R&D WISCO

Development of Advanced Automotive Materials at WISCO

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WISCO Auto Steel Development

WISCO's main development targets 2018

- 200-230 billion CNY of turnover from principal steel business
- 150 billion CNY of income from the related businesses

Strategic Products Portfolio

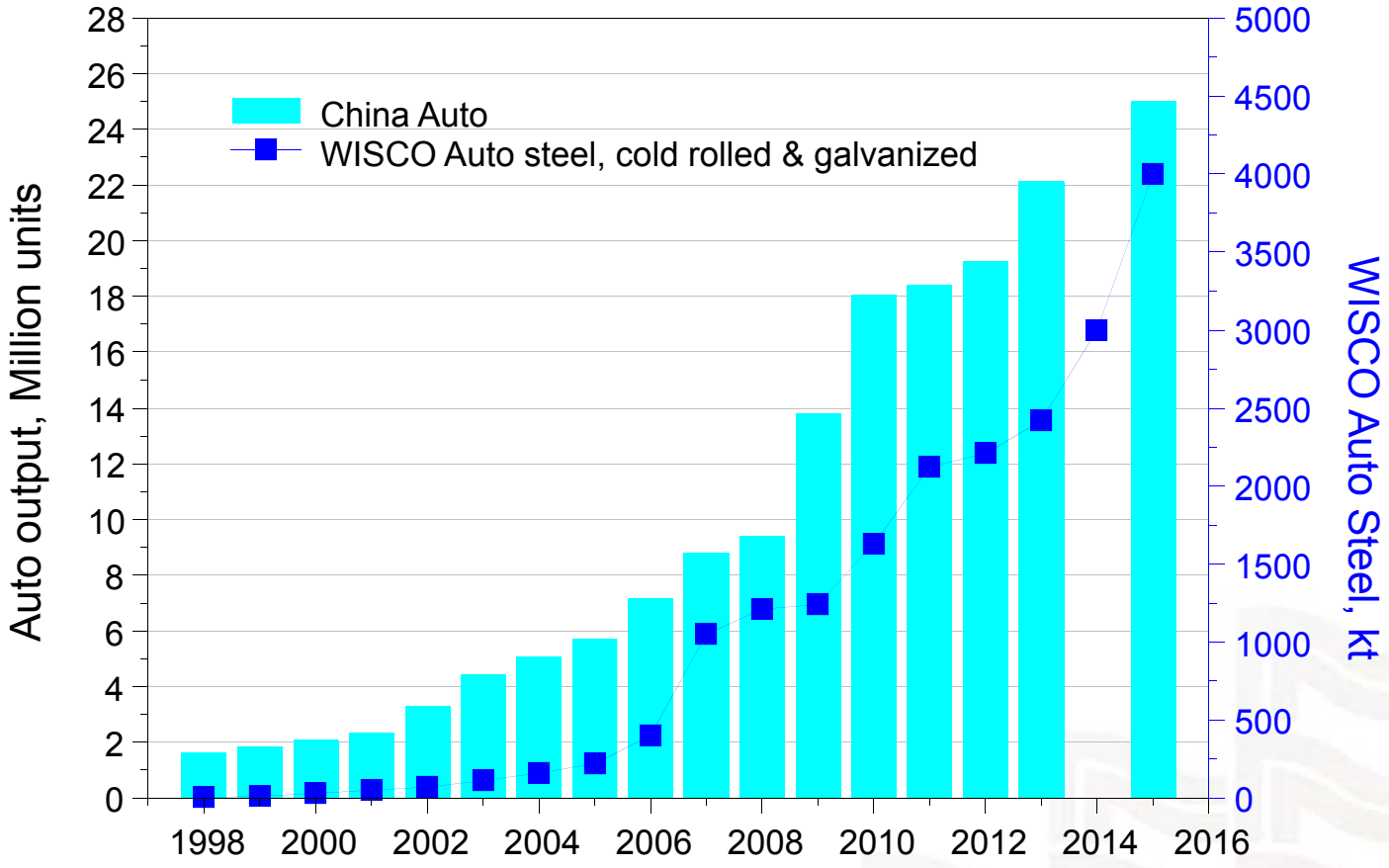
冷轧硅钢片 Cold Rolled Silicon Steel

汽车用钢 Automotive Steel

高性能工程结构用钢 High Performance Engineering Structural Steel

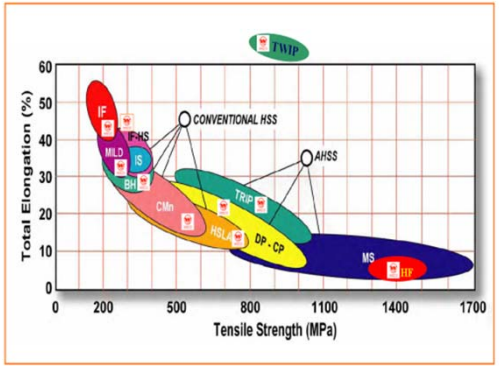
精品长钢 High Quality Long steel Products

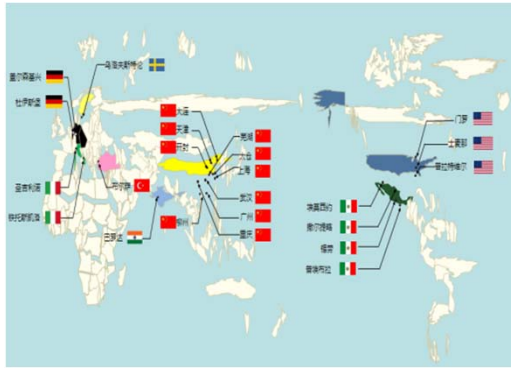
Growth of automotive steel in WISCO



2013, the output of auto steel in WISCO is about 3mt (including hot rolled auto steel)

