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Methods of Cold Rolling Oil Evaluation in te rms of Heat Streak Resistance and Strip Surface Cleaning Property, together with their Applications

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Synopsis :
Evaluation methods of heat streak resistan ce and sheet surface cleaning property of cold rolling oil were establishe d. The lubricity was evaluated by scoring limit load using the modified Timken tester and four-ba ll tester. Surface cleaning property was quantitatively evaluated by the quantity of ca rbon on the surface of the test piece after annealing. Through these methods, it was po ssible to develop high lubricity rolling oil with performance to increase 10 to 20% rolling speed and to decrease 15% oil consumption compared with those of the conv entional rolling oil. The new surface clean rolling oil has a good surface cleaning property and lubricity that can be used in rolling of the steel sheet with 0.4mm thickness.

The body can be viewed from the next page.

Methods of Cold Rolling Oil Evaluation in terms of Heat Streak Resistance and Strip Surface Cleaning Property, together with their Applications*

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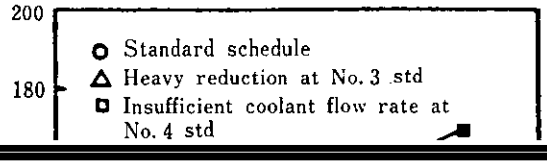
2 Evaluation of Heat Streak Resistance

2.1 Mechanism of Heat Streak Formation

2.1.1 Origin of heat streak



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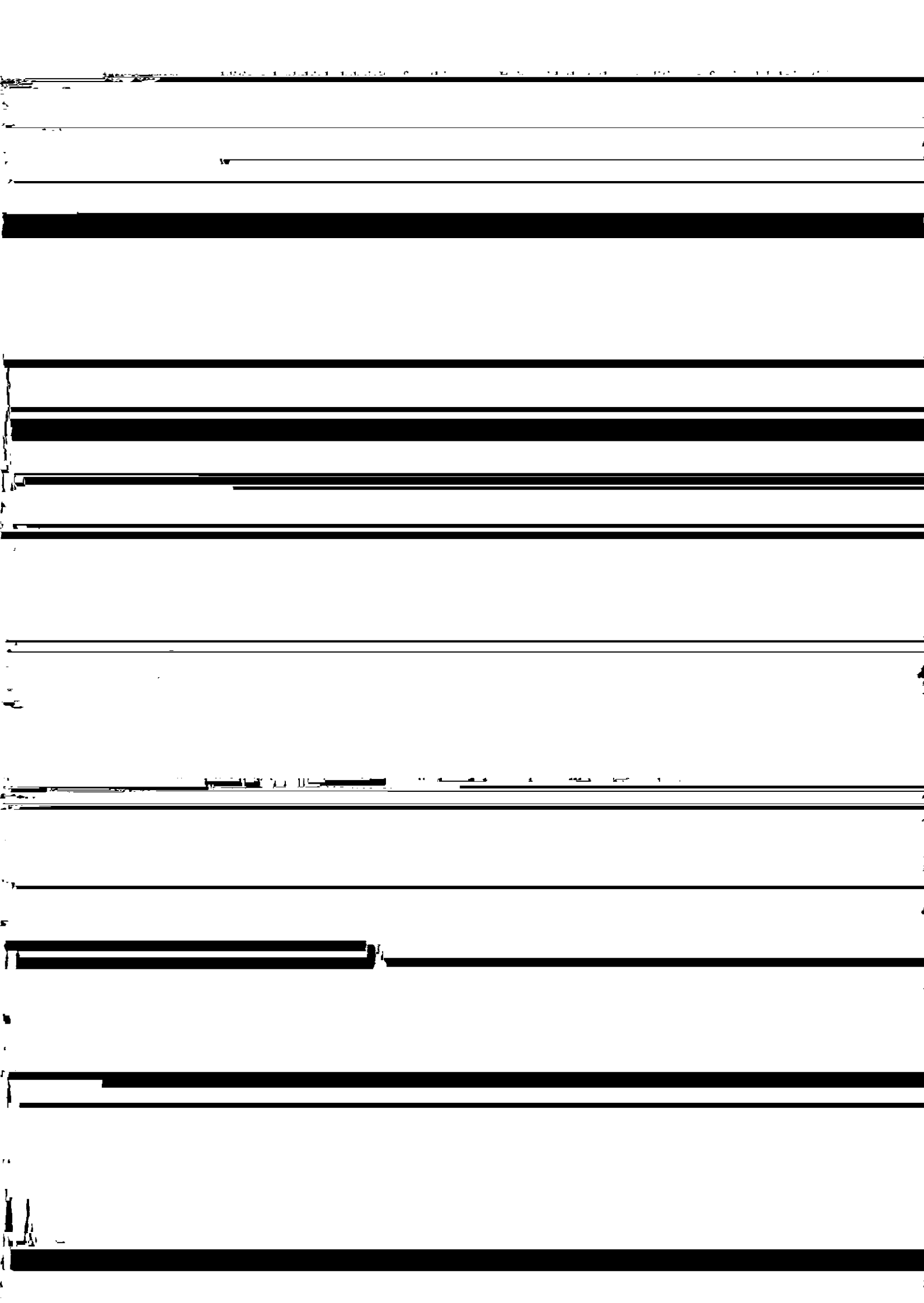
Based on the authors' own analysis the distributions of pressure, oil film thickness and temperature around

