Difference between Cold Spot and F minimum Value Spot in a Still Can during Thermal Sterilization

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Abstract: Canning is the most conventional used thermal processing in food industry, as well as aseptic processing. While the liquid food is been heating, because of the existence of convection, the cold spot in the can is moving. Meanwhile, the sterilization value (F) of each point in the can differs with each other. So the cold spot is not always the spot of sterilization minimum value ($F_{\min}$). Cylindrical liquid can of water and different concentrations of CMC (1.0%, 1.5%, 2.0% and 2.5%) were simulated by solving the governing equations for continuity, momentum and energy conservation, using "COMSOL[®]" multiphysical coupling field software package which based on finite element method of analysis. Through finding out cold spot of 100 °C, 105 °C, 110 °C and 115 °C in the can and the $F_{\min}$ spot, temperature and sterilization value were compared. The results indicated that there were obvious differences between cold spot and $F_{\min}$ spot. Also, the concentration of 1.5% CMC liquid can be regarded as a critical viscosity. It means if the viscosity of liquid is above the critical viscosity, the traditional thermal sterilization time is satisfied, whether the original sterilization time should be moderately prolonged, especially for thinly fluid (the sterilization time should be prolonged 2.54% for water), in order to ensuring food safety.

Key words: Thermal sterilization, sterilization value, sterilization time, cold spot, F minimum value spot.