Development of automotive steel in WISCO





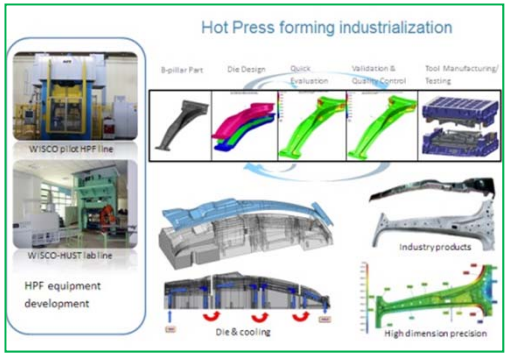
Products

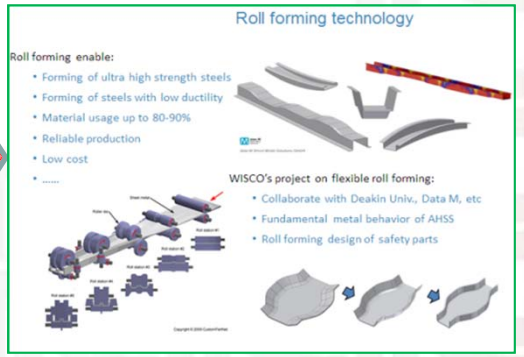
Service

Auto Steel

Support

processing





Grade availability

Mechanical properties (GA/GI/EG)

Yield Strength MPa	140	180	220	260	300	340	380	420	460	500
High strength IF steels		●	●	●	●					
Bake hardening steels	●	●	●	●	○					
HSLA steels				●	●	●	●	●	○	○
Hot rolled pickling steels		●	●	●	●	●	●	●		

High formability category:

- Yield strength 140 - 420MPa

● Commercially available

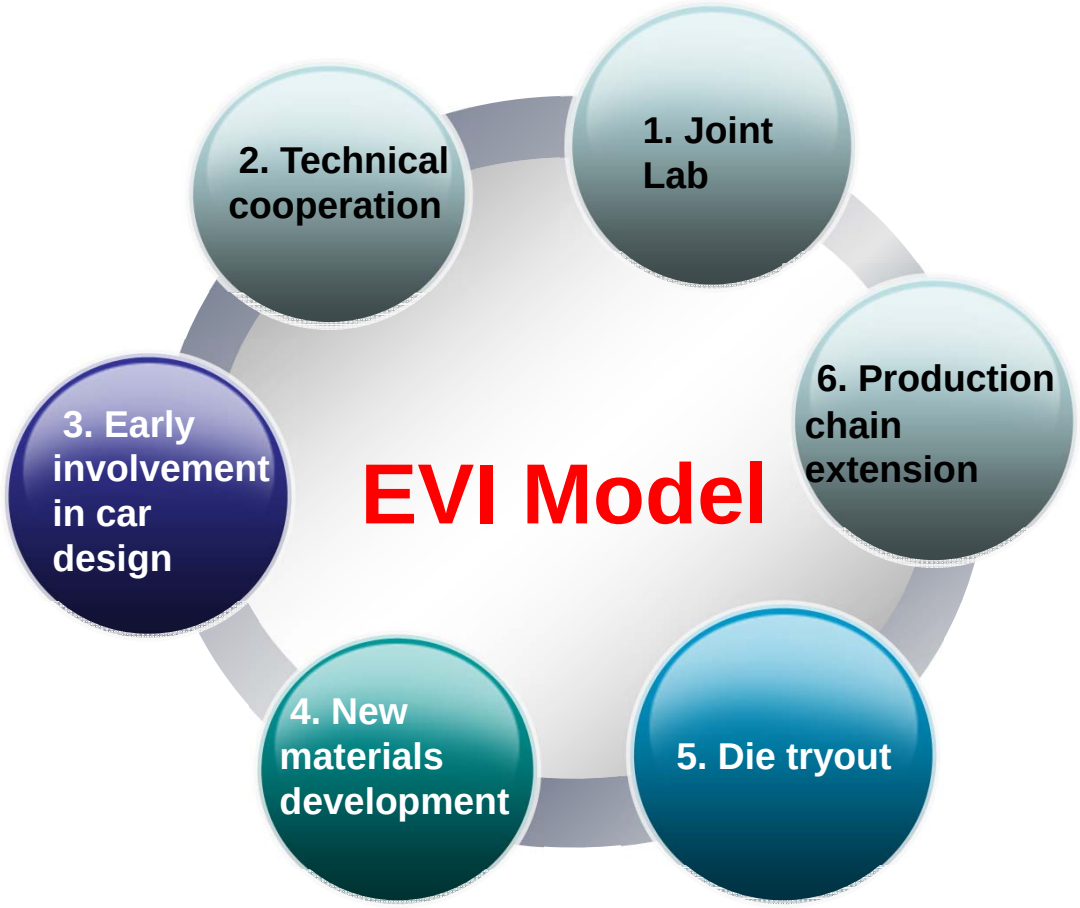
○ Laboratory development

High strength category:

- Tensile strength 450 - 1500MPa

Tensile Strength MPa	450	600	700	780	980	1300	1500	1700
Dual phase steels	●	●	●	●	○			
TRIP steels		●	○	●				
Hot forming steels						●	●	○
3rd generation steel				○				

