Multiphysics Study of Infrared Thermography (IRT) Applications

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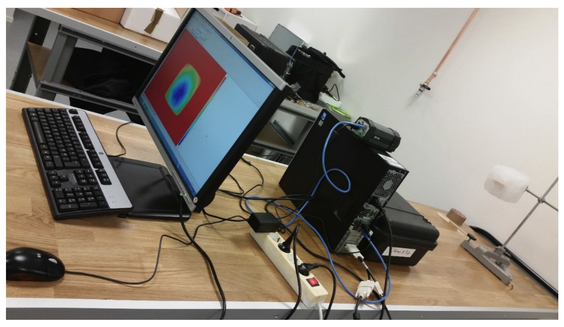
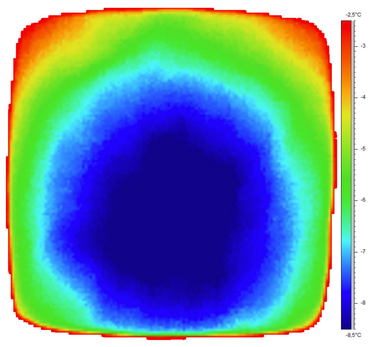
Abstract

Infrared thermography is the science of detecting infrared energy emitted from an object, converting it to apparent temperature, and producing images of that radiation, called thermograms. Infrared thermography means "beyond red temperature image". IR thermography being a remote non-contact/non-destructive means of testing is perfectly suitable for tests in extreme environments. Also, it is fast, reliable, and detailed. Due to the advantages offered by IR thermography, it is being employed in various industries. Infrared thermography (IRT) has a long history in industrial applications; however, its use is increasing exponentially in the research and development sectors. Academic and research institutions are finding IR thermography as one of the fundamental tools for teaching and research. This review paper discusses studies where IR thermography has been used effectively in research and development projects at the UiT The Arctic University of Norway. The applications discussed in this work are:

- Thermal conductivity and heat transfer coefficient of freshwater and marine ice.
- An industrial solution for detecting icing.
- Determine relative required insulation (IREQ) of clothes.
- Surface temperature of steel samples under tensile testing at room and cold temperatures.

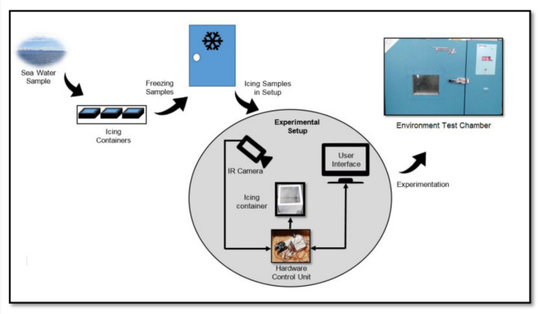
Thermal Conductivity and Heat Transfer Coeff. of Ice*

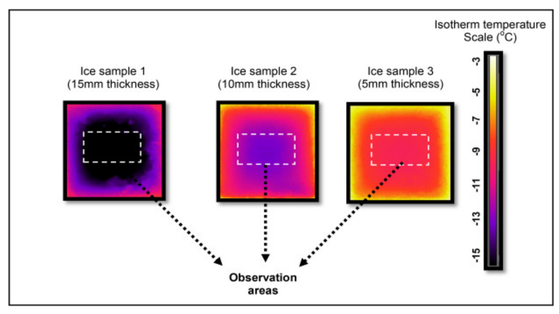




*Rashid, Taimur; Khawaja, Hassan Abbas; Edvardsen, Kåre. Determination of Thermal Properties of Fresh Water and Sea Water Ice using Multiphysics Analysis. The International Journal of Multiphysics 2016; 10(3), p.277 - 291. doi: 10.21152/1750-9548.10.3.277.

