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A new approach of tube bugling based on electromagnetic attractive force

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Small tube bulging by electromagnetic forming is a challenging issue because the coil must be placed inside of the pipe to generate repulsion electromagnetic force. To solve this problem, a novel method for forming pipe fittings by using electromagnetic attraction is proposed. To generate an electromagnetic attraction, a special current is used to drive the coil. This special current consists of a wide pulse current and a narrow pulse current. For the sake of verifying the feasibility of this method, a circuit-electromagnetic-structure coupling finite element model was built to analyze the deformation process, and an electromagnetic forming system with two sets of power supplies was designed and fabricated. Two capacitor bank power supplies (1MJ/25kV/3200 μ F & 75kJ/25kV/240 μ F) have been used to energize the coil which produces a pulsed magnetic field. A series of bulging experiments used of AA 1060 aluminum alloy tubes with a thickness of 1mm have been carried out on this system. The tubes were successfully deformed and the maximum deformation reached 5 mm.

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