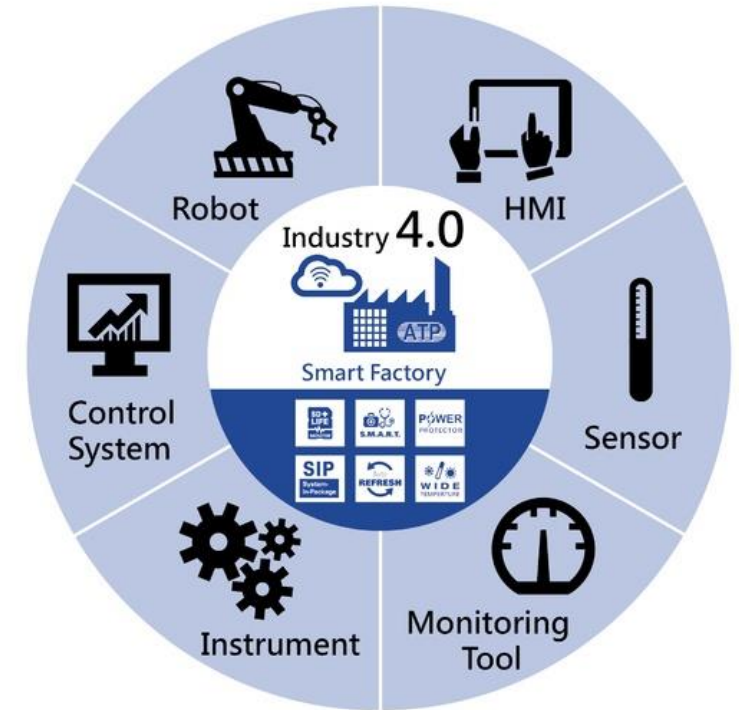


Apply innovation in Advanced and Additive manufacturing Technologies

The future

Intelligent factories with zero waste and optimised efficiency, using automated processes.

Smart use and re-use of materials, energy efficient and environmentally friendly



Enabling technology?

- ✓ Connectivity and IT
- ✓ Integrated sensors
- ✓ Predictive analytics
- ✓ Real-time monitoring

The benefits

- ✓ Intelligent process control
- ✓ Process stability and high machine availability
- ✓ Understanding performance **during** the process
- ✓ High productivity and capability

Renishaw technology enables...

Highly productive precision machining

Reduced skill requirements

Reduced quality costs

Factory automation



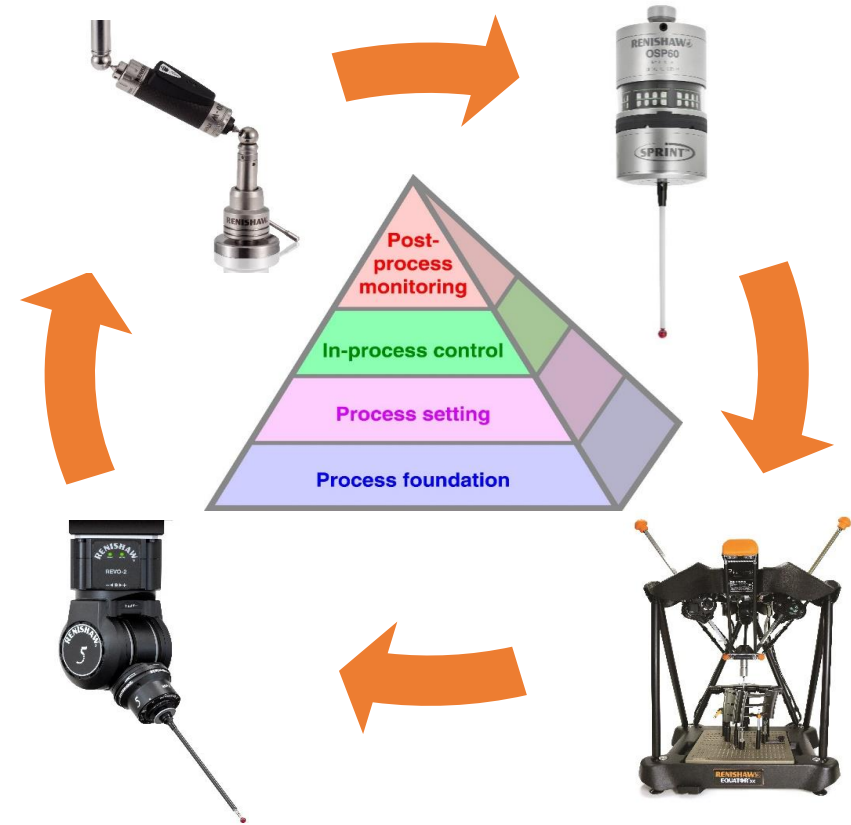
Advanced Manufacturing involves Industrial Metrology

