



Trends in Die Casting and Extrusion Call for Premium Tool Steel Solutions

1. A short introduction to Kind & Co.

2. Kind & Co. – a relevant specialist in the niche
3. Automotive trends and challenges/opportunities for tool steel
4. Innovative tool steel solutions for demanding applications
5. Concluding theses

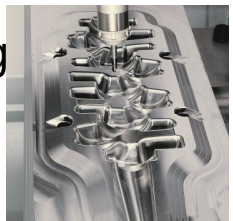
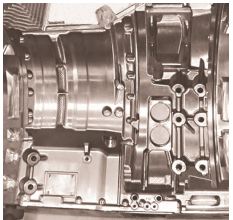
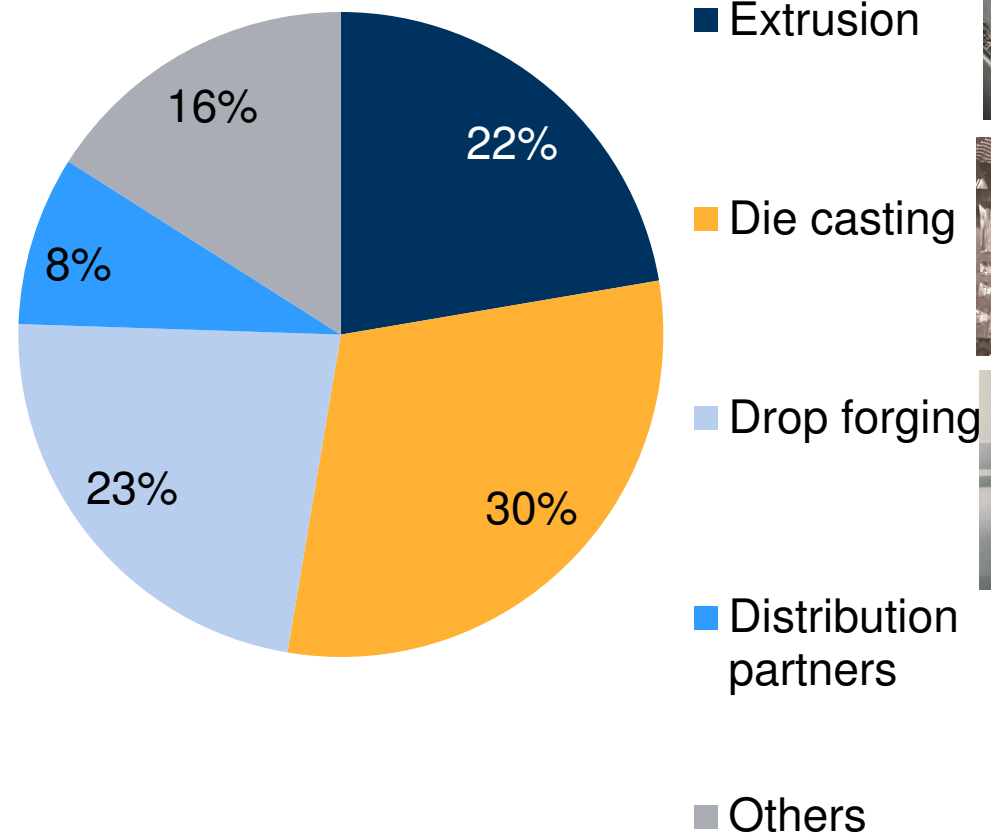
Kind & Co.: A privately owned hot work tool steel specialist



KIND & CO., EDELSTAHLWERK, GmbH & Co. KG

- » Founded 1888 – 130 years of experience!
- » Located close to Cologne, Germany
- » Privately owned

