

Roll Forming Process and Die Design for a Large Size Square Tube

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Abstract : This paper proposed the cold roll forming process and the die design methods for a 400mm by 400 mm square tube with 16 mm in thickness. The tubular blank made by cold roll forming is 508mm in diameter. The square tube roll forming process was designed considering the layout of rolls and the compression ratio distribution for each stand. The final tube corner radius and the edge straightness in the front end of the tube are to be controlled according to the tube specification. A five-stand forming design using four rolls at each stand was proposed to establish the base reference of square tube roll forming quality. Different numbers of pass and roll designs were proposed and compared to the base design in order to find the feasibility of increase pass number to improve the square tube quality. The proposed roll forming processes were simulated using FEM analysis. The thickness variations of the corner and the edge areas were examined. The maximum loads and the torques of each stand were calculated to study the power consumption of the roll forming machine. The simulation results showed the square tube thickness variations and concavity of the edge are acceptable with the JIS tube specifications for the base design. But the maximum loads and torques are very high. By changing the layout and the number of the rolls were able to obtain better tube geometry and decrease the maximum load and torque of each stand. This paper had shown the feasibility of designing the roll forming process and the layout of dies using FEM simulation. The obtained information is helpful to the roll forming machine design for a large size square tube making.

Keywords : cold roll forming, FEM analysis, roll forming die design, tube roll forming

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