ALUMOLD®

The Alternative

1. Advantages…

❶ For mold makers

- Optimal machining

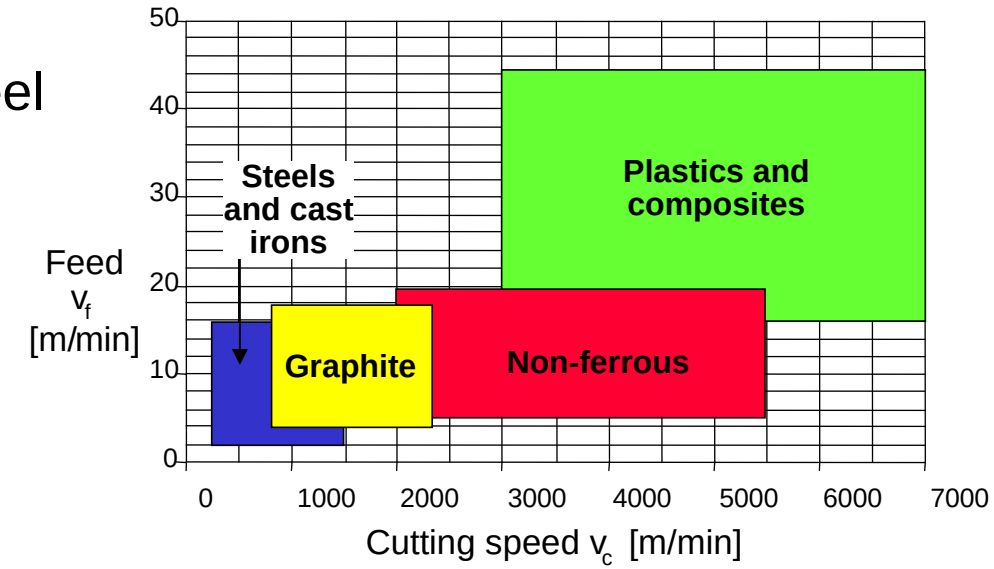
  Milling : up to 10x / steel

  EDM : up to 5x / steel

  Polishing : up to 4x / steel

  At least : 30% savings

- Low tool wear
- Dimensional stability
- Short time delivery
- Easy handling : 3x lighter / steel



1. Advantages …

❷ For mold users

- ➢ Improve productivity

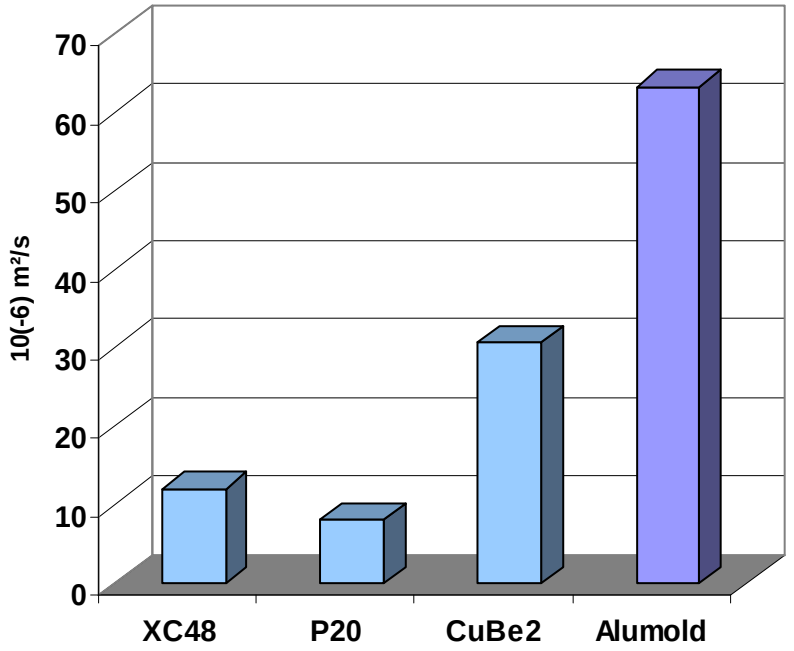
  High thermal diffusivity

  = *“high evacuation speed”*

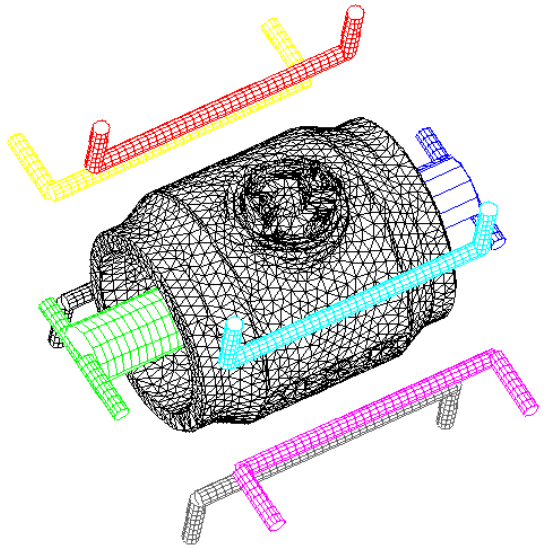
  ⇨ ***Cooling times reduced and cycle time savings from 10 to 60%***