Tool steel revenues 2015



Kind & Co.: Excellent quality and service, deep value creation, global network

Excellence across the entire value chain

» Steel melting and remelting



» Forging



» Heat treatment



» Vacuum hardening



» Milling/machining



» 3D processing/near net shape



» Stocks



» Mill in Bielstein, Germany

» Own entities (processing, stocks) in Italy, US, China

» Long-time distribution partners in all relevant markets

OEMs



Tier 1



Mould makers



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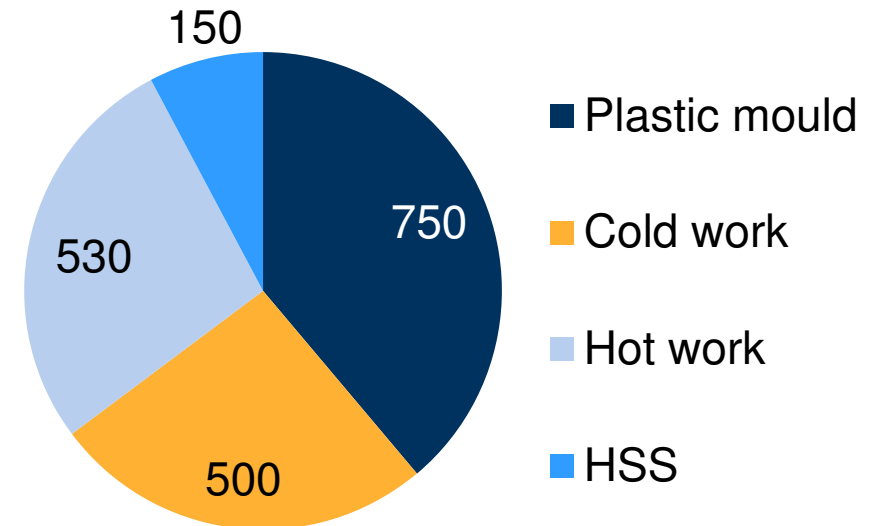
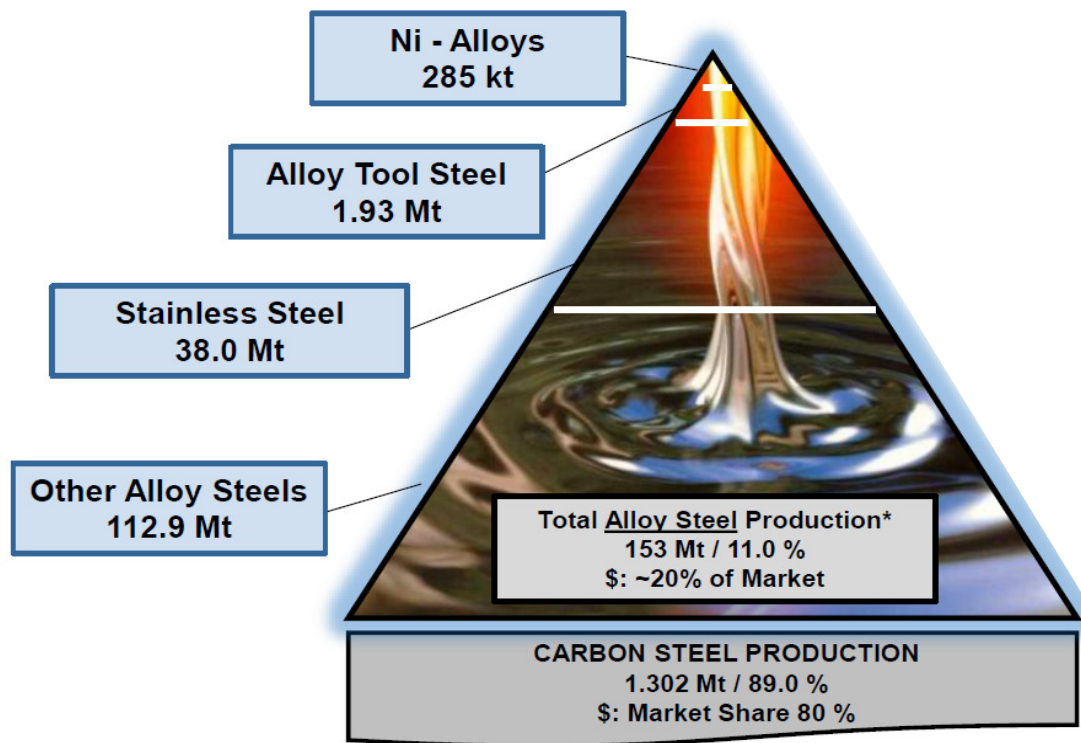
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Hot work tool steel: Kind & Co. a relevant player in the niche within the niche!