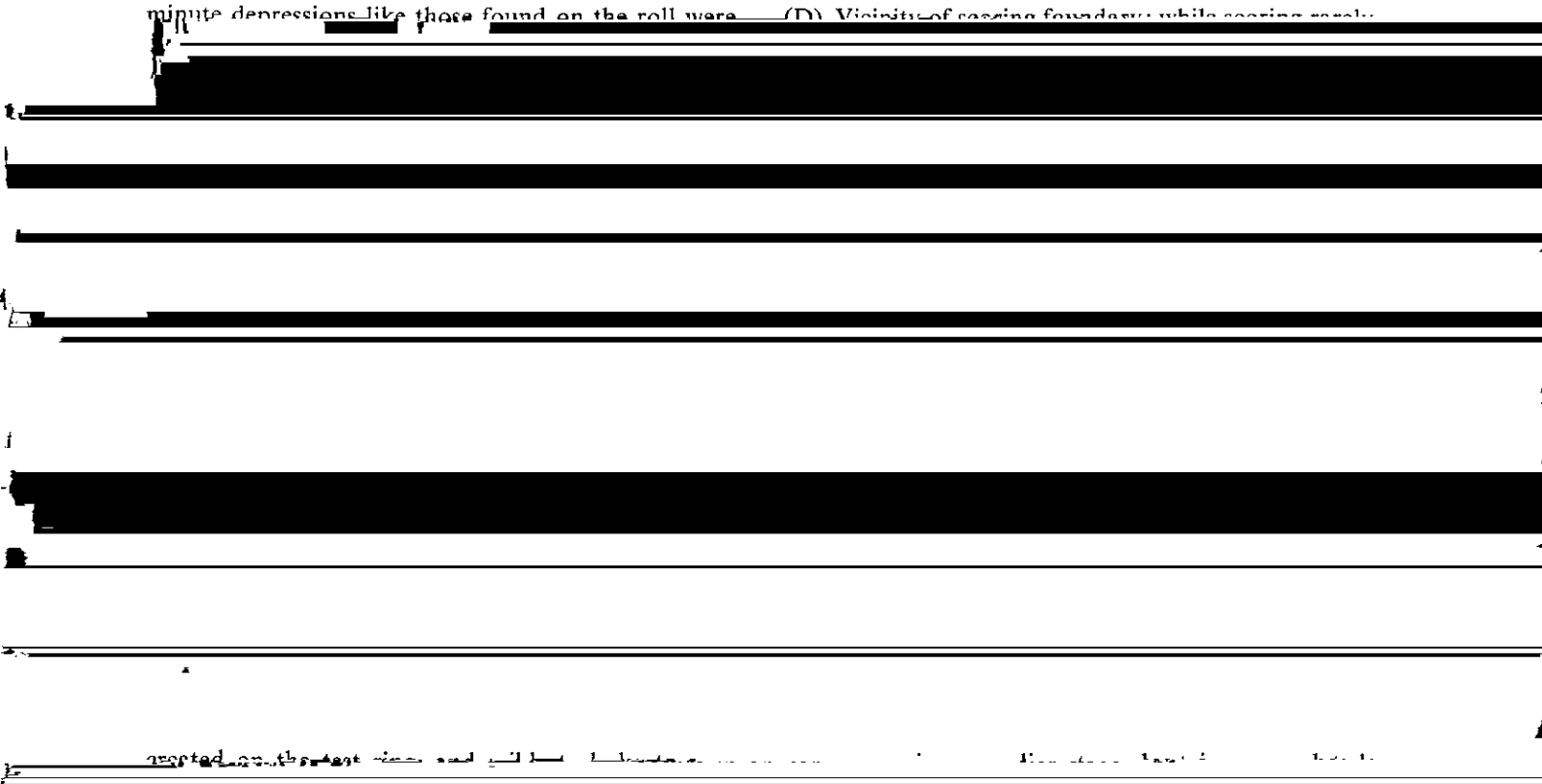
and temperature increased markedly and oil film made thinner.

