



SHORT-TERM AGEING

EN 12607-1: Bitumen and bituminous binders – Determination of the resistance to hardening under influence of heat and air - Part 1: RTFOT method

Overview

The test is not a classical test providing results, but an ageing/conditioning procedure for bituminous binders.

RTFOT is a method to simulate the short-term ageing behaviour of bituminous binders used for hot mix asphalt. It is described in EN 12607-1 as one of three methods to address short-term ageing behaviour of bitumens. For other than hot mix asphalt mixtures, these standard conditions may not necessarily apply.

Definition and Terminology

Short-term ageing/conditioning: The conditioning that the binder goes through during the methods described in EN 12607 (Part 1, 2 and 3). Short-term ageing is deemed to represent the ageing a bituminous binder undergoes during handling and mixing of asphalt mixtures. EN 12607-1 aims to simulate the hardening experienced by a binder during mixing in an asphalt mixing plant.

Long-term ageing/conditioning: The conditioning that the binder goes through during the accelerated pressure ageing procedure. In the case of hot mix asphalt binders, the long-term ageing is carried out on binders that have already been conditioned through short-term ageing/conditioning. Long-term ageing is deemed to represent the ageing a bituminous binder undergoes during the service life of an asphalt pavement.

Practical Information:

The test temperature must be selected carefully.

- Usually, the RTFOT procedure is carried out at 163 °C, which should be reached within 15 min of the start of the test otherwise the test is invalid.
- Other temperatures than 163 °C may be applied, see section 8.1 of EN 12607-1.
- Viscosity-reduced binders may need lower conditioning temperatures in order to keep the viscosity of the rolling film equivalent to the standard procedure, while high viscosity binders may need higher conditioning temperatures.
- For bituminous binders used in warm-mix applications, the standard conditioning temperature may not necessarily reflect the ageing occurring during asphalt production and laying.

Temperature distribution in the RTFOT oven needs to be homogeneous.

- In order to obtain binders that are properly conditioned, it is important that the temperature distribution within the RTFOT oven is uniform.
- The rotation speed of the fan and the carriage should be checked regularly, using metrological principles, see Annex B of EN 12607-1.
- Annex B of EN 12607-1 also describes various methods how the homogeneous distribution of the conditioning temperature can be verified.

After conditioning, the sample needs to be prepared for testing.

- If testing after RTFOT-conditioning does not take place immediately, pour all the hardened binder into the same collecting vessel straight away.
- For PMBs, heating the containers to 180 °C for a short time may be necessary to remove the hardened binder from the containers.
- Practical experience indicates that it may not be possible to remove all of the hardened binder from the containers. Section 8.2 of EN 12607-1 states that 90 % of the sample shall be recovered from the containers. Practical experience suggests that less than this is recoverable.
- The sample shall be allowed to cool, then sealed and stored at ambient temperature, see EN 12594.
- Reheating of the hardened binder should be in accordance with EN 12594, except that higher sample preparation temperatures may be needed to reflect the hardening of the binder. Stirring in order to homogenise the mixture and avoid incorporating air bubbles is necessary.
- Measure the characteristics of the hardened binder within 72 h in accordance with the respective method, see section 8.3 of EN 12607-1.

If the short-term aged binder is to be long-term aged as well, the time between both procedures should be carefully chosen.

- EN 12607-1 does not explicitly specify these conditions. Experience recommends to start long-term ageing within 72 h of short-term ageing.
- In general, sample preparation has to be done according to EN 12594.
- If hardened binder from RTFOT is not used for PAV-ageing immediately, it should be stored in sealed containers at ambient temperature.
- Any reheating of the hardened binder must be in accordance with EN 12594, except that higher sample preparation temperatures may need to be chosen to reflect the hardening of the binder.

The shape of the glass container should be considered.

- EN 12607-1 describes convex as well as concave containers, see section 5.4 of EN 12607-1.
- Convex containers allow easier removal of the hardened binder, but may allow spillage of the binder during the RTFOT-procedure.
- A scraping tool may be used to assist removal of the hardened binder, but any tool used should not damage the glass container.