EVI in WISCO



Material:
- Development
- Testing
- Approval

Forming:
- Cold stamping
- Hot stamping
- Roll forming

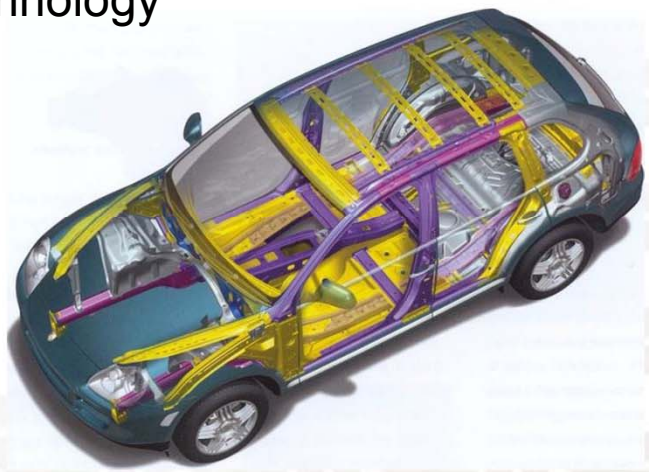
Die & Part:
- Design
- Manufacturability
- Formability analysis

- Innovative technology with value service for customers
- From styling to mass production

New Materials Research and Development

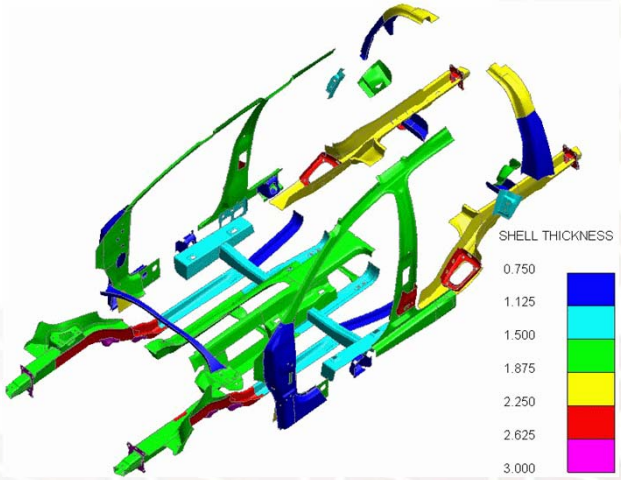
Materials requirements for automotive

- The development of automotive industry putting more pressures on materials manufacturing and new materials developments.
- Challenges for steel industry:
  - Low cost – preferable through total life cycle
  - Easy mass production – preferable with current manufacturing facilities
  - Long term profitable – moving downstream with added values
  - Low energy consumption forming technology
  - Joining with multi materials
  - …

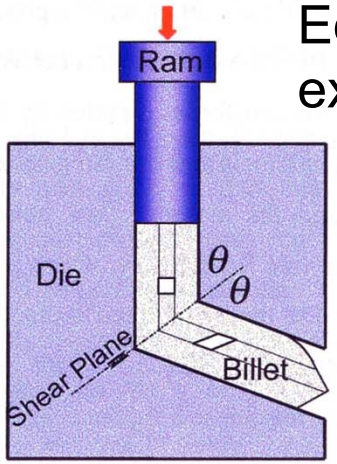


Steel development opportunities

- New automotive materials
  - Super fine grain steels
  - Nano-steels
  - Low density steels (<7.1g/mm³)
- New forming and joining technologies
  - Hot forming
  - Hydroforming
  - Steel laminate composite
  - Multi material joining (with steel)
- New surface technology
  - Co-deposition

