



TARK THERMAL
SOLUTIONS

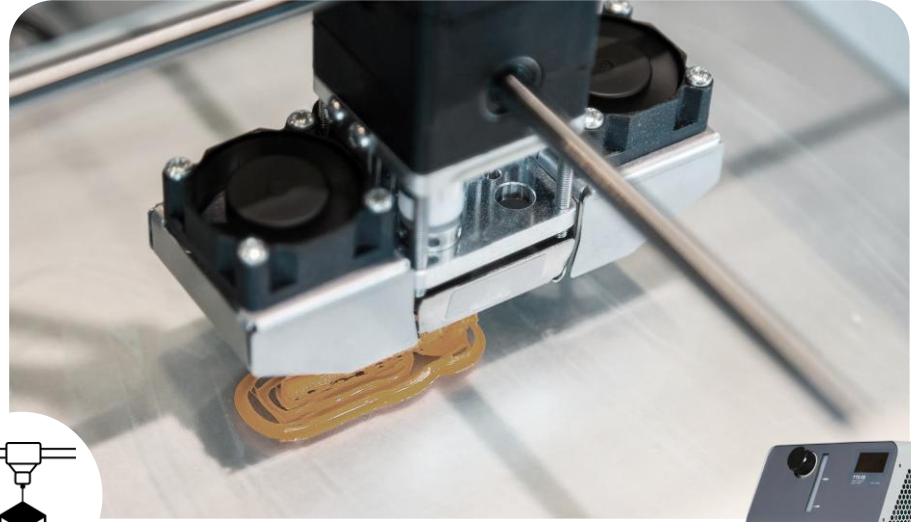
Precise Thermal Management for Additive Manufacturing



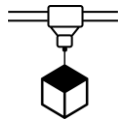
Introduction

Additive Manufacturing enable:

- Rapid prototyping
- Workflow digitization
- Manufacturing of final products



Thermal management is required to



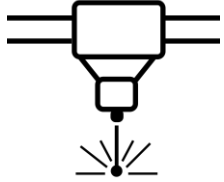
Cool laser and electronic
beam optics

Cool power source

Control viscosity of
liquid powder



Application Overview



A Laser beam, electron beam, or a thermal heated printhead are used to melt material together and create a 3D object

\$36.6 Billion

Expected additive
manufacturing market
by 2025 (up from USD
8.4 billion 2019)

3D Technology Applications

- Medical – casts, prostheses etc.
- Aerospace and automotive - light weighted parts
- Consumer goods

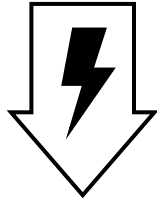


Application Challenges



TEMPERATURE CONTROL

Require stable operating temperature of $20^{\circ}\text{C} \pm 0.1^{\circ}\text{C}$



POWER CONSUMPTION

Maximizing performance while reducing power consumption



VIBRATION AND NOISE

Loud, vibrating machines create dangerous work environment



ECO-FRIENDLY

Governments phase out refrigerants with high global warming potential (GWP)

Comparing Cooling Technologies

Compressor-Based Refrigeration Systems

- High Coefficient of Performance (COP)



