Design of a Compact Pressure Sensor for Multi-Layer Insulation in a Vacuum

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Summary

Team 15, sponsored by the NASA Marshall Space Flight Center, is tasked with developing a compact pressure sensing device that is capable of measuring the interstitial vacuum pressure between layers of Multi-Layer Insulation (MLI). The additional requirements for the pressure sensor are that it maintain the MLI's structural integrity, minimize heat flow into the interstitial space, minimize power consumption and take at least one measurement per second. The device must be able to read pressures as low as 10^{-2} Pa (10^{-3} torr) and would be beneficial if it can measure up to atmospheric pressures. From a House of Quality, the most important engineering characteristics with respect to customer requirements was determined and considered in designing the concepts. Three main concepts were generated: a capacitor pressure sensor, a multi-stage capacitor pressure sensor and a fiber optics pressure sensor. A decision matrix was used to determine the capacitor as the most viable option with the second choice being the multi-stage capacitor. Prototype of the capacitor pressure sensor is currently being tested.