Non-HPDC Processing of Magnesium

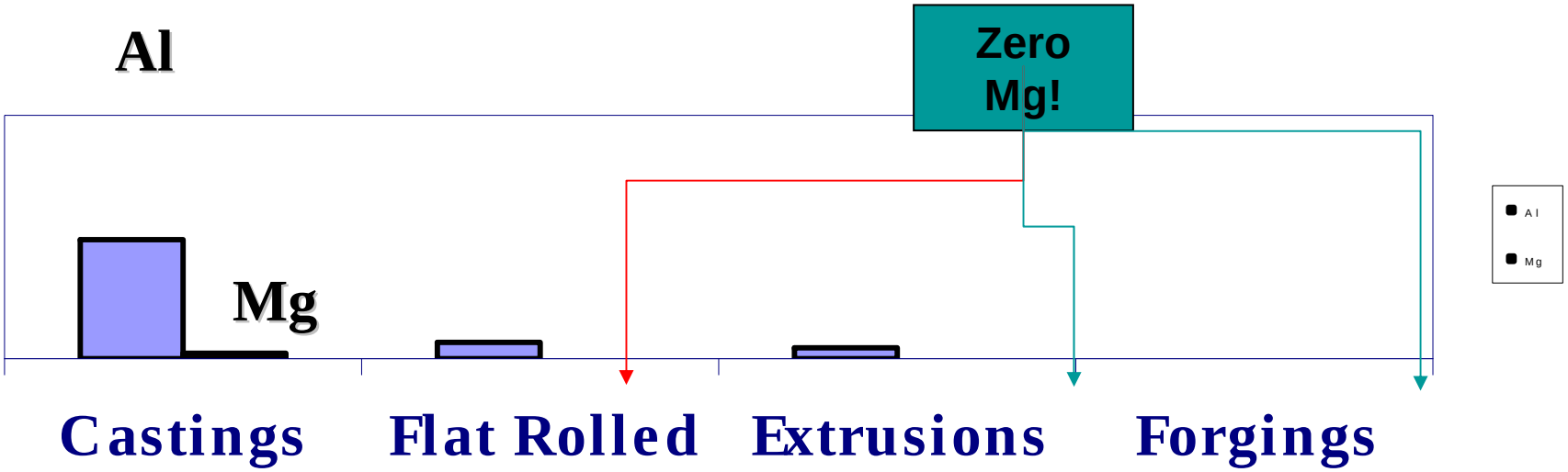
Randy Beals

There is limited engineering and process data on the properties and applications of non-HPDC processing.....

- **Semi Solid (except for Thixomolding)**
- **Gravity SPM and sand**
- **Low pressure DC and sand**
- **Squeeze**
- **Foam**

The data on the formability of Mg and on using Mg in stamping, forging, and extrusion applications is just beginning (primarily in EU)

Volume of Formed Mg/Al Products



The data on the formability of Mg and on using Mg in stamping, forging, and extrusion applications is just beginning (primarily in EU)

At Room Temperature

Structure	# slip sys	Elong
bcc (Steel)	42	~ 40%
fcc (Al)	12	~ 30 %
hcp (Mg)	3	4~10%

At ~ $0.6T_m$ (230 ~ 280^0 C) the number of slip systems approaches Al. Then, acceptable deformation, by rolling, stamping and extrusion are possible.

Experience @ VW with Sheet Forming of AZ31

- **Similar forming behavior at ~ 220°C, as steel & Al at RT**
- **Maximum drawing ratio $ß_0$ comparable to steel**

- **Al sheet is only competitive with steel @ ~ $2.20/kg**
- **Mg sheet would then have to cost 1.5 x or $3.30/kg...**

- **But guess what?**
- ***TK has started a $10M forming lab & will buy all Samag-Oz 50MT….that bodes a very interesting future for worked Mg!***
- ***The German government is sponsoring forming R&D….***

Forming Magnesium - Partners

- **Salzgitter Magnesium Technologie GmbH (rolled products)**
- **Institute for Metal Forming & Metal Forming Machine Tools (IFUM), U. of Hanover (sheet forming)**
- **Laser Center Hanover (LZH), Hanover (laser-supported material heating)**
- **Institute for Materials Science (IW), U. of Hanover**
- **Volkswagen AG, Wolfsburg (automobile components)**
- **AHC Surface Technology, Kerpen (corrosion protection, surface treatment)**
- **Eckold GmbH & Co. KG, St. Andreasberg (joining)**
- **GKSS-Research Centre for Magnesium, Geesthacht (material characterization)**