Tool steel by category, in kt

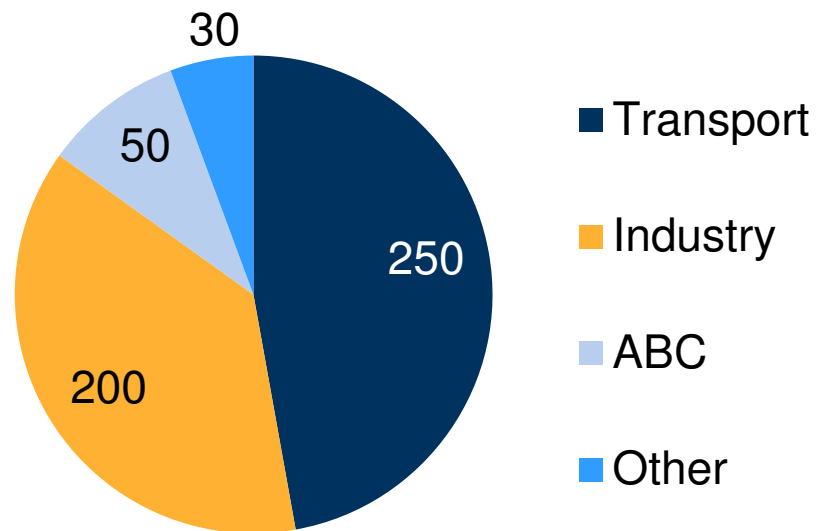


- » Approx 60kt 1.2714/L6 included in the 530 kt hot work tool steel
- » Thus approx. 470kt „real“ hot work tool steel
- » Approx 4% global market share for Kind & Co.

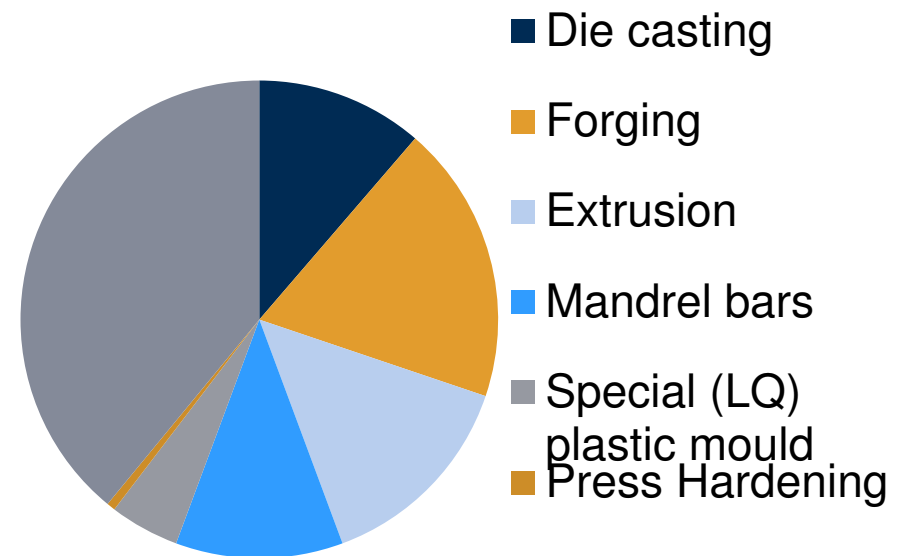
Source: SMR, Kind & Co.