- ➢ Save time on injection press
- ➢ Easy handling / less efforts
- ➢ Better quality

$$\text{Thermal Diffusivity} = \frac{\text{Thermal Conductivity}}{\text{Specific Heat} \times \text{Density}}$$



- Case study : valve body, PEHD, wall thickness 1.2 in.



<u>Steel : P20 – 110 Kg</u>

Thermal conductivity : 30 Btu/h.ft.°K

Specific heat : 0.110 Btu/lbm.°F

Density : 7.8

Heat capacity : 3.58 10^6 j/m^3

Thermal diffusivity : 0.387 ft^2/h

<u>Aluminum : alloy 7000 serie</u>

Thermal conductivity : 88 Btu/h.ft.°K

Specific heat : 0.204 Btu/lbm.°F

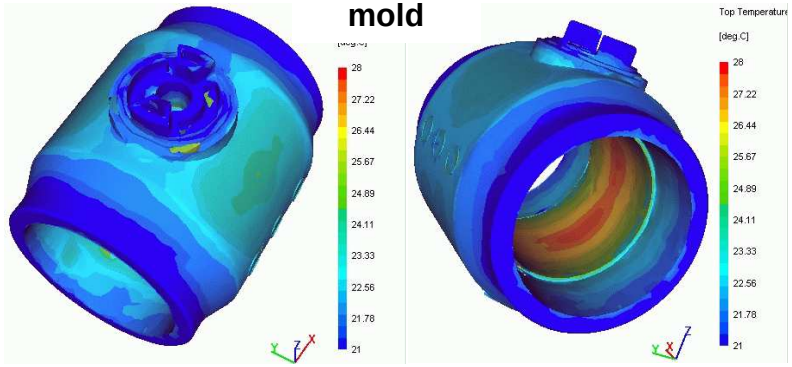
Density : 2.8

Heat capacity : 2.18 10^6 j/m^3.°C

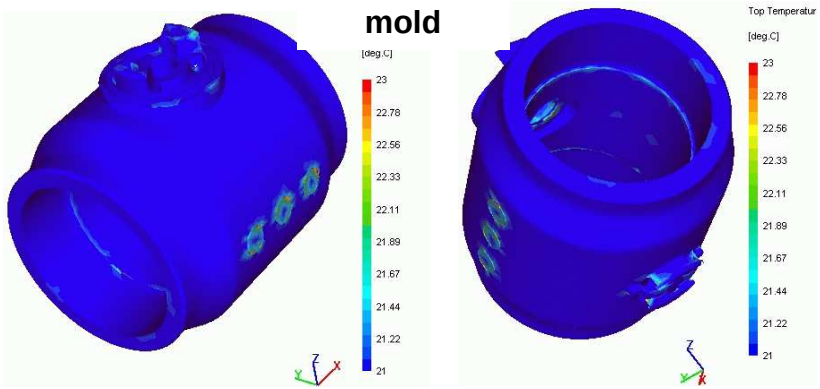
Thermal diffusivity : 2.441 ft^2/h

- Temperature distribution at demolding

Steel mold



Aluminum mold



	ALUMOLD 500 mold	**Equivalent steel mold**
Cycle time	6 minutes	15 minutes approx.
Out of round	0.015 in.	0.04 to 0.08 in.
Surface quality	Excellent	Good
Pressure inside the mold	18 850 psi (23200 psi max) (400 MTons injection press, screw 4.5 in.)	
Weight of the part	6.2 lb.	
mold Temp. Plastic Temp.	68 ℉ 448 ℉	
Target production	100 000 parts	

1. Advantages

Example : car bumper (fig. : average T°within mold during cycl e)

COSTS COMPARISON	Raw material		Total cost of the mold (incl. mach.)	Cycle time	Production time for 200,000 parts	Injection cost (1800MT @ $200/h)
	kg	$	$	s	days	$
P20 steel	30 000	70 200	700 000	47	110	528 000
Alumold	12 000	90 000	600 000	35	81	390 000
Savings with Alumold	18 000	-19 800	**100 000**	12	**29**	**138 000**

