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The Use of Superplastic Tin-Lead Alloy as A solid Lubricant in Free Upsetting of Aluminum and Brass

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Abstract : The main function of a lubricant in any forming process is to reduce friction between the work piece and the die set, hence reducing the force and energy requirement for forming process and to achieve homogeneous deformation. The free upsetting test is an important open forging test. In this paper, super plastic tin-lead alloy is used as solid lubricant in the free upsetting test of non-ferrous metals and compared with eight different lubricants using the following three criteria: one comparing the value of the reduction in height percentages, i.e. the engineering strain, in identical specimens of the same material under the effect of the same compressive force. The second is comparing the amount of barreling produced in each of the identical specimens, at each lubricant. The third criterion is using the specific energy, i.e. the energy per unit volume consumed in forming each material, using the different lubricants to produce the same reduction in height percentage of identical specimens from each of the two materials, namely: aluminum and brass. It was found that the super plastic tin-lead alloy lubricant has produced higher values of reductions in height percentage and less barreling in the two non-ferrous materials, used in this work namely: aluminum and brass. It was found that the super plastic tin-lead alloy lubricant has produced higher values of reductions in height percentage and less barreling in the two non-ferrous materials, used in this work, under the same compression force among the different used lubricants.

Keywords : aluminum, brass, different lubricants, free upsetting, solid lubricants, superplastic tin-lead alloy
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