

**Rubber
granulate
on PVC roof
material**



blubase™

APPLICATION OF TPO MATS

For a long time, it was assumed that the application of a TPO (thermoplastic polyolefin) mat provides the necessary protection if you place rubber granulate blocks (as tile supports) on flat roofs with PVC roof material. When PVC and rubber come into contact with each other, this automatically triggers a chemical reaction. This chemical reaction reduces the percentage of plasticisers in PVC. The TPO mat counteracts this reaction, but its application regularly causes problems in practice.

MIGRATION OF PLASTICISERS

The chemical reaction between rubber and PVC is caused by a component which is added to the rubber by the manufacturer during the production of rubber. This is called "6PPD" (phenaline diamine). 6PPD is an antioxidant which is added to rubber products to protect them from ozone and UV radiation. It keeps the rubber flexible and also has other beneficial effects in the production of the rubber itself.

The consequence of the chemical reaction between rubber and PVC is that the plasticiser content in PVC is reduced (migration), making the PVC less flexible, which can have consequences for the quality of the roof material. Plasticisers are, by their nature, gradually released from PVC, ultimately resulting in the loss of a very important PVC property (flexibility).

PRACTICAL APPLICATION OF TPO MATS

In practice, a TPO mat often fails to stay in place and comes out from under the rubber block over time. This can be caused by wind and rain, but another factor is that the surface of a flat roof is not always flat for all kinds of reasons. In the latter case, the rubber blocks appear not to have sufficient contact with the roof surface, which means that the TPO mat is not truly fixed and instead shifts or blows away. Fixing TPO mats to roofing is a difficult task to achieve in practice.

KIWA AND SOLAR CONSTRUCT NETHERLANDS

To further investigate the above-mentioned practical problem, Blubase commissioned Kiwa BDA (testing, inspection and certification) in Gorinchem to carry out an analysis of the migration problem of plasticisers in the laboratory.

In a laboratory setup, Kiwa brought rubber granulate blocks and PVC roof material into contact with each other for an extended period of time. In addition, the blocks of rubber – to reflect what happens in practice – had weights placed on them to exert pressure on the PVC material (... "the upper side of the PVC roof waterproofing sheet".....) of 12.5 kPa. Carrying out the test at a higher temperature during the entire study simulated the ageing of the PVC roof material over a period equal to 15–20 years.

Following the laboratory test, Kiwa confirmed that the plasticiser content in PVC decreased from approximately 30% to over 23% over a period of 15–20 years through direct contact with the rubber granulate. Blubase has the Kiwa test report.

AGEING OF PVC ROOF MATERIAL PLAYS A ROLE

The results of the laboratory test carried out by Kiwa confirm once again that additional preliminary research needs to be carried out by the installer before installing solar panels on a flat roof with PVC roof material. In addition to the technical studies recommended by Blubase (see product memo), analysis is required of the age, thickness and quality of the PVC roof material. After all, as a result of ageing, the quality can be so poor as to make any safe placement of the product out of the question.

For example, what should be done with PVC roof material that is more than 10 years old? The roofer's warranty has expired, while the PVC roof material has aged under the impact of UV radiation and/or dirt accumulation (harmful bacteria).

CONSEQUENCES OF TPO MATS SHIFTING OR BEING BLOWN AWAY

In places where TPO mats appear to have shifted or even disappeared completely over time, it can be concluded, in most cases, that the pressure exerted by the relevant rubber granulate block on the PVC roof material at that specific location is (or has been) reduced due to unevenness of the roof surface.

In such cases, the rubber granulate can come into direct contact with the PVC roof material, which triggers the migration of plasticisers. However, at low pressures, the migration of plasticisers between the rubber and PVC is correspondingly less, even dropping right down to zero (with no contact). In those cases, the quality of the PVC roof material at the contact points also does not deteriorate faster than usual.

RENOLIT ALKORPLAN

Blubase has acquired Renolit, the global manufacturer of the thermoplastic Alkorplan. PVC roofing membranes are also affected by the problems relating to TPO mats. While Renolit recommends using TPO mats to be on the safe side, at the same time, it acknowledges that the plasticisers in PVC roof material are also naturally released gradually with ageing:

"The Alkorplan roofing membrane has a plasticiser content of 34%. Since the material has a larger mass per unit area than average, there is more plasticiser present in absolute terms. Depending on the thickness of the roofing membrane (1.2 mm, 1.5 mm, 1.8 mm or 2 mm), an ageing process will occur over the years. Ageing occurs under the influence of various conditions, of which the UV load is the most significant. A roofing membrane with a thickness of 1.2 mm can reach a plasticiser content of around 23% after 20 years."

"It is difficult to say exactly what plasticiser content a roofing membrane has after x years. This depends on various factors. Carrying out annual maintenance (removing dirt) will extend the service life of a roof."

CONCLUSION

1. Laboratory research confirms that direct contact between rubber and PVC roof material leads to the migration of plasticisers from PVC. As a result, the plasticiser content drops from about 30% to 23% after 15–20 years.
2. Both UV exposure and dirt accumulation naturally reduce the plasticiser content in PVC to around 23% after 20 years.
3. Installing solar panels protects the underlying PVC roof material from UV radiation.

On this basis, Blubase concludes that placing rubber granulate blocks directly on PVC roof material does not cause increased quality loss for PVC roof material at the contact points. In this case, the placement of TPO mats on the roof can be omitted.

Blubase recommends carrying out annual maintenance on PVC roof material, in particular by removing accumulated dirt.

July
2020,
Blubase