Hot work tool steel: A view on end use and application and the role of Kind & Co.

By end use, in kt



By application (wild guess!)



- » Kind & Co. market share estimates
- » Die casting: approx. 10-15%
- » Forging (excl. 1.2714) approx. 5-10%
- » Extrusion: approx. 10-15%
- » ... and a significant share of the growing press hardening market!

Source: SMR, Kind & Co.

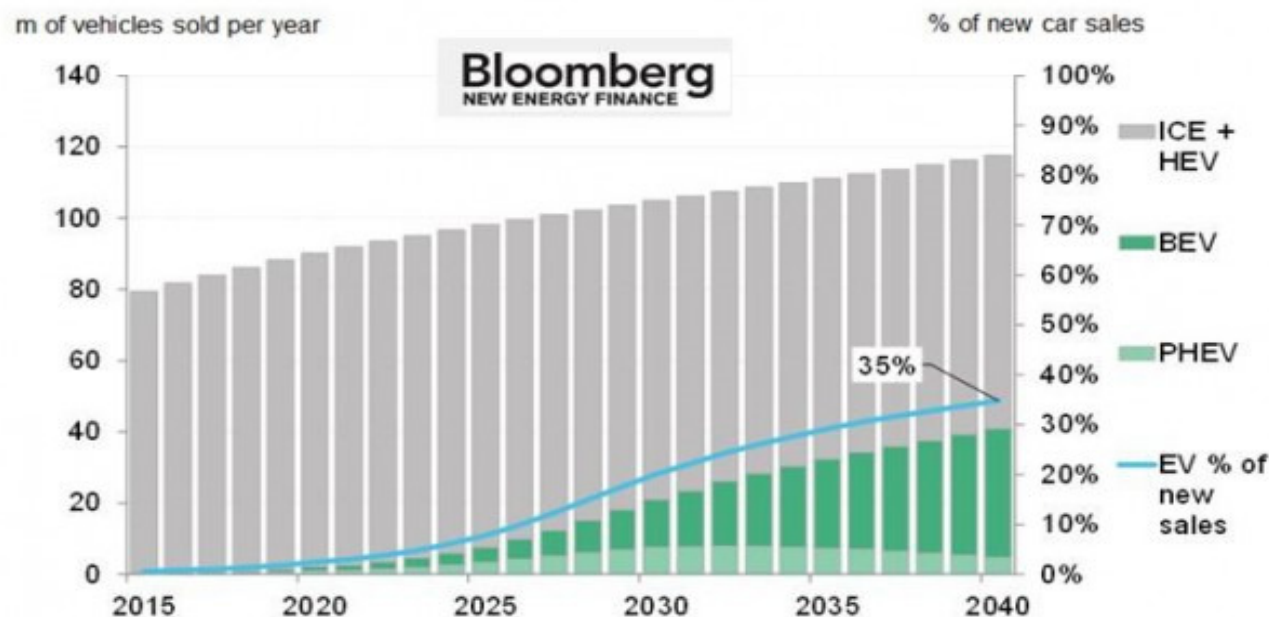
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Trends with potential for disruptive change exist in the Automotive value chain

Potentially disruptive trends in Automotive:

- » Electrification of the power train
- » Carsharing/ diverse mobility
- » Autonomous driving
- » Connectivity
- » ...

- » Peak production for conventional (internal combustion engine (ICE), including hybrid (HEV)) cars already reached in 2030?
- » Progress in electrification seems more likely today than 2-3 years ago (VW „Dieselgate“, emission „tricks“ of other OEMs, increasing level of subsidies for e-cars, ...)



Source: „Automotive revolution – perspective towards 2030“ (01/2016, McKinsey); Bloomberg (03/2016); Kind & Co.

Scenario for the drop forging market: double or triple whammy?

