Aviation Fuel Gauging Sensor Utilizing Multiple Diaphragm Sensors Incorporating Polymer Optical Fiber Bragg Gratings - DTU Orbit (08/01/2019)

A high-performance fuel gauging sensor is described that uses five diaphragm-based pressure sensors, which are monitored using a linear array of polymer optical fiber Bragg gratings. The sensors were initially characterized using water, revealing a sensitivity of 98 pm/cm for four of the sensors and 86 pm/cm for the fifth. The discrepancy in the sensitivity of the fifth sensor has been explained as being a result of the annealing of the other four sensors. Initial testing in JET A-1 aviation fuel revealed the unsuitability of silicone rubber diaphragms for prolonged usage in fuel. A second set of sensors manufactured with a polyurethane-based diaphragm showed no measurable deterioration over a three month period immersed in fuel. These sensors exhibited a sensitivity of 39 pm/cm, which is less than the silicone rubber devices due to the stiffer nature of the polyurethane material used.