CNC machine calibration and performance assessment

Consistent process output - accommodate variation

Compensate for changes or drift during machining

Verification of parts to meet design intent



Traditional factory...

High labour
content / cost

Low productivity

Queuing

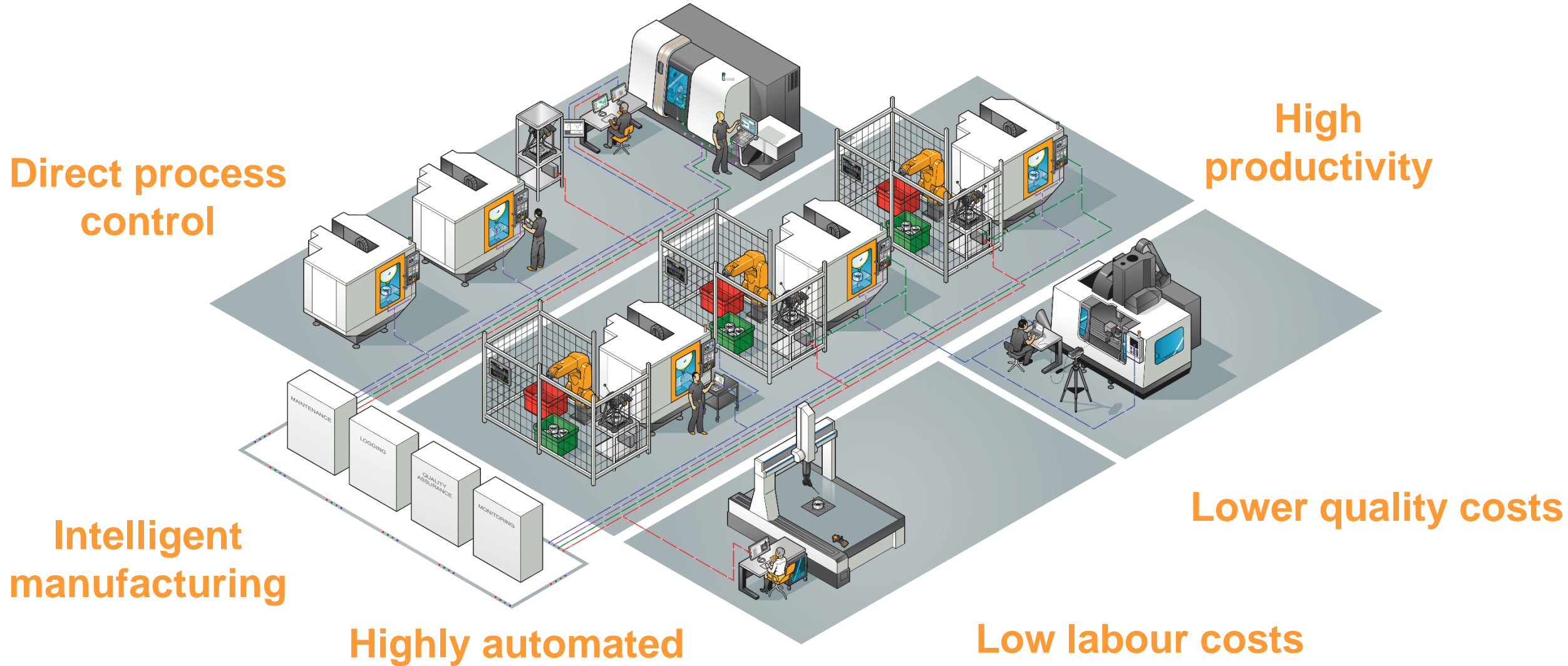
Skilled operators

Remote QC area

High quality costs



Future factory



Process control

Integrated process control solutions

RENISHAW 






Applications relevant to many industries



Aerospace



Precision manufacturing

Process Input / source of variability					
Machine dynamic performance – accuracy of interpolated features	✓				
Cosmetic surface finish on circular interpolation	✓				
Machine set up – critical alignments and positions			✓		
Tool length and diameter offset measurement		✓			
Confirmation of expected tool assembly		✓			
Work piece set up – position and alignment			✓		
Compensation for input material variation			✓		
Machine and part thermal growth compensation			✓	✓	
Tool breakage detection		✓			
Process control of tool offsets			✓	✓	
Point of manufacture QA				✓	
Final certification and pass off prior to assembly					✓

