CLAIMS

1. A process for the production of a tube comprising:

deforming a corrosion resistant alloy plate to form a hollow cylindrical preform having a longitudinal seam region located between two abutting ends of the deformed plate, wherein

the corrosion resistant alloy plate comprises a martensitic stainless steel, a martensitic/ferritic stainless steel, a duplex stainless steel, a super duplex stainless steel, a hyper duplex stainless steel, an austenitic stainless steel, an austenitic nickel base alloy, or an austenitic nickel base superalloy, and

the hollow cylindrical preform is formed from the plate such that grains of the corrosion resistant alloy are substantially oriented in the longitudinal direction of the preform;

welding the longitudinal seam region to join together the abutting ends; and

flowforming the hollow cylindrical preform to produce a corrosion resistant alloy tube.

2. The process of claim 1, wherein deforming the corrosion resistant alloy plate to form the hollow cylindrical preform comprises roll bending the corrosion resistant alloy plate.

3. The process of any one of claims 1-2, further comprising machining or grinding the corrosion resistant alloy plate to a flatness of ± 0.020 inch (± 0.508 mm), wherein the machining or grinding is performed before the deforming.

4. The process of any one of claims 1-3, wherein the welding is performed in a nitrogen atmosphere.

5. The process of any one of claims 1-4, wherein the welding is performed using a filler-less welding technique.

6. The process of any one of claims 1-5, wherein the welding comprises laser welding the longitudinal seam region to join together the abutting ends.

7. The process of claim 6, wherein the laser welding is performed in a nitrogen atmosphere.

8. The process of any one of claims 1-7, wherein the welding comprises tungsten inert gas welding (TIG), metal inert gas welding (MIG), or plasma arc welding.

9. The process of any one of claims 1-8, wherein the welding is performed using a filler weld alloy that is the same as the alloy of the preform or is over-alloyed with at least one austenite stabilizing element.

10. The process of any one of claims 1-9, further comprising radially expanding the welded hollow cylindrical preform before the flowforming.

11. The process of claim 10, wherein the welded hollow cylindrical preform is radially expanded by at least 0.5%.

12. The process of any one of claims 1-11, further comprising removing weld kerf from the welded longitudinal seam region.

13. The process of claim 12, wherein removing weld kerf comprises burnishing or skiving the weld kerf.

14. The process of any one of claims 1-13, further comprising annealing the welded hollow cylindrical preform after the welding and before the flowforming.

15. The process of claim 14, wherein the annealing comprises heating the preform to a surface temperature in the range of 1010°C to 1177°C (1850-2150°F).

16. The process of claim 14, wherein the annealing recrystallizes at least a heat affected zone of the welded preform.

17. The process of claim 14, further comprising quenching the hollow cylindrical preform after the annealing.

18. The process of claim 17, wherein the preform is quenched from annealing temperature after no more than 30 minutes time-at-temperature.

19. The process of claim 17, wherein the quenching is performed at a cooling rate that prevents the precipitation of deleterious phases during the cooling.

20. The process of claim 17, wherein the quenching comprises water quenching.

21. The process of any one of claims 1-20, wherein the flowforming comprises reverse flowforming.

22. The process of any one of claims 1-21, comprising flowforming the hollow cylindrical preform at a cold working temperature to a reduction-of-area of 25% to 75%.

23. The process of any one of claims 1-22, comprising flowforming the hollow cylindrical preform at a cold working temperature to a reduction-of-area of 30% to 65%.

24. The process of any one of claims 1-23, flowforming the hollow cylindrical preform in a single pass to produce the corrosion resistant alloy tube.

25. The process of any one of claims 1-24, further comprising annealing the flowformed tube.

26. The process of any one of claims 1-25, wherein the corrosion resistant alloy comprises a duplex stainless steel, a super duplex stainless steel, or a hyper duplex stainless steel.

27. The process of any one of claims 1-26, wherein the corrosion resistant alloy comprises a super duplex stainless steel having a volume fraction of ferrite ranging from 35% to 55%, or a duplex stainless steel having a volume fraction of ferrite ranging from 40% to 60%.

28. The process of any one of claims 1-27, wherein the corrosion resistant alloy comprises a nickel base alloy or a titanium base alloy.

29. A tube produced by the process of any one of claims 1-28.

30. The tube of claim 29, wherein the tube has a yield strength of 110-160 ksi (758-1,103 MPa).

31. The tube of claim 29 or claim 30, wherein the tube has an ultimate tensile strength of at least 125 ksi (862 MPa).

32. The tube of any one of claims 29-31, wherein the ultimate tensile strength of the tube is at least 10 ksi (70 MPa) greater than the yield strength.

33. The tube of any one of claims 29-32, wherein the tube has an elongation of at least 9%.

34. The tube of any one of claims 29-33, wherein the tube has a yield strength of at least 125 ksi (862 MPa), an ultimate tensile strength of at least 130 ksi (896 MPa), an elongation of at least 10%, and an HRC hardness number no greater than 37.

35. The tube of any one of claims 29-34, wherein the tube has an outside diameter of at least 7.0 inches (177.8 mm), wall thickness of at least 0.231 inches (5.87 mm), and a length of at least 34.0 feet (10.4 meters).

36. The tube of any one of claims 29-35, wherein the tube has an outside diameter of at least 9.625 inches (244.5 mm), wall thickness of at least 0.312 inches (7.92 mm), and a length of at least 36.0 feet (11.0 meters).

37. The tube of any one of claims 29-36, wherein the corrosion resistant alloy comprises a super duplex stainless steel having a volume fraction of ferrite ranging from 35% to 55%, or a duplex stainless steel having a volume fraction of ferrite ranging from 40% to 60%, and wherein the tube has a yield strength of at least 110 ksi (758 MPa), an ultimate tensile strength of at least 125 ksi (862 MPa), an elongation of at least 9%, and an HRC hardness number no greater than 38.

38. The tube of any one of claims 29-37, wherein the tube complies with standards of a chemical composition, dimensions, mechanical properties, and microstructure of the produced tubes, in compliance with ANSI/API Specification 5CRA, first edition, February 2010.

39. A process for the production of a tube comprising:

deforming a stainless steel plate to form a hollow cylindrical preform having a longitudinal seam region located between two abutting ends of the deformed plate, wherein

the stainless steel comprises a duplex, super duplex, or hyper duplex stainless steel, and

the hollow cylindrical preform is formed from the plate such that grains of the stainless steel are substantially oriented in the longitudinal direction of the preform;

laser welding the longitudinal seam region to join together the abutting ends;

annealing the laser welded preform; and

reverse flowforming the laser welded hollow cylindrical preform at a cold working temperature to produce a stainless steel tube.