



# Challenges in the hot-work tool steel supply chain – everything, everywhere, all at once

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- Short profile Kind&Co
- Current challenges for producers: everything, everywhere, all at once
- Gigacasting: non-reversible trend with still some challenges
- Big displays (and thixomolding)
- Conclusion

#### Kind&Co – global specialist for hot-work tool steel

#### Short profile Kind&Co

- 135 years of experience
- Global hot-work tool steel specialist
- Covering the entire value chain
- We like to talk opportunities rather than challenges

#### For 135 years, we have been producing high quality tool steel exclusively in Bielstein/Germany



2023

#### 1888

135 years of sophisticated materials solutions, best quality, reliable service, and competent advice

#### Modernity

Tradition Experience and know-how Sustainability Commitment and respect in cooperation Linked with our home region

Up to date production technology Professionalism in service Quick decision processes Internationality

## Kind&Co is a global specialist for hot-work tool steel and provides tailored solutions to demanding applications



- As a family-owned company since 1888, Kind&Co is the only hot-work tool steel specialist worldwide.
- Even though Kind&Co covers the entire range of the conventional hot-work tool steels, the company is well-known for self-developed premium grades tailor-made for the respective application (Cr7V-L, UH1,TQ1, HP1, CS1, Q10, HTR, HSF, LMF, etc.).
- We are proud of our strong application expertise and close proximity to the end customer.

## Kind&Co operates and provides expertise in every step of the value chain





### Despite fundamental challenges posed to tool steel producers, let us rather look at opportunities!





## Gigacasting will stay – against all technological challenges and odds

#### Gigacasting

- Trend to E-Vehicles and new entrants among OEMs supporting gigacasting
- China as the center of gravity for customers and producers
- Equipment availability
- Examples for technological challenges

## Change in automotive engineering ensures increasing demand for large structural components





- To reduce weight, the automotive industry is pushing ahead with the use of structural die cast components.
- New alloy concepts and adapted designs of castings offer additional growth for HPDC structural components.
- Manufacturers of die casting presses are following the trend towards large components.
- The expected growth in E-Vehicles supports the shift in automotive manufacturing from the premium segment to the mass market as well.

## Giga presses enable functional integration of multiple individual components into a single casting





- By investing in larger presses, OEMs are seeking to maximize efficiency by casting structural parts with complex geometries in an entire unit, which were previously produced in multiple castings.
- This functional integration can save downstream production costs (particularly, if you do not own "traditional" production infrastructure yet) and thus establishes a new approach to automotive engineering.
- This new technology was introduced to the market by Idra/Tesla. The number of cars sold by Tesla is rising sharply and with it the number of presses installed.
- Several foundries have decided to use this giga and mega cast technology, either as suppliers to Tesla or for their own vehicles.

Source: https://chargedevs.com/newswire/first-model-y-megacasting-produced-at-teslas-gigafactory-texas/ Sophisticated Materials Solutions | 10

#### China as leading automotive market, particularly for E-Vehicles





- Of the 85 million passenger cars and trucks produced worldwide in 2022, approximately 27 million (>30%) were produced in China.
- With almost 40% of the global passenger car production, more cars are produced in China today than in the USA, Germany and Japan together.
- In 2022, almost 5 million BEV were produced in China.

## Chinese manufacturers fully committed to electrification in the domestic market





- From June 2022 to the end of 2022, at least 600,000
  NEVs were sold each month, in December even more than 800,000 vehicles.
- This means that more than 50% of the entire global fleet is currently being driven in China.
- As of February 2023, BEV accounted for approximately 26% of the market.
- Market volume is expected to reach 7.53 million vehicles in 2027.

