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Estimation of thermal properties of Hexa-Cover

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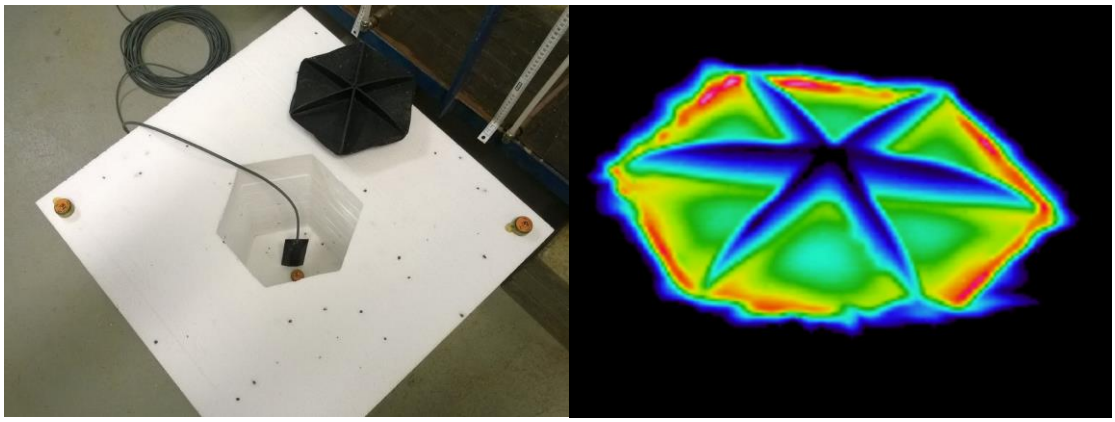
Background

The hexa-cover system is developed as a floating self-organizing system, which can reduce emissions from water surfaces. The system has been demonstrated to reduce water evaporation from water reservoirs, emission of ammonia from manure holding tanks among others. As the system consist of foamed plastic, the hexa-Cover is believed to provide an insulation effect as well. The purpose of this study is to quantify the isolation property of the hexa-Cover, which can be used to estimate the insulation efficiency.

Method

The method is based on the principle of energy balance of an enclosed water volume. The water volume is isolated from the surroundings, except for the surface where the Hexa-Cover is located.

The standard method for measuring λ-, U- and R-values involves heating the water with a fixed heat source until equilibrium is achieved. In this method, hot water is allowed to cool though heat transmission through the Hexa-Cover. This simplifies the experimental setup and makes it possible to estimate the R-value at different temperature differences. In the foam block, three digital temperature gauges are located near the bottom. At the top, two temperature dataloggers are placed to measure the ambient temperature. The hole is filled with hot tap water.



Experimental setup and thermal image of Hexa-Cover during experiment.

The energy will escape though the Hexa-Cover and through the Styrofoam. In order to isolate the effect of the Hexa-Cover, three experiments are performed: 1: No Hexa-Cover – just a free water surface reference 2: With Hexa-cover. 3: The box closed with a Styrofoam lid to measure background heat emission. The average temperature on the horizontal surfaces is measured by the thermal camera to around 35 ^{o}C. This supports the measurement that the Hexa-Cover provides insulation against heat loss from the free water surface.

Conclusion

The Hexa- Cover reduces the heatflux with 74% compared to a free water surface in the same experimental setup.

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