Electrification: Potential impact on drop forging industry

- » Vehicle numbers for ICE cars will drop (in approx. 10 years)
- » Currently, approx. 270 kg of parts from drop forging in power train and engine of a reference car (full weight 1740 kg)
- » Vehicle downsizing and emission regulation will lead to further weight savings especially in the power train
- » Sooner or later: no growth, rather gradually shrinking
- » Further pressure by additive manufacturing?

Potential impact on tool steel producers

- » Drop forging continues to be a sizable market for a while, but no long term growth perspective
- » „Cutthroat competition“ among customers will further increase price pressure
- » Trend to form large forging groups (M&A) likely to be continued and intensified –negotiation power in fewer hands
- » Is there still room for technical solutions or will it be a purely price-driven market?

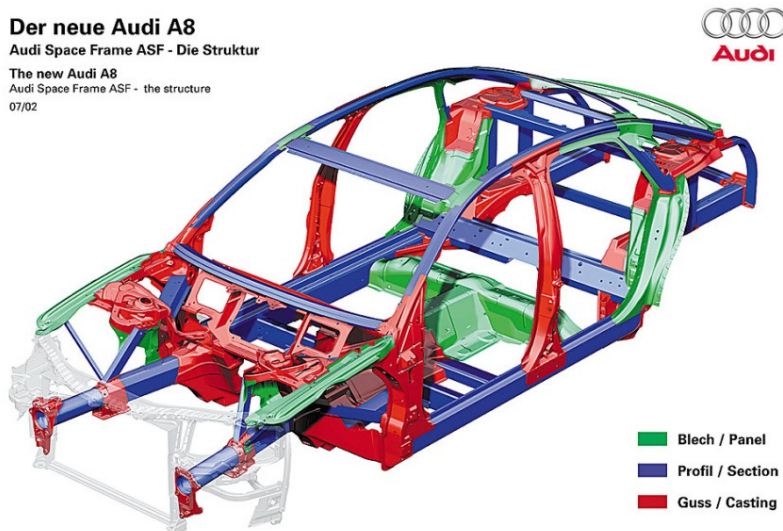


Scenario for the die casting market: economics likely continue to work!

Electrification: Potential impact on die casting industry

- » Weight saving still on the agenda, trend for structural parts still alive*
- » Potential for new massive volume parts (housings for e-motor, batteries) that might be „normed“ across OEM brands

Der neue Audi A8
Audi Space Frame ASF - Die Struktur
The new Audi A8
Audi Space Frame ASF - the structure
07/02



Potential impact on tool steel producers

- » New massive volume parts may come in reach (e.g., 2-3 standard e-motors and batteries for the entire fleet of middle class cars)
- » Economic pressure to provide tool steel that allows for >200.000 shots. Growth needs to be balanced by increased tool life!***
- » Possibility to differentiate technically and in service from competition, particularly in massive volume parts



* Maybe also some space for extruded Al profiles in high strength alloys to substitute steel profiles/sections?

** While number of Al die casting parts 2005-2016 grew 3x, tool life grew from 60.000 shots up to 250.000!

Source: Audi; Kind & Co.

Scenario for plastic mould: the jury is still out on additive manufacturing

Electrification: Potential impact on plastic mould industry

- » Less differentiation of cars through power train, but ...
- » ... more by design (e.g., interior) and software and connectivity

Potential impact on tool steel producers

- » Design differentiation on, e.g., the interior may demand for more plastic moulds – but unfortunately with lower life time expectations
- » Is there an opportunity to capture or will additive manufacturing make the point here (individual design)?



Source: BMW; Kind & Co.

