AREVO

MAKING THE WORLD LIGHTER

High Speed
Automation

True 3D
Robotic
Deposition

End-Use
Products

99%
Density

Composite
Materials

A-FEA
Software

ABOUT US

Thermoplastic composite parts at your fingertips.

AREVO is delivering the future of the composites manufacturing today with breakthrough advancements in software, materials, and robotics. Through enabling the 3D printing of large, mass-produced parts and structures, AREVO is revolutionizing mainstream manufacturing and the global supply chain.

FACTS
- Headquarters in Milpitas, CA
- $60M (USD) in funding
- 55 employees and growing - 13 PhDs
- 100+ patents files, 23 patents issued

WE OFFER
- 3D printed parts (contract manufacturing)
- 3D printing system (purchase or subscription)
- Software
- Proprietary composite materials

OUR INVESTORS

GGVCAPITAL   khosla ventures   AIRBUSVENTURES   defy.   AGC   Λ

HOW DOES OUR TECHNOLOGY WORK?

An integrated solution of hardware, software and materials for 3D printing composite parts.

MANY APPLICATIONS POSSIBLE:
- Mid to large sized continuous carbon fiber reinforced thermoplastic (CFRTP) parts
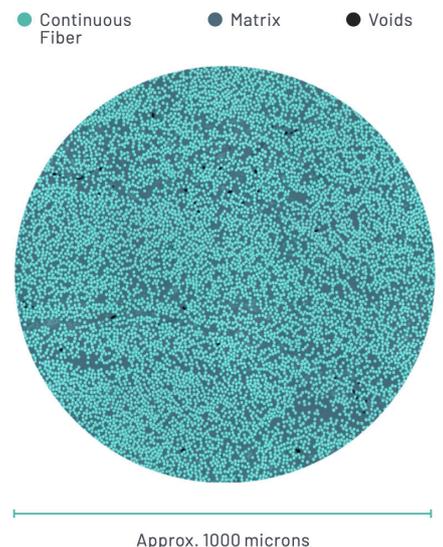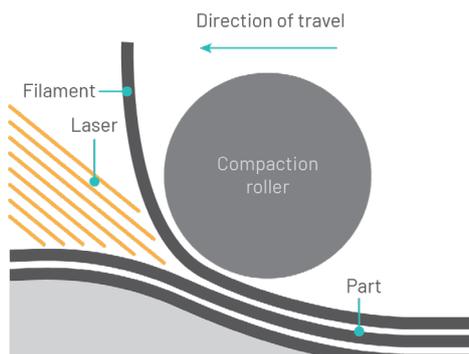- Possible need for support/tooling (depending on application and volume)

ADVANCED TECHNOLOGY:
- True 3D deposition
- Proprietary closed-loop thermal control system

UNIQUE SELLING POINTS:
- Easy to use and setup
- Fast material changeover
- Room temperature processing
- Simple site & facility preparation
- Automated manufacturing equipment

INDUSTRIAL ROBOT DRIVES DEPOSITION HEAD

SCHEMATIC OF AREVO DED PROCESS

Direction of travel

Filament

Laser

Compaction roller

Part

Printed parts demonstrate homogeneous polymer matrix with < 1% voids

● Continuous Fiber   ● Matrix   ● Voids

Approx. 1000 microns

APPLICATIONS

AREVO is making your world lighter. Great applications include E-mobility products such as electric vehicles, bicycles, and scooters. Industrial tooling, jigs, and fixtures. Aerospace and automotive stiffeners, braces, brackets, and fittings. Sporting good products with complex shapes requiring high performance materials. Sporting good products with customizable shapes and performance."

EXAMPLES

- **E-MOTO**
  Design to product in 5 weeks; DED-made frame, fork, handlebars, and wheels.
  Size: ~ 700 x 270 x 15 mm^3
  ~ 27 x 11 x 0.6 in^3

- **SUPERSTRATA**
  The world's first, custom printed bike.
  Size: ~ 700 x 270 x 15 mm^3
  ~ 27 x 11 x 0.6 in^3

- **HINGE BRACKET**
  This optimized part yields 70% weight savings over the original aluminum design.
  Size: ~820 x 630 x 20 mm^3
  ~32 x 25 x 1 in^3

- **COBONDED STRINGER**
  Made in one piece: a cobonded structure without bonding.
  Size: ~670 x 230 x 115 mm^3
  ~26 x 9 x 4 in^3

- **DRONE CHASSIS**
  Unibody chassis for integrated parts, weighing 50% lower than the original design.
  Size: ~ 850x 850 x 40 mm^3
  ~ 34 x 34 x 1.6 in^3

- **TENNISRACKET**
  Unibody chassis for maximum strength.
  Size: ~ 700 x 270 x 15 mm^3
  ~ 27 x 11 x 0.6 in^3

- **SEAT BRACKET**
  Replace a four-piece metal assembly with one composite part and 30% weight savings.
  Size: ~370 x 520 x 30 mm^3
  ~15 x 21 x 2 in^3

- **FAN BLADE**
  Customizable shapes for your aerodynamic needs that can be explored without expensive tooling extra period
  Size: ~580 x 145 x 170 mm^3
  ~23 x 6 x 7 in^3

EXPLORE THE POSSIBILITIES OF...

