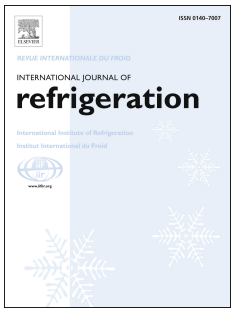
Accepted Manuscript



The Effect of Salinity and Temperature on Electromagnetic Wave Attenuation in Brine

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PII: S0140-7007(14)00343-0

DOI: 10.1016/j.ijrefrig.2014.11.013

Reference: JIJR 2927

To appear in: *International Journal of Refrigeration*

Received Date: 26 September 2014

Revised Date: 25 November 2014

Accepted Date: 30 November 2014

Please cite this article as: Hales, A., Quarini, G., Hilton, G., Jones, L., Lucas, E., McBryde, D., Yun, X., The Effect of Salinity and Temperature on Electromagnetic Wave Attenuation in Brine, *International Journal of Refrigeration* (2015), doi: 10.1016/j.ijrefrig.2014.11.013.

The Effect of Salinity and Temperature on Electromagnetic Wave Attenuation in Brine

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Abstract

Ice slurries are typically formed from an aqueous solution of water and salt (NaCl) at 5% salinity. Ice pigs, used in many industry areas, are taken from a bulk ice slurry and used to clear waste or recover product from pipes. Ice fraction is a key property of an ice slurry, since it determines it's 'thickness' and therefore cleaning capacity. Electromagnetic wave interrogation has been shown to accurately predict an ice fraction to within an error of ±1.2%. The largest remaining process error comes from inherent salinity variation, which affects the electromagnetic wave attenuation significantly. Increasing electromagnetic wave attenuation with increasing salinity and the effect of temperature, shown to also increase attenuation, is quantified. Calibration methods are proposed, aiming to eliminate the unwanted effect of varying salinity. Analysis on multiple samples showed a 16% reduction in average error, and 9% reduction in maximum error when the calibration method was applied.

Keywords: Ice Pigging, Ice Fraction, Electromagnetic Wave Attenuation, Brine, Salinity, Temperature

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