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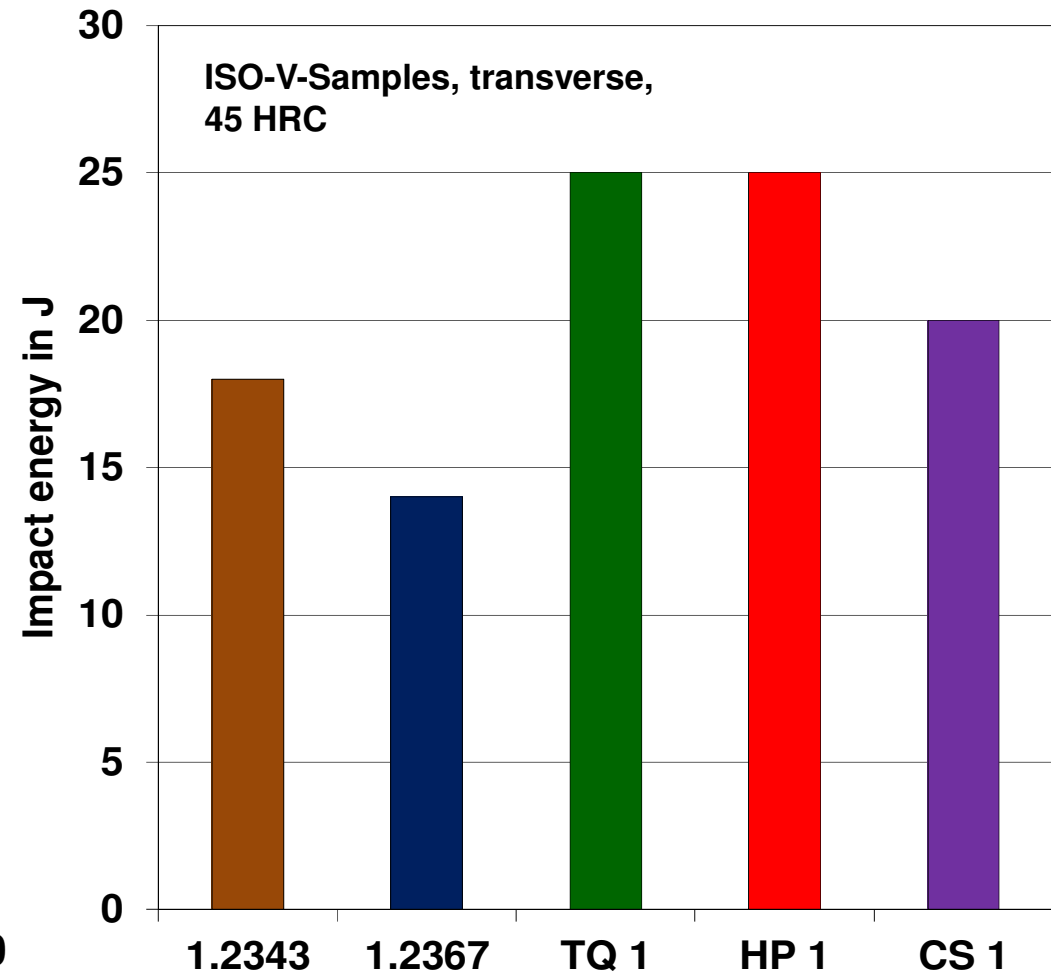
