



# WP4.D4 / RECOMMENDATION FOR THE ELABORATION OF MISSING TESTING PROCEDURES FOR SOLAR FLUIDS

**1<sup>ST</sup> DRAFT**

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### SUMMARY

Important fluid properties are currently not or poorly documented by most manufacturers.

### MISSING TESTING PROCEDURES

Missing testing procedures in order of relevance are: (1) temperature limits and lifetime of solar fluids. (2) compatibility with plastic materials. (3) Calculation of embodied energy.

### TEMPERATURE LIMITS AND LIFETIME

Temperature limits and lifetime of solar fluids are a complex issue and are dependent on many factors of a particular application.

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Temperature limits and lifetime of solar fluids are a complex issue and are dependent on many factors of a particular application.

### COMPATIBILITY WITH PLASTIC MATERIALS

Compatibility with plastic materials is important for the use with collectors, tubes and connectors made from polymeric materials.

### EMBODIED ENERGY

Embodied energy is of particular interest for life cycle assessments (LCA) of solar systems.

## SUMMARY

In central and northern Europe, solar collectors are usually filled with an antifreeze fluid to prevent bursting of pipes and other containments during cold periods. Several important properties of these fluids are currently not documented by the manufacturers or require the development of new standards. This document gives recommendations for the elaboration of new testing procedures that can fill this gap.

## Missing testing procedures

Missing testing procedures have been identified on several occasions /Hal04/Hal05a/Hal05b/Hal05c/. Most importantly, temperature limits and lifetime of solar fluids are poorly documented. Also compatibility with plastic materials and embodied energy are subjects that clearly lack standardized methods for the determination of these properties.

Missing procedure	Urgence
Standard test procedure for temperature limits and lifetime of solar fluids	very high
test procedure for the compatibility of solar fluids with plastic materials	high
standard method for the calculation of embodied energy and other life cycle relevant data of solar fluids	moderate

## Temperature limits and lifetime

Temperature limits and lifetime of solar fluids are a very complex issue. Whatever value we set for the temperature limit that a solar fluid may cope with for – lets say – 10 years, the value will be dependent on a large number of parameters such as:

- detailed temperature-profiles of the system over time
- maximum collector operation temperature
- maximum collector stagnation temperature
- emptying behaviour of the collector field
- possibility of entering fluid in the collector field during stagnation
- metals present in containment materials
- oxygen present in the fluid loop
- pressure of the fluid-loop
- volume flow and diameter of pipes
- volume of the total fluid in the system in relation to metal surfaces and collector field volume

If we want to decide whether a solar fluid has failed to cope or not, we have a number of parameters that we can measure and draw conclusions from such as:

- freeze protection
- evolution of particles in the fluid
- pH
- Reserve Alkalinity
- Corrosion Test ASTM D1384

If a manufacturer wants to make a statement about the temperature-limits and lifetime of his product, he must therefore decide first about test conditions to apply to the fluid, and then he must decide about parameters to evaluate after the test. Today, each manufacturer has his own test procedure, and results from these tests are usually not published. Publication of these data is widely searched by planners and installers of solar systems, and if publication is to come, a standard test procedure should be available to determine temperature limits and lifetime in order to be able to compare different products from different manufacturers.

The elaboration of a Standard test procedure for temperature limits and lifetime of solar fluids is highly recommended.

## Compatibility with plastic materials

Compatibility with plastic materials is another issue that lacks standardisation. Only few manufacturers give information about the compatibility with plastic materials, sometimes with a temperature limit, sometimes not. The compatibility with plastic materials is important for the use of solar fluids with plastic collectors, tubes and connectors.

The elaboration of a test procedure for the compatibility of solar fluids with plastic materials is highly recommended.

## Embodied energy

Embodied energy is an important number for the life cycle assessment of products (LCA). So far, none of the manufacturers of solar fluids gives values for the embodied energy of his product. Since this value will be more and more demanded.

The elaboration of a standard method for the calculation of embodied energy and other life cycle relevant data of solar fluids is recommended.

## Literature

- /Hal04/ Haller M., NEGST WP4 Subtask 8: Results of a survey on standards for solar fluids testing, 2004
- /Hal05a/ Haller M., Vogelsanger P., NEGST WP4-8: Existing standards for solar fluid properties, July 2005
- /Hal05b/ Haller M., Vogelsanger P., NEGST WP4-8: Report on corrosion and lifetime tests for solar fluids
- /Hal05c/ Haller M., Vogelsanger P., NEGST WP4-8: Recommendation for the use of standards for solar fluid parameters