## Machine manufacturers accompany the new market requirements





- Manufacturers are increasing the clamping forces of their machines to meet market requirements. Examples
  - Bühler: Expansion to 8,400 t and 9,200 t clamping force with Carat 840 and Carat 920,
  - LK Machinery / Idra: Increase from 5,500 t clamping force in HPDC cells to 8,400 t,
  - HDC (Haitian Die Casting): Offers large die casting presses up to 8,800 tons.
- Market share of presses with clamping forces above 5000 t is continuously increasing and further developments are planned. Biggest machine existing on the planet is operating in China (LK, 12.000t).
- We estimate 60-100 machines above 5.000t clamping force ordered for or already built up in China.

#### Many technological/logistical problems yet unresolved but the trend will continue and require premium solutions



Examples for technological and logistical problems

- Dies reach a weight of easily 150-160t:
  - Reducing the number of tool shops which are (already) equipped to serve the segment
  - Causing substantial logistical problems for transportation of the dies (for service etc.)
- Amount of metal being cast per shot reaching 150-200kg
  - Causing substantial problems in the shot sleeve (metal corrosion, heat exposure)
  - Requiring even higher metal temperatures because of long flow paths, dramatically increasing the thermal shock for the mold
- Requirement for using low-Fe Al alloys to skip heat treatment for the huge parts (distortion-)
  - Problem of metal corrosion getting even bigger
- Large parts with high geometrical accuracy

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- Demolding without distortion can be difficult
- Produced parts are largely unable to be transported logistically, so that production needs to be in direct proximity to car manufacturing

• In the end, yet another opportunity for superior hot-work tool steel solutions!

The demand for big displays is triggering new casting technologies

# Big displays (and thixomolding)

- Demand for big displays
- Developments in thixomolding
- Avoiding critical demolding problems offers opportunities



## Thixomolding is a long-known process for small parts in electronics fields





- Examples: Parts for electronics/telecommuncation, electronic heat sinks, hand-held devices, medical devices, housings, ...
- We estimate about 500-600 production machines which are in use internationally.
- Main markets so far due to the main field of application are Japan, China, Taiwan, South Korea and Malaysia, as well as the US.

## Recent developments enable trends for bigger and better display/infotainment components







#### Developments of the process

- Improved mechanical properties and reduced porosities.
- New alloys with higher heat conductivity.
- Optimization on flow allows filigree designs.
- Bigger units available (from 250-850t closing pressure to now 1.000-1.300t)
- Beyond 1.300t, R&D projects exist.

#### Advances in process applications

- High quality even for larger molded parts with high accuracy.
- Larger data processing units, display components and electrical elements with more computational power/better heat dissipation.

## Very tight demands on the components give rise to premium hot-work tool steel solutions





- In the presence of any thermoshock cracks, thin cooling fins cling to the working surface and are ripped off during demolding.
- Extremely tight planarity specifications, especially to avoid the rainbow effect in display holders, require minimum demolding force applied to still warm and soft parts.
- Larger parts result in longer flow paths and higher metal temperature.
- High working hardness and at the same time great toughness require special developed hot-work tool steel used for the inserts (e.g., Kind&Co CS1).

Who only looks at the risks, misses the opportunities (and has less fun in life)

#### Conclusion



#### Conclusion



- Kind&Co is a globally operating hot-work tool steel specialist with 135 years of experience. We operate in every step of the value chain and therefore can offer competence and deep application know-how in all relevant applications.
- Today's business context presents numerous critical challenges to producers of hot-work tool steel (including energy prices, availability of work force, demand volatility, and changing demand patterns across regions-). They all need to be addressed one by one.
- Limiting the perspective, however, to challenges results in missed opportunities. We are focussing on two trends and opportunities:
  - Giga/Mega-Casting is posing huge challenges both technologically and logistically but however, the trend is irreversible. Premium tool steel solutions able to cope with the challenges will be very welcome to customers.
  - The trend to big displays in many applications, be it white goods or cars, will continue. The generation of our children will want everything to work like a mobile phone. The die casting parts in the inevitable displays offer opportunities for premium hot-work tool steel solutions that help comply with highest surface and geometry/planarity demands.

#### **Contact details**



#### Thank you very much for your attention

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