Ambient Liquid Loop Systems utilizing Thermoelectric Coolers

- Spot cooling of system components

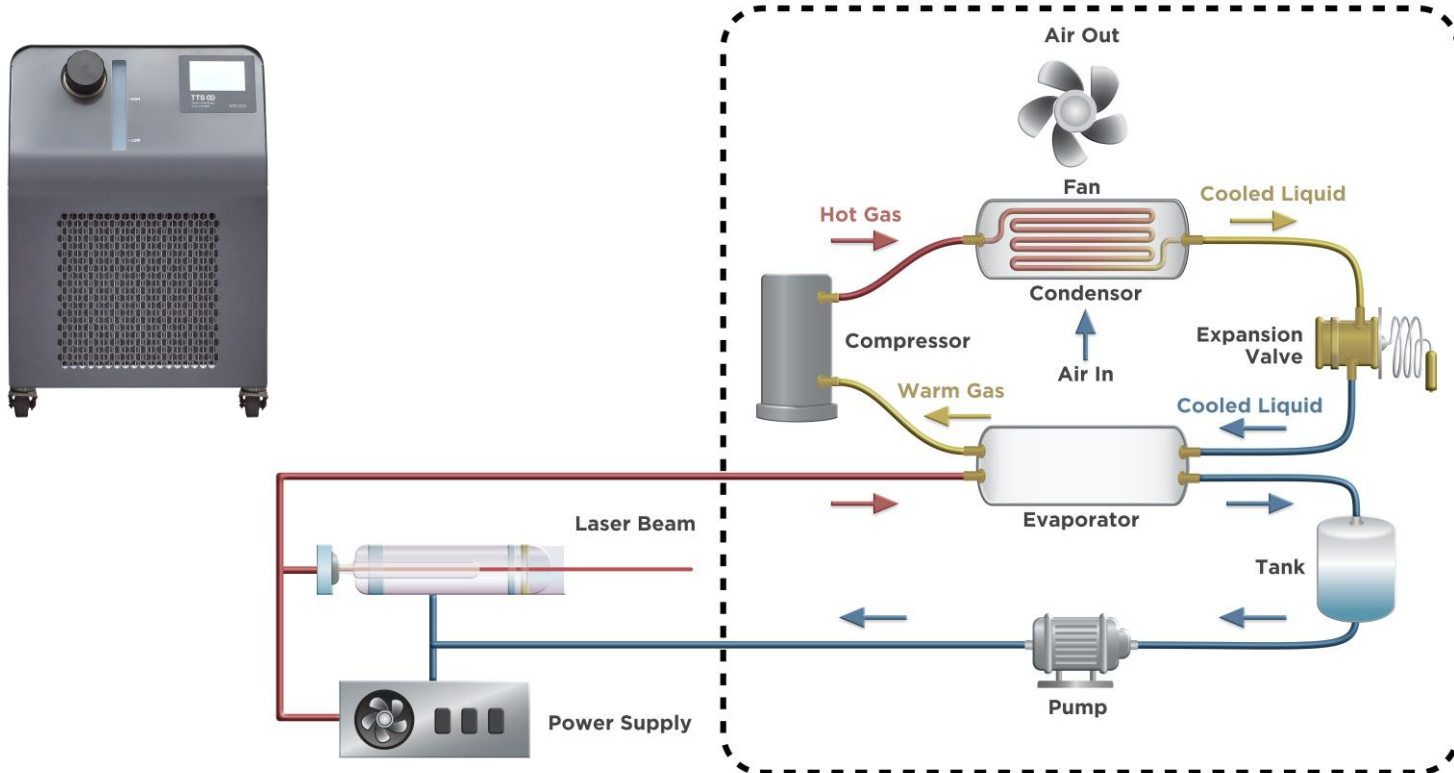


Ability to cool to well below ambient temperatures



Thermoelectrics in 3D Printers

Recirculating Chillers efficiently cool Additive Manufacturing systems



VRC Chiller Series

The VRC Value Chillers offer OEMs a cost-effective and reliable thermal management solution that keeps sensitive electronics in industrial and analytical equipment at the optimum temperature.



The VRC Chiller is available in 1200 2700 and 4800 Watts

- **Precise Control** – Temperature stability to within $\pm 0.5^{\circ}\text{C}$
- **High COP** - Achieves high COP to minimize power consumption
- **Low GWP** - Half the GWP compared to traditional hydrofluorocarbons (HFC) refrigerants
- **User-friendly** - LCD touchscreen display
- **High uptime** - Maintenance can be scheduled at any time