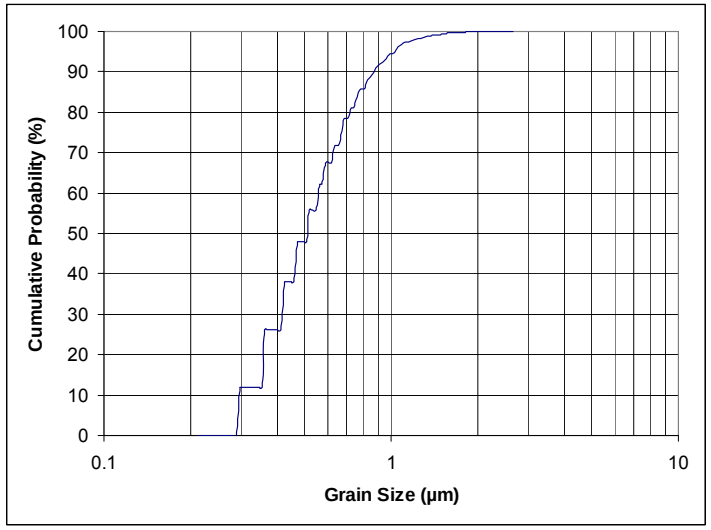


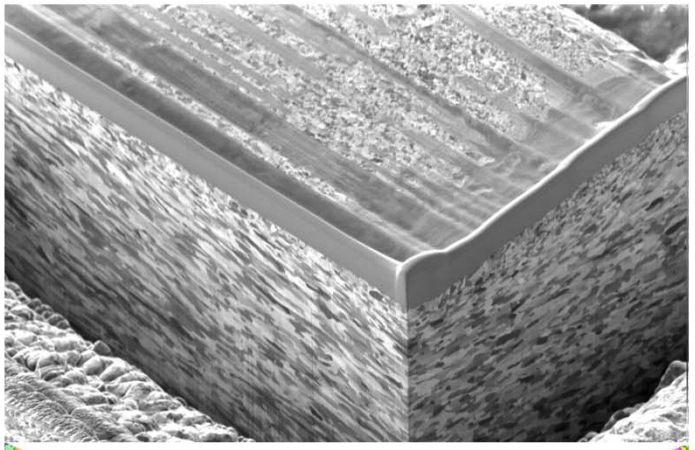
Ultrafine grained IF steel

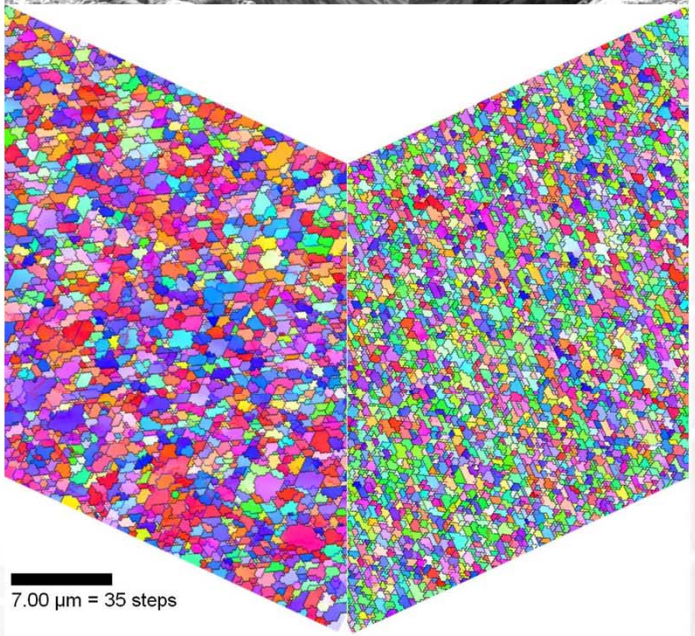


Equal channel angular extrusion (ECAE)

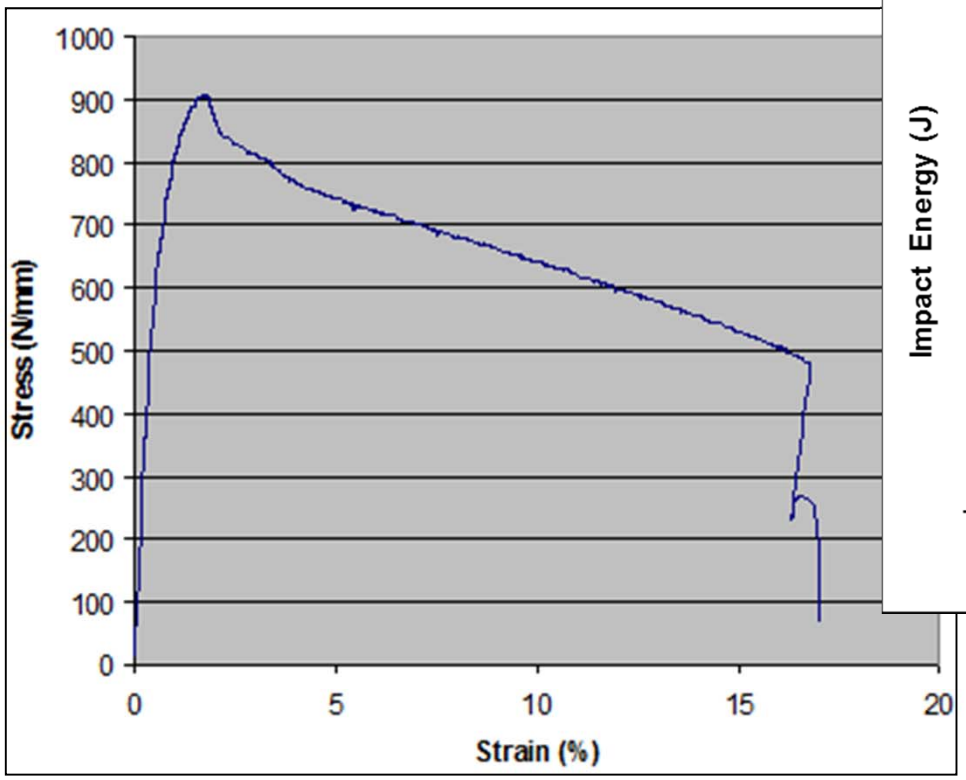
average grain length and width of 0.8 and 0.2μm

