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Tanks

Additional information related to ECE/TRANS/WP.15/AC.1/2011/17

Results from static test

Transmitted by the Government of Sweden

Background

This informal paper refers to the static and dynamic material tests that are mentioned in paragraph 3 in document ECE/TRANS/WP.15/AC.1/2011/17. The static test has been performed by Federal Institute for Materials Research and Testing in Germany (BAM) and the results are presented below.

Static test

1. The test performed by BAM was a quasi-static, slow speed test and the set-up can be seen in Figure 5. The test sample is mounted to the clamping ring. The punch moves towards and into the test sample at a velocity of 2 mm/s until it fractures. The test was accomplished for some austenitic-ferritic and some austenitic stainless steel grades, all in 3 mm thickness, and the energy absorption capacity of a material, being evaluated from the punch force and punch deflection. In order to simplify the outcome of the test, the mean energy absorption capacity of each of the two material groups (austenitic-ferritic and austenitic stainless steel) was taken. Two test specimens after testing are shown in Figure 6. The mean energy absorption capacity in kJ can be obtained from Figure 7 at respective mean deflections in mm..

Figure 5
Test set-up for static test

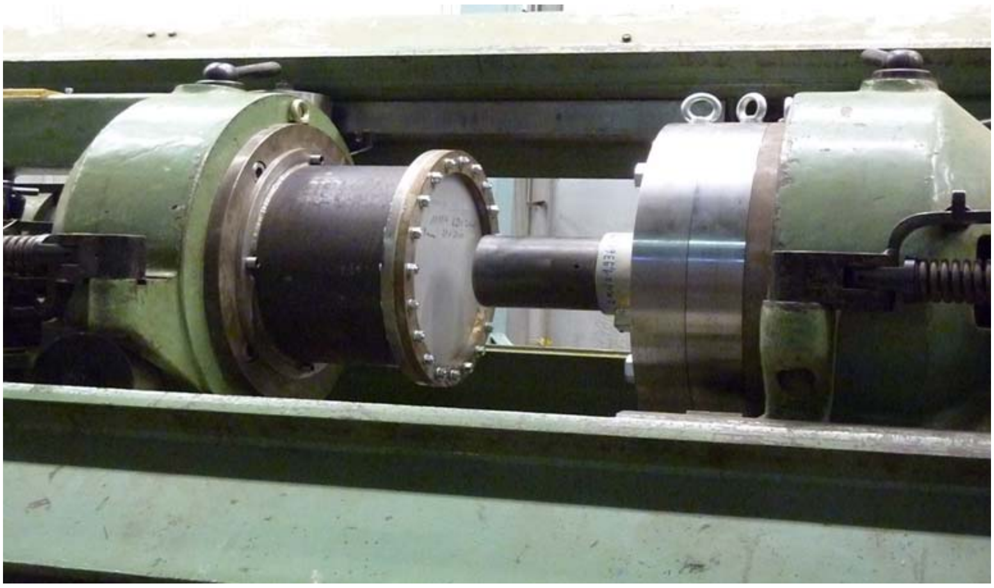
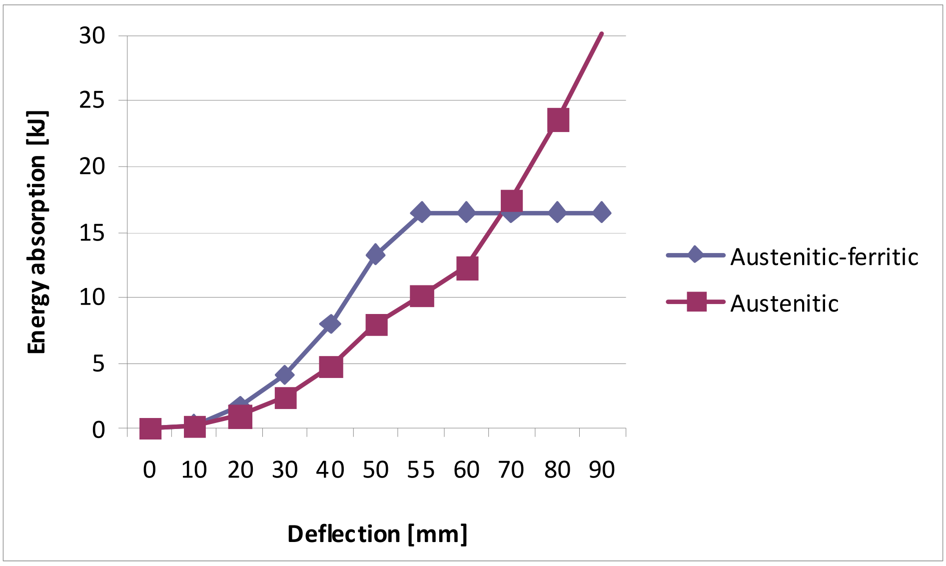


Figure 6
Test specimens after fracture, showing an austenitic stainless grade to the right and an austenitic-ferritic grade to the left. The diameter of the specimens is about Ø500 mm.

Figure 7:
Mean energy absorption in kJ



2. As can be seen from the test results in Figure 7, the austenitic-ferritic stainless steels have higher energy absorption up to 70 mm deflection and over that the austenitic stainless steels have the highest energy absorption. This also means that if the available “damage energy” is less than 17 kJ, the austenitic-ferritic stainless steels have better performance (giving less damage for a small impact) and correspondingly if the “damage energy” is greater than 17 kJ the austenitic stainless steels performs best.

3. The results from the tests show that both the two different material groups have advantages in different ranges of energy absorption or punch displacement. What is needed for further discussion is an actual requirement for the energy absorption capacity of the tank shell materials, both for low and high pressure tanks.