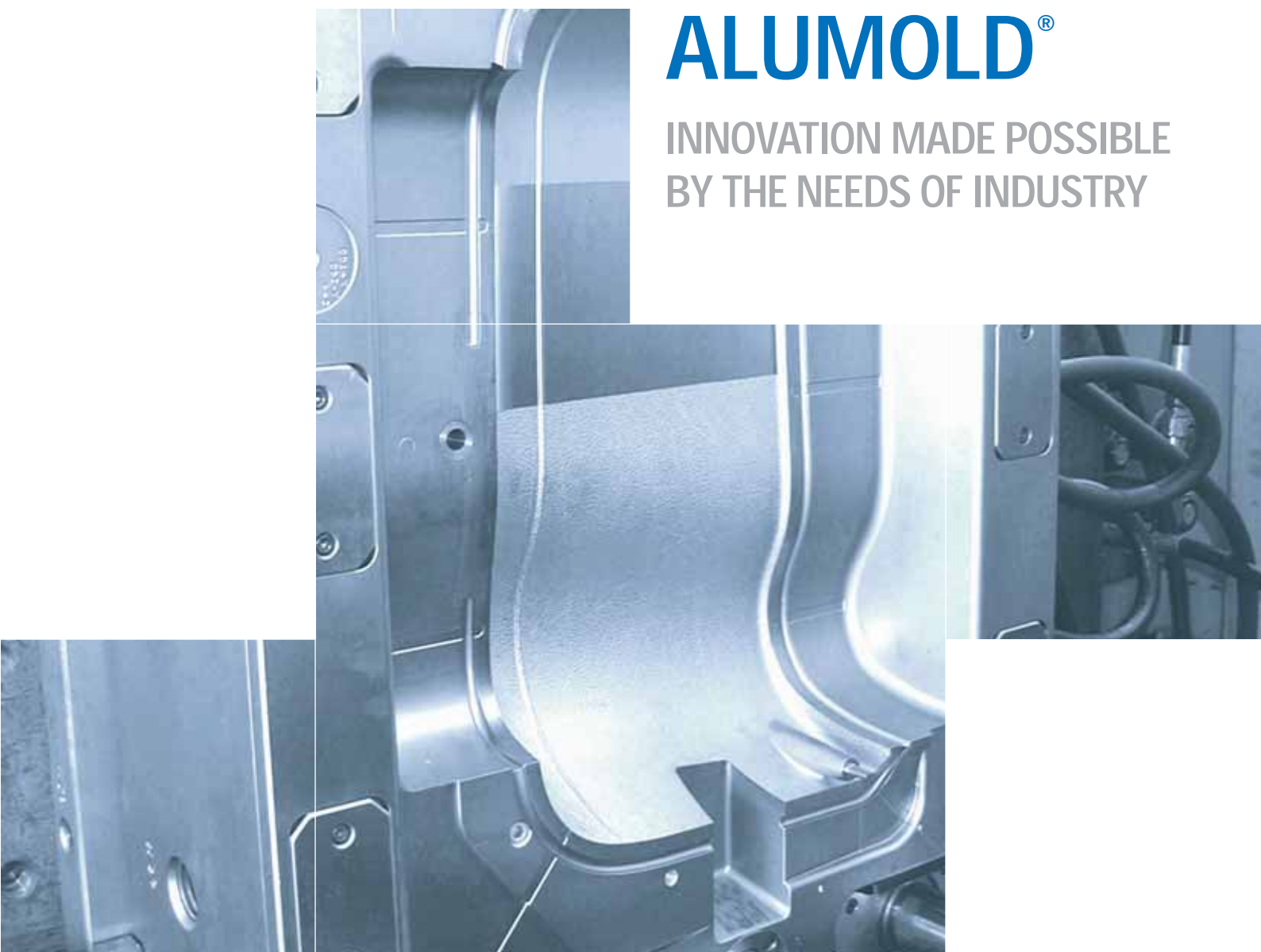




ALUMOLD[®]

INNOVATION MADE POSSIBLE
BY THE NEEDS OF INDUSTRY



ALUMOLD®

THE ENVIRONMENT IS BECOMING INCREASINGLY COMPETITIVE

The undeniable advantages of aluminium molds for thermoplastic injection molding have contributed to developing a very active and responsive environment. The sector is splitted between an increasing number of companies on an international scale. The technical means are available to most of the companies of this sector and therefore the know-how has reached a high level of skill. In order to remain leaders and stay competitive, mold producers must cope with economic requirements that demand cost reductions and tight production deadlines.

