Cutting of hollow profiles using electromagnetic fields

Abstract:
Semi-finished parts with a hollow profile are commonly used in plant and container construction or automotive engineering. Mandatory cutting operations within the process chain are normally done using laser or metalcutting manufacturing. These processes are cost intensive due to expensive machines, tools, laser gas, indispensable lubrication and a long part production time. The application of pulse magnetic fields as an alternate concept for cutting these parts earns diverse advantages. There are no additives necessary and a high quality of the cut surfaces can be achieved for example. Furthermore cutting times and energy demands can be reduced significantly. The method works with an electric pulse which is discharged into an inductor. The discharge induces an electric pulse to the work piece. As a result of this process an electromagnetic field is generated between the inductor and the work piece which forms the hollow profile. If the energy of the electric pulse is sufficient, the material will be cut just with a stagnant tool. In order to cut a hollow profile three forms of electromagnetic field shapes can be used: expansion, compression and compression with the use of a field former. In all three forms a cylindrical coil is implemented. Research done at...
our institute shows, that semi-finished parts cut with the method of using magnetic impulse cutting (IMC) have a sheared edge without burr. The fracture surface is homogeneous and free of cracks. These results are given for all three field shapes and depend on several process parameters as for example the loading energy, the discharging frequency or the cutting tool geometry. The study quantifies the influence of these parameters. Additionally possible cutting geometries and cutting processes like trimming or notching are shown.

**Stichworte:** blanking; magnetic pulse; high speed

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