

DIVERGENT 3D: DIRECT METAL LASER SINTERING IN AUTOMOTIVE MANUFACTURING

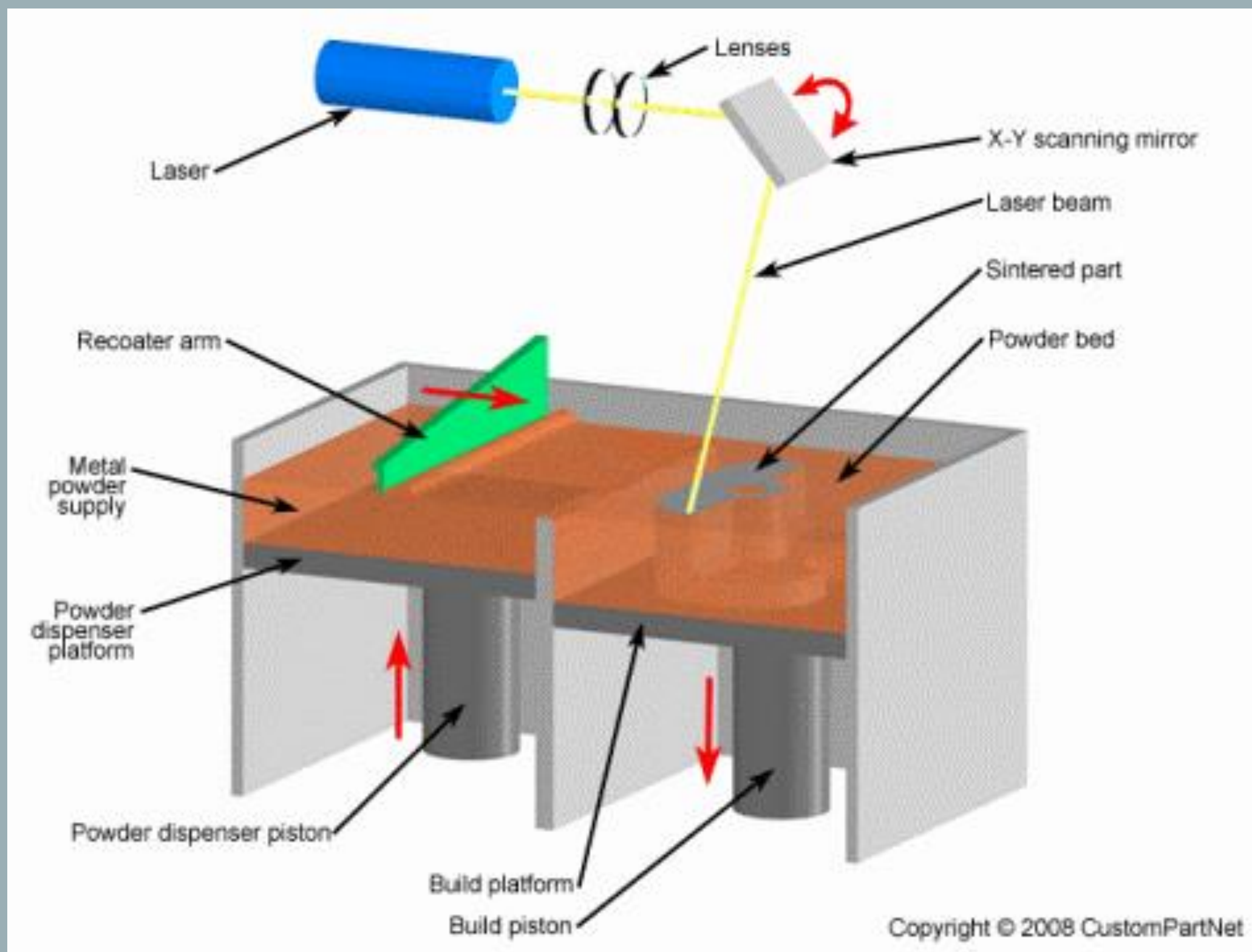


Figure 1 – Diagram of direct metal laser sintering

WHAT IS DIRECT METAL LASER SINTERING (DMLS)?

- Direct Metal Laser Sintering, also known as selective laser metal melting, is a process by which metal powder is spread in a thin layer using a ceramic blade. The powder is heated to close to its melting point and selectively melted by a low-powered laser of about 300-500 Watts, as shown in fig. 1
- The process is controlled by a computer using a computer aided design or CAD model
- Parts are printed using steel, stainless steel, aluminum, as well as alloys including titanium, nickel, cobalt, and copper
- DMLS printed parts often have smaller dimensional tolerances and greater complexity than parts built using subtractive manufacturing

WHAT IS DIVERGENT 3D?

