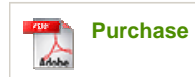




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Evaluation of ultrasonic aluminium degassing by piezoelectric sensor

H. Puga^a, J. Barbosa^a,  , J. Gabriel^b, E. Seabra^a, S. Ribeiro^c and M. Prokic^d



^a CT2 M – Centre for Mechanical and Materials

Technologies, Universidade do Minho, Azurém 4800-058 Guimarães, Portugal

^b IDMEC – Pólo FEUP, Faculdade de Engenharia da Universidade do Porto, 4200-465 Porto, Portugal

^c FEUP, Departamento de Eng^a Metalúrgica e de Materiais, 4200-465 Porto, Portugal

^d MP Interconsulting, 2400 Le Locle, Switzerland

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Abstract

The purpose of this work was the development of a reliable technique to evaluate the intensity of acoustic cavitation during degassing of aluminium melts and to use it to select the optimum processing time for an envisaged degassing efficiency.

A high sensitivity piezoelectric disk type device was used as a sensing feedback in water and liquid AlSi9Cu3 alloy. The signal acquisition and processing was carried out on a dedicated LabVIEW[®] based application which allowed real-time monitoring of the piezoelectric sensor's data and ultrasonic parameters. Standard Fast Fourier Transform was applied to obtain the dominant frequencies, as well as the sub and ultra-harmonics. It was found that the amplitude of the FFT sub-harmonic ($f/2$) was the best indicator to evaluate the process degassing efficiency, and it could be used to select the optimal processing time, independently of other variables.

The developed methodology was applied to several AlSi9Cu3 melts, and validated by measuring the final alloy densities and the volume fraction of porosities, revealing that it is an efficient, fast and cost effective technique to evaluate the degassing treatment of aluminium alloys. Experimental curves of AlSi9Cu3 alloy degassing efficiency as a function of $f/2$ amplitude are presented for different degassing times.

Keywords: Melting; Degassing; Casting; Aluminium alloys; Piezoelectric devices

Article Outline


1. Introduction
2. Degassing system
 - 2.1. Acoustic sensor
 - 2.2. Ultrasonic generator
 - 2.3. Experimental set-up
 - 2.4. Experimental procedure

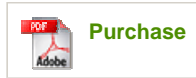
3. Results and discussion

4. Conclusions

Acknowledgements

References

 Corresponding author. Tel.: +351 253510220/59; fax: +351 253516007.



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