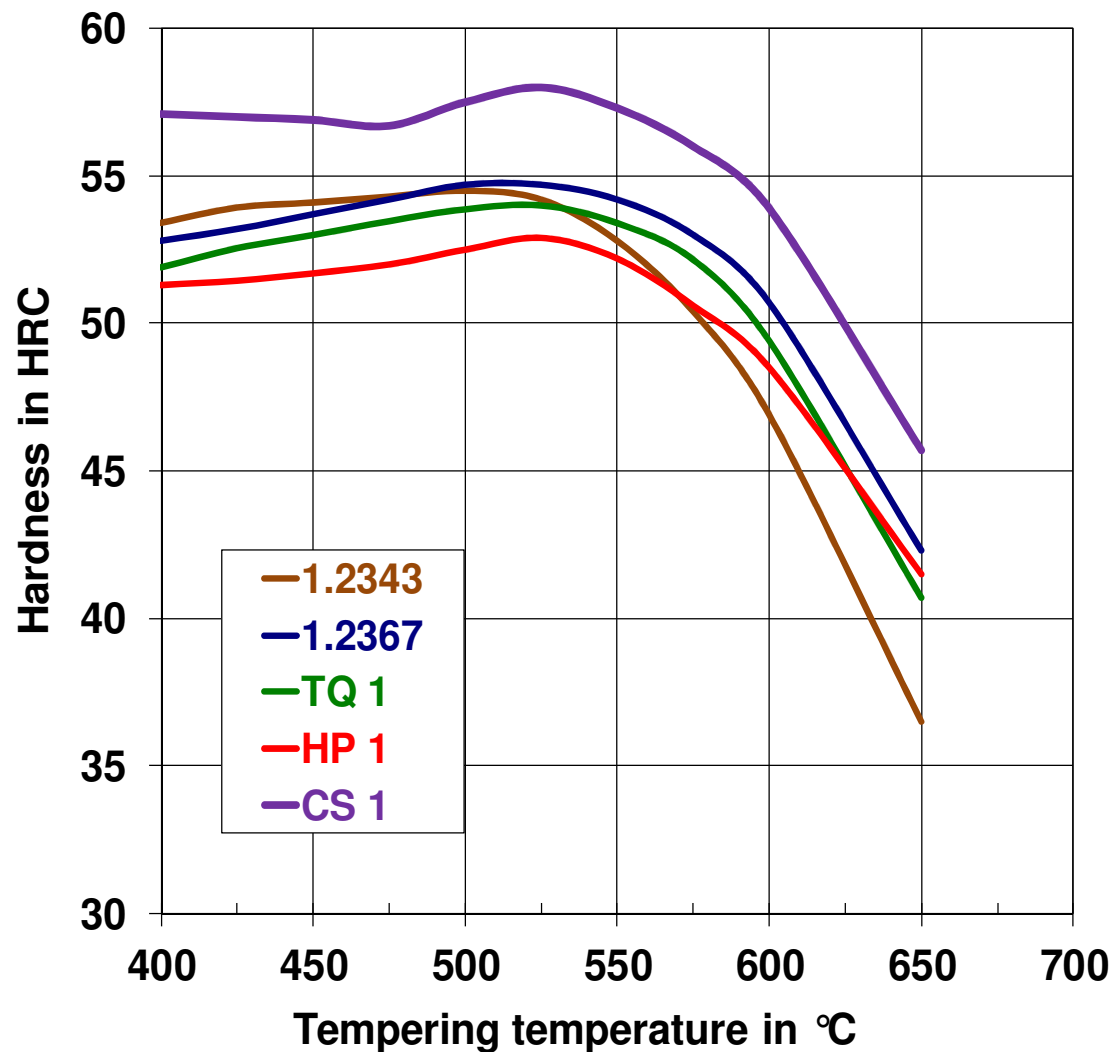
Kind & Co. steel to solve tomorrow's die casting and extrusion challenges

