Claims

1. A method for producing hot-rolled, seamless pipes from transformable steel, in particular for pipelines for deep-water applications, in which the pipe ends are hot-upsetted in order to achieve a thickened wall portion after a final rolling process of the pipes, characterized in that a preselected ratio between a wall thickness of the pipe end and a wall thickness of a pipe body adjoining the pipe end is set by the hot-upsetting process such that a pipe is achieved with a pipe end which has a lower strength than the pipe body after a uniform hardening and tempering process of the entire pipe following the hot-upsetting process by using a previously ascertained wall thickness-dependent cooling rate during the tempering treatment.

2. The method according to claim 1, characterized in that a pipe with a pipe end is obtained after a uniform hardening and tempering treatment of the entire pipe after the hot-upsetting process, which has a lower strength, a lower hardness and a greater toughness as compared to the pipe body.

3. The method according to claim 1 or 2, characterized in that the hardening and tempering treatment consists of heating to a temperature between 910 and 980°C, a holding time at this temperature between 10 and 30 minutes, a subsequent quenching process and subsequent tempering to a temperature between 610 and 680°C, advantageously between 640 and 670°C, with holding times between 10 and 45 minutes followed by cooling in still air.

4. The method according to any of claims 1 to 3, characterized in that the pipe ends are hot-upsetted over a given length in one or more upsetting and reheating processes.

5. The method according to any of claims 1 to 4, characterized in that at least 1.1 times, 1.2 times or 1.3 times the wall thickness in relation to the wall thickness of the pipe body is produced at the pipe end by the hot-upsetting process.

6. The method according to any of claims 1 to 4, characterized in that at least two times the wall thickness in relation to the wall thickness of the pipe body is produced at the pipe end by the hot-upsetting process.

7. The method according to any of claims 1 to 4, characterized in that at least 1.5 times and at most 2.5 times the wall thickness in relation to the wall thickness of the pipe body is produced at the pipe end by the hot-upsetting process.

8. The method according to claims 1 to 7, characterized in that the thickened wall portion extends from the front side of the pipe in the longitudinal direction of the pipe over a length of at least 80 mm.

9. The method according to any of claims 1 to 8, characterized in that the pipes are processed mechanically in accordance with the required finished sizes after the hardening and tempering step.

10. The method according to claim 9, characterized in that a shoulder-free and notch-free transition is produced from the thickened pipe end to the non-thickened pipe body in the longitudinal direction of the pipe on the outer circumference and/or inner circumference.

11. The method according to any of claims 1 to 10, characterized in that a strength is produced at the pipe ends, which is at least 5 %, preferably at least 10 %, below the strength of the pipe body.

12. The method according to any of claims 1 to 11, characterized in that the pipe ends are upsetted at temperatures between 1000 and 1450°C.

13. The method according to any of claims 1 to 12, characterized in that high-strength steel with minimum yield points of 415 MPa is used.

14. The method according to any of claims 1 to 13, characterized in that transformable steel with the following chemical composition in % by weight is used as a material for the pipe production:

C: max. 0.18
Si: max. 0.45
Mn: max. 1.85
P: max. 0.02
S: max. 0.015
N: max. 0.012
Cr: max. 0.30
Cu: max. 0.50
Ti: max. 0.04
As: max. 0.030
Sn: max. 0.020
Nb+V+Ti: max. 0.15 %
Mo: max. 0.50 %
Ni: max. 0.50 %
Pcm: max. 0.22 % for C contents of less than or equal to 0.12 %
with
$Pcm = C + Si/30 + (Mn + Cu + Cr)/20 + Ni/60 + Mo/15 + V/10 + 5\,B$
and
CE: max. 0.47 for C contents above 0.12 %

and

CE: max. 0.22 for C contents of up to 0.12 %

with

CE = C + Mn/6 + (Cr + Mo + V)/5 + (Cu + Ni)/15

the remainder being iron including unavoidable steel accompanying elements.

15. The method according to claim 14, characterized in that transformable steel with the following chemical composition in % by weight is used as a material for the pipe production:

C: 0.05 to 0.12

Si: 0.20 to 0.40

Mn: 1.35 to 1.75

P: max. 0.015

S: mx. 0.003

N: max. 0.007

Cr: max. 0.10

Al: 0.020 to 0.040

Mo: 0.08 to 0.35

Ni: 0.15 to 0.35

Cu: 0.15 to 0.25

Nb: 0.02 to 0.08

V: 0.05 to 0.08

B: max. 0.0005

with

Pcm max. 0.21

the remainder being iron, including unavoidable steel-accompanying elements.

16. The method according to claims 14 and 15, characterized in that the following values for Pcm and CE are observed depending on the demanded minimum yield point of the employed material:

415 to 485 MPa: Pcm max. 0.21 and CE max. 0.38
485 to 555 MPa: Pcm max. 0.22 and CE max. 0.47
625 to 690 MPa: Pcm max. 0.25 and CE max. 0.53.