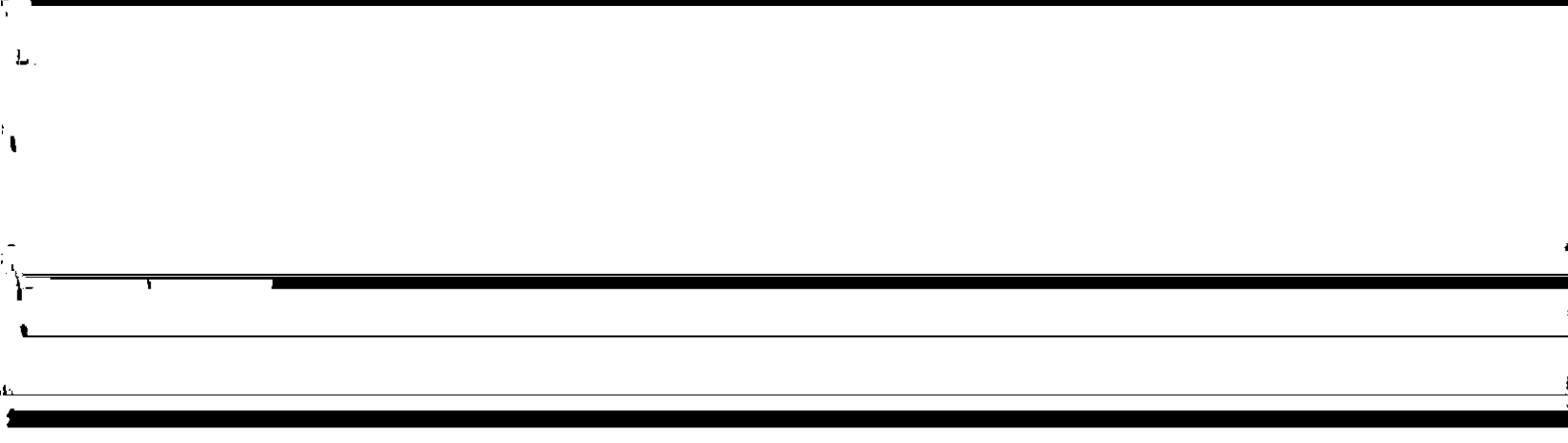
and the modified four-ball tester was provided with a by-pass circulation so as to ensure stable emulsification

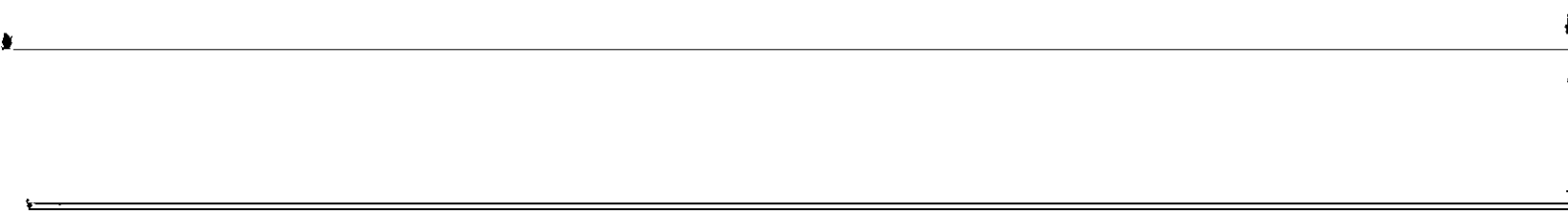
The evaluation was attempted by using three kinds of rolling oil of which lubricity had been asses-



