

# INVESTIGATION OF SOY MILK DEPOSITED ON STAINLESS STEEL BY INFRARED THERMOGRAPHY

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## Abstract

This paper proposes a real-time investigation of soy milk deposited on stainless steel surface (SS) during the heating process by considering the relationship between emissivity and mass of soils on the surface using a thermal image processing technique. The understanding on organic fouling behavior is an important step leading to the optimum cleaning operations.

The mass of soy milk deposited on SS during heating process at the temperature of 75°C for 180 min was measured by the weighing method and compared to the emissivity values analyzed from the infrared thermography in real-time. Two different types of stainless steel grades (AISI 304 and 316) with various average surface roughness ( $R_a$ ) values (0.4, 0.8 and 3.2  $\mu\text{m}$ ) were carried out.

Emissivity values of sample plates which soil deposited on the surface, were obtained from the real-time processing of a thermo-map of soil film compared to the temperature of a reference surface (known emissivity value). Applying this technique to all conditions, it was found that the increasing of emissivity values of sample plates as the amount of soil film on SS increased could be detected in real-time for both SS grades. The emissivity of SS having soil on the surface was higher than a clean SS since the soil film on the SS caused the roughness of surface changed. It could also detect that emissivity values of both SS grades had no significantly difference at the same  $R_a$ .

From the detection of soy milk deposited on SS using the real-time thermal image processing acquired from infrared camera during heating process, it could be concluded that the proposed technique was possible to investigate the accumulation of soy milk and other soil types on the surface.

**Key words:** *Infrared thermography, soy milk, fouling, average roughness, real-time thermal image processing*