



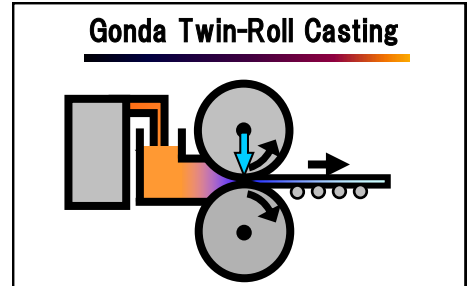
MAGNESIUM ALLOY SHEETS

DEVELOPMENT OF NEW ROLL CASTING SYSTEM FOR PRACTICAL USE

Gonda Metal has developed successfully the new twin-roll casting system for magnesium alloy strips: **GTRC (Gonda Twin-Roll Casting system)**. Although it has been considered that manufacturing the magnesium alloy sheets of AZ61, AZ91, AM50 and AM60 was very difficult, finally it became possible by this development for manufacturing them by combining new twin-roll casting and rolling.

1. WHAT is TWIN-ROLL CASTING?

As shown in the right picture, this method can make as-Cast strip by supplying molten magnesium alloy through twin-roll and solidifying it instantly. Its' casting speed is more than 30 m/minute.



2. PROPERTIES of OUR SYSTEM

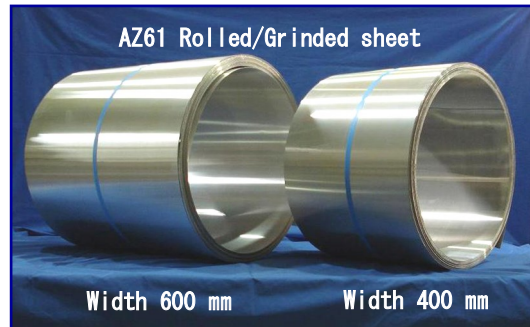
- This system can manufacture as-Cast strip with small grain size and equiaxed crystal by rapid cooling. Magnesium alloys of AZ61, AZ91, AM50 and AM60, besides AZ31, can be manufactured by this system.
- This system can obtain high productivity because its high speed casting and the productive balance to rolling process can be easily taken.
- This as-Cast strip is able to use for a die casting material. **As-Cast strips and rolling sheet made of AZ91, AM50 and AM60 are very suitable.**
- **Also they made of AZ21, AZ31 and AZ61 are very suitable for materials for a plastic deformation.**
- ★ Additionally, we are working on the development of **Anti-flammable Magnesium Alloy Sheets, AZX and AMX.**

3. MASS PRODUCTION for AZ61 sheet

Now we are working on the mass production for AZ61 sheet. Because we believe the properties of AZ61 are superior to AZ31 in intensity and corrosion resistance, and are superior to AZ91 in formability.

Production Range of AZ61

	Thickness	Width
As-cast strip	2.0~4.0 mm	≤630 mm
Rolled/Grinded sheet	0.5~3.0 mm	≤600 mm



Coils of 600 mm/400 mm in width of Rolled/Grinded sheet

4. VARIOUS PROPERTIES of AZ61 sheet

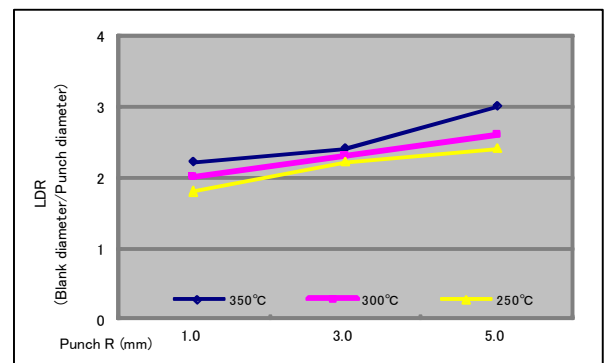
Deep-Drawing Test

In the deep-drawing test with cup drawing punch stated in the below, it is possible to obtain over 2.0 of LDR (Limiting Drawing Ratio) under the condition of temperature over 300°C even if the punch R is 1 mm (=inner R is 1 mm). Additionally, it is also possible to obtain the same result at 250°C if the suitable conditions for producing the sheet and for pressing are given.

In the severe test with square drawing punch, more severe than the test with cup, it is also possible to obtain over 2.0 of LDR under the condition of temperature over 300°C even if the punch R is 1 mm.



