

## Comparison with Aluminium Diecasting Alloys

### Technical Information Sheet

The new diecasting alloy, **AM-lite®**, offers considerable advantages over aluminium diecasting alloys. AM-lite is more diecastable than common aluminium diecasting alloys and is well suited for thin walled or intricate castings. AM-lite is 25 % lighter than aluminium and so more parts can be made per unit weight of metal. This fact combined with soaring aluminium prices means that considerable savings can be made on the cost of diecast parts. Die life is considerably longer for AM-lite than for aluminium and surface finishing by electroplating is cheaper.

### Reduced Costs

Compared to aluminium diecasting alloys, AM-lite offers benefits in the following areas:

- Light weight design
  - density 25% less than aluminium
  - capability to cast thinner, more intricate, parts
- Cost of metal per part
  - more parts per unit weight can be made from AM-lite
  - cost savings of 15 - 17% for same design
- Diecasting
  - reduced cycle time due to lower heat input
  - substantially increased die life
  - improved diecastability
- Surface finishing
  - better as-cast surface quality
  - improved electroplating at lower cost

### Case study 1: projected cost savings for an engine cover

Operation	Saving with AM-lite
<b>Diecasting</b>	
Weight	36% weight saving
Cost of metal	22 -29% saving
Die life	At least double
Cycle time	37% reduction
<b>Cost of diecast part</b>	12 – 14% saving
<b>Surface finishing</b>	
Painting costs	similar
Electroplating costs	10% saving

#### Approximate dimensions:

523 x 287mm  
2.3mm thick in aluminium  
1.9mm thick in AM-lite

#### Weight:

820g in aluminium  
520g in AM-lite

### Case study 2: projected cost savings for a furniture part

Operation	Saving with AM-lite
<b>Diecasting</b>	
Weight	50% weight saving
Cost of metal	38 - 44% saving
Die life	At least double
Cycle time	20% reduction
<b>Cost of diecast part</b>	29 - 32% saving
<b>Surface finishing</b>	
Powder coating costs	similar
Electroplating costs	10% saving

#### Approximate dimensions:

300 x 40mm  
5mm thick in aluminium  
3.2mm thick in AM-lite

#### Weight:

240g in aluminium  
120g in AM-lite

# Comparison with aluminium diecasting alloys

# AM-lite®

## Diecasting

Compared to aluminium, diecasting cycle times for AM-lite are significantly reduced because of a considerably lower heat input from the molten metal and shorter die spray times. Die life is substantially increased with AM-lite because of substantially reduced thermal shock on dies and less molten metal attack. AM-lite is significantly more diecastable than aluminium allowing the production of thinner more detailed parts. The as-cast surface finish of AM-lite is also significantly higher quality than aluminium.

## Surface finishing

The as-cast surface of AM-lite has a high quality that requires reduced polishing, or buffing, in surface finishing operations. Like aluminium, diecast AM-lite® provides an excellent substrate for finishing operations such as painting and powder coating. AM-lite® is significantly easier than aluminium to electroplate.

## AM-lite® can be readily electroplated

AM-lite can be readily electroplated to produce a variety of decorative surface finishes. The high quality as-cast surface of AM-lite reduces the amount of buffing or polishing required and the surface chemistry provides for excellent adhesion of deposited layers. A unique pre-treatment, Bondal® Mg, has been developed for AM-lite by MacDermid Inc. Electroplating of aluminium is more difficult and expensive than AM-lite because it requires a relatively complex pre-treatment – and the scrap rate due to defects in the final product is considerably higher.

## Properties

With the exception of Young's modulus, the tensile properties (eg yield strength and tensile ductility) of AM-lite are similar to diecast aluminium A380 alloy. While AM-lite has better creep properties than common magnesium diecasting alloys (eg AZ91D), it has a significantly lower high temperature creep strength than A380. Corrosion rates in salt spray testing are slightly better for AM-lite.

Property	A380	AM-lite	Comment
Density	2.7 g/cm <sup>3</sup>	2.0 g/cm <sup>3</sup>	AM-lite is 25% less dense than A380
Young's modulus Specific modulus (E/ρ)	71 GPa 26.3 GPa(g/cm <sup>3</sup> ) <sup>-1</sup>	45.3 GPa 22.6 GPa(g/cm <sup>3</sup> ) <sup>-1</sup>	Young's modulus of AM-lite is lower than A380
Yield stress (0.2% proof) Specific yield stress (YS/ρ)	160 MPa 59 MPa(g/cm <sup>3</sup> ) <sup>-1</sup>	160 - 170 MPa 80-85 MPa(g/cm <sup>3</sup> ) <sup>-1</sup>	Similar yield stress. Specific yield stress of AM-lite is higher.
Ultimate tensile strength Specific UTS (UTS/ρ)	320 MPa 118 MPa(g/cm <sup>3</sup> ) <sup>-1</sup>	230 – 250 MPa 115 – 215 MPa(g/cm <sup>3</sup> ) <sup>-1</sup>	UTS of A380 is higher. Specific UTS is similar.
Tensile ductility	3 – 4 %	3 – 4 %	Similar tensile ductility
Corrosion rate (mass loss, 5 day, ASTM salt spray test)	0.3 mg.cm <sup>-2</sup> day <sup>-1</sup>	0.2 mg.cm <sup>-2</sup> day <sup>-1</sup>	AM-lite is slightly more resistant to general corrosion

## Improved light weight design

The improved diecastability of AM-lite makes it more suitable for complex thin walled designs than aluminium alloys. While AM-lite has a lower Young's modulus than aluminium, stiff light weight structures can be readily created by the use of thin ribs that are made possible by the alloy's high diecastability.

## Melt handling

AM-lite has a slightly lower melting temperature of 585°C compared with 595°C for aluminium A380. Like other magnesium alloys, molten AM-lite can be contained in mild steel crucibles and transferred in heated steel tubes. In contrast molten aluminium is aggressive towards iron and steel and special refractory crucibles are required. Molten AM-lite is more oxidation resistant than other magnesium alloys but it still requires the use of a dilute cover gas for melt protection. No cover gas is necessary for aluminium alloys.

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Further information on AM-lite® can be obtained from Advanced Magnesium Technologies.