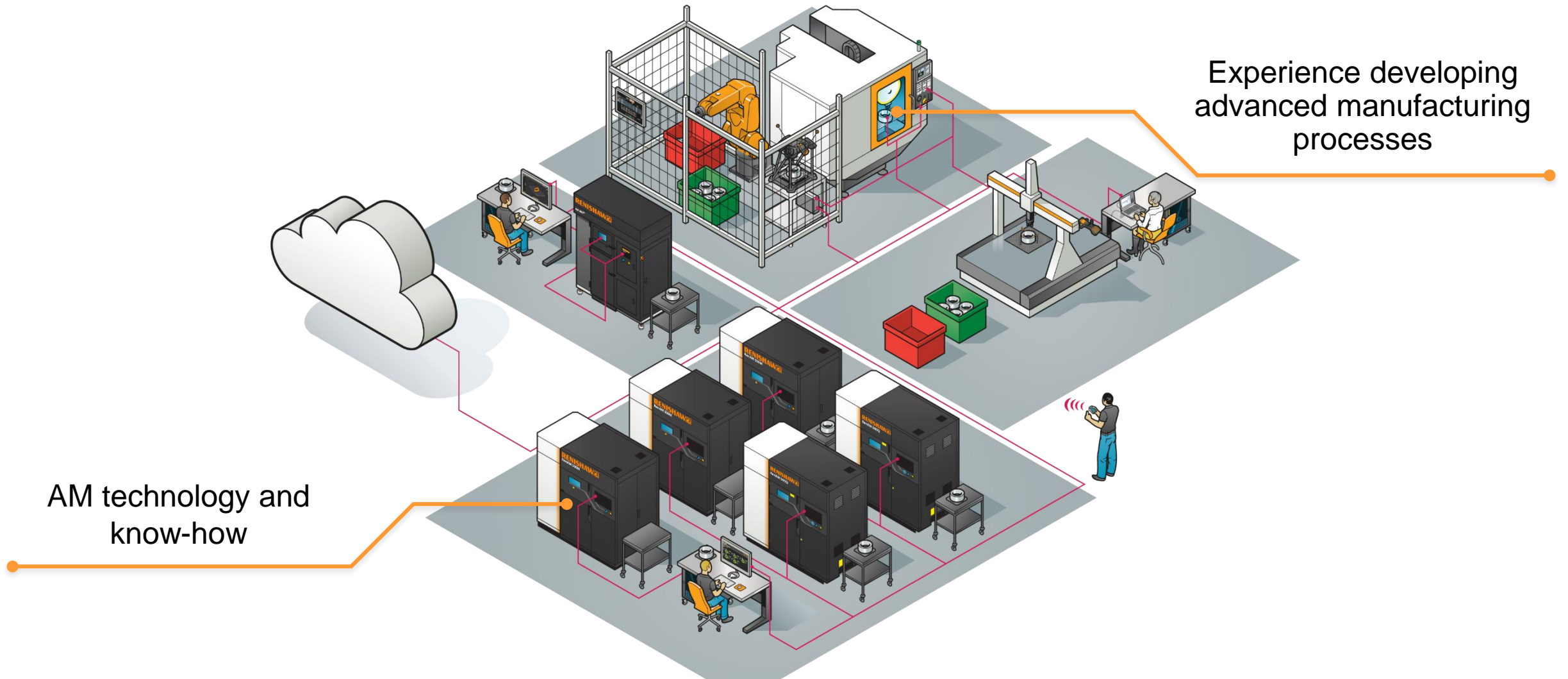


Automotive



Heavy industry

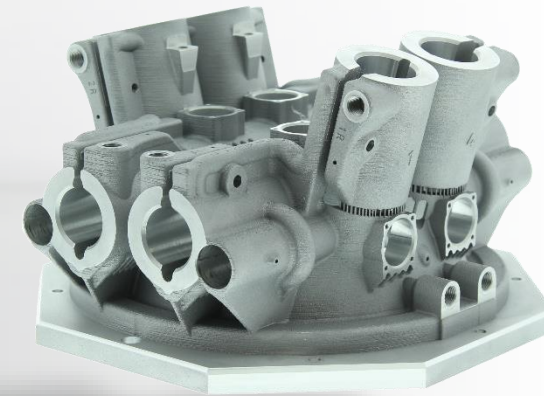
Additive Manufacturing is part of Advanced Manufacturing



RenAM 500Q – Delivering productivity through product innovation



AM produced galvo mounting gives 4 lasers full field of view



Standard vs high productivity

2 lasers



4 lasers

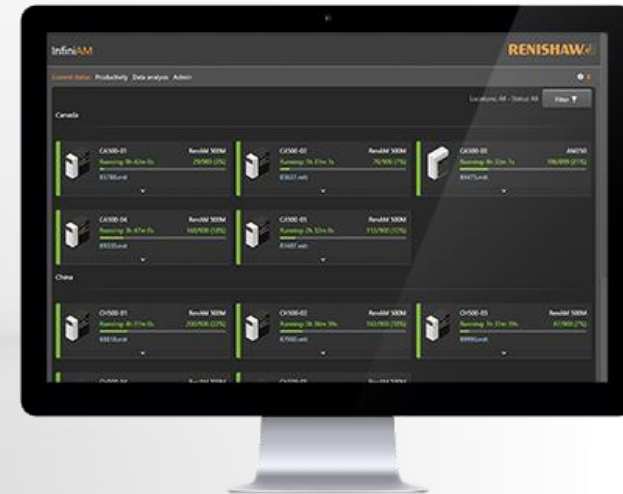


Build progress after 19 hours