PRODUCT INNOVATION PROVIDES THE ONLY MEANS OF STANDING OUT FROM THE CROWD

Producers must constantly innovate to keep ahead and maintain a high level of competitiveness. Innovation is the keystone behind a successful offer and is essential if a company wants to differentiate from competition. For this reason, using aluminium to produce molds for the plastic industry constitutes a significant leap in technological and economic progress.



MOLD MAKERS

PART MANUFACTURERS

ORIGINAL EQUIPMENT MANUFACTURERS

ALUMOLD® IS CURRENTLY
THE DRIVING FORCE
BEHIND EFFICIENCY,
RESPONSIVENESS
AND PROFITABILITY

EFFICIENCY

The Alumold® range offers a wide selection of mechanical characteristics that are suited to most applications in the plastics industry. The range includes 4 groups of alloys that provide an efficient solution suited to each type of application.

RESPONSIVENESS

The alloys in the Alumold® range have excellent machining characteristics and are ideally suited to polishing which is achieved 4 to 10 times quicker than for steel. This time saving reduces the time needed to produce molds.

PROFITABILITY

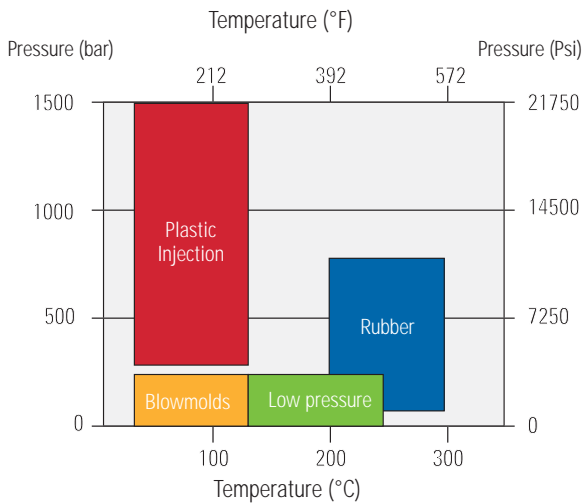
Alumold® provides thermal diffusivity far greater than that of steel and beryllium copper. This advantage not only reduces cycle times and optimises gains in productivity but also improves the quality of the resulting products.



ALUMOLD®

AN INNOVATIVE RANGE

The Alcan Alumold® range provides an excellent alternative to steel. It offers high-performance physical and mechanical properties, particularly machining, corrosion resistance, weldability, suitability for polishing and etching.



Alumold® 500

The aluminium alloy with the highest-performance characteristics in the range in terms of hardness and mechanical properties.
Run-production molds for injection and very large production runs for blowing, thermoforming...
Machine and mechanical parts requiring very high mechanical properties.
Machining plates for cutting.
Excellent machining properties.

Alumold® 400

Pilot- and medium-sized run-production molds for injection, run-production molds for blowing and thermoforming.
Perfectly suited to repairing by welding.

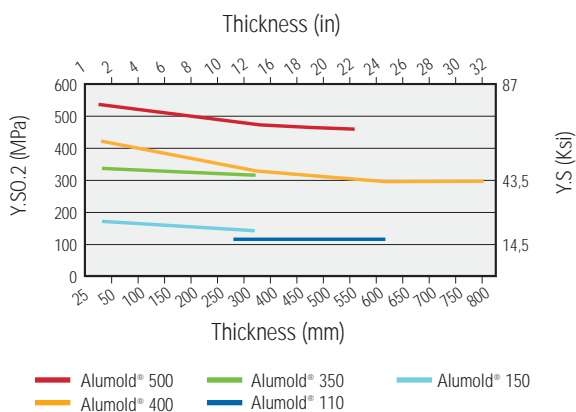
Alumold® 350

Low pressure, RIM, shoe molds.
Excellent machining characteristics (chip breakage)
Resistance to high temperature.

Alumold® 110

Alumold® 150

Prototype molds for injection, blowing, thermoforming, foam and expandable polystyrene.
Perfectly suited to repair by welding.





