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High Tc SQUID based Magnetic Contaminant detection System for Beverage or minced flesh

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A computer controlled contaminant detection system based on high-Tc Superconducting Quantum Interference Device (SQUID) for a beverage or minced flesh has been designed and constructed. There is a possibility that individuals ingest contaminants that have been accidentally mixed with food because processed foods have become very common. Therefore, a detection method of small contaminants in food is required. Last year, we developed and started to sell the High-Tc SQUID based detection system with a belt conveyer, which is for food such as a cheese or a meat. However the system with a conveyer can not apply to a liquid material such as juice or minced flesh in process. There is a strong demand for detection of magnetic contaminants in minced flesh or juice with pulp because a strainer cannot be applied to such a pulpy liquid. Therefore, we developed the detection system based on high-Tc SQUID for a beverage. The outer dimensions of the system are 800 mm length x 530 mm width x 1560 mm height. A straight tube with a dimension of 25 x 70 mm, in which a beverage flows is penetrating the system. This system employed a newly developed double-layered cylindrical magnetic shield. The distribution of the magnetic field in the magnetic shield was carefully simulated by FEM (Maxwell, Ansoft Corporation); the gap between each shield layer was optimized before fabrication. Then the shielding factor of 1/970 in z- component, which is good enough to operate the system in a factory was achieved. The two identical SQUIDs were employed so that they can keep the sensitivity over the full width of the tube. As a result, we could successfully measure small iron particles in the order of hundreds micron. This detection level was hard to be achieved by a conventional X-ray detection or an eddy current method. We believe that this system is the fist practical SQUID based metallic contaminant detector for a beverage.