CATEGORY: ROLL SURFACE INDICATIONS

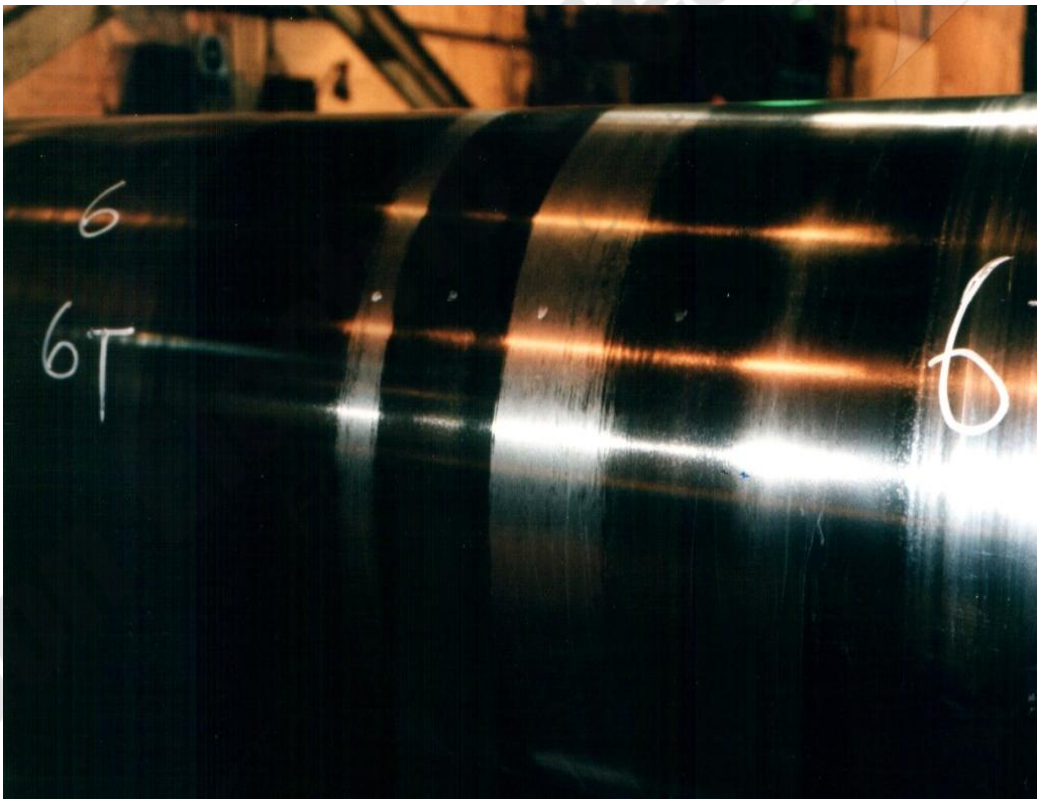
TYPE: PEELING

AFFECTS: WORK ROLL (HOT MILLS)

CHARACTERISTICS

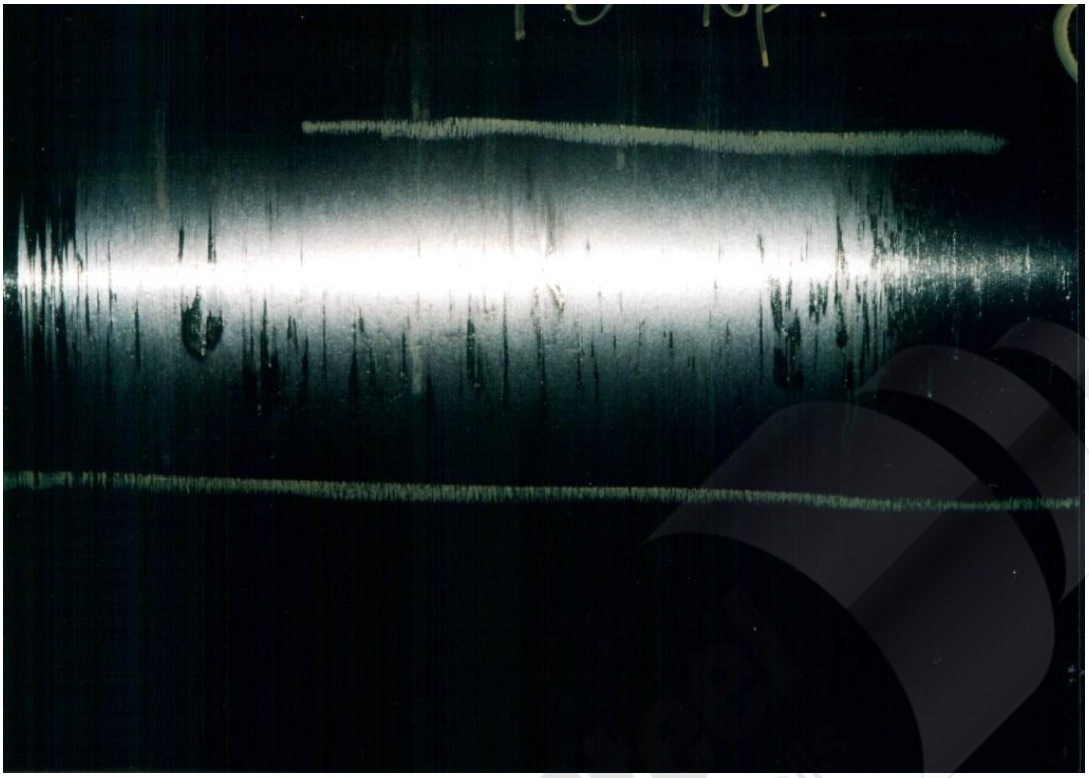
Peeling only occurs in hot strip mill applications and is characterized as a partial removal of the barrel surface oxide layer in circumferentially aligned strips or bands. The areas of the barrel surface experiencing peeling displaying a bright surface finish. Unlike with banding (see section II.A) the roll surface beneath the peeled off oxide remains smooth without break up of the parent roll material.