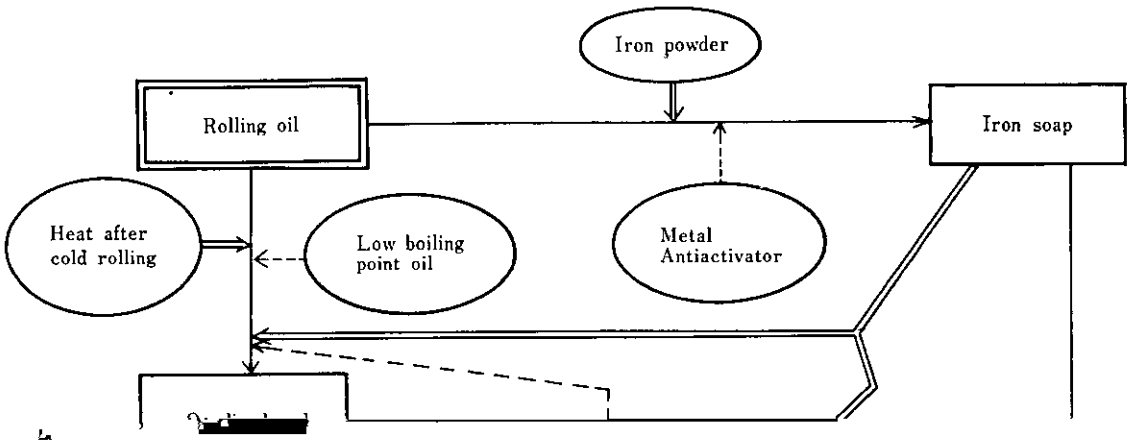
minute depressions like those found on the roll were (D). Vicinity of seeding boundary while seeding rarely

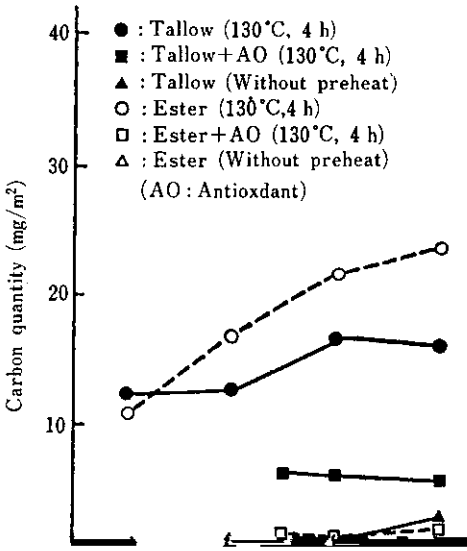






used as test blocks. Under the


Iron powder
Rolling oil
Iron soap
Heat after cold rolling
Low boiling point oil
Metal Antiactivator



the lubricity of tallow-based, thin gage rolling oil used in the 4-tandem mill.

Since the mill-clean rolling oil was used in the 4-tandem mill concurrently with the thin gage rolling oil, it is necessary to select base oil and additive which do not affect the surface cleanliness adversely when mixed with these oils, and the performance of selected lubricant was examined. Purified tallow was used as base oil, and the results of lubricity evaluation with various additives added are shown in **Fig. 9**.

In order to conduct the experiment in the emulsified state, emulsifier was added to each test oil so that the emulsion stability index (E.S.I.) would become 0.7 to 0.8.

As is evident from **Fig. 9**, adding mineral oil reduces the scoring limit at 300 kgf load, while the addition of extreme pressure additive and synthetic ester presents

