

A Practical Framework for Economic Evaluation of Additive Manufacturing Technologies

Tomáš Cejpek¹ Jaroslav Kollmann²

Abstract

Additive manufacturing through 3D printing is becoming an important element of small-batch and custom production; however, the issue of determining real production costs remains insufficiently addressed. The aim of the article is to propose and verify a practical economic calculation model for FDM technology that is implementable in the MS Excel environment. The methodological framework is based on the identification of key cost items (material, labour, electrical energy, machine depreciation, and auxiliary materials) and their projection into a calculation model. Based on a model example, a summary cost table was created, which enabled an analysis of the contribution of individual factors to the final price. The results show that the most significant cost element is labour, while the share of material and energy is marginal. A comparison with market prices of similar products confirmed the validity of the model and its practical applicability. The contribution of the study is a simple and transparent procedure accessible to small businesses, educational institutions, and individuals. A limitation is its application only to plastic materials; future research should also encompass 3D printing with metals and extend the model to include environmental and life cycle costs.

Keywords: FDM technology, additive manufacturing, cost calculation, 3D printing

Doi: <https://doi.org/10.66414/mlabs.9720>

¹ Academic Assistant, Institute of Technology and Business in České Budějovice, Czech Republic. ORCID: 0000-0003-4717-9442

² Asst. Prof., Institute of Technology and Business in České Budějovice, Czech Republic. ORCID: 0000-0003-4110-145X