592a Heat Transfer Considerations in Thermal Processing with Container Agitation: Dual Mode Axial Rotation Involving Particulates in Viscous Fluids

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Heat transfer rates to canned foods can be significantly enhanced by induced mechanical agitation in canned contents by subjected packaged cans to either end-over-end or axial agitation. Axial agitation is frequently used in continuous systems while the end-over-end agitation is mostly used in batch systems. The successful establishment of thermal processes of canned foods is nevertheless based on a sound knowledge of thermo-bacteriology and understanding of mechanism of heat transfer. Evaluation of the associated heat transfer coefficients (overall, U and fluid to particle, h), associated with canned liquid/particle mixtures, in canned particulate fluids while they are subjected to motion is challenging because of the difficulties involved with attaching temperature measuring devices to liquids and particles without affecting their normal motion. Further, data gathering from these devices also becomes challenging because the wires used to transfer the signals can pose problems during the operations. While wireless temperature sensors have come to some rescue, establishing a scientifically sound methodology is still quite challenging. The heat transfer to the canned contents during agitation can be expected to be dependent on several product and system dependent properties: product type, size and shape, viscosity of the liquid, thermo-physical properties of fluid and particles, retort temperature, rotation speed, etc. This presentation looks at establishing an appropriate methodology for the evaluation of U and h, and results of several case studies to demonstrate the influence of product and process variables.