SINGLE POINT INCREMENTAL FORMING PROCESS ON FORMABILITY OF CONICAL CUPS FROM AA6802 ALLOY

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ABSTRACT

Single Point Incremental Forming (SPIF) is an innovative sheet metal forming technology that produces complicated geometries without the use of dedicated dies, making it ideal for rapid prototyping and low-volume production. In SPIF, a localized tool deforms the material layer layer, following a preset tool path, to achieve a specific shape, such as conical cups. When manufacturing conical cups from AA6082 aluminium alloy, process parameters such as tool feed rate, step-down size, spindle speed, and lubrication have a major impact on the material's formability. These factors control the strain distribution, thickness variation, and Mace finish of the finished product. Optimizing these variables is critical for achieving high formability, minimizing defects, and improving the mechanical properties of the conical cups, transforming SPIF into a versatile and efficient forming process for applications requiring light weight, durable components in industries such as automotive and aerospace.

This study investigates the impact of major process parameters such as tool diameter, step down. feed rate, and spindle speed on the formability of conical cups manufactured from AA6082 aluminium alloy. The results indicate that bigger tool diameters and smaller step downs increase formability and surface quality. Optimizing these characteristics is critical for making high-quality parts, particularly in industries such as automotive and aerospace, where lightweight materials are vital.

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