- Making lighter parts
- Replacing metals with composites
- Integrating parts
- Reducing product cycles

... USING AREVO'S XPLORATOR SOFTWARE.

FEA tools for composites additive
Generative design tools for new parts
Optimal, tailored fiber placement
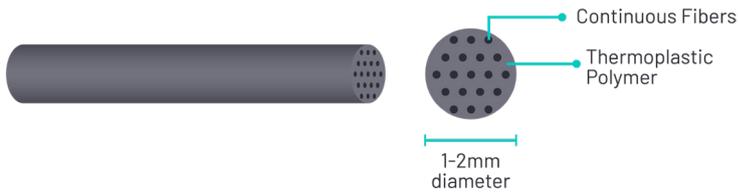Manufacturing blueprints for DED process

MATERIALS

Continuous Carbon Fiber Reinforced Thermoplastics.

PEEK (Polyether ether ketone) + AS4 CF; 50% Fiber Volume
Content (FVC)
Nylon + AS4 CF (beta)

SCHEMATIC OF COMPOSITE FILAMENT

Continuous Fibers
Thermoplastic
Polymer

1-2mm
diameter

HARDWARE: AREVO AQUA

The automated Directed Energy
Deposition machine.

Print parts between the size of a basketball
and a bike frame with our lights out system.
What will you print?

Ambient Processing
Conditions
6-Axis Robotic Arm
Status Light
Deposition
Head (DH300)
Operator
Interface
Material
Management
System (MMS)
Rotating Build Plate
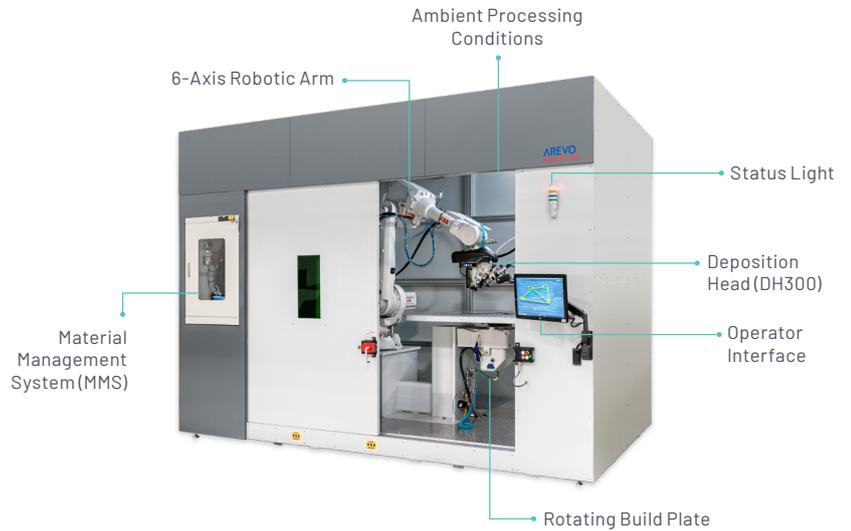
MANY APPLICATIONS POSSIBLE:
- Mid to large sized composite CFRTP parts
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UNIQUE SELLING POINTS:
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HARDWARE: AREVO DIRECTED ENERGY DEPOSITION HEAD

AREVO's Directed Energy Deposition head is mounted
at the end of a 6-axis industrial robot arm. The robot
moves the head and the build plate...

Industrial
Robot
Composite
Filament
Laser
Composite
Filament
Compaction Roller
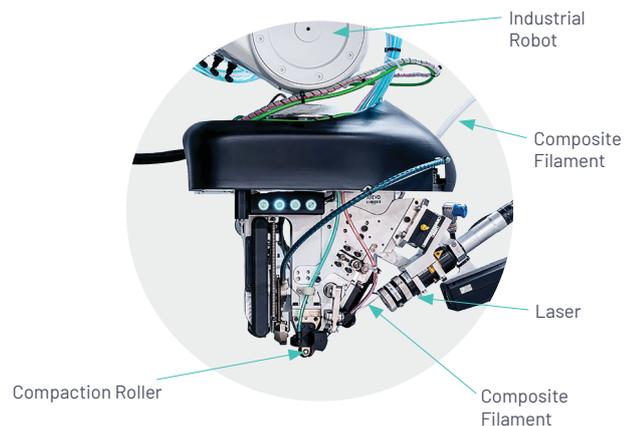
SOFTWARE: AREVO XPLORATOR

Optimize your design, analyze with additive finite element analysis (A-FEA),
slice the model and generate toolpaths, all in one integrated software solution.

