

AN INVESTIGATION OF OIL RESIDUE ON SURFACE BY INFRARED THERMOGRAPHY

Jedsada Chaishome^{1*}, Teerawat Nunak², Yutthapong Tuppadung³,
Taweepol Suesut¹, Navaphattra Nunak¹

¹Faculty of Engineering, King Mongkut's Institute of Technology Ladkrabang, Chalongkrung Rd. 1, 10520 Bangkok, Thailand

²Measuretronix Co., Ltd. (Head Office), Lat Phrao Rd. 2425/2, 10310 Bangkok, Thailand

³Provincial Electricity Authority, Ngamwongwan Rd. 200, 10900 Bangkok, Thailand

*e-mail: jedsada.ch@kmitl.ac.th

Abstract

This work aims to propose a visual inspection, infrared thermography technique, of oil residual mass on stainless steel surface (SS) (hydrophilic surface representative) and polytetrafluoroethylene (PTFE) surface (hydrophobic surface representative). An improved understanding of the oil fouling characteristic is a key point to develop this technique. The effect of surface roughness on the oil contact angle, oil residual mass, and the resulting average temperature of the residues on SS and PTFE surface was studied.

For the infrared thermography technique, the mass of oil adhered to each interface using heating at a temperature of 80 °C for 10 minutes. SS AISI 304 plaques with the average surface roughness of 0.4, 0.8, and 3.2 µm and PTFE with that of 0.4 and 0.8 µm were examined. All samples were snapped top view using a thermal image camera. The average temperatures were obtained from the color spectrum of the thermal images.

It could be summarized that the proposed measurement is possible to detect the accumulation of oil on the SS whereas it was not clearly different that on the PTFE surface. A greater oil residual mass on both hydrophilic and hydrophobic surfaces is a result of an increase in surface roughness and sequential wettability from the contact angle as expected. Moreover, each liquid-solid interfacial material has its specific surface characteristic.

Finally, each liquid-solid interfacial material has its specific surface characteristic and the new and used oil-SS interface could be detected by infrared thermography technique.

Key words: *Infrared thermography, Average roughness, Contact angle, Residual mass.*