

HP 3D Printing enables **Van Raam** to achieve efficient short-run production of bicycle parts



Data courtesy of Van Raam



With HP Multi Jet Fusion technology, **Van Raam** can produce short runs of parts for their rickshaw-style bicycle, the ‘Chat’ while saving costs and production time



Data courtesy of Van Raam

Introduction

For nearly a century, Van Raam has produced a wide range of bicycles. The product range includes: tricycles, side-by-side tandems, scooter bikes, wheelchair bikes, tandem bikes, low step-through bikes, and walking aids. During the last 30 years, Van Raam became a company that specializes in designing and manufacturing special-needs bicycles. All production takes place in Varsseveld, a town in the Netherlands. Van Raam’s Dutch-quality special-needs bicycles are designed for adults and children with physical disabilities; for customers who want more stability and security while cycling; or for those who prefer to ride as passengers rather than pedal on their own.

Most of Van Raam’s customer base is located in Europe and North America, but Van Raam bikes can be found all over the world. Each bicycle is manufactured using innovative, quality, and sustainable techniques and is designed based on the customer’s individual needs and preferences. Customers can browse bicycles on Van Raam’s website and design their own with various structure, color, and accessory options.

Van Raam collaborates with Delft University of Technology to implement innovative designs and create modern bicycles.

In 2019, Van Raam’s rickshaw-style bicycle, the “Chat,” was awarded first place in the Special Purpose Bikes category at the Eurobike Gold Awards.

- **Industry**

Mobility and transportation

- **Sector**

New mobility

- **Objective**

Low-volume production of final parts for the “Chat” rickshaw-style bicycle while decreasing production time and costs.

- **Approach**

Van Raam adopted HP Multi Jet Fusion technology to print parts that are durable enough to withstand the weight of a bicycle and to print in low volumes to satisfy on-demand orders.

- **Technology | Solution**

HP Multi Jet Fusion technology, HP Jet Fusion 4200 3D Printing Solution

- **Material**

HP 3D High Reusability (HR)¹ PA 12

1. HP Jet Fusion 3D Printing Solutions using HP 3D High Reusability PA 12 provide up to 80% powder reusability ratio, producing functional parts batch after batch. For testing, material is aged in real printing conditions and powder is tracked by generations (worst case for reusability). Parts are then made from each generation and tested for mechanical properties and accuracy.

Challenge

Because each of Van Raam's bicycles is designed and manufactured based on the unique needs of customers, each type is printed in relatively low quantities, from a few dozen to a few thousand per year depending on demand. These production volumes are not high enough for Van Raam to justify injection molding as a production process considering the time and cost it takes to make each mold. This led Van Raam to explore manufacturing with 3D printing technologies instead.

To prototype and produce parts for their special-needs bicycles—such as small bike covers, assembling and production tools, and

components like cover rings and cover caps—Van Raam first used deposition modeling (FDM) machines but soon learned that because they wanted to print a large number of components, they needed a technology that could keep up, and FDM wasn't cutting it.

“We wanted to keep innovating, and we wanted more production and higher numbers of 3D printed parts,” said Sjoerd ter Horst Additive Manufacturing Engineer at Van Raam.