Steel Designation			Alloy Content in mass.-%								
Mat.-No.	AI SI	Brand	C	Si	Mn	P	S	Cr	Mo	V	Nb
1.2343	H 11	USN	0,38	1,00	0,40	≤ 0,020	≤ 0,005	5,20	1,20	0,40	---
1.2367	---	RPU	0,38	0,40	0,40	≤ 0,020	≤ 0,005	5,00	3,00	0,60	---
---	---	TQ 1	0,36	0,25	0,40	≤ 0,012	≤ 0,003	5,20	1,90	0,55	---
---	---	HP 1	0,35	0,20	0,30	≤ 0,012	≤ 0,003	5,20	1,40	0,55	+
---	---	CS 1	0,50	0,30	0,40	≤ 0,012	≤ 0,003	5,00	1,90	0,50	+

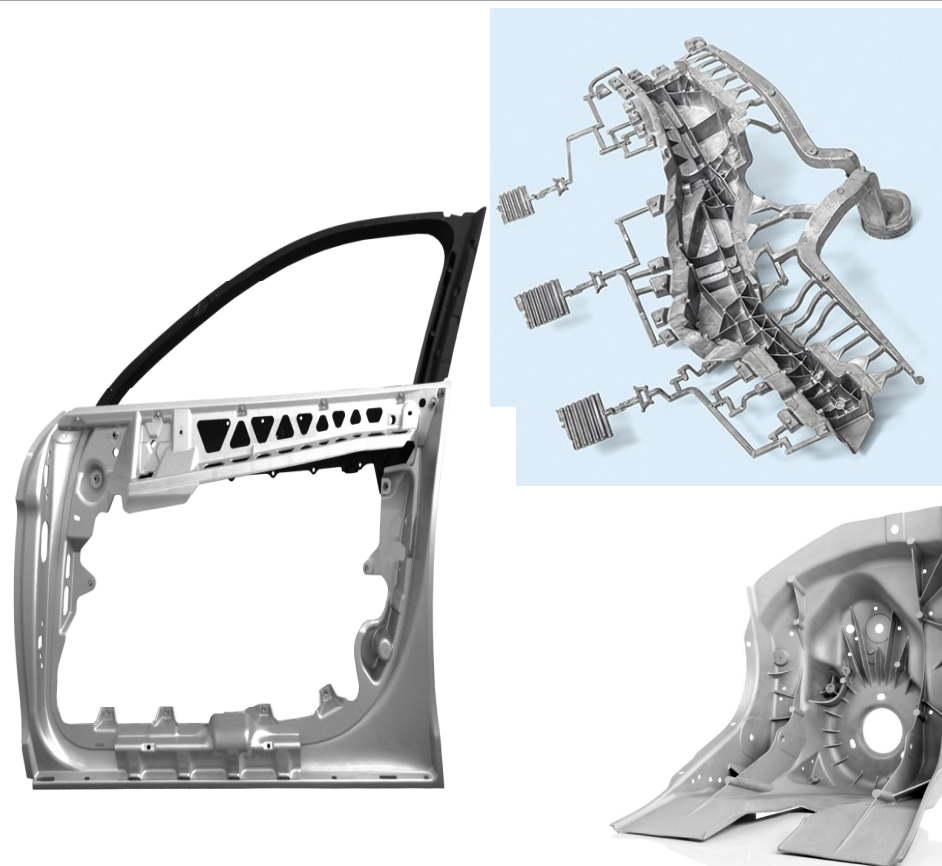
Here is our idea:

- » In die casting, tool life will decide the economics against additive manufacturing
- » In extrusion, there is potential for high strength extruded profiles – requiring better steel for containers and extrusion dies/heading
- » **Kind & Co. has developed special grades, e.g., TQ 1, HP 1, and CS 1, which are characterised by highest cleanliness and lowest concentrations of detrimental traces elements**

Lower stresses in dies enable higher hardness of tool steel



CS1 will solve the problems of the next generation dies and tools



Steel Brand	Alloy Content in mass.-%									Room Temperature Properties		
	C	Si	Mn	P	S	Cr	Mo	V	Nb	Rm in Mpa	Rp0,2 in Mpa	Z in %
TQ 1	0,36	0,25	0,40	≤ 0,012	≤ 0,003	5,20	1,90	0,55	---	1480	1250	53
CS 1	0,50	0,30	0,40	≤ 0,012	≤ 0,003	5,00	1,90	0,50	+	2074	1480	42

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Executive Summary

- » Kind & Co. is a small, but relevant player in the double niche of hot work tool steel. Our strategy is built around excellent quality and service, deep value creation, and a global network
- » We believe that the electrification of the automotive power train is more likely to gain speed than 2-3 years ago, with different impact on traditional tool steel applications:

- » Drop forging:



- » Die casting (and extrusion):



- » Plastic mould:



- » Kind & Co. is well prepared to support the automotive value chain, e.g., by special steel grades increasing the tool life: TQ1, HP1, CS1

Thank you very much for your attention!

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