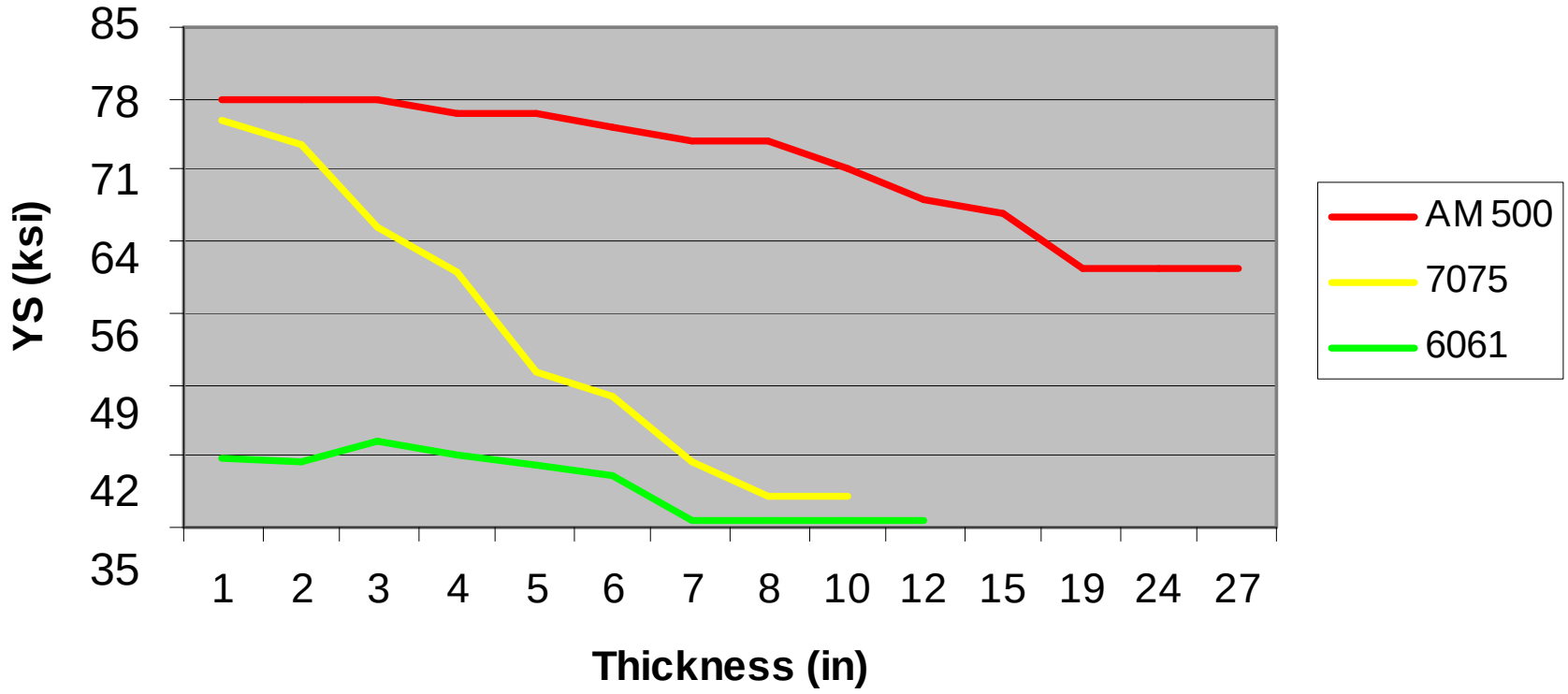
2. Competition

Alumold 500 vs. steel (4" thick)

	Alumold 500	Carbon steel	P20	Tool steel
Density	2.82	7.8	7.8	7.8
UTS (ksi)	84	90	146	190-290
YS (ksi)	76	47	129	145
Young Modulus (ksi)	10,400	30,450	30,450	30,450
Hardness (HB)	185	174	304	400 - 600
Thermal conductivity (Btu/h.ft.°K))	88.5	30	22.5	19.6
Thermal diffusivity (ft^2/h)	2.441	0.542	0.387	0.348
Specific heat (Btu/lbm.°F)	0.204	0.11	0.11	0.11

