KAWASAKI STEEL TECHNICAL REPORT
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Steel Pipe

Characteristics of Stainless Steel for Automotive Exhaust Systems and Its Production by Tandem Cold Rolling

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Synopsis :
Ferritic stainless steels for automotive exhaust systems are reexamined for corrosion resistance and properties at elevated temperatures. Production process of the steels using conventional facilities for plain carbon steels in studied. Stainless steels have good corrosion resistance to inner condensate and outer road salt. Ti-stabilized type 409L is better than nonstabilized type 410L in both corrosive environments. Type 409L also has better properties at elevated temperature and better press formability, and is considered to be the optimum material for these automotive applications. It is shown that rolling by the high-productive tandem mill and optimizing the condition of the annealing process can provide stainless steel strips with sufficient quality of dimensions, surfaces, and properties.

The body can be viewed from the next page.

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Synopsis:

Ferritic stainless steels for automotive exhaust

2 Changes in Corrosive Environment of Automotive Exhaust Systems and Material Properties Required

Recent trends in the selection of material for automotive exhaust systems and required properties are shown in **Table 1**. Stainless steels are replacing conventional materials in exhaust manifolds, mufflers, and front and tail pipes.

The principal problems in [illegible] with [illegible]

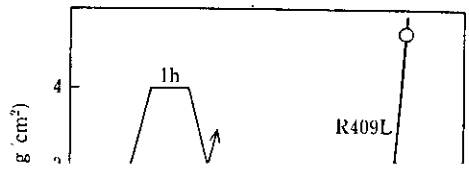
emission control.

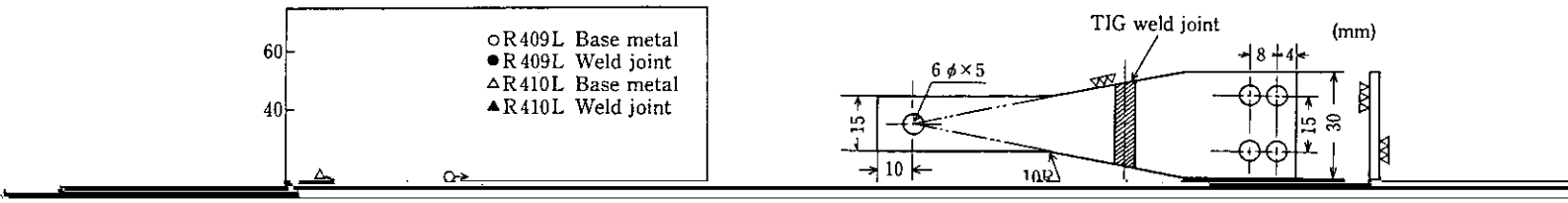
Material for exhaust manifolds must provide excellent high-temperature characteristics, since the operating temperature of this part may reach 800°C. In particular, durability under conditions of repeated heating and cooling is necessary.

Increasingly high requirements are being placed on materials for exhaust manifolds, in response to the elevated temperatures at which higher performance

3.1 Properties at High Temperatures

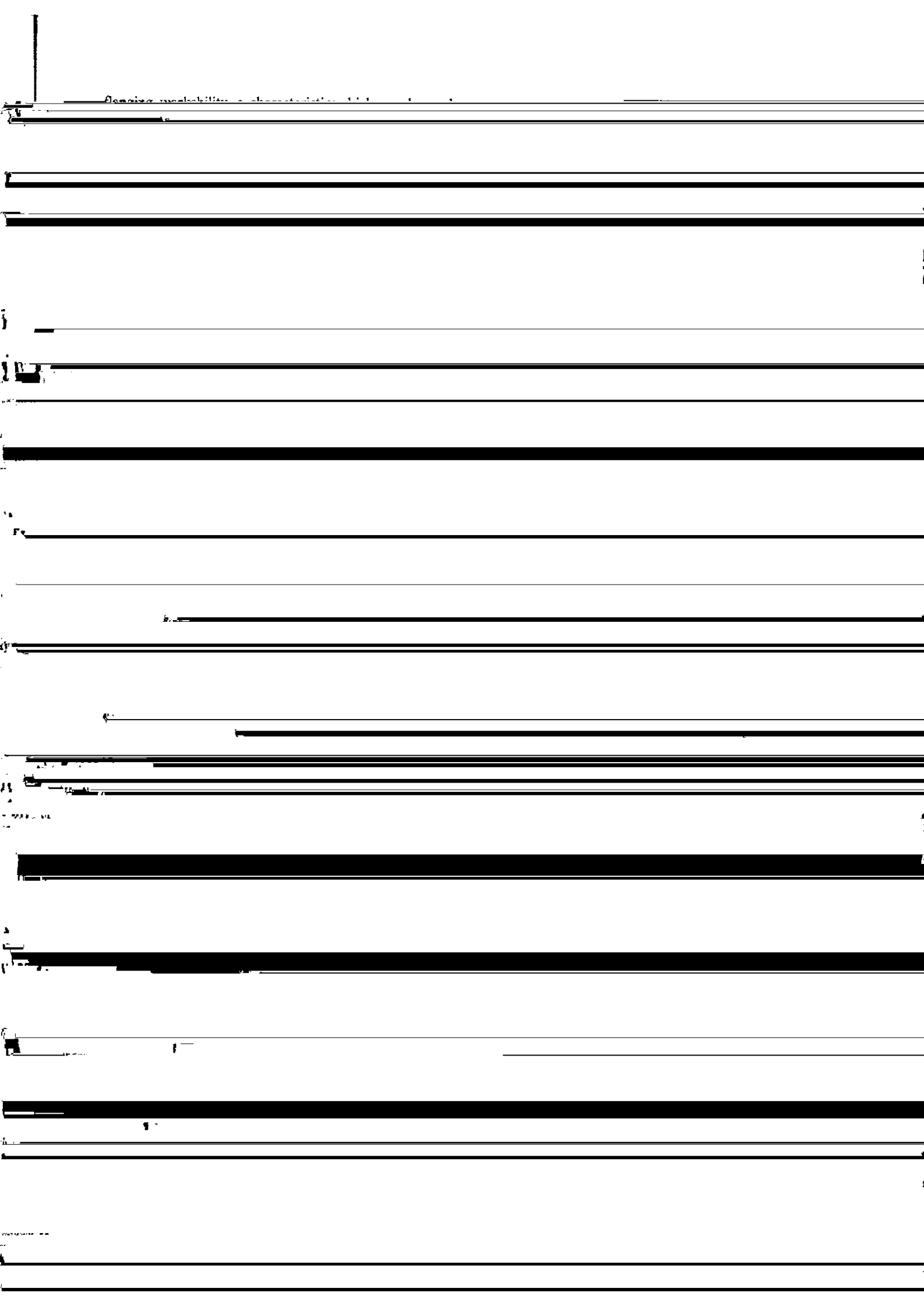
Parts such as the exhaust manifold, which are used in the vicinity of the engine where temperatures may be




