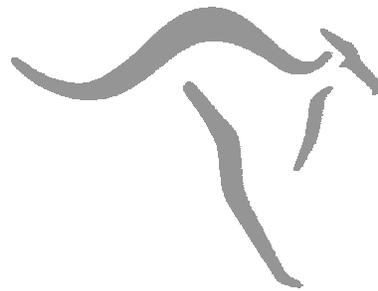


**AM-cover
Magnesium Melt Protection**

Advanced Magnesium Technologies



AM-cover: Magnesium Melt Protection

Outline

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AM-cover: Magnesium Melt Protection

Brief Introduction

- **The green hub of AM-cover is HFC-134a (1,1,1,2-tetrafluoroethane) or the common refrigerant R134**
- **Australian researchers at CAST and AMC developed AM-cover in the late 1990's**
- **Alpha testing on various magnesium processes yielded that AM-cover would be a promising, and relatively simple, alternative cover gas technology, when compared to the usual practice of using a SF6 gas blend**

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Where AM-cover has been in North America

- **Beta trials were conducted in both Mg die casting and other Mg casting processes in 2003 - 2004**

- **The results of these trials confirmed not only a reduction in GWP emissions in excess of 95%, but also the following industrial improvements:**
 - **Lower Mg smoke emissions**
 - **Lower metal loss to oxidation**
 - **More stable process parameters**
 - **Lower energy usage**

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Where AM-cover has been in North America

- **One plant has completely converted from its SF6/CO2/Dry Air blend to AM-cover, with projected emission reduction equivalent to 162,000 tonnes of CO2**
- **A second licensee has been using AM-cover on two die cast machines, in replacement to their SF6/Dry Air blend since 2003, with projected emission reduction equivalent to 114,000 tonnes of CO2**

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Where AM-cover is now in North America

- **The licensee that completely converted to AM-cover in March, 2004 has eliminated SF6 from its operations and has avoided emitting GHGs equivalent to 108,000 tonnes of CO2**
- **The licensee that has been using AM-cover on two die cast machines since 2003 has avoided emitting GHGs equivalent to more than 125,000 tonnes of CO2 (this represents only 2 of over 20 die cast machines that this company operates)**

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Where AM-cover is now in North America

- **The beta trials indicated a ~ 50% reduction in metal loss to oxidation in the single machine trials**
- **Monitoring this issue in the full industrial application of AM-cover has displayed a plant-wide reduction of between 30% - 50% (depending on individual furnace lid design and cleaning practices).**
- **In all industrial cases, the generation of dross smoke from the furnace dross and handling tools was greatly reduced due to AM-cover's residual effect**

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Where AM-cover is now in North America

- **The initial beta trial of AM-cover within a cold chamber die cast machine furnace displayed a 64% reduction in the variation of the metal temperature. The root cause of this great reduction in process variation was assigned to the elimination of the oxide component of the bottom sludge in this 1,360 kg capacity crucible.**
- **Based on this assumption, energy usage for melting and die casting of Mg was monitored at the second beta trial. With only a 30% reduction in metal oxidation loss, a 35% reduction of electrical energy usage was noted, with the same lack of bottom sludge as the first trial.**

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Where AM-cover is going in North America

- **Our first plant-wide licensee is getting ready to convert their second operation to AM-cover**
- **AMT's other licensee is in the midst of justifying its largest Mg operation's conversion, including the lowest cost opportunity of nitrogen generation**
- **AMT has been informed that its US Patent will soon be granted for our process technology.**

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Brief Summary

- **AMT has industrially applied our AM-cover Mg cover gas technology to both Mg die casting processes and other Mg casting processes. Our teammates, CAST, have also applied AM-cover to ingot production processes with the first commercial license granted to MEL in 2002.**
- **AMT has shown that the results seen in the North American beta trials can be reproduced on a plant-wide scale for Mg die casting production.**

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Brief Summary

- **AM-cover has been shown in independent monitoring to reduce GHG emissions by 99%, as compared to industrial SF6 based technology**
- **This same research has shown that 83% - 98% of the initial HFC-134a component of the blended gas is consumed in the process of doing its job; inhibiting molten magnesium from oxidizing. This significantly reduces concern over residual HFC emissions, associated with AM-cover's application to the molten magnesium industry.**



AM-cover: Magnesium Melt Protection

Acknowledgements

- **The inventors of AM-cover: Dr. Nigel Ricketts of CAST and Dr. Simon Cashion of AMT Europe GmbH**
- **The two NA licensees (Intermet and “Confidential”) that have generously supplied me with their internal process information**
- **My superiors at Advanced Magnesium Technologies, who allow me to bring this value-added technology to the foundry floor**
- **The operators, who have been so enthusiastic in their acceptance of AM-cover.**