Print parts between the size of a basketball and a bike frame with our lights out system.
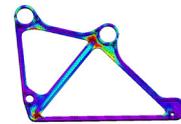
XPLORATOR MODULES

GENERATIVE DESIGN & AFEA
Design with accurate additive finite element analysis (AFEA) that considers
anisotropic properties and critical loads as inputs.
Together, these two modules enable structural optimization for light,
strong parts.
Supports common CAD formats
Provides tools for replacing metallic parts with composites

TOOLPATH GENERATION
Prepare manufacturing blueprints for tailored fiber placement.
True 3D slicing for fibers in all axes.
Automatically generates build surfaces

VIRTUAL PRINTER
Simulate part manufacturing before printing.
Evaluates part for DED manufacturability
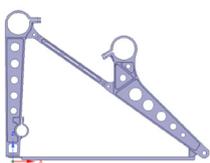
CONTROLLER
Integrated controller for seamless printer interaction.

DIGITAL TWIN
Under development.

DESIGN.

MAKE.

+

GO.

ORIGINAL DESIGN	30 % WEIGHT SAVINGS!	AREVO'S OPTIMIZED DESIGN
Aluminum	MATERIAL	Continuous Carbon Fiber Reinforced Thermoplastics (CFRTP)
4	PARTS	1
Holes	WEIGHT REDUCTION STRATEGY	Generative Design

SPECIFICATIONS

AQUA HARDWARE SPECIFICATIONS

Build Volume (L x W x H)	Geometry Dependent: 1000 mm x 1000 mm x 530 mm 39 in x 39 in x 20 in
Cell Weight & Size (L x W x H)	Approx. 4000 kg ~ 8818 lbs (integrated caster wheels) 4215 x 2032 x 2921 mm 166 in x 80 in x 115 in
Power Requirements	208 VAC, 70 A, 3P+N+G, 50 / 60 Hz
Compressed Air Supply	620 kPa / 140 LPM, ISO 8573-1 Class 1
Nitrogen Supply	345 kPa / 4.8 LPM, ≥99% purity
Vacuum Supply	75 kPa / 225 LPM
Exhaust System	Facility exhaust connection required
Robot	6 axis robotic arm + continuous rotation turntable
Laser	Main: 800 W, 980 ± 20 nm (NIR) Alignment: < 5 mW, 650 nm (Visible, Red)
Operating Environment	20–50 ºC, 30–60 % RH, non-condensing
Acoustic Noise Emission	< 85 dBA
Operator Computer Connectivity	Windows 10 (64-bit) (requires external power) Ethernet, internet-enabled CCTV, touch screen
Software	Xplorator for toolpath generation, additive finite element analysis (AFEA) structural simulation, manufacturing simulation, and machine operation. Highlander for maintenance and diagnostics.
Material	PEEK + CF (50% Fiber Volume Content) Nylon + CF (Beta)
Motion	Robotic arm based 6 axis motion + rotating buildplate for True3D deposition
Deposition Process	Laser based directed energy deposition
Consolidation	In-situ out of autoclave process
Automation	Fully automated lights out manufacturing

MATERIALS SPECIFICATIONS

Material data was generated for the carbon-fiber PEEK (50% FVC) from testing coupons, or test specimens, under ambient conditions (unless otherwise stated).

Coupons were manufactured in laminate form using AREVO's DED process and later machined into individual coupons.

PROPERTY	VALUE	UNIT	TEST STANDARD
PHYSICAL			
Specific Gravity	1.56	g/cm³	Gas pycnometry
Water Absorption	0.1	%	ASTM D7191
THERMAL			
Glass Transition Temperature	143 (289)	°C (°F)	ASTM D7028
Melting Point	340 (644)	°C (°F)	ASTM D3418
Heat Deflection Temperature	315 (599)	°C (°F)	ASTM D648
MECHANICAL			
AVAILABLE UPON REQUEST.			

SPECIFICATIONS

XPLORATOR SOFTWARE SPECIFICATIONS

Application Area	Xplorator
Slicer	Yes
FEA Modeling	
Solid elements	Yes
Metals and composite materials	Yes
Viscoelastic materials	Yes
FEA Modeling	
Integrated meshing	Yes
Structural Analysis	
Static FEA	Yes
Transient FEA	Thermal/viscoelastic only
Thermal FEA	Yes
Laminate analysis	Yes
Stress-related failure criteria	Yes
Strain-related failure criteria	Yes
Stiffened panel failure analysis	Yes
Sandwich structure failure analysis	Yes
Multiple load cases	Yes
Numerical solvers	Proprietary
Viewer for FEA results	Yes
Optimization	
FEA iteration	Yes
Topology optimization	Yes
Thickness sizing	Yes
Mass objectives/constraints	Yes
Stiffness and strength objectives/constraints	Yes
Virtual Printer	Yes
Print Controller	Yes

1. Skins, stringers, frames, etc.

WORKSTATION SPECIFICATIONS

Processor	2.5 Ghz or higher
OS	Windows 10 64-bit
Memory	16GB RAM
Hard Drive	20 GB free space (SSD)
Graphics	GPU 8GB RAM