▲Cups (t=1.0 mm sheet is used) Square Cups▲
Punch R 1 mm, R 3 mm, R 5 mm from left side



LDR Chart for Punch R and Press Temperature of

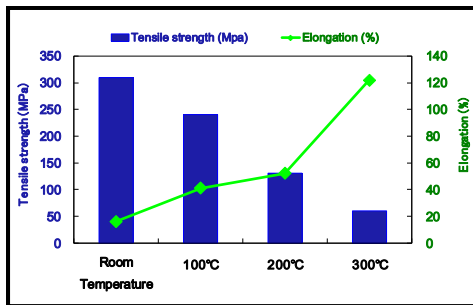
Soaking Test for various alloys

Alloy	Time after soaking		
	1 hour	5 hours	20 hours
AZ31	△	×	×
AZ61	◎	◎	△
AZ91	◎	◎	△

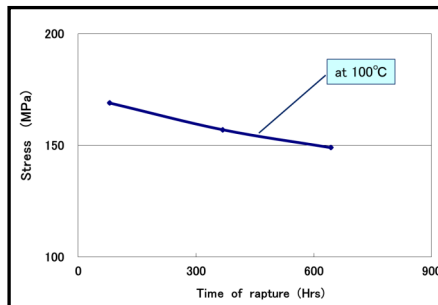
◎: No change △: Started ×: Advanced

Soaking test by 3.4% salt water for as-Cast strips of AZ31, AZ91 and AZ61.
AZ61 is better than AZ31.

Tensile strength and elongation of rolled sheet



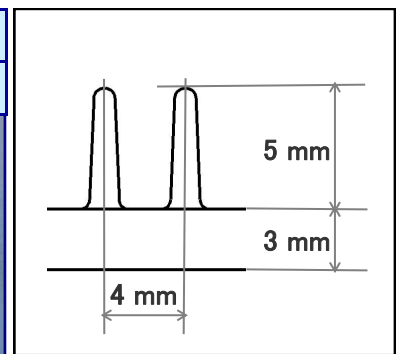
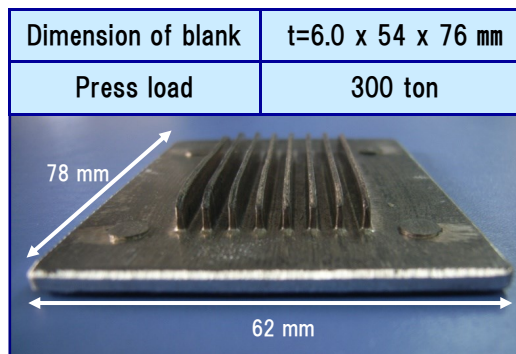
Creep test of Die Forging



5. DIRECT DIE FORGING from AS-CAST STRIP

Die forging is possible to form from casting strip directly. The right photo shows two examples of die forging by using casting strip of AM60 in 6 mm thickness. It is able to form the boss shape clearly.

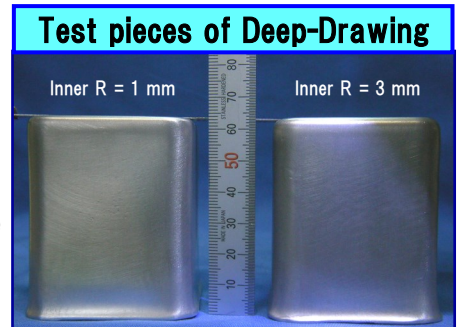
We hope this system will decrease its process of production greatly and be helpful to develop for uses.



6. PRESS FORMABILITY of MAGNESIUM ALLOY SHEET AZ61

Gonda Metal has just proved that the press formability of AZ61 sheet is excellent by purchasing a warm servo press machine under the supply of subsidy for supporting product development by MONODZUKURI (Manufacturing) Small and Medium Enterprises in 2009.

It is possible to perform a warm forming to AZ61 sheet as well as AZ31 sheet. Picture stated right is square cups of inner R 1 mm and 3 mm. Their height is 63 mm. And it is also possible to perform plating and welding to AZ61 sheet.

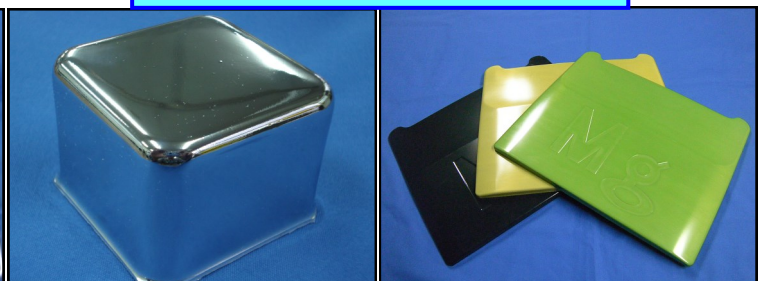


Press Works

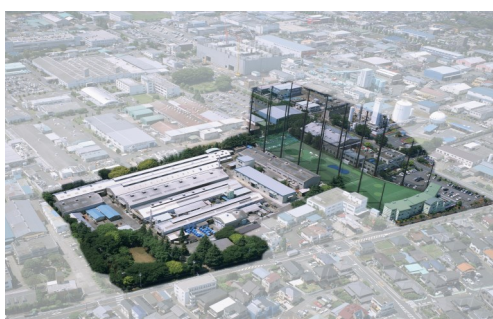


▲ Mobile phone cover (Inner R of outline 2 mm)
Note PC cover for A4 size (Inner R of outline 3 mm) ▲

Surface Treatment



▲ Nickel-Chromium Plating
Anodization/Electrodeposition ▲



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