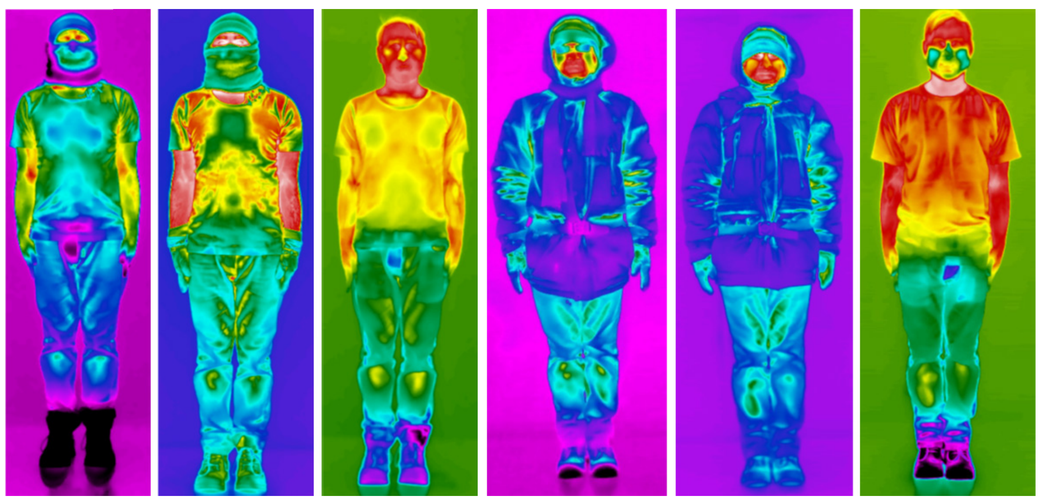
Industrial De-icing Solution*





*Rashid, Taimur; Khawaja, Hassan; Edvardsen, Kåre. Measuring Thickness of Marine Ice Using IR Thermography. Cold Regions Science and Technology 2018; 158, p. 221-229. doi: 10.1016/j.coldregions.2018.08.025.

Relative Required Insulation (IREQ) of Clothes*

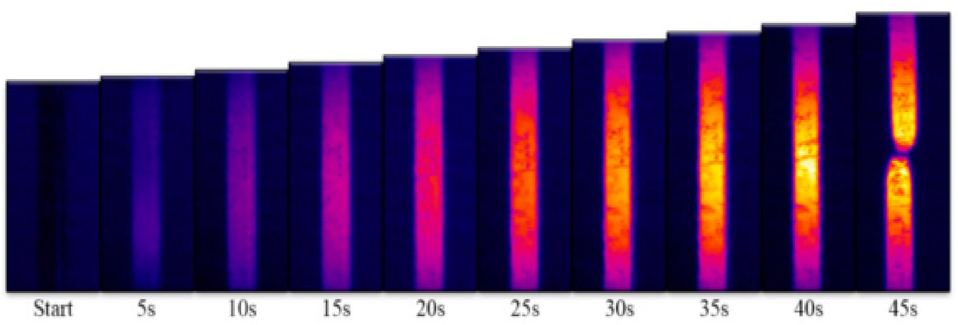


*Ahmad, Tanveer; Rashid, Taimur; Khawaja, Hassan Abbas; Moatamedi, Mojtaba. Study of the required thermal insulation (IREQ) of clothing using infrared imaging. The International Journal of Multiphysics 2017; 11(4), p. 413 - 426. doi: 10.21152/1750-9548.11.4.413.

Thermography of Tensile Testing*

(a) Before

(b) After fracture



*Stange, Even; Andleeb, Zahra; Khawaja, Hassan; Moatamedi, Mojtaba. Multiphysics study of tensile testing using infrared thermography. (fulltekst) The International Journal of Multiphysics 2019; 13(2), p.191 - 202. doi: 10.21152/1750-9548.13.2.191.

Conclusion & Future Work

Infrared (IR) technology is widely used in the research and development as an inspection tool for condition monitoring and predictive maintenance. It is advantageous over traditional visual inspection and other tools because infrared technology does not have to be in contact with the equipment being monitored.

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