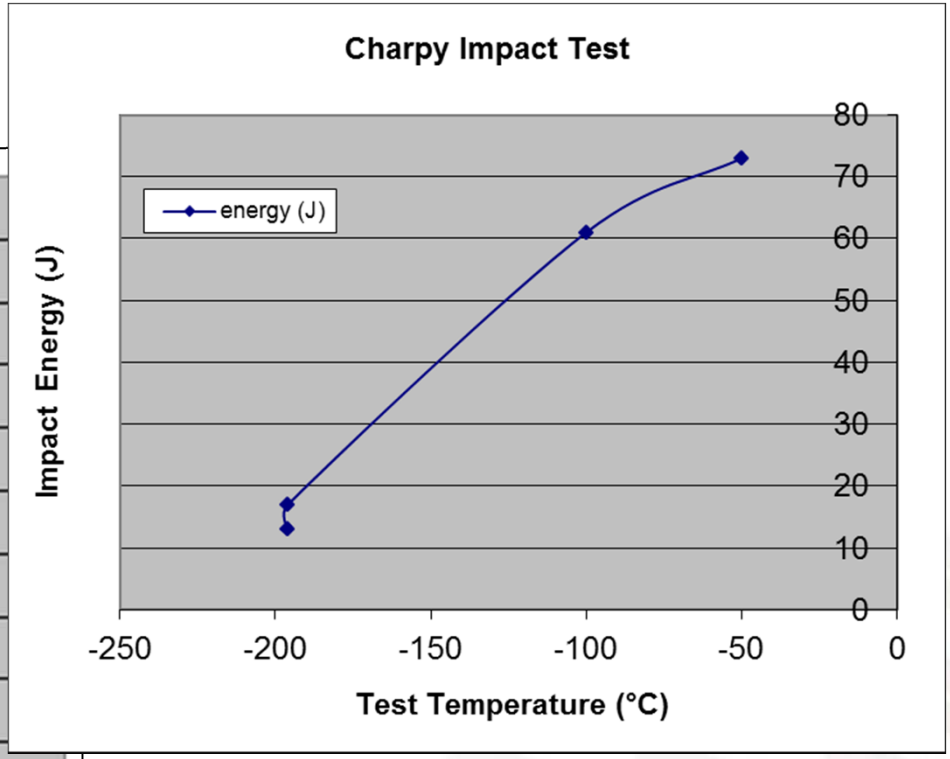






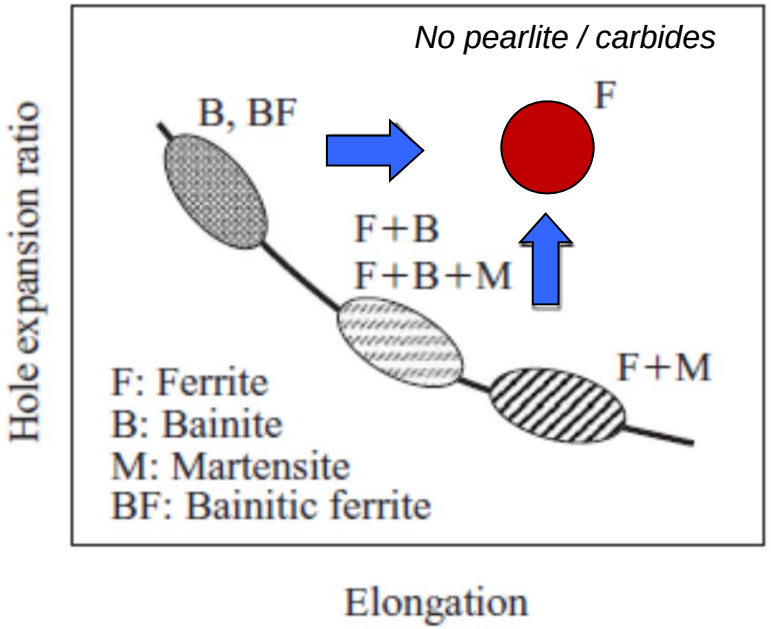
Ultrafine grained IF steel properties

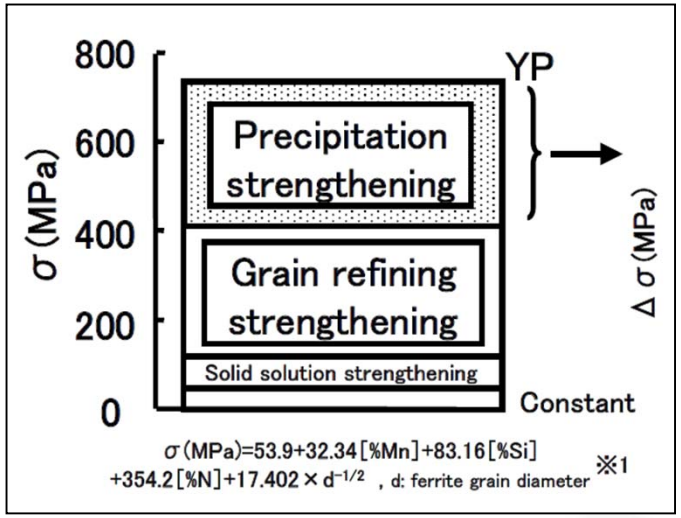




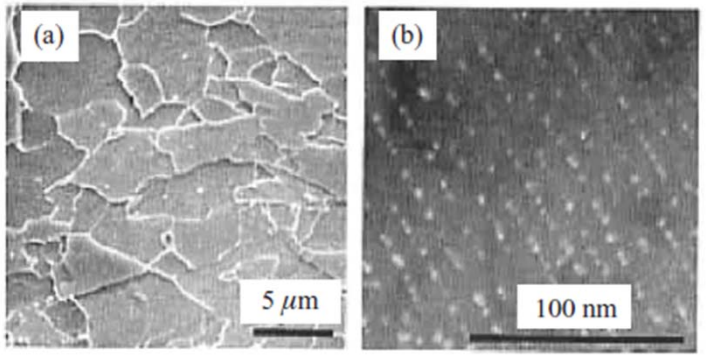
Ultrafine grained dual phase product was shown to have superior properties over conventional DP products.