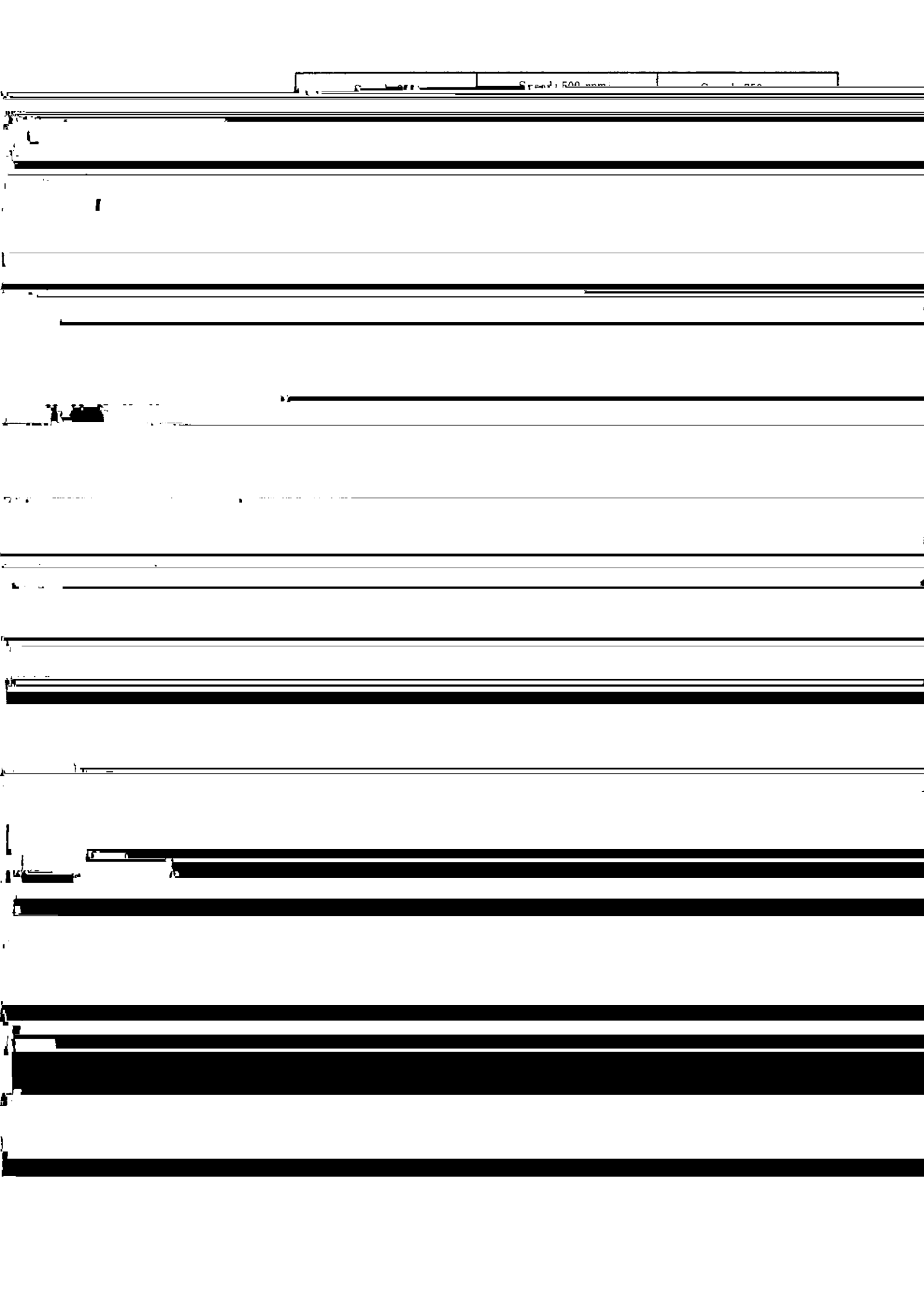
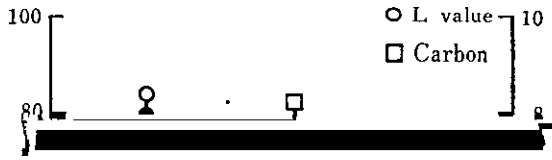


Table 3 Comparison of rolling speed and concentration of rolling oil between former and devel-

4.2 Development of New Mill-Clean Rolling Oil

was used as the fundamental formula. When mineral oil was replaced with tallow (M2 oil), the lubricity was improved, though the surface carbon level rose. When

streaks occurred. As mentioned above, the heat streaks first appear on the under-side of strip where the



The problem in respect of lubricity involves not only heat streak resistance but also friction coefficient, and it is expected that the development of new cold strip mills will require severer lubricating conditi