MOLD MAKERS

PART MANUFACTURERS

ORIGINAL EQUIPMENT MANUFACTURERS

ALUMOLD® DOES NOT CHANGE MACHINING METHODS

The various types of aluminium in the Alumold® range can be machined on conventional and high-speed machining equipment. It is not therefore necessary to replace your existing equipment. However, to optimise machining conditions we recommend the use of specific aluminium cutting tools.

ALUMOLD® IS LIGHTER

Alumold® molds are at least twice as light as steel molds and offer the same features.

Aluminium can be very easily machined using a variety of methods, such as standard milling, high-speed machining, spark erosion machining, grinding... and is machined extremely rapidly.

MACHINING

Milling	Up to 10 x Steel
E.D.M. (Spark ER...)	Up to 5 x Steel
Polishing	Up to 4 x Steel
Welding	Easier with proper method
ALUMOLD®	At least 30 % cost saving



Alumold® molds can be polished and etched very rapidly with very good results. "Mirror finish" is therefore obtained more rapidly than on steel. Similar to steel, special precautions are required for optical shading and we recommend the surfaces be hardened.



ALUMOLD®
high speed machining

ALUMOLD®

SPECIFIC SURFACE TREATMENTS

Alumold® offers a wide range of surface treatments according to the application required (particles reinforced plastics, corrosive environment...):

- Hard anodizing
- Nickel plating
- Vacuum plating
- Etc.

For example, the hardness of hard anodizing or nickel plating is approximately 500 HB which is much harder than that of steel for molds.

The new PVD- and PA CVD-type special aluminium treatments provide even higher levels of hardness.

	Hard anodizing	Nickel plating	PVD	PA CVD
Hardness (HB)	500	600	2000	2700
Thickness (µm)	50 - 100	10-40	3 - 8	3 - 5
Remarks	Alumine layer	Chemical PL Uniform layer	Cr N	DLC



ALUMOLD® Ideal durability

Specific surface treatments can improve resistance to abrasion and mechanical stress. They ensure excellent reliability when the molds are used continually.

MOLD MAKERS

PART MANUFACTURERS

ORIGINAL EQUIPMENT MANUFACTURERS

ALUMOLD® PROVIDES THE ANSWER TO THE MOLD MAKERS NEEDS

The many advantages the Alumold® range offers are proved by the efficiency and competitiveness provided when the molds are designed and produced.

Mold makers can now benefit from the inherent qualities of aluminium that provide very convincing results in comparison to steel. Alumold® is machined up to 10 times faster and offers a considerable gain in productivity. Performance levels that are a direct advantage resulting in higher mold production and in much reduced production cost.



ALUMOLD®

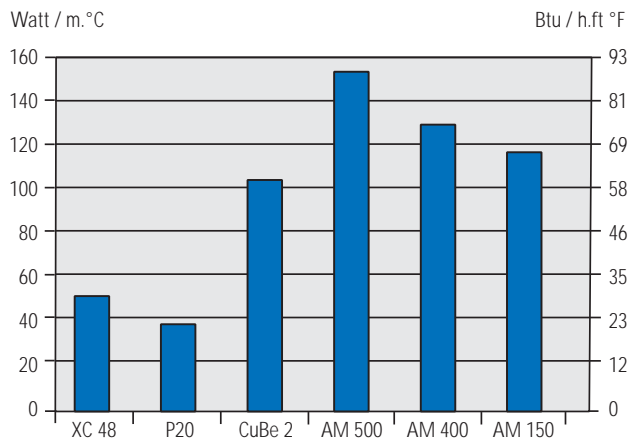
OUTSTANDING THERMAL PROPERTIES

THERMAL CONDUCTIVITY

The thermal conductivity, or even better thermal diffusivity, of aluminium alloys characterises the main function of molds: to cool down or heat up.

These parameters have a direct influence on the duration of the cycle and the dimensional and visual quality of the part.