Nano steels





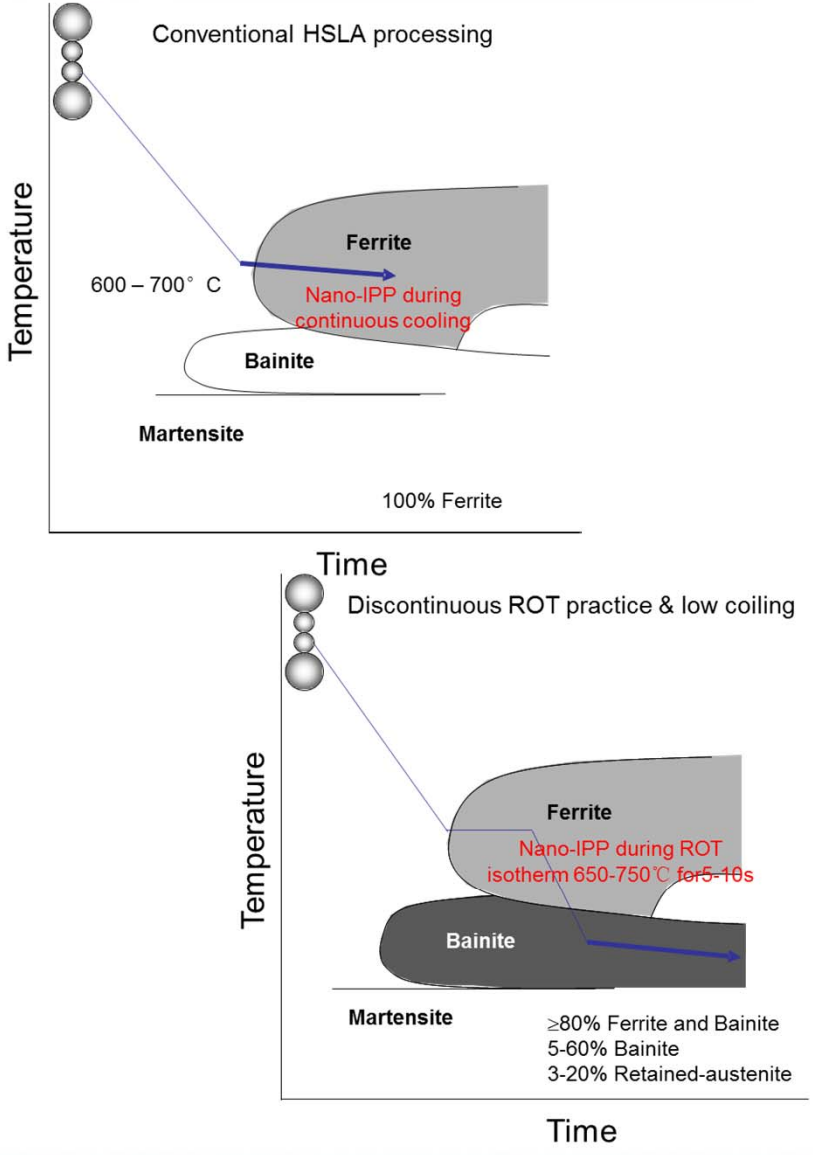
- Nano-steels provide innovative solutions for automotive applications which require high strength in combination with high elongation and stretch-flange formability, such as wheel rim, suspension and chassis etc.
- A single-phase ferrite matrix provides superior stretch-flange formability and elongation compared to matrices with 2nd phase constituents.

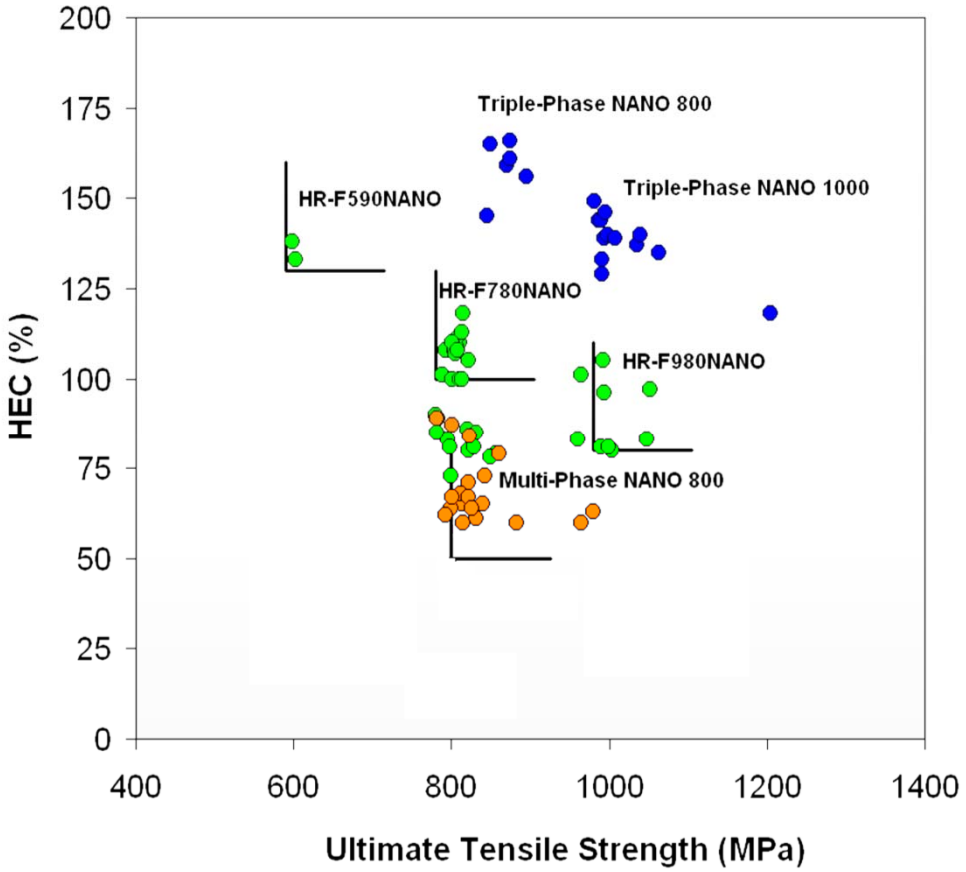


Nano-interphase precipitation in single-phase ferrite matrix

(JFE / TKS patent)

