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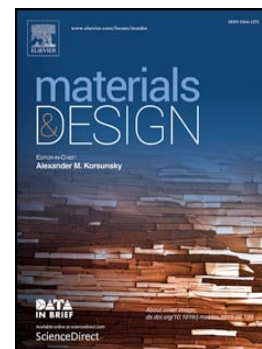
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The combined lateral and axial extrusion process of a branched component with two asymmetrically radial features

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ABSTRACT

A unique combined lateral and axial extrusion process was developed to form a huge solid branched component with two asymmetrically radial features for AP1000 primary pipe applied in nuclear power plant. To support the forming process design, the material model of 316LN stainless steel was established based on the experimental data obtained through isothermal compression tests. The finite element simulation was firstly employed for the feasibility study of this process by using the 1:3 scale model of AP1000 primary pipe. At the junctions of two branches and the main body, higher plastic strain and strain rate significantly facilitated grain refinement and limited the formation of defects. The grain refinement would be critical for ensuring the quality of the fabricated component and prolonging its service life. The results revealed that this unique extrusion process is not only able to fabricate the prototype component with the needed geometry, but also refine the austenite grains at key locations of the final component, which ensured design right the first time for this unique

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