

Title: PBF-LB/M resource efficiency and EOS M290 system instrumentation to collect build-specific life cycle inventory data

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Abstract: Additive manufacturing (AM) combined with design optimization may offer ways to create more sustainable products, where the main benefits are associated with weight reduction (minimal use of raw material), superior performance (reduced use phase environmental impacts), and supply chain simplification. Amongst metal AM technologies, laser-based powder bed fusion (PBF-LB/M) is maturing as a mainstream manufacturing method.

Despite its sustainability promises, the process is energy intensive due to multiple melting steps in material processing and heavy usage of shielding gas. To evaluate a “sustainability breakeven point” for a given design, an engineer needs to assess, among other lifecycle phases, the environmental impacts of the manufacturing process. However, there is currently very limited data available on the resource consumption of the PBF-LB/M process.

At Aalto we have implemented an addon data collection system on top of our EOS M290 to collect build-specific life cycle inventory data. The system logs, every second, the compressed air, energy, and argon consumption. Additionally, material usage and material losses are manually measured. In the industrial setting, a similar system could be used to provide customers with detailed LCI datasets for lifecycle assessment, for example to prove their superior product sustainability, or compliance with sustainability regulation.

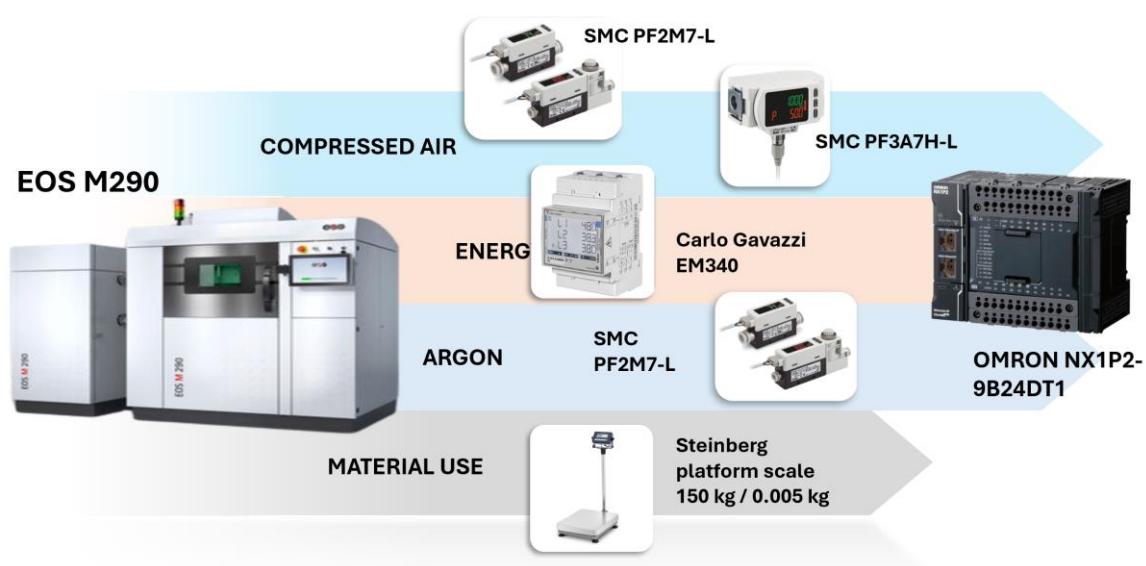


Figure 1. Simplified data collection architecture implemented on an EOS M290 PBF-LB/M system