



Short Report No. 2007034 for Company Paul Craemer GmbH

**Results of mechanical tests on plastic pallets,
Type "EURO H1", from the production period 1995 to 2005**

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1. Background

Paul Craemer GmbH, with headquarters in Herzebrock-Clarholz, has produced since 1993 a pallet with the designation "EURO H1", designed for utilization in the food-hygiene area of production plants. The pallet construction is based on the specifications of the German Standard DIN 55423-5. In connection with transport and storage containers (FLC = Food Load Carrier according to specifications of the standard DIN 55423-1), It serves for the structuring of transport chains between producers of meat/ meat products and the wholesale trade.

The form of the pallet corresponds to the specifications of the DIN 15141-1 Standard and has the dimensions 800 x 1200 x 160 mm (W X L X H). The nominal weight is 18 kg. The rated load is designed for loading with 850 kg. The pallet is produced from polyethylene (PE) plastic and is planned for utilization in the temperature range between -40°C and +70°C.

2. Objective of the investigation

The tests of the German Standard DIN 55423-6 are used for the verification of the performance capability of this pallet type. Both with a view to the quality assurance of pallets to be produced in future, as well as a basis for a service life duration calculation, it was of interest for the Co. Paul Craemer to obtain knowledge about the mechanical properties of pallets which have already been in service for several years in the meat and sausage industry. Tests on used pallets have not previously been carried out.

The Packaging Laboratory of the Fraunhofer Institute Material Flow and Logistics was instructed to carry out selected tests on used pallets, in accordance with the DIN 55423-6 Standard. Pallets originating from the production years a) 2001 - 2005 and b) 1995 -2000, were examined for this purpose. Tests were selected which were suitable for indicating weak points in the pallet construction. Based on the DIN 55423- 6 Standard, the following tests were carried out:

- Rack storage,

- Corner-drop test,

- Horizontal impact test,
- Roller conveyor continuous test.



Fig. 1: Test for rack storage



Fig. 2: Drop test following temperature conditioning



Fig. 3 and Fig. 4: Test structure: Left: Horizontal impact test: Right: Roller conveyor test

3. Tests and results

The tests for the simulation of loading which pallets experience during rack storage were passed by all of the test samples. The bending characteristics of the pallets determined are to a high degree in compliance with the specifications. In addition, they correlate with the results from tests on new pallets. New "EURO H1" pallets from the company Craemer were tested in the year 2006, by order of the DIN Certco, in the Packaging Laboratory of the Fraunhofer Institute ML and may carry the DIN accreditation.

Of special interest in the case of pallets which are employed in hygiene-critical areas is the strength with regard to impacts. In case of stacked pallets it can easily happen that pallets fall down. The danger exists in this case that the pallet body will be damaged and, through that, the formation of germs becomes possible within the pallet. Before the tests the pallets were stored for 24 hours at -25°C for the low temperature test and at $+40^{\circ}\text{C}$ for the high temperature test.

The results can be evaluated as positive. In case of approx. 50% of the deep-frozen pallets, dents were determined on the deck after the second or the third fall, in part with incipient cracking. However, the frequency and the scale are within the range of what is considered usual. In case of the preheated pallets, there were no incidents of damage recorded in any of the test samples.

The horizontal impact tests carried out are used for the simulation of loading which can act on

loaded pallets during transport by truck. The pallets were loaded with a mass of 850 kg, distributed over 28 FLC units.

The loading in case of a braking procedure is in the form of a horizontal deceleration, where the FLC must be held in position on the pallet deck by the surround in ribs. Also these tests can be evaluated as positive throughout.

The roller conveyor continuous test is also implemented with loading, in each case 850 kg mass with FLC. Within the framework of the test, the pallet runs over a gravity roller conveyor with a roller spacing of 210 mm. The travel over these rollers produces alternate bending loads on the runners and feet of the pallet. The examined pallets already indicated slight cases of damage before the tests, in part in the runners and feet. The tests clearly exceeded the minimum test duration of 60 hours, and ran for up to 129 hours in places. All results could be evaluated as extremely positive. In none of the pallets examined did any cases of new damage appear.

4. Summary

In conclusion it must be said that the results from the four pallet tests with the EURO H1 pallet were surprising. It had not been foreseen that pallets which originate from the production year 1995 would provide such positive results. No significant operational issues are identified. The following can be concluded:

- The pallet construction is extremely robust and does not indicate any weak points, in spite of the rough handling
- The material properties do not change, in spite of the exposure to (UV, IR) and chemical cleaning agents, or change only slightly. The strength and robustness of the pallet is almost unchanged, also after more than 12 years in use.
- The life/ service duration of the EURO H1 should be given as at least 12 years. This also provides a basis for a future investment calculation.

Packaging Laboratory in Fraunhofer Institute IML

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