60
40
○R409L Base metal
●R409L Weld joint
△R410L Base metal
▲R410L Weld joint

TIG weld joint
(mm)
6 ϕ×5
8
4
15
10
15
30

[redacted]



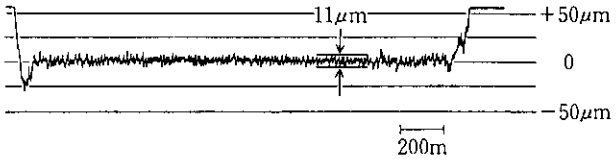
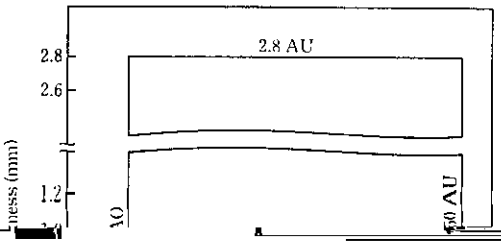
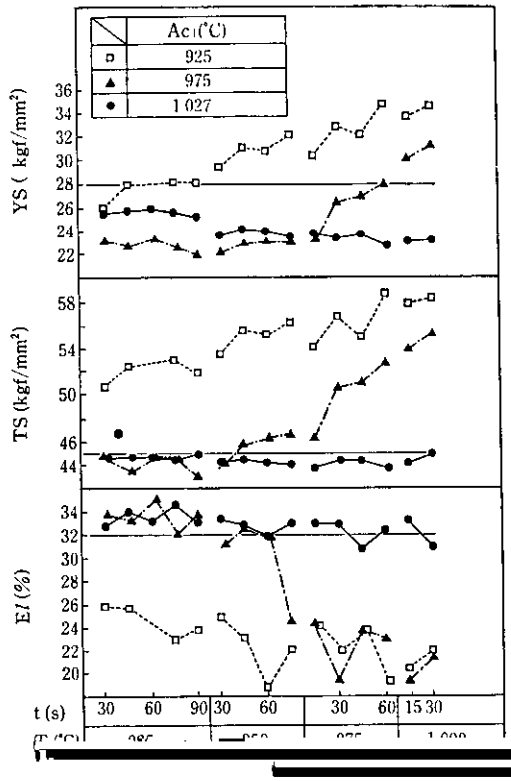


Fig. 10 Example of thickness record of tandem rolled R409L





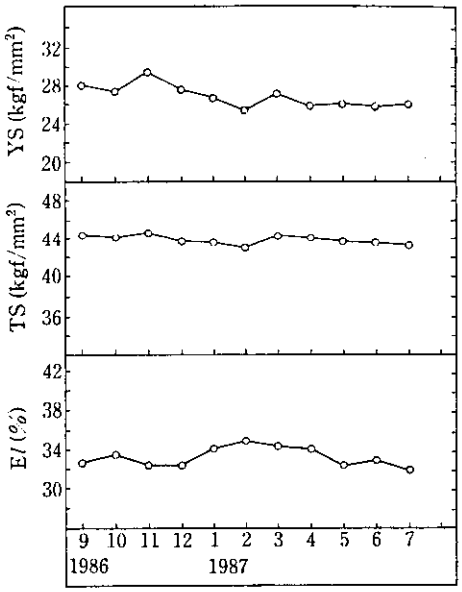


Fig. 14 Stable results in mechanical properties of R409L in recent years