sheet

Improved battery cooling – Design study

Increased pack performance powered by Additive Manufacturing



22%

increased cooling performance

47%

reduction in pressure drop

~60%

higher productivity

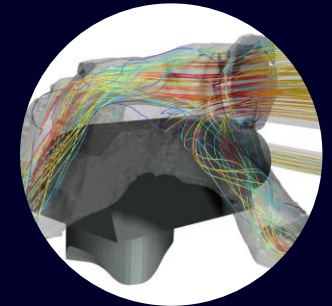
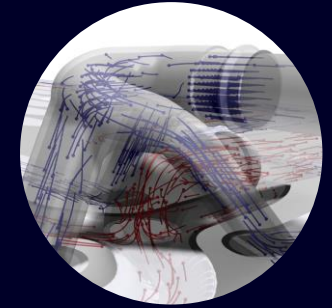
~30%

lower costs

Additive Manufacturing

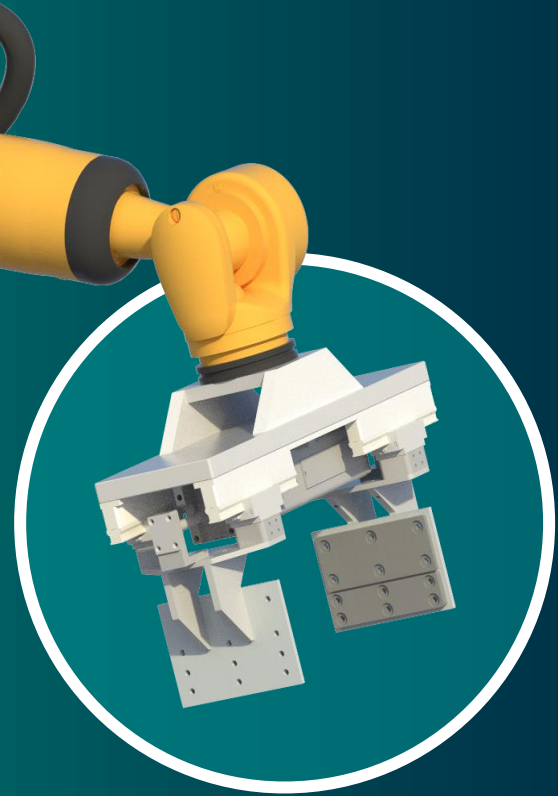
Case study Hannover Messe 2023: Flow splitter

Application	Increased pack performance powered by Additive Manufacturing
Challenges	Efficiently dissipate the heat generated during the rapid charging the heat generated during the rapid charging process and during the load cycles
Solution	Additive manufacturing and CFD topology optimization with an organic design and a seamless integrated process from design to production execution
Benefits	<p>Additive Manufacturing offers benefits along the entire product lifecycle</p> <ul style="list-style-type: none">▪ Produce this coolant manifold faster, more cost-effectively, more sustainably and in larger quantities▪ Increase the cooling performance▪ Reduce pressure loss



Topology optimized robot end effector

Save resources, time, and money by Additive Manufacturing



~91%

reduced **carbon footprint**

~83%

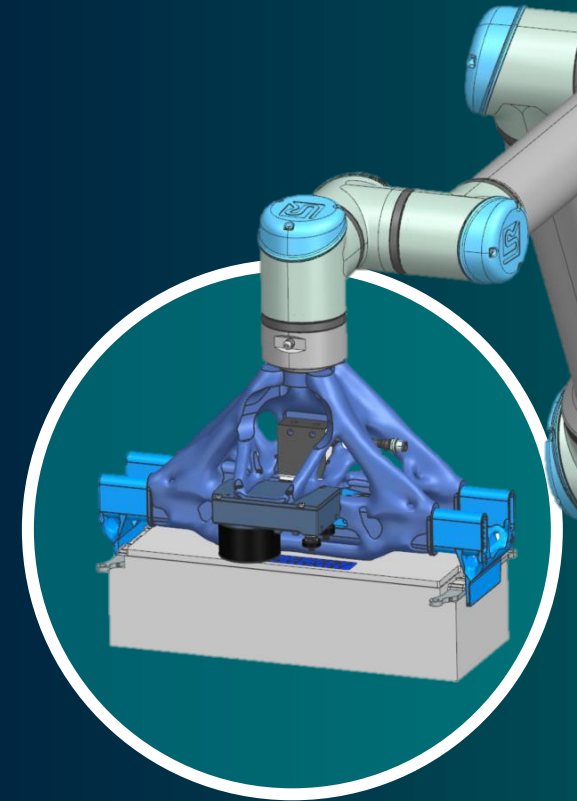
less **parts**

~93%

reduction in **weight**

~50%

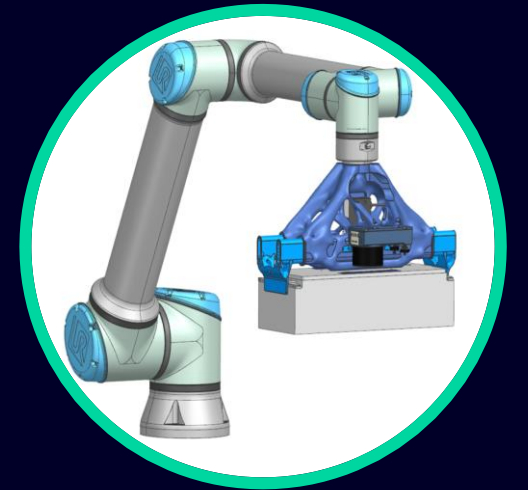
energy **savings**



Additive Manufacturing

Case study Hannover Messe 2023: 3D-printed gripper for battery pack assembly

Application	Topology optimized robot end effector to grip modules in a battery assembly line
Challenges	Industry traditionally uses heavy and complex end effectors on large robots for handling relatively light components
Solution	Additive Manufacturing digital twin from design, simulation to optimization combined with latest additive machine technologies powered by Siemens automation
Benefits	<p>Additive Manufacturing offers benefits along the entire product lifecycle</p> <ul style="list-style-type: none">▪ Minimize costs and CO₂ emissions (up to 90 %)▪ Use smaller robots with less energy consumption▪ Save energy and maintenance costs (up to 50 %)▪ Reduce lead times for the production of new end effectors▪ Simplify assemblies (reduce number of parts) (>90% weight reduction)



Additive Manufacturing

Case study Hannover Messe 2023: 3D-printed gripper for battery pack assembly

Use Case description

- Parts per build plate: 4 sets built on EOS P 500 (=20 parts)
- Material: carbon-reduced PA2200
- Volume per part:
 - Gripper: 171,13 cm³
 - End Effector: 1.063,58 cm³
 - Connector: 13,54 cm³
- Production time: 15,33h/4 sets
- Post-Processing steps:
 - Smoothing
- Energy used: 3.614 kWh per year

