MECHTEST –DEVELOPING A METHODOLOGY FOR TESTING THE MECHANICAL SNOW AND WIND LOAD ON SOLAR THERMAL COLLECTORS

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Synopsis

Within a growing market, quality assurance gains an increasing importance. The most important norm in the field of solar thermal collector testing is the EN 12975.

The methods used in the EN 12975 are nowadays in some cases inappropriate, because they can be applied only to a limited extend due to innovative collector concepts and designs. Further research is needed to develop new concepts for mechanical load tests in order to meet the actual quality requirements and cover a wide range/variety of appliances. Innovative products such as PVT and façade collectors need to be integrated in these testing methods.

Due to an increasing number of extreme weather events the mechanical load test needs to provide sufficient assurance that a collector can master these challenges. Therefore the forces, different collector designs have to withstand, have been analyzed in order to simulate them as representative as possible.

This paper provides a new concept of a mechanical load test, based on more realistic testing conditions to reduce the barrier for new collector concepts on entering the market, keeping the quality level high at the same time.

1 Introduction

The European Solar Keymark, based on the norm EN 12975 for solar collectors and the EN 12976 for solar thermal systems, is the worldwide best developed quality label. It is not only in Germany (for the Renewable Heat Act and the MAP) required to get subsidies. The norm includes a definition for performance tests as well as for mechanical load tests to check the reliability of solar thermal collectors.

To satisfy the upcoming challenges new collector designs and modern installation systems imply for mechanical load tests, the testing facility and methods that are used need to be adapted.

The methods actually used in the norm are not applicable e.g. to vacuum tube collectors, so that the Solar Keymark Network decided to leave these collectors out which is noted in the corresponding certificates.

This led to the situation that the testing laboratories have been requested, both from assurance companies and collector manufacturers, to develop adequate testing procedures to deliver reliable and realistic data on the resilience of solar thermal collectors. The mechanical load test for the collectors needs to be adopted in order to meet quality assurance goals and secure further market entrance for innovative products.

2 Content

2.1 Detailed analysis of damage events and causes

The study describes the deficits of mechanical load tests by analyzing causes of damage based on qualitative interviews with experts and data from research institutes, industry, structural designers and assurances. Weaknesses of actual mechanical load tests are described under consideration of closely linked branches as slate, roofing companies and façade experts to define a realistic load situation of the collectors.

2.2 Conception of a mechanical load test

A wide range of collector technologies for different appliances result in diverse collector designs (Fig. 1) with different load schemes.

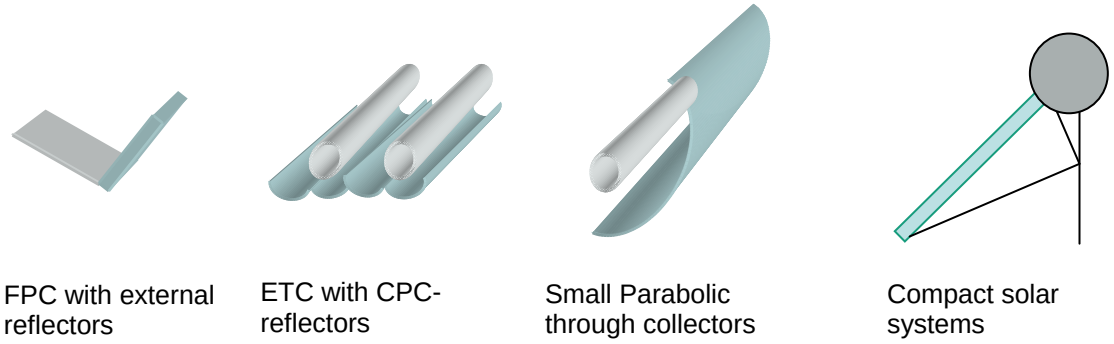

Figure 1: Examples of different collector shapes, to illustrate the different conditions for wind and snow load

For several collector geometries it is impossible to transfer the mechanical load onto the collector by using suction cups. Especially for innovative collectors with concentrating mirrors this method is not applicable, but also for common flat plate collectors it is doubted that the transferred loads can mirror the most critical loads adequately and therefore the results are not representative for all applications.

The gap of information resulting from the limited testing possibilities needs to be closed urgently. Especially for the concentrating technologies an exact knowledge on the conducted/dissipated loads and the resilience of the collector devices is necessary.

The proposed approach is giving results in a more differentiated way then the test procedure does right now. The pass fail criteria would thereby changed to a detailed table of installations and loads the collector was approved for and other for which not. By doing this, not every product has to fulfill all the hardest boundary conditions, which makes the testing outcome more flexible. At the same time the clear documentation keeps the information level for the consumers high.

A credible, modern testing procedure, covering new collector designs and installation concepts can be established. This would lead to a higher planning security in terms of entering new market segments as facades, lightweight designed roofs but also single family houses. This finally leads to a cost reduction by optimized dimensioning.

3 References

[1] EN 12975-1,2:2006

[2] DIN 1055