ArcelorMittal Powders

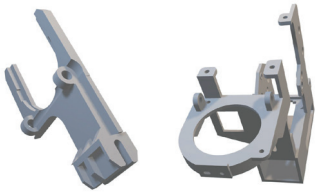
Plotting the path to productivity: Addimen beta-tested the AdamIQ™ algorithm

Productivity is the most significant issue in Additive Manufacturing. The machines are expensive and depreciation costs are the major factor in the cost of parts produced. Maximising the output of the equipment is the best way to drive down costs per part. As part costs come down, the range of applications addressable with Additive Manufacturing increases.

ArcelorMittal has, for its traditional steel-making operations, built a significant expertise in solving complex multi-variant problems. Addressing the complexities of the laser powder bed fusion (LPBF) technology, the company has adapted some of this knowledge into an optimisation algorithm to maximise laser up-time, minimising printing time.

AdamIQ™ algorithmic optimisation happens as a final step of build preparation. All build job parameters and configuration should be prepared and frozen by the customer (printer) in their version of the build job. The AdamIQ™ optimisation is an add-on that improves the customer's build job in a single pass. A few minutes of re-vectorisation can save hours of printing time.

Addimen, a company specialized in professional 3D printing of high value-added parts, was a beta-tester of this optimisation service offered by ArcelorMittal Powders and was able to confirm productivity gains on a first series of commercial parts.



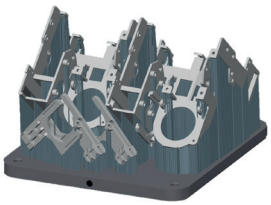
The two parts that are the subject of this case study are part of a tilting structure.

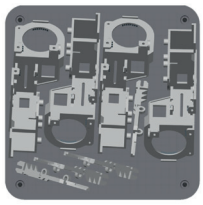
Printing specifications

Customer	Addimen (Gonvarri)
Material	AdamIQ™ 316L
Machine	Renishaw RenAM500S
Build height	149.3 mm
Number of layers	2,488
Total part volume	259.5 cm^3
Total support volume	327.5 cm^3

Build job parameters

Layer thickness	60 µm
Power	1 laser, 275 W
Speed	1 m/s
Hatch distance	0.11 mm
Focus diameter	80 µm
Printing strategy	Meander (original)
Layer rotation	67 °
Inert gas	Argon
Preheating	None
Contour	2 border





Results

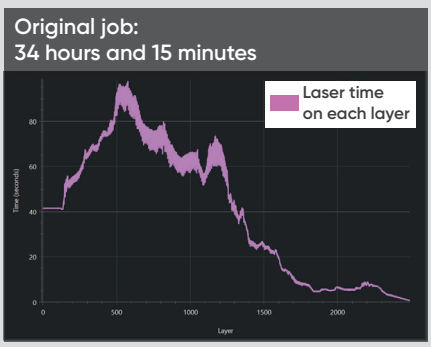
In this case study, Addimen first did their standard build job preparation and, for their parameters and single laser, calculated a build time of 34 hours. They then applied ArcelorMittal's AdamIQ™ productivity algorithm in one-click on the build job and the build time was reduced to 27 hours.

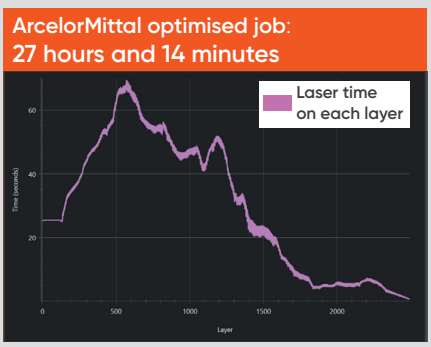
Saving in total print time

20%

This productivity increase can allow Addimen to be competitive using the single-laser machines in its existing installed machine base when comparing with more recent multi-laser equipment.

ArcelorMittal Powders will soon deploy a beta version of its service in the cloud, that will allow anyone equipped with a Renishaw 500-Series printer to try out AdamIQ™ PAAS - Productivity As A Service.





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Methodology

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1. Part design and mesh (Unchanged)
2. Preparation of the build job (Unchanged)
3. **ArcelorMittal productivity algorithm optimisation (Additional step)**
4. Part printing (Faster)

ArcelorMittal's cloud-hosted AdamIQ™ algorithm converts the original build job into a new, optimised, one.

Layer by layer, the usage of each laser is optimised for the geometry to be printed. Printing parameters are unchanged by this process, which for some applications is critical to part certification. Heat levels are maintained within the limits of the original build job. The new, optimised, build job is made available to the end-user to print and process as usual.

Joseba Sagarna
Manager and co-founder
Addimen

Additive Manufacturing technology is evolving very fast: new machines with more lasers working simultaneously and more competitors... To remain competitive in this fast-changing environment and maintain our position without making major investments, we need to find ways to leverage our existing machine fleet and extend the return on investment of our installed base. This collaboration with ArcelorMittal allows us to reduce printing time while maintaining consistent quality in 316L parts. AdamIQ™ Steel Powders and its approach to Additive Manufacturing with Productivity as a Service is a breakthrough for us.

Juan Manuel Martínez
Senior Researcher
ArcelorMittal Global R&D

This advancement is the culmination of extensive digital expertise derived from our R&D steel manufacturing operations. We are bridging our historical steel knowledge with cutting-edge digital and Additive Manufacturing technologies. Our collaboration with Addimen has been instrumental, confirming that we are meeting actual market demands: we achieved a 20% reduction in printing time while maintaining existing printing parameters and build job definitions, using only a single laser. We are now ready to multiply the gains and push the logic further with Addimen as beta tester of our multi laser algorithm on their multi laser machines.

Wrapping up...

Productivity boost. In LPBF, laser assignment is vitally important. In industrial build jobs or serial production a correct laser assignment is key to maximising the output of the existing equipment.

Scalability. As algorithmic optimisation only changes laser paths to maximise laser on-time, this approach is highly scalable. It can be integrated into existing manufacturing setups without significant changes in hardware or operational procedures.

Material agnostic. The solution is a purely mathematical optimisation of the laser path which leaves other printing parameters (e.g. layer thickness, hatch distance, laser power) unchanged. It is therefore material agnostic and works across all materials being printed. Some limitations do exist with respect to materials that are prone to cracking or warping, which can be addressed with our technical team.

Interested? Consult our experts to validate the suitability of your own test case.

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We are committed to your productivity!

Visit **powders.arcelormittal.com** or e-mail us at **contact.powders@arcelormittal.com** to talk to our experts.

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