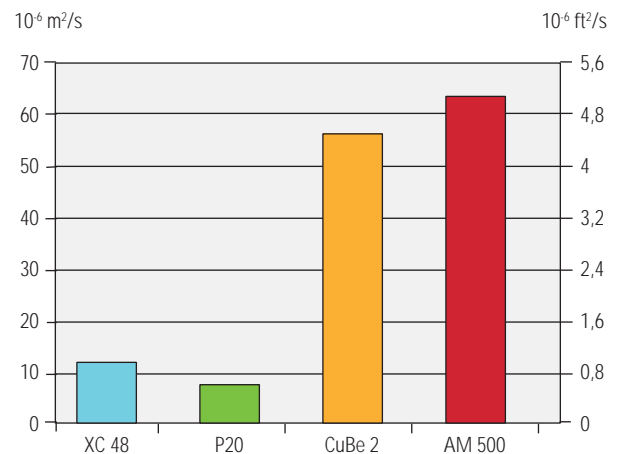
Thermal conductivity in Alumold® 500 is 4 times greater than in P20 steel.



THERMAL DIFFUSIVITY

Thermal diffusivity is the transmission of heat, or alternatively evacuation speed. It is 8 times greater in aluminium than in steel. Its relation to thermal conductivity is shown in the following equation:

$$\text{Thermal diffusivity} = \frac{\text{Thermal conductivity}}{\text{Specific heat} \times \text{density}}$$



Distortion of plastic parts is directly linked to the uniformity of the cooling process. High diffusivity lowers the average temperature of the mold surface and reduces the differences in temperature between the fixed and moving sections.

ALUMOLD®
improve your productivity

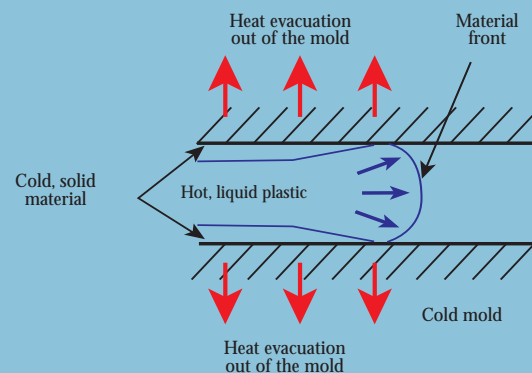
ABOUT THERMAL DIFFUSIVITY

The advantage of aluminium, from a thermal point of view, is its considerable capacity to transfer heat compared to steel. In a polymer transformation process, this characteristic is extremely important for controlling the temperature of molds subjected to hot/cold cycles.

Thermal conductivity, which is the opposite value to thermal resistance, characterises the facility with which the material transfers heat. It does not, however, take into consideration the time taken to transfer heat.

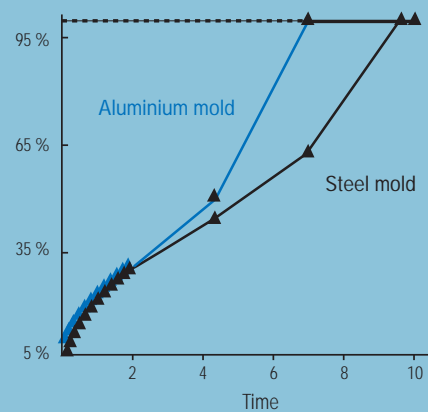
To demonstrate the thermal advantage of aluminium over steel in increasing productivity, it is therefore much more relevant to speak in terms of thermal diffusivity. The value, which is expressed in m^2/s , is the speed at which heat is diffused or evacuated through the mold and is a vital quality for reducing hot spots and reducing cycle times. The extremely rapid diffusion of heat in aluminium compared to steel results in a surface temperature that is much more uniform.

When thermoplastics are molded using an aluminium mold the heat given off by the polymer transformed in the injection phase is therefore evacuated much more rapidly out of the mold.



This enables a thicker solid material to be obtained more rapidly than with a steel mold (see figure below). The result is therefore an improved solidification structure, less distortion of the component and improved surface quality.

