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Mala Mani
Science Editor
JoVE
1 Alewife Center, Suite 200, Cambridge, MA 02140

Re: JoVE55061 “Experimental procedure for warm spinning of cast aluminum components”

August 14, 2016

Dear Dr. Mani,

Thank you for both your editorial review of the manuscript referenced above, as well as the reviewer's comments. I have made changes to the text to reflect both your feedback, as well as those from the reviewers and these are contained in the latest draft. 'Track changes' was employed to highlight the modifications made; please find attached a description of how each of the received comments were addressed.

We thank the reviewers for their efforts and believe that their comments serve to significantly strengthen the submission.

Warmest regards,

Matthew Roy BSc MSc PhD

cc: Daan Maijer

Response to editorial review

- Comment 1: Formatting requests to specifically spell out author first names and italicising Latin phrases.
Response: The requested formatting changes have been implemented where possible, however, the first names of all authors are not known/accessible.
- Comment 2: 2.1 How is the rotational run-out ensured?
Response: Modification to the manuscript and equipment list have been made to reflect the use of a dial gauge indicator.
- Comment 3: 2.5 - Please clarify to ambient with the center engaged.
Response: Changed to "... to ambient *temperature* with the *live tooling* center engaged."
- Comment 4: 2.6 - How is this loosened?
Response: Changed to "Loosen the jam nut assembly on the roller stand (Figure 3) *with a wrench*."
- Comment 5: 2.7 Please describe how these should be assembled rather than referencing the figure if the assembly is to be filmed.
Response: This has been implemented.
- Comment 6: 3.1 How is the workpiece loaded? Is there a particular orientation?
Response: This has been clarified.
- Comment 7: 3.7 Are these actions done manually?
Response: Yes, it is a manual lathe. This detail has been included in the introduction.
- Comment 8: 3.8 How is this ensured?
Response: Clarified.
- Comment 9: 4.1 How does one know when forming is complete?
Response: Forming is complete when the experimentalist is satisfied with the level of deformation obtained. This has been clarified.

Response to Reviewer 1

- Comment 1: The keyword of 'forging' is not consistent with the topic of this paper. The topic of this paper is experimental procedure for warm spinning of as-cast aluminum and the forging is not involved.
Response: We had included the keyword as there are elements to the process which encompass forging (lubricants, etc.) and for the purposes of reaching a potentially wider audience. We have removed the keyword.
- Comment 2: The paper indicate that "this alloy is not suitable for forming at room temperature owing to its limited ductility and must be formed at elevated temperatures", please present the material properties of as-cast A356 aluminum at room temperature and the elevated temperature.
Response: We presume that the reviewer is requesting mechanical properties of the alloy. The authors have previously published a paper on the constitutive behaviour of this alloy, which we have now referenced. As the material is also rate-dependent, we feel that presenting mechanical properties will detract from the scope of the submission.
- Comment 3: The forming parameters are important for obtain sound product. Please explain that in Fig 1 what inputs can be monitored by the battery operated Data Acquisition (DAQ).
Response: We have amended P2, 3rd paragraph to include "A battery operated Data Acquisition (DAQ) system containing a miniature wireless computer capable of monitoring the temperature of the mandrel during forming and the blank for characterizing heating has been installed on the quill of the lathe."

- Comment 4: The temperature distributions of the workpiece influence the geometric dimension and microstructure obviously. But as described in step 3.4 to step 3.8, the spinning process has to be stopped to clamp as well as measure and adjust the temperature. The distributions of the workpiece temperature will be influenced. Therefore, it is better to use the on-line measurement and temperature automatic adjustment system.
- Response: The authors agree, and this is evident in the discussion section. However, both budget and the interference of contact-based temperature measurements to the forming process preclude this addition at the present time. The most common contactless measurement is through measuring/correlating infrared emission, which is prone to error in the current application by aluminum's low emissivity. We have added a passage to that effect at the end of the 2nd paragraph in the discussion section: "In order to effectively capture the evolution of temperature of the blank during processing, a non-contact measurement technique is desirable; however common infrared-based techniques are hampered by aluminum's low emissivity and how the surface changes during processing. This is the principal reason why an instrumented, commissioning blank was employed to capture the typical thermal response achieved with the protocol described ..."
- Comment 5: The shape and geometric dimension of the blank and spun workpiece is the base to design a reasonable forming method and process parameters of spin-forming, the forming qualities (geometric dimension and microstructure) of the spun workpiece are the verification of the forming process. Please present the geometric dimension of the blank, as well as the forming quality of the spun workpiece.
- Response: The authors have clarified the existing details provided in Fig. 6 with the last sentence in representative results being "Cross-sections and microstructure of the as-cast blank and those obtained in multi-pass sample are shown in Figure. 6, and the authors have previously described more details of workpiece geometry, specific cross-sectional changes in wall thickness, defects observed, and dimensional variation in microstructure on the full set of samples.^{8,13}" citing the relevant papers.
- Comment 6: The reduction ratio of wall thickness is one of the most important parameters used to indicate the deformation degree. Please show the reduction ratio of each pass during the warm spinning of as-cast A356 aluminum.
- Response: Please see the authors' response to Comment 5.
- Comment 7: The array of the burners in Fig. 5 is 1x4, it is different from the 2x2 in the other figures. The array of the burners would influence the temperature distribute of the workpiece, why the array of the burners for measure the workpiece temperature is different from that of the flow forming process?
- Response: The reviewer's point is well taken. The photograph originally submitted with Fig. 5 of the heating system was from initial heating trials, while the representative results were from the arrangement shown elsewhere in the submission. We have removed the photo and modified the figure legend.

Response to Reviewer 2

- Comment: Regarding the request for quantified levels of uncertainty over the thermal data collected and the recommendation of the inclusion of thermal camera equipment.
- Response: This comment has largely been addressed by our response to Comment 4 from Reviewer 1; there is some confusion as to the function of the data acquired from the DAQ system. To bypass the issues of indirect measurement of the blank/workpiece temperature, we have advocated a heat transfer model approach, and have modified the discussion section accordingly. As the temperatures are recorded at various stages of the process directly from the blank, the data from the DAQ is complimentary and serves to inform a process model.