Solution

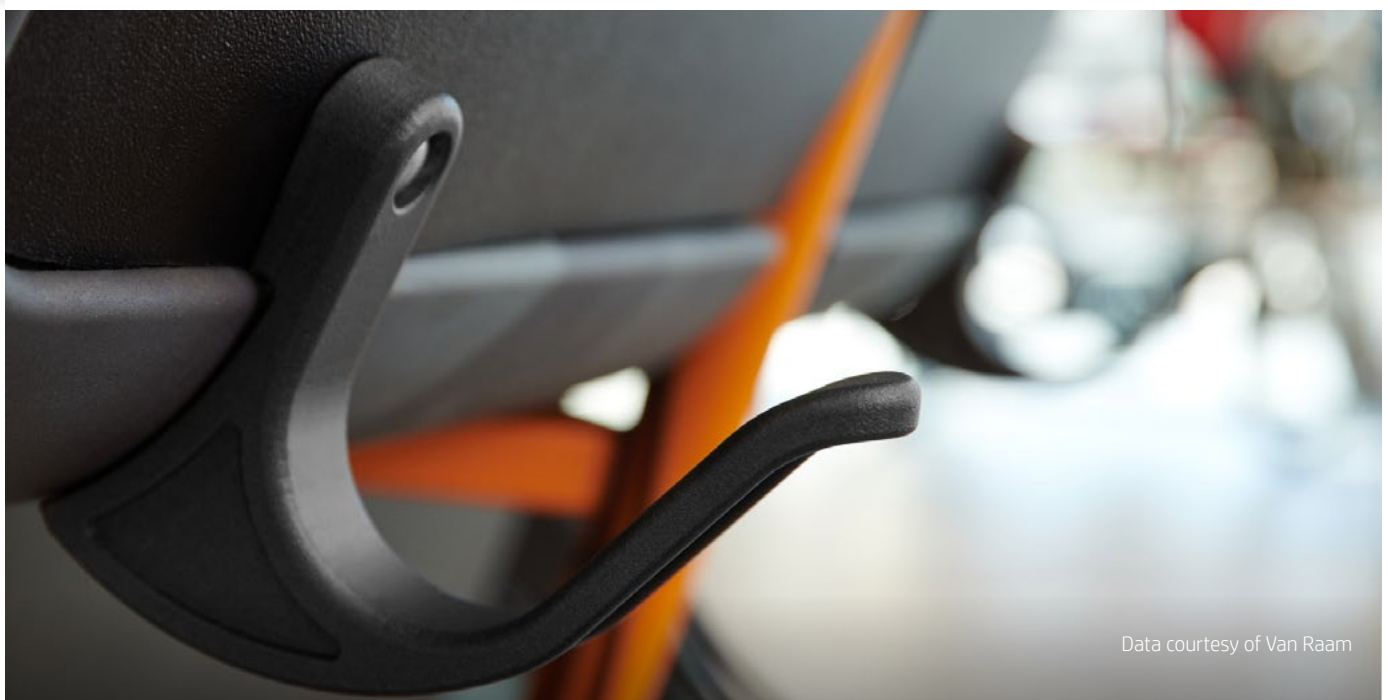
Unsatisfied with just FDM technology, Van Raam learned about HP Multi Jet Fusion technology through a business associate and ultimately chose to try it in order to help increase production and produce more robust final parts, specifically for their new “Chat” bicycle model.

“We decided to use HP MJF because we wanted to produce small series of components of which the design is easy to adjust, because the Chat is a new bike in the Van Raam product range,” ter Horst said.

The Chat is a bicycle that allows children and/or adults with limited

mobility to ride comfortably in a front passenger seat while a cyclist pedals the bicycle. Resembling a rickshaw, the Chat can fit up to two adults or one adult and two children, and is affixed slightly below the front of the bicycle so that the operator of the bike can view the road without obstruction, as well as “chat” with the passengers.

Using the HP Jet Fusion 4200 3D Printer, Van Raam produced six different components (a total of 10 components) for the Chat: the adjustable kickstand/footrest that keeps the bike in place when stationary and simultaneously lowers the front footplate to assist passengers with entry into the chair; parts that comprise the canopy storage mechanism when the canopy is not in use; and fixation brackets for the wheel covers.



Result

Since adopting HP Multi Jet Fusion technology, Van Raam is substantially scaling their production of final parts using 3D printing. Engineering teams now have the freedom to create and experiment with new part designs that they are confident will be durable enough to withstand the weight of a 216-pound bicycle.

Without the need for expensive and time-consuming molds required with injection molding, Van Raam is able to save costs and production time.

“With new parts, we also try to focus on ‘Design for assembly’ (DFA),” said ter Horst. **“This means that we try to design the parts in such a way that the assembly process is simplified and accelerated. For example, integrating multiple functions in one printed part (e.g., a printed hinged part) reduces the need to assemble different parts on the**

bike, which in turn saves assembly time.”

With HP Multi Jet Fusion, Van Raam also can keep a digital inventory of their part designs and print a specific design when it is requested by a customer.

In the future, Van Raam envisions expanding their use of 3D printing and HP Multi Jet Fusion technology: **“We plan to apply more 3D printed parts on both existing and new bikes, and to create tools for production and assembly,”** ter Horst said.

“Our ideal future would be to have a whole stand-alone 3D printing production center inside Van Raam, with multiple HP [Jet Fusion 3D] printers and an R&D center, where we would always be looking for new applications for 3D printed parts. With smart innovations and applications, we can develop smarter and more efficient ‘high-end’ bikes.”



Data courtesy of Van Raam

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Learn more about Van Raam at vanraam.com

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