Steel use in transport from a sustainability perspective

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1. Importance of life cycle thinking
Tailpipe Emission Regulation

How to get it?
Weight reduction is one of solutions.

Source: International Council on Clean Transportation August 2011
Challenging weight reduction with HSS

Changes in social background
- rapid economic growth
- fuel economy
- crash safety
- global warming
- SBT

High Tensile Strength Steel (HSS)
- mild steel
- ~440MPa class
- ~590MPa class

Super HSS
- 780~980MPa
- 1180MPa~
- Hot stamp

Tensile strength (Gpa)

Unexplored Area

The Japan Iron and Steel Federation
CO₂ emission from material production stage

Per 100kg Normal steel 100kg eq.
- HSS: 75kg
- Aluminum: 67kg
- Magnesium: 50kg
- CFRP: 45kg

Reference: World Auto Steel
Life long environmental impact of vehicle

Material selection becomes more important

Fuel economy is dominant → Material selection is dominant

Future trend

Material production /waste treatment /recycling

- Conventional
- HV
- Future

- Material production
- Body/parts production
- Fuel preparation
- Tailpipe emission
2. Advantages of steel in material recycling
Types of Material Recycling

**Thermal Recycling (Open-loop Recycling)**
EO products are incinerated and the heat is recovered as thermal energy to produce electricity or steam. The recovery has no effect on the reduction of natural resource consumption for virgin materials, but it is a low cost and energy saving way for recycling of flammable materials.

**Cascade Recycling (Open-loop Recycling)**
The material is used as a secondary material in another product. The recycle may continue cascadelly in several steps. In each step, the material quality drops or changes and finally the material comes to the EoL.

**Closed-loop Recycling**
The material is recycled to the original material without or with very little loss of its characteristics or quality so that the number of recycling can be infinite. Closed-loop recycling reduces consumption of natural resources of the material, accompanying environmental impacts, and generation of wastes. Closed-loop recycling is superior to open-loop recycling in terms of sustainability.
Conditions for Rational/Sustainable Material Recycling

a) Separation and collection is easy
b) Environmental impact of recycling is smaller compared to production using natural resources
c) Recycling system is economically sustainable

Additional conditions for “Closed-loop Recycling”
d) No/small quality degradation through recycling
e) Can be recycled into various products
Conclusions

1. Life Cycle Thinking is the key to keep right direction in global environmental issues

2. Steel has great advantages in terms of material recycling
Thank you for your attention

Steel, the most eco-friendly material