% THICKNESS OF THE COLD SOLID MATERIAL DURING CYCLE



ALUMOLD®

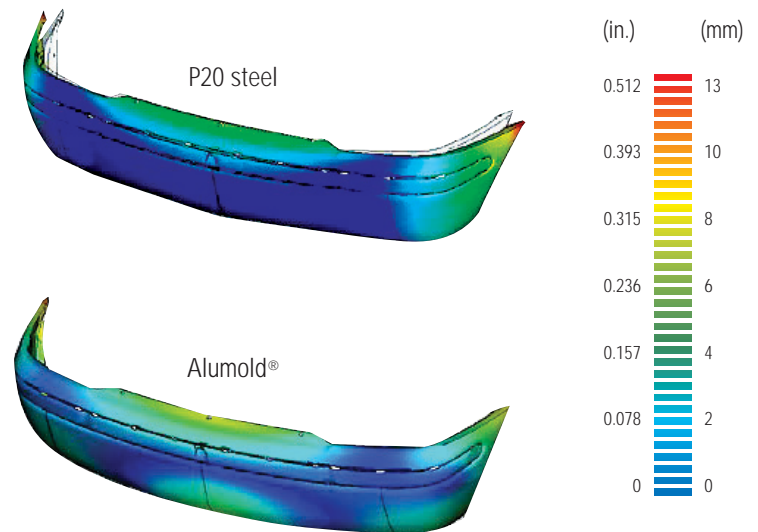
AUTOMOTIVE BUMPER

IMPROVED QUALITY OF PARTS...

Alumold® achieves dimensional qualities that are significantly better than steel molds in a shorter cycle time.

For vehicle bumpers, the difference in lateral distortion with an identical cycle time is shown in the following simulation.

DISTORTION OF THE PART AT DEMOLDING



VALVE BODY

The thicker the part, the greater the difference.

In the example of a valve body with a wall thickness of 30 mm / 1.2 in., the ovalisation defect of the part decreased by 70 % and the surface appearance improved.

During injection the heat flow from the material is evacuated more uniformly and rapidly. Solidification of thick components is obtained in less time and the dimensional measurements are more accurate.



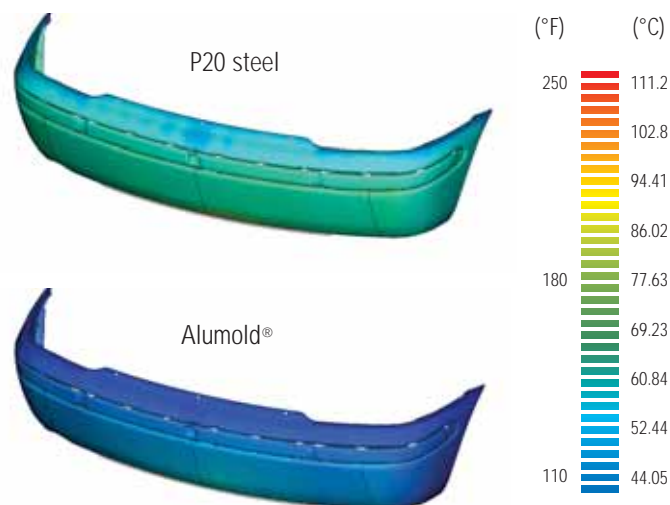
...AND REDUCED CYCLE TIMES

In addition to improvement of the component, Alumold® also considerably reduces cycle times.

In the example of the bumper, 25 % of time is saved compared to P20 steel (47 seconds for steel molds compared with 35 seconds for Alumold® molds).

The time saving may even be as much as 60 % if the cycle time needed to achieve identical dimensional accuracy of components is taken into consideration.

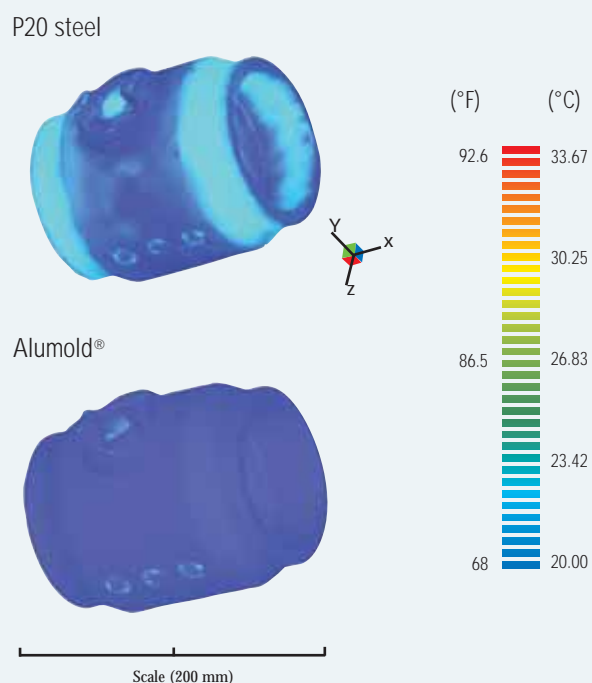
AVERAGE TEMPERATURE WITHIN THE MOLD DURING CYCLE



For valve bodies of similar measurements, the cycle time was approximately 15 minutes using a steel mold. The cycle time was reduced to 6 minutes when using Alumold®.