Benchmarking nano-steels





Hot forming steels development

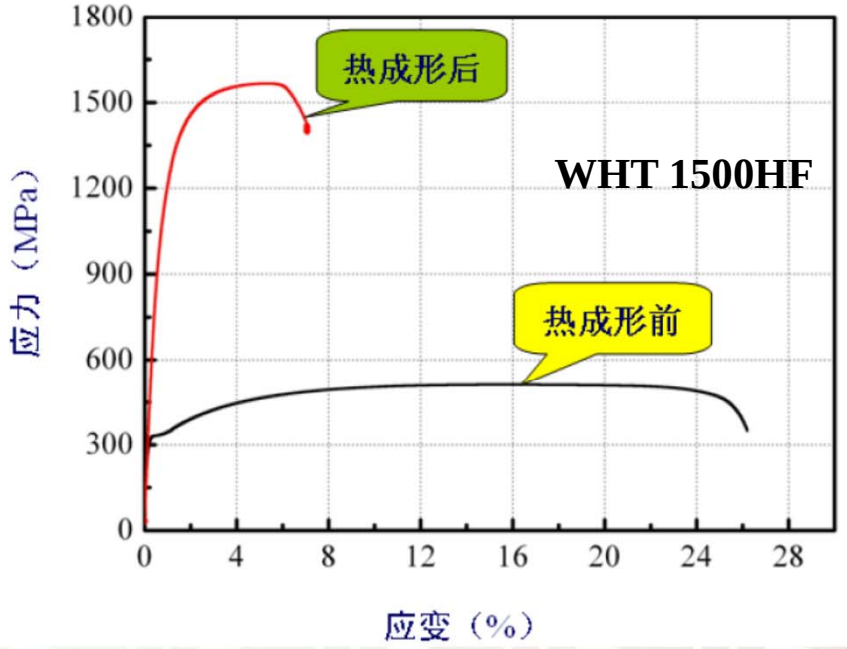
- Producing 1300MPa and 1500MPa grades of hot forming steels in uncoated, cold rolled and batch annealed condition, with annual capacity of 800kt.

Cold rolled and annealed

Grade	Yield strength (MPa)	Tensile Strength (MPa)	Total elongation (%)	Thickness (mm)
WHT1300HF	≥ 280	≥ 400	≥15	0.7～2.0
WHT1500HF	≥300	≥420	≥15	0.8～2.0

After hot forming

Grade	Yield strength (MPa)	Tensile Strength (MPa)	Total elongation (%)
WHT1300HF	950~1200	1300~1450	＞6
WHT1500HF	950~1250	1300~1600	＞ 6

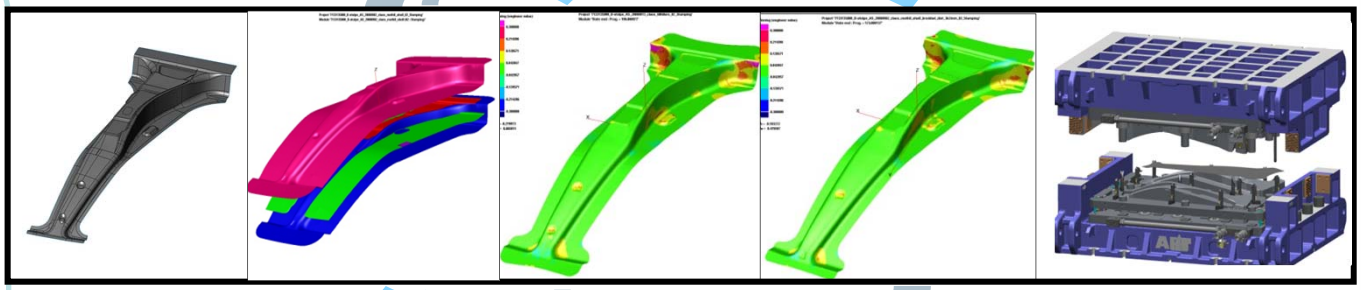


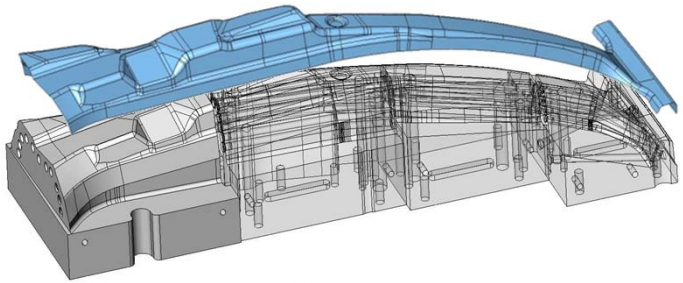
Hot forming industrialization

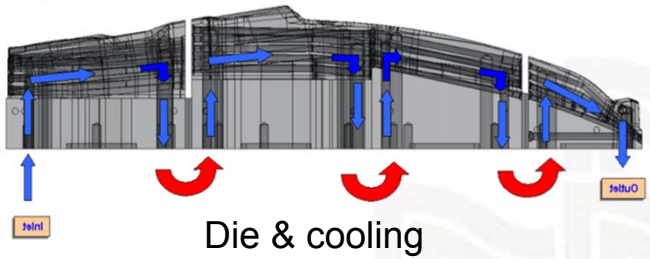
WISCO pilot HPF line

WISCO-HUST lab line

B-pillar Part Die Design Quick Evaluation Validation & Quality Control Tool Manufacturing/ Testing

