

Accepted Manuscript

Title: A coupled experimental/numerical approach for the characterization of material behavior at high strain-rate using electromagnetic tube expansion testing

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PII: S0734-743X(16)30460-2
DOI: <http://dx.doi.org/doi: 10.1016/j.ijimpeng.2016.07.002>
Reference: IE 2723

To appear in: *International Journal of Impact Engineering*

Received date: 14-12-2015
Revised date: 18-7-2016
Accepted date: 19-7-2016

Please cite this article as: Anne-Claire Jeanson, François Bay, Nicolas Jacques, Gilles Avrillaud, Michel Arrigoni, Gilles Mazars, A coupled experimental/numerical approach for the characterization of material behavior at high strain-rate using electromagnetic tube expansion testing, *International Journal of Impact Engineering* (2016), <http://dx.doi.org/doi: 10.1016/j.ijimpeng.2016.07.002>.

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14 **Highlights**

- 15 • Instrumentation and modelling of electromagnetic tube expansion are developed.
- 16 • The behavior of AA-1050 at strain-rates of 1000 s⁻¹ to 5000 s⁻¹ is identified.
- 17 • The parameters of the Johnson-Cook model are highly correlated in these tests.
- 18 • The sensitivity of characterization to experimental uncertainties is evaluated.

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20 Abstract: High speed forming processes such as magnetic pulse forming are gaining interest in the
21 sheet metal industry. Their design and development require specific effort on numerical modeling as
22 well as on the characterization of the high strain-rate mechanical behavior of metals. Standard dynamic
23 tests (SHPB, plate impact, simple tension...) are limited in their representativeness of the deformation
24 modes encountered in high speed processes. The present study describes how the electromagnetic tube
25 expansion test can be used as a high strain-rate test for the identification of material constitutive
26 parameters. Through numerical analysis, the deformation mode and the sensitivity of radial expansion
27 to material constitutive behavior are depicted. Then, the material parameter identification methodology
28 is applied to annealed 1050 aluminum tubes. It is shown that the test is capable of highlighting the
29 strain-rate sensitivity of behavior, in spite of relatively high sensitivity to measurement uncertainties.

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