In this example, the cooling properties of aluminium result in a time saving of approximately 50 % compared to steel molds.

WALL TEMPERATURE OF THE COMPONENT AT DEMOLDING



ALUMOLD®

A MATERIAL THAT PAYS FOR ITSELF AS YOU DEVELOP YOUR PRODUCTS

Aluminium molds have many advantages over steel ones in terms of cost and time.

- Saving on machining
- Saving on operating

EXAMPLE OF A SKI HELMET MOLD

This ski helmet mold has already produced over 800,000 shots. At this stage, the cost of the mold is minimal compared to the total production costs.

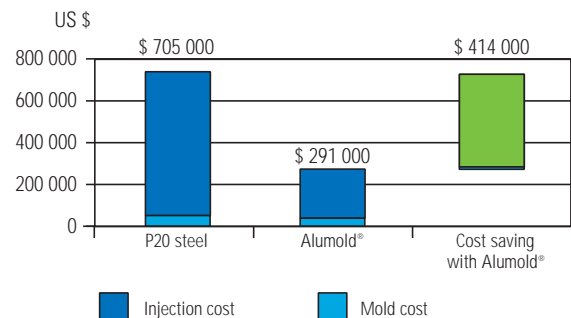
The savings compared to a steel mold easily enable the manufacturer to produce another mold in order to continue the series or change the design.



TOTAL COST SAVING WHEN USING ALUMOLD®

	Raw material		Total Mold cost	Cycle time	Production 800 000 shots	Injections cost (300MT at \$50/h)
	kg	US \$	US \$	s	days	US \$
P20 steel	1 500	3 500	38 000	60	556	667 000
Alumold®	500	4 250	25 000	24	222	266 000
Cost saving with Alumold®		-750	13 000	36	334	401 000

TOTAL COST SAVING WITH ALUMOLD®: 414 000 US \$



MOLD MAKERS

PART MANUFACTURERS

ORIGINAL EQUIPMENT MANUFACTURERS



ALUMOLD®: HELPING YOU COPE WITH THE DEMANDS OF THE MARKET

In addition to the many advantages described above, Alumold® offers a genuine capacity for technical innovation that actively meets the various market demands. Because Alumold® molds are less expensive and produced more rapidly, they therefore allow greater responsiveness that enables changes in shapes and styles to be followed more closely while optimising production costs.

ALUMOLD®
efficiency, responsiveness,
profitability

ALUMOLD®

ALCAN IS ACTIVELY COMMITTED TO OPTIMISING THE FUTURE

Alcan Aerospace, Transportation and Industry is constantly affirming its leadership in high-technology applications and producing materials that have higher levels of performance to meet the requirements of applications that are increasing in number and becoming more specific.

Our know-how enables customers to benefit from Alcan's experience in many sectors: aeronautics, transport, engineering, etc. and to provide them with effective means to optimise their responsiveness, efficiency and competitiveness.

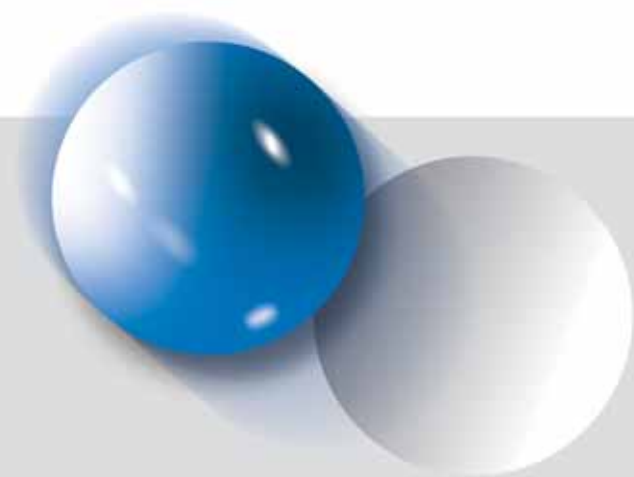
This technical progress is also part of a sustainable development program based on controlled operation and recycling of aluminium alloys.





ALCAN,
MANAGING FOR SUSTAINABILITY





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