RenAM 500Q – Delivering productivity through product innovation



Compatibility with InfiniAM
process monitoring



RenAM 500Q – Compatibility with InfiniAM process monitoring

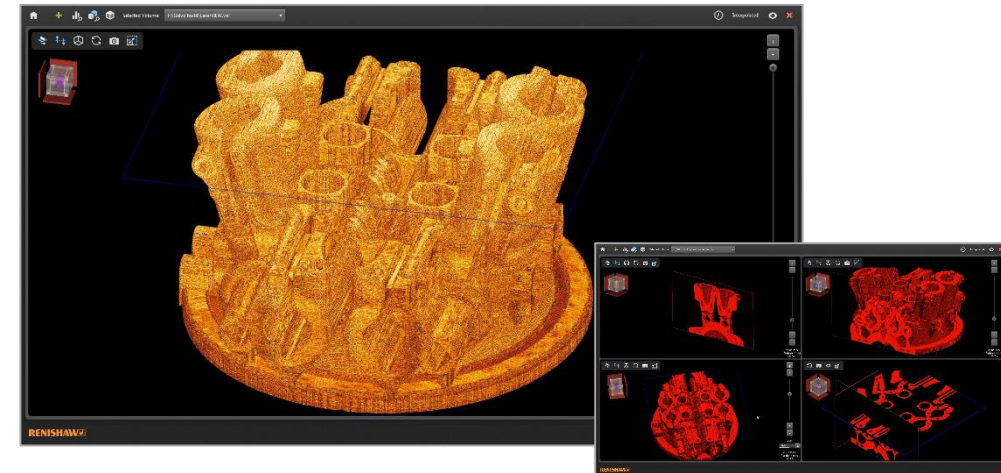
RenAM 500Q system sensors automatically control and monitor the build process

- Make informed decisions about process quality during build with InfiniAM Central.
- System sensors: Atmospheric, Pressure, Thermal sensors and cooling control, Gas control, Powder.