EXAMPLE



Example 1

Peeling of the barrel surface oxide layer of a high speed steel work roll.



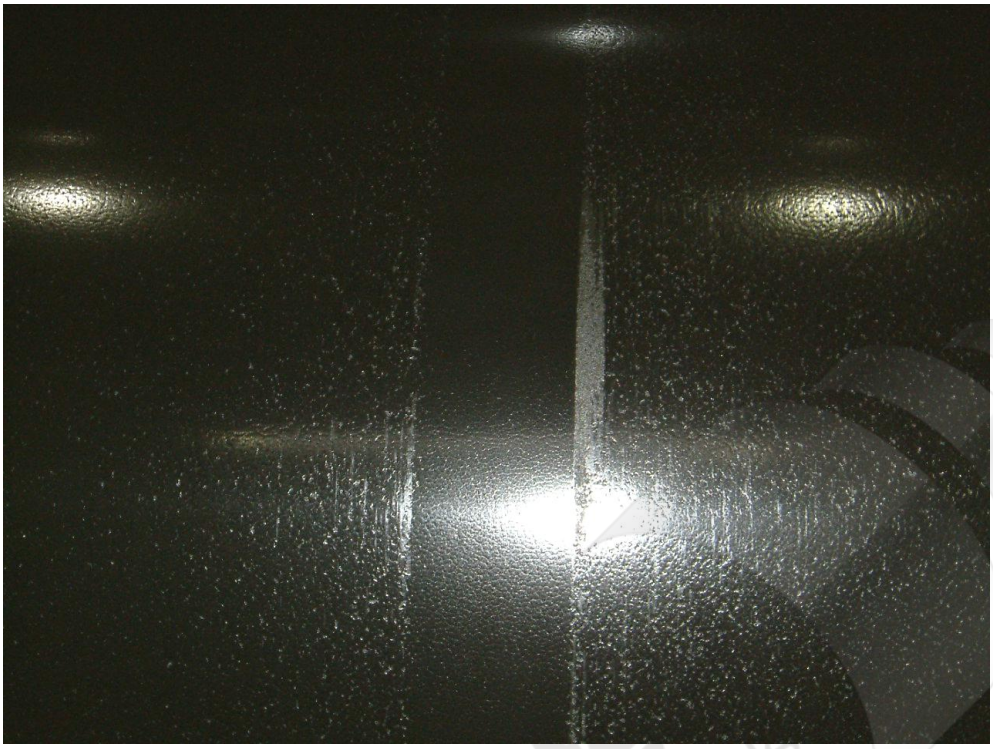
Example 2

Close up of the peeled surface oxide layer. It can be seen that the roll surface beneath remains smooth without break up of the roll material.

MECHANISM

Peeling only occurs in hot strip mill applications and is typically limited to the early stands where the strip temperatures are the hottest. During rolling, the roll barrel surface in contact with the strip or bar is heated to a sufficiently high temperature so that on exiting the roll bite oxidation occurs. The thickness of the oxide layer that forms is determined by many factors such as temperature, exposure time to air and roll/slab chemistry. The presence of a stable, uniform oxide is critical to the stability of the rolling process. This oxide layer is subjected to alternating shear stresses in the roll bite due to the speed mismatch between the strip and roll. When this stress exceeds the strength of the oxide layer (or its bond strength to the roll surface) then peeling occurs.

Unlike in banding (section II.C) the roll material below the peeled oxide bands remains intact and smooth such that it is possible for re-oxidation of the banded area to occur. Oxide peeling and re-building had been proven to be a continuously evolving mechanism occurring throughout a rolling campaign. The rate of oxide re-build as well as its thickness will differ for roll material grades such as HSS and HiCr iron materials



Example 3

Rebuild of a fresh oxide layer can be seen in a previously peeled area on this high speed steel work roll.

PREVENTION

As described above, oxide peeling and re-building is a continuously evolving mechanism. However excessive and repeated peeling of the oxide layer may result in localized differences in surface friction coefficients in the roll bite resulting in scale defects on the strip surface. A consistent oxide layer is also desirable to act as a barrier between the strip and roll surface preventing localized welding of the two, especially in the middle stands of a mill resulting in cobbles and other mill accidents.

Peeling of the oxide layer can be delayed by

- Ensuring a consistent and uniform strip temperature, rolling reduction and water coolant flow across the barrel contact area.
- Reducing the campaign length.
- Selection of the correct roll grade to optimize the oxide thickness and strength.