

Achieving UL 94 V0 Fire Ratings on Parts Printed with HP Multi Jet Fusion Technology (MJF) and PostPro Vapor Smoothing



Industry
Automotive



Material
HP 3D High Reusability (HR) PA 12 Flame Retardant (FR)

Achieving UL94 V-0 flammability ratings with 3D-printed polymer parts presents a significant challenge. In addition to meeting strict fire safety standards, components must often deliver airtight performance under pressure and exhibit surface quality comparable to injection-molded parts. Without appropriate post-processing, the inherent surface porosity of additively manufactured parts can limit their use in such demanding applications.

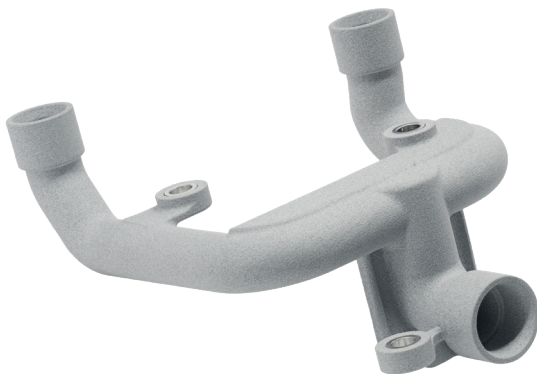
A Protolabs customer faced these requirements when developing automotive components. By combining HP MJF 3D printing with PostPro vapor smoothing, they achieved sealed, low-porosity surfaces that passed leak testing at 6 bar and met UL94 V-0 flammability requirements. This enabled the use of parts printed using HP 3D HR PA 12 FR in demanding end-use applications where traditional additive manufacturing alone was not sufficient.

About the Application

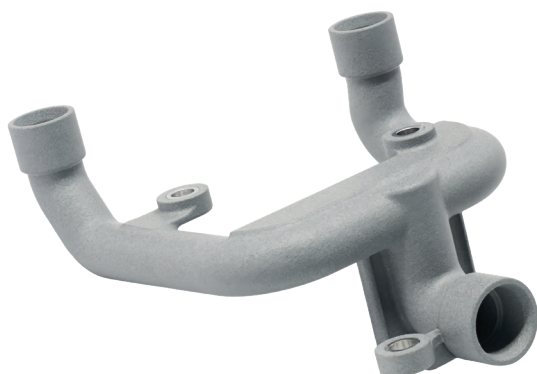
The components are used as coolant distributors within the engine bay of a high-performance sports car. In this environment, the parts must withstand internal pressure, elevated temperatures, and strict safety requirements.

In addition to mechanical performance, surface quality is critical. The components must be airtight, resistant to leakage, and comparable in finish quality to injection-molded parts.

While additive manufacturing enabled design flexibility and reduced lead times, achieving the required surface sealing remained a key challenge.



BEFORE



AFTER

Challenge & Solution

The application required:

- UL94 V-0 requirements
- Airtight performance under 6 bar internal pressure
- Injection mold-like surface quality
- Sufficient durability for engine bay conditions

Although the HP MJF technology enabled the production of complex geometries, the combination of HP 3D HR PA 12 FR material with vapor smoothing had not previously been validated, and no internal data was available.

To address this, the customer conducted internal testing using PostPro vapor smoothing. The process seals the surface of the printed parts, reducing porosity and improving overall integrity.

The results confirmed that HP 3D HR PA 12 FR treated with vapor smoothing passed UL94 V-0 testing at a wall thickness of 2.7 mm and achieved the required leak tightness at 6 bar.

The Difference Made by PostPro Vapor Smoothing

Vapor smoothing enabled several critical performance improvements:

- **Surface sealing:** Reduced porosity improves airtightness and supports leak-tight performance under pressure
- **Leak resistance:** Components successfully passed leak testing at 6 bar internal pressure
- **Certified performance:** Parts meet UL94 V-0 Flammability requirements for automotive applications
- **Improved surface quality:** Surface roughness was significantly reduced from Ra 10.6 μm / Rz 59 μm (as-printed) to Ra 3 μm / Rz 16 μm after vapor smoothing.



Conclusion

This case demonstrates how combining HP MJF Additive Manufacturing with PostPro vapor smoothing enables 3D-printed components to meet the strict requirements of automotive applications, including flammability certification and leak-tight performance under pressure.

By delivering sealed, high-quality surfaces, vapor smoothing extends the use of additive manufacturing into applications that require reliability, safety, and regulatory compliance.

As a result, parts printed using MJF technology and HP 3D HR PA 12 FR material with vapor smoothing has been added to the customer's standard offering, supporting new applications and broader adoption of additive manufacturing in automotive production.

Benefits of AMT PostPro Vapor Smoothing for Automotive, Railway, Aerospace and Electronics Applications:

- ✓ Airtight components through reduced surface porosity
- ✓ Compliance with UL94 V-0 flammability standard
- ✓ Improved durability for demanding environments
- ✓ Injection mold-like surface finish
- ✓ Enables new end-use applications for 3D-printed parts



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