Fully prepared for InfiniAM Spectral melt pool sensing technology

- Collect and view part quality information live, as the build progresses.



RenAM 500Q – Delivering productivity through product innovation

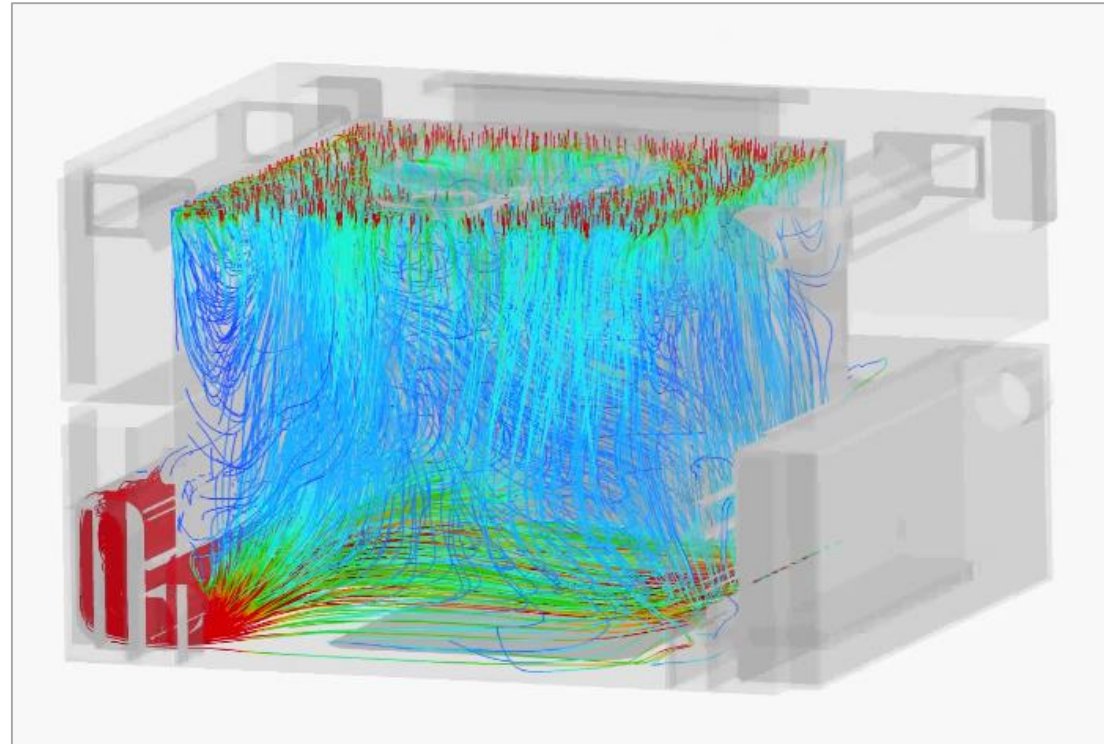
High volume intercooled gas flow with cyclone separator



