

High Formability 780–980MPa Class Hot-Rolled Steel for Automobile Suspensions

1.

Among automotive parts, the requirements for so-called “suspension parts” such as the suspension, chassis, etc. include durability in the forms of fatigue strength, corrosion resistance, etc. in addition to strength and rigidity. For this reason, mainly hot-rolled steel sheets which have a larger thickness than cold rolled steel sheets are used in these parts. Although the materials mainly used at present are 440–500MPa steel sheets, application of higher strength hot-rolled steel sheets is being studied in order to realize weight reduction in suspension parts.

JFE Steel developed 780–980MPa class high formability high strength hot-rolled steel sheets by fully utilizing technology for precise microstructure control of steel sheets. This article introduces the outstanding performance of the developed steel sheets.



Photo 1 Appearances of punched edge

2. D

2.1 B

980MPa class steel sheet, which has a yield strength of 980MPa and a tensile strength of 1020MPa, and an elongation of more than 60%, which is higher than that of the conventional steel. The 980MPa class steel sheet also has a high formability exceeding that of the conventional 780

1), which was achieved by producing a fine, uniform microstructure and reducing 80e(a)umnt

Table 1 Mechanical properties of developed steels

	Yield strength (MPa)	Tensile strength (MPa)	0.2% proof stress (MPa)	Elongation at break (%)	Forming limit diagram (FLD) (%)
Developed 980	2.6	900	1020	13	60
Developed 780	2.6	730	800	18	80
Conventional 780	2.6	710	810	17	40

† Originally published in JFE GIHO No. 41 (Feb. 2018), p. 85–86

(thickness: 2.9mm) and the conventional steel sheet (thickness: 2.6mm) in a plane bending fatigue test, and the fatigue strength of the punched edges of the materials when punched with a 10mm punch (clearance:

2.3

In suspension parts, electrodeposition coating is generally performed to improve corrosion resistance, in which phosphate treatment is performed to form a zinc phosphate coating in the previous processes. If formation of this zinc phosphate coating is inadequate, defects may occur in the electrodeposited coating, and as a result, corrosion resistance will decrease. Therefore, it is necessary to form a dense layer of zinc phosphate crystals. Fig. 2 shows SEM images of the sur

20%). In comparison with the conventional steel sheet, the developed 780MPa steel sheet has high fatigue strength in both the flat sheet and at the punched edge. If the surface roughness of a steel sheet is high, local stress concentrations will occur at the surface, fatigue cracks will be generated easily, and fatigue strength will decrease³⁾. The surface roughness of the developed steel sheet was reduced by optimizing descaling conditions in hot rolling, and as a result, it is thought that the fatigue strength of the base metal increased. In addition, if the roughness of the punched edge is large, local stress concentration will occur, fatigue cracks will be generated easily from the punched edge, and the fatigue strength of the punched edge will decrease³⁾. With the developed steel sheet, it is thought that the fatigue strength of the punched edge increased because generation of cracks at the punched edge is suppressed and the developed sheet has a smooth punched edge in comparison with the conventional sheet, as shown in Photo 1.

automobiles by creating a mass production system for the steel sheets and promoting a further expansion of their applications.

3) Tomita, K.; Shiozaki, T.; Urabe, T.; Osawa, K. Tetsu-to-Hagané. 2001, vol.87, p.557.

)RU)XUWKHU ,QIRUPDWLRQ 3OHDVH 8
6KHVV%QHVV 3ODQQLQJ 'HSW -)(6WHHO

- 1) Hasegawa, K.; Kawamura, K.; Urabe, T.; Hosoya, Y. ISIJ International. 2004, vol.44, no.3, p.603.
- 2) Okano, T.; Sakumoto, K.; Yamazaki, K.; Toyoda, S.; Suzuki, S. Key Eng. Mater. 2016, vol.716, p.643.