

SibFU Researchers Propose Simulation Model to Optimize Small-Batch Production

The researchers from Siberian Federal University have [developed](#) a simulation model aimed at optimising production capacity at enterprises producing small-batch discrete parts, for example, electronic equipment.



The model allows making quick calculation and, based on them, flexibly regulating the production cycle thus preventing overload or downtime of equipment, which positively affects the prompt implementation of product release plan and contributes to compliance with the specified delivery times. The developers used Tecnomatix software by Siemens PLM to create the model.

Efficient utilization of production capacities in a highly competitive environment, and the need to take into account the wishes of customers is a serious challenge that requires modern solutions. The Krasnoyarsk developers proposed a digital simulation model which will extremely accurately predict the optimal load for production, help unload its problem areas, and, at the same time, increase the profitability and competitiveness of the company, using this model, in the market.

*'The study is dedicated to the analysis of options for building the architecture of the planning information system in small-batch production. We used a Krasnoyarsk enterprise developing radio-electronic equipment as a test site. Complex electronics are produced by a specific order in small batches, and even within one batch, there may be a large number of product manufacturing options. We focused on the real indicators of the production plan of the enterprise and developed a simulation model that helps to optimize the production schedule, taking into account the specifics of small-batch custom production. We can receive orders for equipment one by one, or there can be none for some time. Sometimes a manufacturer has a dilemma — should they take an urgent extra order, or short-term profit will result in damage to reputation if other orders are not completed on time. How to avoid overlaps or production downtime in such cases? The answer is applying lean management principles, synchronizing the work of equipment, create a continuous flow of converting parts and components into a finished product,' said **Denis Kapulin**, research leader, head of the specialised department of information technology at the electronic production, Siberian Federal University.*



The researchers applied Tecnomatix, Siemens plant simulation software, for the model.

'The relevance of simulation modelling is out of doubt in the pre-production phase; besides, it is a common practice for foreign corporations. For example, Volkswagen, when opening a plant in Kaluga, carried out such simulations to organize the smooth operation of the shops. In Russia, business owners are also gradually concluding that modelling the production process in advance means avoiding unpleasant surprises in the future and beating competitors. In terms of innovation, we proposed to integrate a simulation model into a production planning system to implement the concept of adaptive production that can quickly respond to changes,'

added **Denis Kapulin**.

According to the Krasnoyarsk developers, calculating the production process in advance is not enough, it is also necessary to respond promptly to emerging additional factors, such as disruptions in supplies or parts, or handling unplanned orders. It takes all the running you can do, to keep in the same place, as in a famous story by Lewis Carroll.

'In the case of custom-made small-batch high-tech production, managers need to keep the finger on the pulse and make adjustments to the plan constantly. Sometimes the number of components in one product reaches tens of thousands of units, and there are several hundreds of such products to be produced – it is simply unrealistic to recount all this manually every time the input is changed. Simulation modelling is a tool that, firstly, will speed up adjustments to the production plan many times over, and secondly, will do this not only in crisis but practically in the background,' summed up the scholar.

By the way, the research is only gaining momentum and will be implemented at Siberian Federal University for another two years.

The study is financially supported by the Russian Foundation for Basic Research within the framework of scientific project No. 20-07-00226.

[Пресс-служба СФУ](#), 16 January 2021

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Web page address: <https://news.sfu-kras.ru/node/24103>