

CASE STUDY: 3D PRINTED FOOTRESTS FOR  
ALSTOM ELECTRIC PASSENGER TRAINS SAVE  
MORE THAN 20K EUR AND 172 DAYS OF LEAD TIME

**LOCTITE**<sup>®</sup>

## LOCTITE 3D PRINTING IMPLEMENTS FIRST 3D PRINTED PARTS IN AN ALSTOM AGV, HIGH-SPEED, ELECTRIC TRAIN

*Exterior shot of an Alstom AGV, very high-speed, multiple unit electric passenger train*

### Background

Alstom is a multinational company that provides sustainable mobility solutions, from high-speed trains, metros, monorails, and trams to turnkey systems, including services, infrastructure, signaling, and digital mobility.

Alstom currently has a 3D printer on-site to manufacture 3D-printed parts utilizing DLP technology for end-use part production. Alstom has generated more than 15.2 billion EUR in sales (FY 2021/2022) and is a Fortune 500 company.

### APPLICATION:

Footrests for high-speed passenger trains

### MATERIAL:

LOCTITE 3D 3843 HDT60 High Toughness  
Matte Black

### TECHNOLOGY:

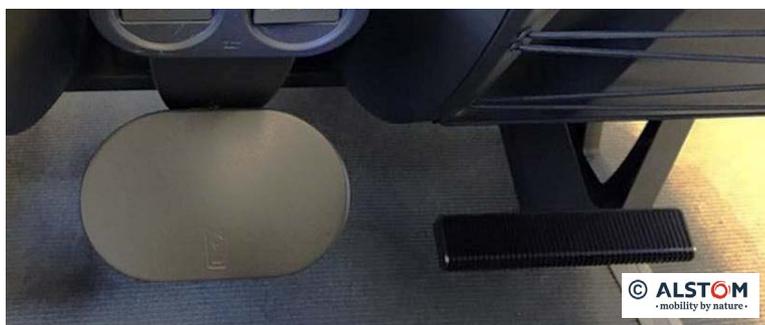
Nexa3D NXE400 Printer

### The Challenge

An Alstom fleet that has been running for ten years was experiencing part degradation. The Alstom Maintenance team in Nola, Italy, needed to replace two-hundred footrest parts due to damaged or vandalized parts aboard the AGV ETR575, a very high-speed, electric multiple-unit passenger train.

Alstom wanted to produce additional parts, but the original supplier could not provide replacement parts due to stock availability and mold discontinuity. To replace the footrests, which were experiencing degradation, Alstom needed to re-purchase expensive tooling for this single application.

Alstom also explored alternatives, such as a new mold, which was too expensive to produce spare parts. They also spent some time exploring other manufacturing technologies, such as milling, but the footrests were almost impossible to manufacture in this fashion. Alstom then decided to make the switch and explore [3D Printing solutions](#).



*Close up of the passenger cabin of an Alstom AGV cabin showing footrest parts printed with LOCTITE 3D 3843 HDT60 High Toughness, Matte Black*

**Henkel**

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## The Solution

Technology: [Nexa3D NXE400](#)

Material Selection: [LOCTITE 3D 3843 HDT60 High Toughness Matte Black](#)

Cleaner: IPA

LOCTITE 3D 3843 HDT60 High Toughness Matte Black				
43 %	1806 MPa	51 MPa	53 J/m	63°C
Elongation at Break	Young's Modulus	Ultimate Tensile Strength	Impact Strength (Notched)	Heat Deflection Temperature



Close-up of footrest parts (10 in x 2 in) printed with LOCTITE 3D 3843 HDT60 High Toughness Matte Black

Alstom discovered that 3D printing was the best solution to manufacture spare parts. Initially, Alstom looked into SLS systems, but this alternative was ultimately not chosen because of the expensive post-processing required. They eventually turned to the [3DZ Service Bureau](#) for their expertise in guiding professionals and companies in choosing the most suitable solution for industrial production. They needed to consider the long-term stability and durability of the 3D-printed parts, as they would be subject to intense wear and tear in a commercial setting. After considering this, the LOCTITE 3D printing portfolio was chosen as the path forward.

After evaluating the LOCTITE materials portfolio, Alstom determined that LOCTITE 3D 3843 HDT60 High Toughness in Matte Black was the best solution for their application requirements. LOCTITE 3D 3843 HDT60 High Toughness in Matte Black is an ABS-like general-purpose resin with high-impact strength and moderate HDT. It displays high-green strength, which enables it to print accurately and function without needing a heated build platform.

Alstom was required to select a material that would provide excellent surface quality for a customer-facing part. LOCTITE 3D 3843 HDT60 High Toughness exhibits a superior finish and moderate temperature resistance, which ultimately sealed the choice for this application.

## BENEFITS

Alstom received the footrest parts and immediately implemented them in a passenger saloon of an AGV ETR575, a very high-speed, electric multiple-unit passenger train. Ultimately, they reduced their lead time by 96% and cut overall costs by 25%. Alstom's original lead time was 180 days, but after turning to LOCTITE and Nexa3D's NXE400 platform, their lead time is only one week.

By leveraging 3D printing and Additive Manufacturing, the team saved more than 20,000 EUR and 172 days of lead time, which is monumental from an operations standpoint.

The switch to DLP technology allowed for fast iterations and turnaround and was adopted as an on-demand manufacturing solution. It is additionally being scoped out for additional projects in the Alstom fleet of trains.

**"We are very interested in the technology, so we bought an NXE400 machine to have the internal capability to print these prints in combination with LOCTITE materials. We appreciate that this resin can withstand customer specifications, and we are considering printing additional parts for our other fleet of trains." – Lorenzo Gasparoni, Alstom**

Want to learn more about Henkel's unique material solutions for the additive manufacturing industry? Visit Henkel's LOCTITE 3D Printing at [LoctiteAM.com](#) or reach out to us via [loctite3dp@henkel.com](mailto:loctite3dp@henkel.com)

About **LOCTITE**

LOCTITE Additive Manufacturing delivers unique photopolymers with production capability, customized resins and engineering services to identify the best application to address your needs. With a constantly growing portfolio of high-performance materials, specialized equipment and post-processing solutions, LOCTITE overcomes the limitations of conventional 3D printing to enable additive manufacturing for the production of durable, functional parts. Through its strategic partnership with technology leaders for specialized equipment, LOCTITE is driving the adoption of 3D printing beyond prototyping and toward the production of final parts. ([www.LoctiteAM.com](#))

About **nexa3D**

Nexa3D is passionate about digitizing supply chain sustainability. The company makes ultrafast polymer 3D printers, that deliver 20x productivity advantage, affordable for professionals and businesses of all sizes. The company partners with world-class material suppliers to unlock the full potential of additively manufactured polymers for volume production. The company makes automated software tools that optimize the entire production cycle using process interplay algorithms that ensure part performance and production consistency, while reducing waste, energy, and carbon footprints. For more information, please visit [www.nexa3d.com](#).