2. Competition

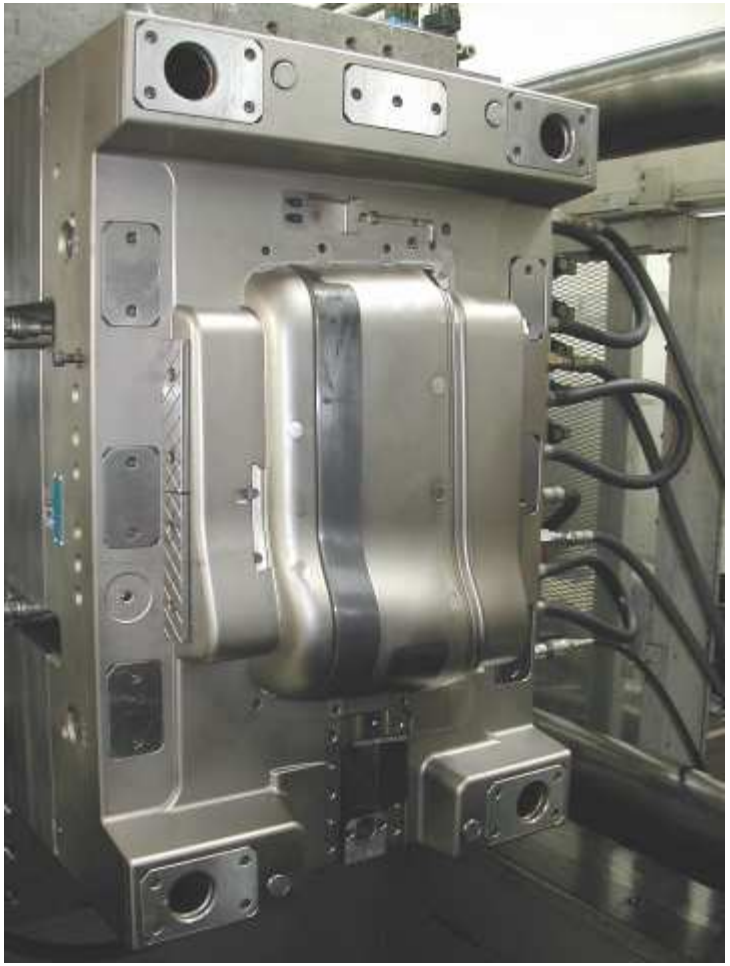
Alumold 500 vs. other aluminum

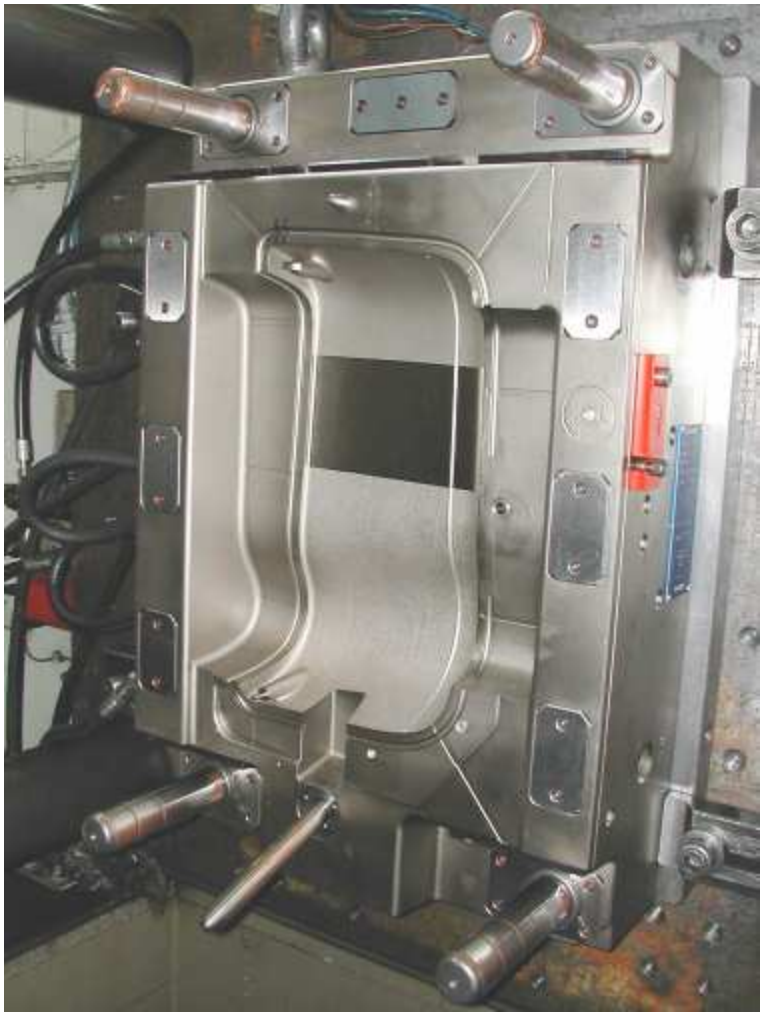


ALUMOLD®

ALCAN

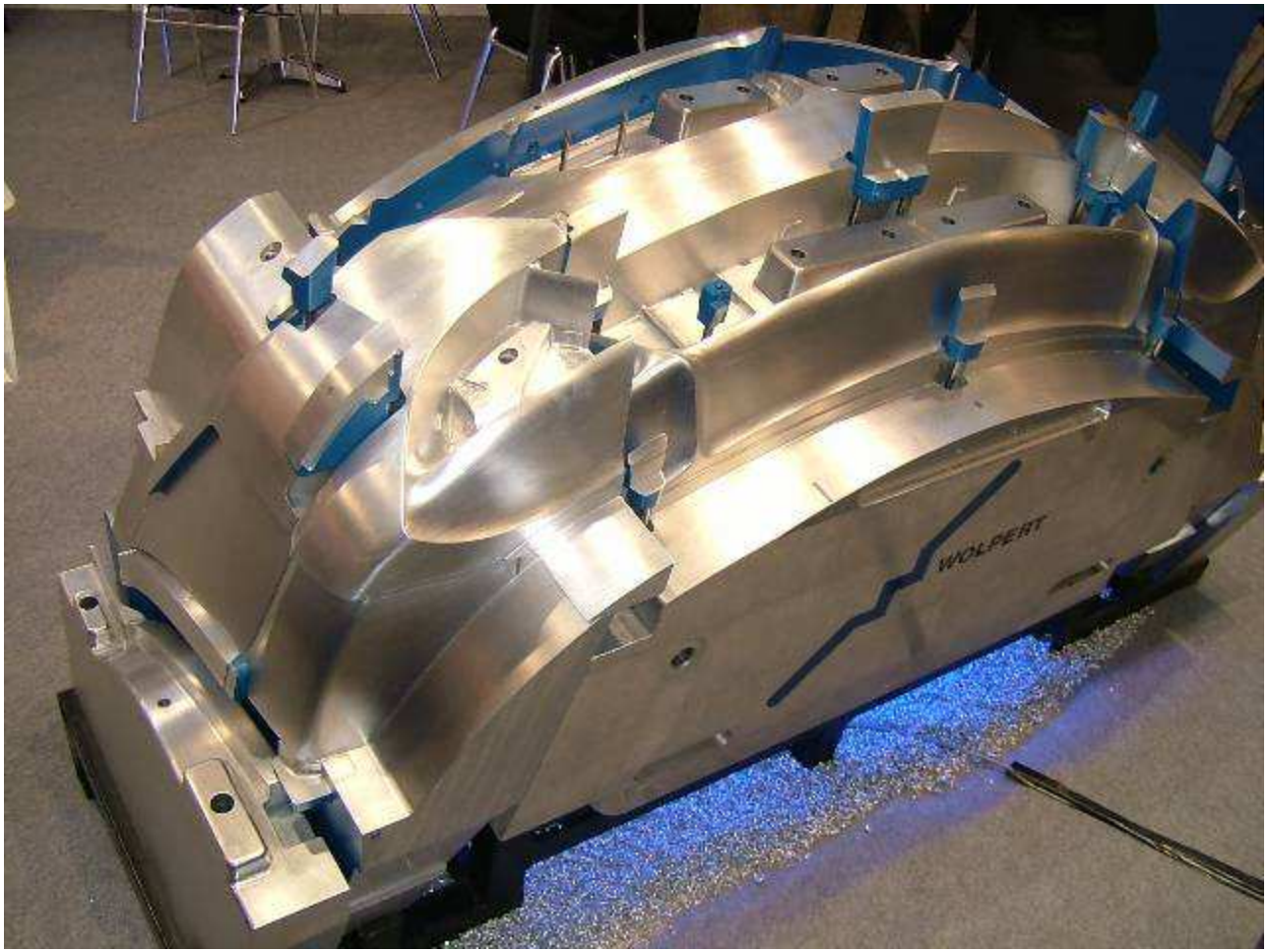
Door pocket - Renault Trafic (Alumopla European Project)





Air conditionning cover

Car bumper – BMW 3 Series



Spare wheel case – Mercedes Benz Maybach

5. Conclusion

- Aluminum molds - a solution for fast and efficient response.
- Aluminum is recyclable and is a solution to reduce energy consumption during machining and operating the molds, and finally to reduce the GHG emissions.
- For successful implementation: **optimized design, manufacturing and operation parameters of the mold** for specific end-use applications.
- Aluminum metallurgy and fabrication support available from world class Alcan technologists.