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## Section 2: Digital twin of production (Big Data)

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### Application of local non-stationary metallurgy for the additive manufacturing of metal and polymetal products



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In the last decade, the additive techniques find their application in various branches of industry. In the first turn it is connected to the fact that the use of such techniques allows reducing expenses for materials in the course of production due to minimization of mechanical treatment, as well as to increase performance and reduce the manufacturing time of products. The key feature of these methods is a possibility to obtain the products of specified shape “as-built”, with separation of manufacturing to three stages: preparation of CAD-model of component, 3D printing of product as per selected model, and the final processing to obtain the final component.

For manufacturing the large sized products in aviation and aerospace branches, the most applicable is the technique of Electron Beam Additive Manufacture (EBAM) based on wires or rods. It possesses the most preferable features, comparing to the competitors: simple implementation and high manufacturing speed.

The Electron Beam Additive Manufacture from wire/rod is characterized by the process of local non-stationary metallurgy, when the wire is directly fed to a molten pool created by the electron beam. It allows to finely monitor the material microstructure and to control its properties in the different areas of the same article. Due to application of the multi-wire feed technique, there is a possibility to form polymetal products with a gradient of physical&mechanical properties, and the use of feeding the metal rods will allow to implement 3D printing of the heat-resistant alloy products.

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## Digitalization of industrial thermal processes and units



This report will illustrate the basic features and possibilities of equipment for the Wire Electron Beam Additive Manufacture which is produced at the Institute of Strength Physics and Materials Science of the Siberian Branch of the Russian Academy of Sciences, as well as the examples of its application in the real economy sector, and also the promising trends of using EBAM in commercial production.

There may be changes in the time schedule.  
See the current information on the [website](#)

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