- Divergent 3D is a project run by its chief investor and CEO, Kevin Czinger, who is driven by concerns and a belief in a 3D printed future for the automotive industry.
- The company's main interest is in licensing out its DMLS technology to other automakers for use in car manufacturing, both for parts and for full vehicles.
- In 2015, they produced the Blade supercar, the world's first fully functional, highway safe 3D printed car, shown in fig. 3, which features a carbon fiber chassis connected by DMLS printed "nodes", or joints, shown in fig. 2.
- Divergent 3D's overall mission comes in several parts:
 - lower cost through reduced waste
 - increase customizability
 - More sustainable manufacturing
 Which they hope to achieve through DMLS

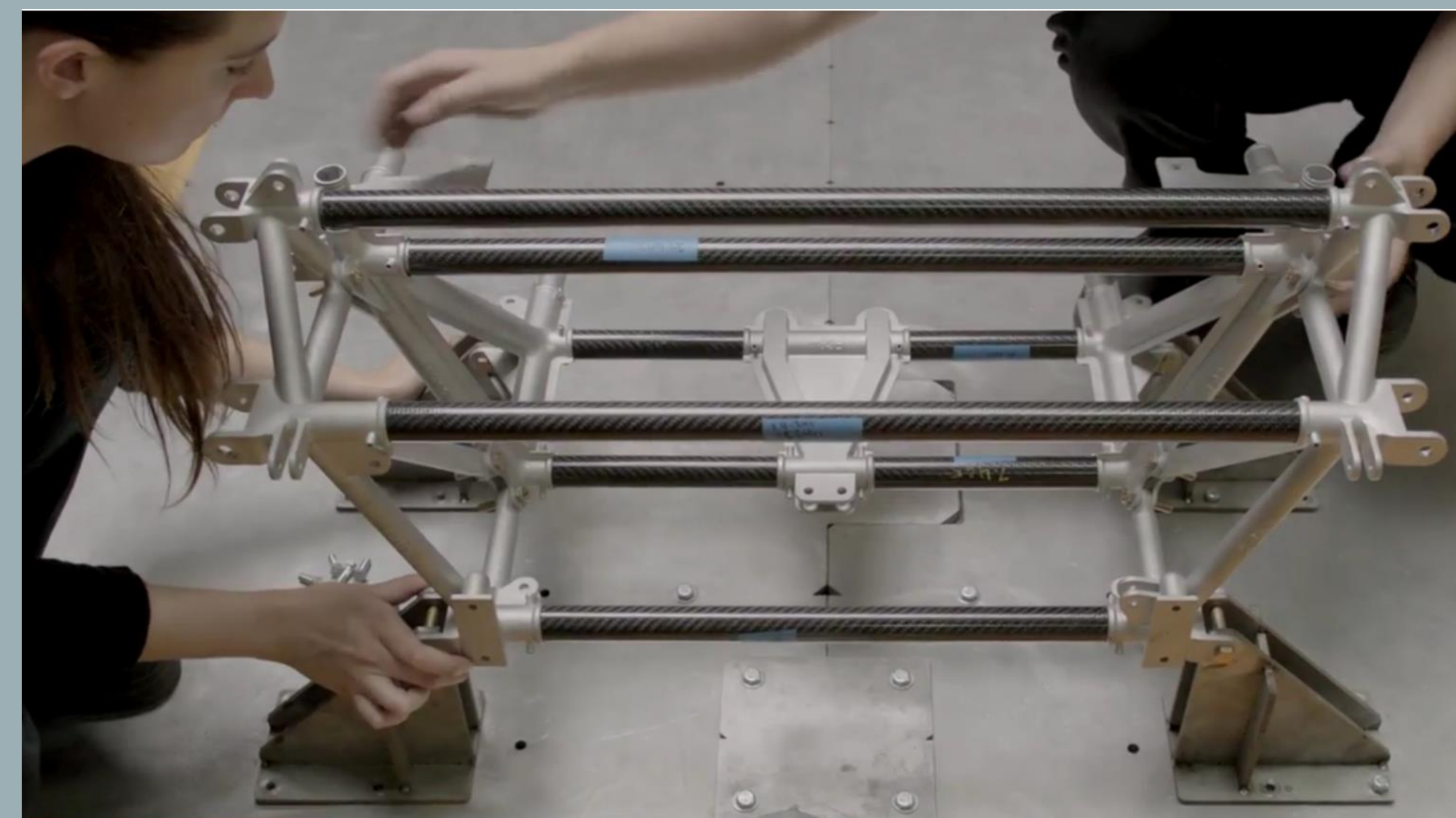


Figure 2 – Chassis nodes and carbon fiber tubing



Figure 3 – Blade supercar

DIRECT METAL LASER SINTERING	SUBTRACTIVE MANUFACTURING
Supply Chain Differences	
• Production near consumer	• Centralized production
• No need for tooling	• Different custom tooling for each part
• Reuse excess material	• Excess material is lost
• Short production phase	• Longer time to market
Product Design Differences	
• Highly customizable products	• Mass-produced, identical products
• Stronger materials for more sustainable parts	• Weaker parts don't last as long
• Smaller number of more complex parts	• Greater number of simple parts

KATHERINE TODD, ANILA GHOSH