# AUTHENTISE MONITOR

Intelligent Process Monitoring for Industrial Additive Manufacturing

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**AUTHENTISE**

*Authentise Monitor delivers market-leading options for two core quality assurance needs: melt pool monitoring and detection of defects in the powder bed during layer preparation. To read about the current state of process monitoring in additive manufacturing, download our [background brief](#).*

## Powder Bed Monitoring

Authentise's computer-vision-based print monitoring tool automatically detects defects during each layer preparation on the powder bed.  Where current solutions rely on manual inspection or comparison between simultaneous machines, Authentise Monitor filters out background noise in the image and detects ridges or pits in the powder bed and signals to the machine to make another pass at the bed to address the issue. Multiple bed failures can indicate bad powder stock and Authentise uses machine learning to identify if the failure is mechanical or faulty stock so that proper action can be taken to address the issue. Better stock means greater consistency between runs which leads to reliable parts.

Additionally the system collects data after each layer of printing has occurred. The system captures images of the sintered layer and compares them against the simulated images to determine how closely the actual print layer matches the desired layer. If difference between the actual and expected layers is greater than a set threshold, the system triggers manual inspection or failure of the given part.

Authentise Monitor uses machine learning to identify if the failure is mechanical or material related

In some setups the system will analyse the temperature gradients between each layer of printing. An infrared camera is set up to take pictures of the powder bed and computer vision identifies hot and cold spots. This information is then provided to printing software that can modulate laser power to help prevent failures caused by thermal bleed across the powder bed surface and reduce imperfections in the finished part.

Setup for the Powder Bed Monitoring system consists of installing camera hardware above the powder print bed, installing the Authentise Monitor software, and running calibration. Once calibrated, the system automatically runs, determining when the powder bed contains defects or a printed layer doesn't match an expected layer and triggers re-coatings or other sends notifications to technicians as needed to correct the issue.

System measurements, actual vs expected layer variation, re-coating, and other machine parameter modifications made are exposed as reports in the same way as with the Melt Pool Monitoring system.  Reporting is available at various levels of detail, such as a run-to-run, day-to-day, or even as fine grain as an hour-to-hour or minute-to-minute time scale. Operators can set up alerts so that the machine will

inform them if the failure rate rises above certain thresholds. This gives operators the chance to inspect the print stock or the machine itself for damage and take corrective action before the problems grows into expensive replacements or downtime.

## Melt Pool Monitoring

Authentise brings real time analysis to melt pool monitoring. By using line-cameras which are synced with the laser, Authentise is able to overcome the major issues traditionally associated with melt pool analysis, and has created a system which can do real-time melt pool analysis and is working towards in-process modification. This creates parts with the same material properties between runs by directly measuring emerging variances and resolving them.

System setup consists of installing the hardware (usually an IR spectrum line camera) into the machine, installing the Authentise QA software, and running calibration. Once calibration is completed, the system operates in a way that is virtually transparent to the machine operator, only alerting the operator when certain thresholds are exceeded. Authentise is also working on automating the adjustment to the machine parameters during each print in the future.

Authentise brings real time analysis to melt pool monitoring.

The measurements and subsequent machine parameter modifications made are exposed to operators and technicians in the form of various reports. Reports can be setup to show various levels of detail, such as run-to-run, day-to-day, or even as fine grain as immediate alerts, an hour-to-hour or minute-to-minute time scale. These reports show laser power manipulation, print speed, melt pool size variance and other measurements that were taken and the decisions that were made to maintain quality.

## Authentise Monitoring Sandbox

Authentise deployed its machine learning algorithms on low cost FDM printers for you to test its solution. The system works with almost any off-the-shelf webcam which should be positioned so that it has a direct view of any object being printed. After an initial, one-time calibration step the camera is set up. From there technicians start a print and the rest is left up to the Authentise algorithms. The user can leave the area and the software will monitor the video feed automatically.

The printer is driven by Authentise cloud printing service which retracts the nozzle and uses the camera to take pictures of the print build every few layers. The computer vision algorithm compares the pictures to a render of the model up to the stage of the print on that moment

and looks for common deviations. If it senses any deviation between the render of the model and the object which is printing it immediately sends a text message or email to the user. The user can inspect the images or respond back with simple commands to 'pause' or 'stop' and the printer will stop printing. This enables the user to return to the print site, and possibly salvage the build before it's too late while also preventing any major filament waste or damage to the surrounding area or the printer itself. For more information or to request access please log on to vision.authentise.com.

## Summary

Current quality assurance solutions for AM rely on manual inspection or post-processing data which means late failure detection and wasted time and stock. Authentise brings intelligent systems and cutting edge software approaches to manufacturing engineering. Our systems detect variances as they happen allowing the machine to take automatic corrective action before a slight difference in input becomes completely failed output. Authentise brings full-loop process control to AM that ensures that what leaves the printer is what the designer intended every print, every time.

Please contact us to discuss how we can help bring monitoring intelligence to your Additive Manufacturing equipment.