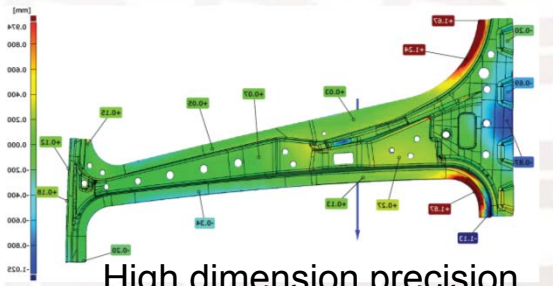






Die & cooling

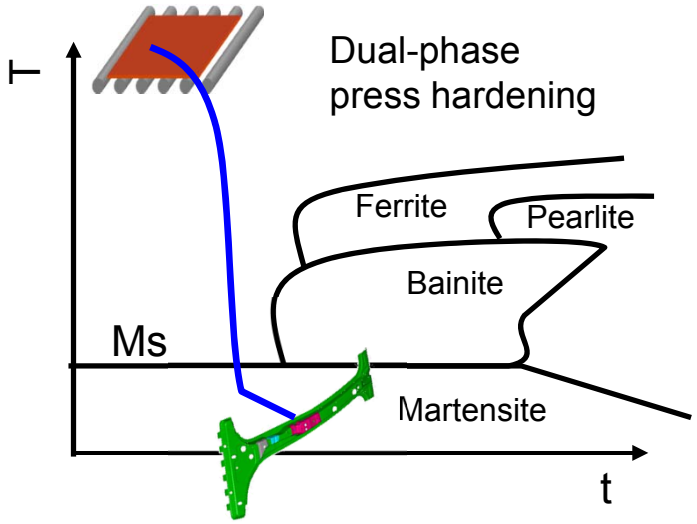
Industry products

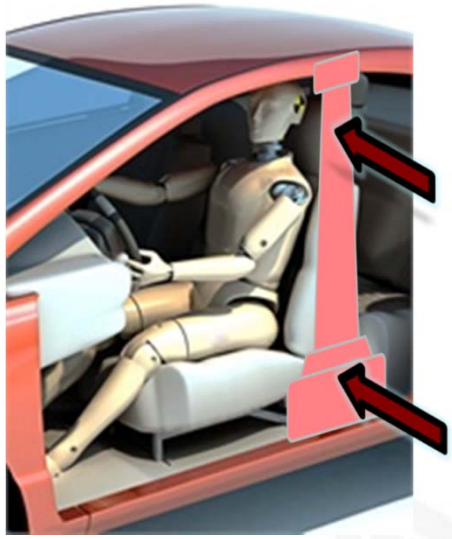


High dimension precision

Development on hot forming technology

- Expanding the range of press hardening steels with accelerated cooling
- Partial austenisation to achieve dual phase press hardening
- Hot forming laser welded blanks or partially annealed the press hardened components





Passenger protection with high crushing strength

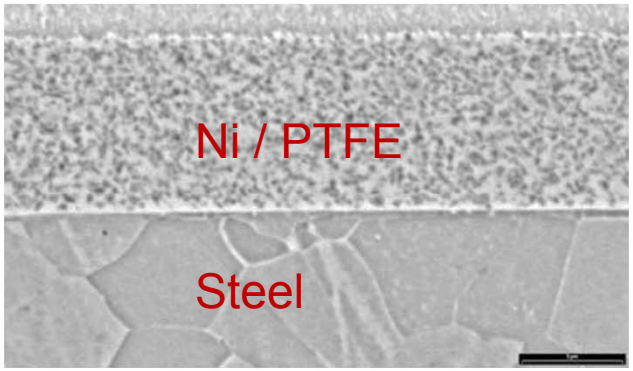
Absorbing impact energy by deformation

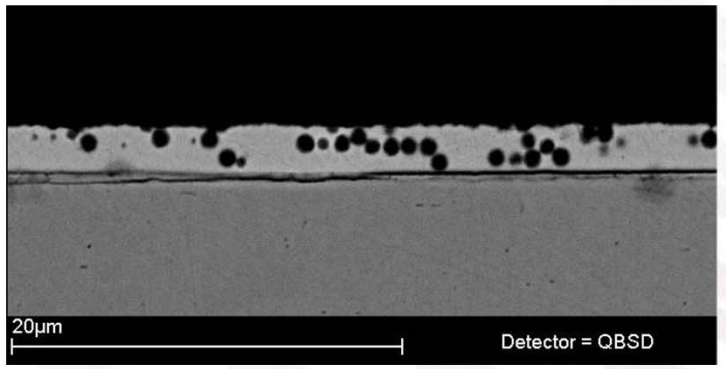
TWB

Tailored quenching

Development on surface technology

- Designed surface coating to give specific functionality, e.g. composite coating with metal or metallic oxides particle combination.
  - Anti-corrosion + increased hardness + low friction (e.g. M/PTFE)
  - Anti-corrosion + low wear (e.g. M/SiC)
  - Anti-corrosion + low electrical contact resistance (e.g. M/carbon)
  - Anti-corrosion + adhesion to organic films (e.g. M/resin)





Thank you!

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