UltraTEC™ UTX Series

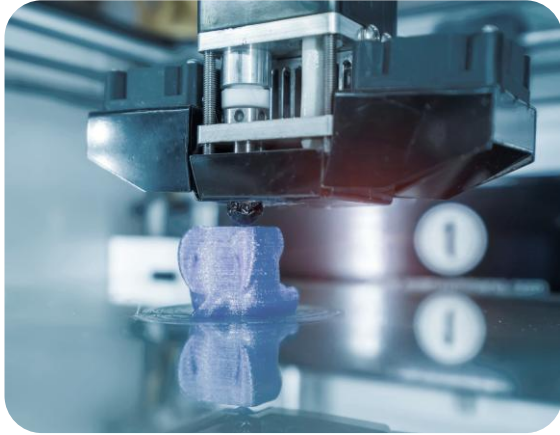
Premium thermoelectric coolers

- **Precise Temperature Control**
Spot cooling allow for precise temperature control
- **296 Watts Heat Pumping Capacity**
Advanced thermoelectric materials for higher heat pumping capacity
- **(ΔT) up to 72°C**
Improved temperature differential with higher thermal insulating barrier
- **Reliable Solid-State**
No moving parts, solid-state Peltier coolers significantly reduce maintenance and total ownership costs.



The UltraTEC™ UTX Series is offered in 13 models.

Conclusion



3D PRINTING MACHINES REQUIRE ACTIVE COOLING

Ensures maximum performance
and
long operating life

3D Printers require thermal
management solutions for
maximum performance

THERMAL MANAGEMENT DESIGN CHALLENGES

Demands for high performance,
reduced energy consumption,
environmentally friendly refrigerants

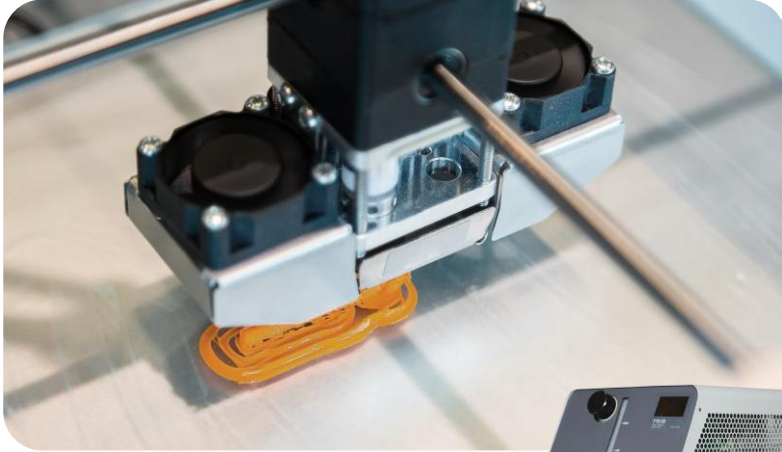
THERMOELECTRICS PROVIDE SPOT COOLING

Reliable and cost-effective
cooling of components.

VRC CHILLERS OFFER HIGHER COP

For precise temperature control of
additive manufacturing applications

For more Information



Learn more about our products

[VRC Recirculating Chillers](#)

[UltraTEC UTX Series](#)

Read more about precise thermal management for additive manufacturing in our application note

tark-solutions.com/thermal-technical-library/application-notes/precise-thermal-management-additive-manufacturing



About Tark Thermal Solutions

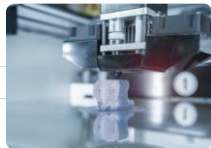
Tark Thermal Solutions develops thermal management solutions for demanding applications



Medical



Analytical



Industrial



Transportation



Telecom

DIVERSE PRODUCT PORTFOLIO

Thermoelectric Coolers, Thermoelectric Cooler Assemblies, Temperature controllers and Liquid Cooling Systems

SOLVING COMPLEX ISSUES

Our engineers use advanced thermal modeling and management techniques to solve complex heat and temperature control problems

ACCELERATING TIME-TO-MARKET

We partner closely with our customers across the entire product development lifecycle.

MAXIMIZING PERFORMANCE

Our global manufacturing and support resources help customers maximize productivity, uptime, performance and product quality



Visit our website and full service hub under **tark-solutions.com**



Visit our website and full service hub under **tark-solutions.com**



Chat directly with our service-team via the Tool on our Website



Contact us for a personal consultation at:
sales@tark-solutions.com

**Tark Thermal Solutions
is the optimum choice
for standard or custom
thermal systems**