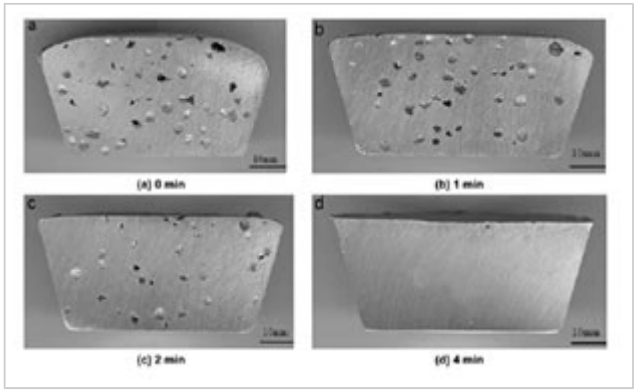
Aluminum Technology

Aluminum technology and its related process: casting, extrusion, precipitation hardening, forming, composite

Saturday, December 29, 2007

Degassing of Aluminum Alloys Using Ultrasonic Vibration



During the solidification of aluminum alloys, dissolved hydrogen creates porosity that, left unchecked, is detrimental to the mechanical properties of aluminum alloy castings, heavy section plates, and forgings. Degassing is the most effective, most commonly used method to reduce porosity.
The degassing method generally employed in the aluminum industry is rotary degassing, which involves bubbling argon, chlorine, and various salts through the melt to absorb hydrogen and other impurities. As these bubbles break the surface, aluminum is lost to oxidation by the furnace gases and entrapment in dross. Additionally, the use of chlorine creates environmental issues.

A Department of Energy Industrial Technologies Program project undertaken by the University of Tennessee at Knoxville and Oak Ridge National Laboratory (ORNL)—with

Blog Archive

► 2009 (6)

► 2008 (52)

▼ 2007 (10)

▼ December (10)

New book on Aluminum Casting

Aluminum Extrusion for IPOD

New Delft Material Concept For Aircraft Wings Coul...

Degassing of Aluminum Alloys Using Ultrasonic Vibr...

Aluminum's Durability and Aesthetic Value in Aeria...

Fill Your Car Up with Aluminum?

Airbus and Current Aircrafts Metal Technologies

Higher Strength 7xxx Options

industrial support provided by Ohio Valley Aluminum Co. and Secat—has been completed that gives a better understanding of the effect of ultrasonic vibration on the degassing of liquid aluminum. The final technical report of Award # DE-FC36-02ID14399—upon which this summary is based—is available for download at www.osti.gov/bridge/purl.cover.jsp?purl=/886703-ohkArs/.

The project focused on validating the feasibility of ultrasonic degassing in molten aluminum, exploring the possibility of combining ultrasonic processing with other technologies such as vacuum degassing and argon degassing, and investigating the mechanisms of ultrasonic degassing.

Project AchievementsThe major achievements of the project, which was carried out between September 2002 and September 2005, included:

Design and construction of a number of experimental systems for testing ultrasonic degassing.Several experimental systems were designed and built to degas aluminum using ultrasonic vibration under various conditions, such as in air, under vacuum, and in combination with argon degassing. The systems, located at ORNL, are available for use by the aluminum industry through the lab's User Facilities program.

Demonstration of ultrasonic degassing of aluminum alloys.Ultrasonic degassing was tested in aluminum melt under various conditions including degassing in air, under vacuum, and in combination with an argon purge. The results indicate that degassing can be achieved within a few minutes of ultrasonic vibration—much faster than the traditional degassing methods. Ultrasonic degassing—either using ultrasonic vibration alone, or with vacuum degassing, or in combination with using an argon purging gas—was found to be much more efficient in degassing a small-volume melt than the traditional argon degassing method.

Investigation of the mechanisms of ultrasonic degassing.Experiments were carried out in water to observe cavitation and the evolution of cavitation bubbles during high-intensity ultrasonic vibration. The conditions under which cavitation occurs and the survival of the cavitation bubbles were examined.

Development of new technology for ultrasonic degassing of molten aluminum alloy.Based on the understanding of the evolution of cavitation bubbles derived from this research, a new method was validated for using a small amount of purge gas to increase the efficiency of ultrasonic degassing. The method has the potential of significantly reducing the degassing time and dross formation during degassing. Initial experimental results show that a reduction of more than 50 percent of dross formation can be achieved using this new technology.

Advantages of the TechnologyAccording to the study, the new technology offers several advantages:

Coke will join using aluminum bottles.

Fuel Standards Will Force Lighter Autos

Labels

7xxx (1)

accident (1)

ACHT2009 (1)

age hardening (1)

Aging (1)

airbus (1)

aircraft (3)

Aluminum (41)

aluminum castings (14)

Aluminum foam (1)

Al–Si casting alloys (6)

architecture (1)

article (1)

automobile (14)

Automotive industry (1)

baseball (1)

bauxite (1)

- No moving/rotating parts in the degassing system. No rotary graphite parts are used in this technology, so the system is more robust.
- Fast degassing. The bubbles formed in this technology are much smaller than those in a conventional degassing system.
- Less use of argon and no use of chlorine. The cavitation bubbles are formed within the metal, so the bubble/melt surface is free from oxidation. As a result, no chlorine is needed.
- Minimal capital investment/operating cost.
- Less dross formation. The melt surface is not disturbed during ultrasonic degassing.

Aluminum Now: July/August 2007

at 1:24 PM

Tags: Aluminum, casting, degassing. foundry

0 Comments:

Post a Comment

Newer Post Older Post Home

Subscribe to: Post Comments (Atom)

Search Google Custom Search

book (1)
bottle (2)
casting (2)
conductivity (1)
conference (3)
container (1)
corrosion (1)
Creep (1)
CSIRO (1)
cylinder (2)
degassing (2)
degassing. foundry (1)
die casting (1)
energy (1)
energy crisis (2)
environment (6)
EPA (1)
extrusion (3)
Failure (1)
Fatigue (2)
flux (1)
foundry (1)
fuel (1)
grain refinement (3)

heat treatment (1)
hydrogen (2)
hypereutectic (1)
insurance (1)
ipod (1)
low cost car (1)
melt treatment (2)
modification (1)
non-ferrous (1)
Porosity (1)
precipitation hardening (1)
Presidential Candidate (1)
price (2)
properties (1)
purdue university (1)
recycle (4)
Residual stresses (1)
Slip-bands (1)
smelter (1)
sport (1)
Viscoplasticity (1)
wear (1)
welding (1)
XRF (1)

Link

Aluminum Technology Bookstore