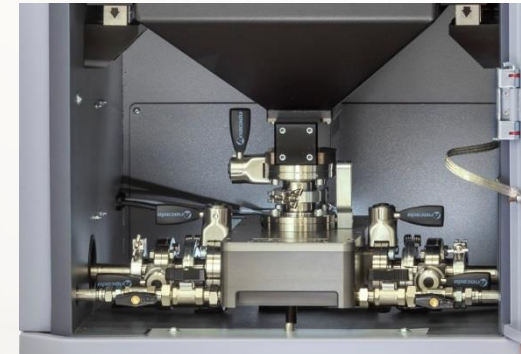
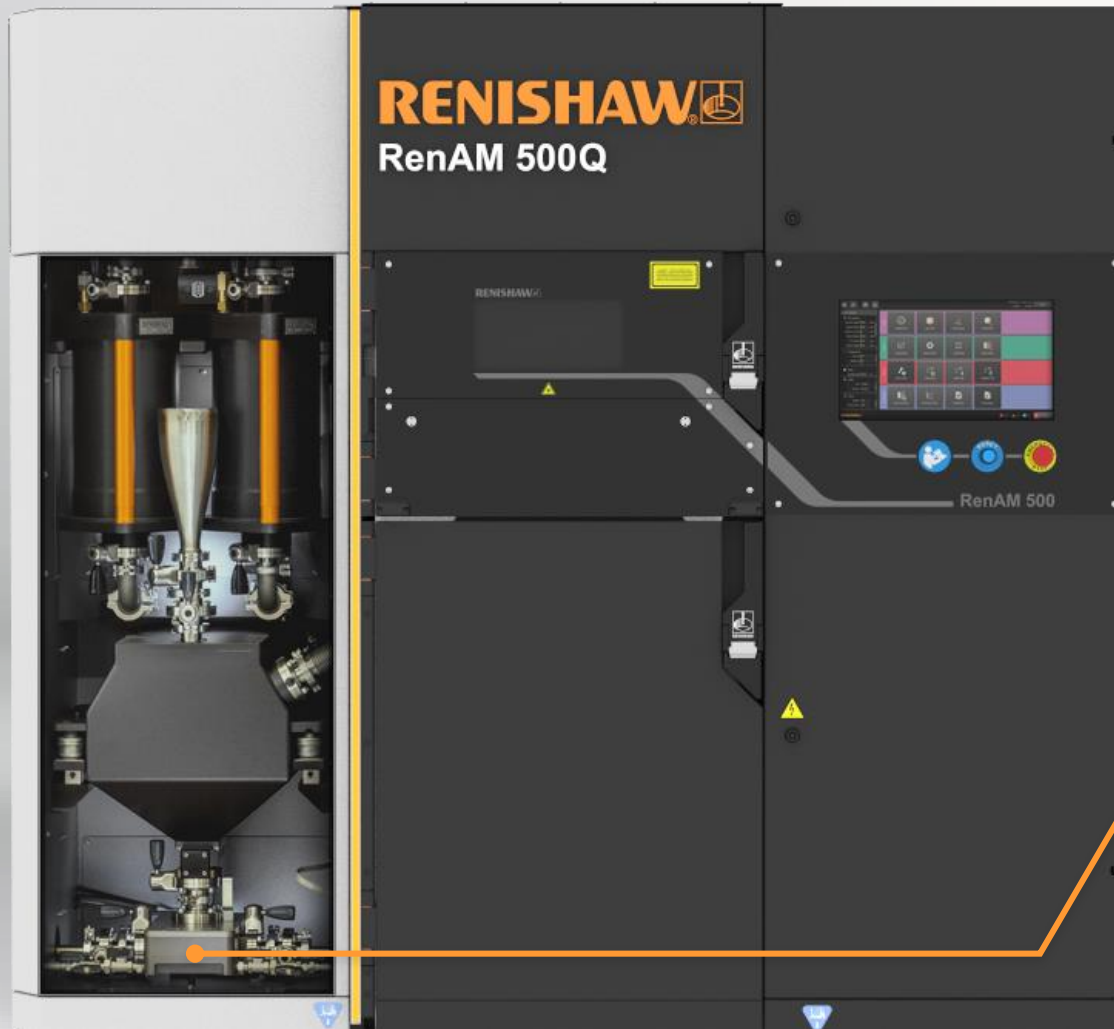
RenAM 500Q – High volume intercooled gas flow

Maintain process consistency and laser energy transmission

- Superior gas flow removes process emissions from 4 lasers.
- Intercooled gas reduces condensate contamination inside the build chamber.
- Cyclone separator captures larger particulates, extending filter life and maintaining effective gas flow throughout the build.



RenAM 500Q – Delivering productivity through product innovation



On-board sieving

RenAM 500Q – On-board sieving

Practical automated management of additional powder throughput on high-productivity systems.

Focus on productivity:

- Minimise waste and reduce operating costs.
- Reduce operator intervention and risks associated with human factors.
- Drastically shorten turnaround times.



Powder is recycled and re-used in a single process under an inert atmosphere.