

THE STORY OF 4D

adidas & Carbon at it again.

adidas 4DFWD represents yet another breakthrough in design, product development, and manufacturing.

EPU 44 - The Next-Gen Elastomeric Resin

To meet the performance criteria of adidas' design team while also holding up to the durability demands of footwear, Carbon's materials scientists used software to discover and simulate 50,000 virtual chemical formulations while searching for the perfect combination of characteristics for the 4DFWD midsole. Their search returned many possible formulations that the team began printing and testing. The end result: EPU 44, a lighter and stiffer material that's also optimized for durability, print accuracy, and efficiency.

40%
Bio Based

60%
Stiffer

The adidas Testing Gauntlet:
100k Stress Cycles, 250 Miles Running, Abrasion, UV Stability, Color Fastness

Number 1 in Running

The 4DFWD is a one-of-a-kind midsole with a built-in mechanical advantage and it's the latest example of innovation through the power of unrestricted design, a hallmark of the partnership between adidas and Carbon.

Where it All Began

While we got to where we are really fast, it wasn't overnight. Challenge and innovation has defined the story of 4D since 2016.

1 4D Futurecraft Development

Years of high-precision athlete data gave adidas the dream of creating a shoe with variable properties across the midsole to improve performance for different sports, but this ability couldn't be done with traditional injection or compression molding.

With this new exciting capability and Carbon's rapid product development process, adidas quickly churned out over 50 different lattices for the 4D midsole before landing on the current design, 10x the number of iterations when compared to their traditional processes.

2 Elastomeric Material Development

EPU 41 is a high-molecular weight elastomeric resin that would enable the new midsole to be responsive and supportive while returning energy to the runner. The Carbon team iterated over 150 different material formulations to achieve the desired mechanical properties.

UNC Blue:
The Pool Lab in Redwood City features the colors of co-founder, Joe DiSimone's alma mater, UNC Chapel Hill.

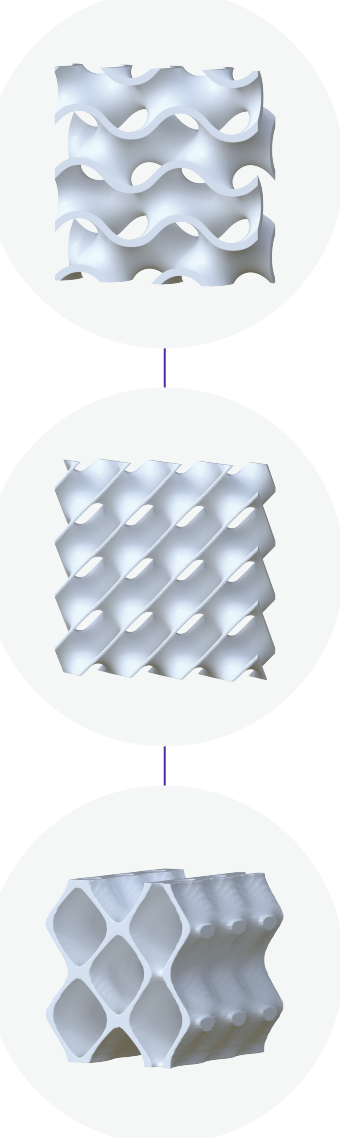
4DFWD

The 4DFWD midsole translates the downward forces that are generated when a runner's foot strikes the pavement into forward momentum. This innovative effect reduces braking forces while moving the runner forward.

Bow-Tie Base Cell

At the heart of the 4DFWD is the bow-tie cell that shears forward under vertical stress. The unique, anisotropic shape was selected after an exhaustive search through a database of over five million possible cell shapes to find exactly the right mechanical response.

Lattice for Special Effect:
The Carbon platform makes it possible to leverage the unique properties of anisotropic lattices. Here are just a few:



Digital Light Synthesis

adidas is constantly evaluating new emerging technologies that can help deliver next-level performance for their customers. Additive manufacturing would give adidas' designers new capabilities, allowing data to truly inform design. After research was done to investigate many 3D printing platforms, it was determined that Carbon's materials and printing process was exactly what they were looking for.

However, adidas found new design freedom in the Carbon platform with the ability to tune specific performance zones in a single monolithic design. This ability allowed adidas to unlock lattice designs with multiple durometers and free of the foam found in traditionally constructed midsoles.

The monolithic, lattice design of 4D comprises over 10,000 individual struts that enable the precise tuning of the midsole for performance—increased lattice density provides support, while decreased density creates cushioning, giving runners lasting comfort and responsive feedback.

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3 4D Futurecraft Manufacturing

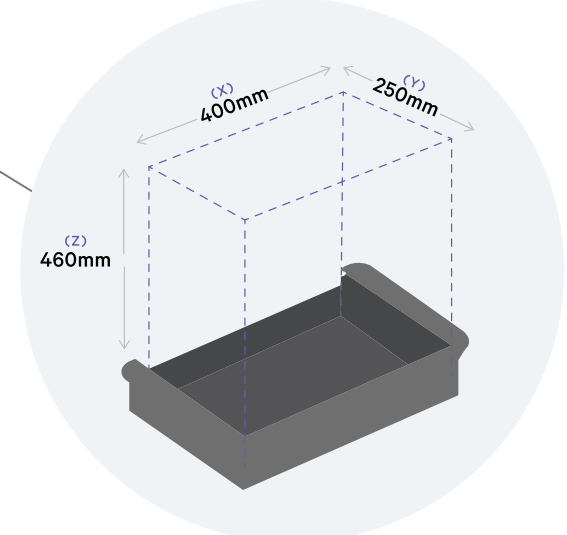
The Carbon L1, with its build volume at 400 x 250 x 460 mm (15.7 x 9.8 x 18.1 in) accommodates the printing of a pair of midsoles flat on the platform. The speed and accuracy of the L1 would give adidas the production capabilities needed to mass produce the new midsoles.

Carbon established an incubator factory with the new Carbon L1 printers in its Redwood City facility to develop and validate the processes necessary to produce the 4D at scale, with a target of printing 100,000 midsoles by 2018.



Production Details:

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Printer Platform: Carbon L1
Material: EPU 41
Print Time per Pair: ~30 min
Post-Processing: Solvent-Free Spinning



Millions of
midsoles printed
and delivered



Four different midsole
models, in running and
life-style categories



Four color
variations

