Economic Commission for Europe

Inland Transport Committee

Working Party on the Transport of Dangerous Goods **1 September 2011**

Joint Meeting of the RID Committee of Experts and the Working Party on the Transport of Dangerous Goods

Geneva, 13-23 September 2011
Item 2 of the provisional agenda
Tanks

Additional information related to ECE/TRANS/WP.15/AC.1/2011/44

Results from dynamic test of austenitic and austenitic-ferritic stainless steels

Transmitted by the Government of Sweden

Background

1. 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 and paragraph 8 in document ECE/TRANS/WP.15/AC.1/2011/44 respectively. Both tests have been performed by Federal Institute for Materials Research and Testing in Germany (BAM).

2. Results of the static test have been presented in informal document INF.33 (March 2011). Results of the dynamic test are compared to the static tests.

Dynamic tests

3. Supplementary to the static tests, dynamic tests were carried out by BAM. The test set-up can be seen in Figure 1. In this test, a pendulum accelerates, moves towards and into the clamped test sample. The test was accomplished for the same austenitic and austenitic-ferritic steel grades as tested in the static test. The plate thickness was 3 mm. The dynamic test measures the energy absorption capacity of a material, which is retrieved from the pendulum force and deflection of the material.

4. The results from the static and dynamic tests are comparable. The austenitic stainless steels show in both the tests, a higher energy absorption at rupture than the austenitic-ferritic stainless steels, but poorer performance where the impact energy is below about 15 kJ. Figure 2 and 3 show the energy absorption of the tested austenitic and austenitic-ferritic steels, as obtained by means of the static and dynamic tests.

5. The energy absorption is depicted as function of crash distance, where high impact accidents would lead to a larger crash deformation and low impact accidents to a smaller deformation. As pointed out in INF 33, section 2, austenitic-ferritic stainless perform better statically where the impact energy is less than 17kJ (see Figure 2). Similar observations can

be made for the dynamic tests, where austenitic-ferritic steels show a better performance at an impact below 15 kJ (Figure 3). Yet, it applies to both material families that the dynamic tests led to slightly lower energy absorption capacity values than the static tests.

6. The results of the static and dynamic tests lead to the question if there should be more differentiated minimum requirements or minimum demands for a material. In section 3 of INF.33 it was pointed out that a discussion on minimum energy absorption requirements is needed. This may also be a topic for future research concerning materials and design rules and their fulfilment of safety demands from the authorities.

Figure 1
Test set-up for dynamic test at BAM

Figure 2:
Energy absorption in kJ – static test

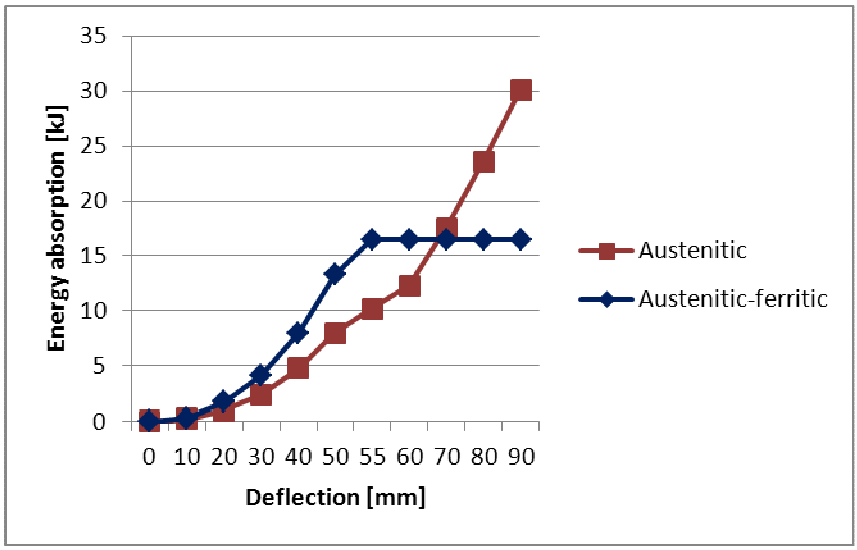

Figure 3:
Energy absorption in kJ – dynamic test