CLAIMS

The invention claimed is:

1. A pressure sensor for measuring gas or liquid pressure comprising:

a chamber having an inlet that receives the gas or liquid;

a flexible diaphragm within the chamber that has a surface that is exposed to the gas or liquid after it flows through the inlet;

a pressure sensor system that senses changes in the flexible diaphragm caused by changes in the pressure of the gas or liquid; and

a pressure-insensitive sensor system that senses changes in the flexible diaphragm not caused by changes in the pressure of the gas or liquid and that is insensitive to changes in the flexible diaphragm caused by changes in the pressure of the gas or liquid;

wherein the pressure-insensitive sensor system comprises:

multiple local sensors at different pressure-sensitive locations on or within the flexible diaphragm; and

an extrapolation processing system that extrapolates from outputs of the multiple local sensors changes at a pressure-insensitive location on or within the flexible diaphragm that experiences changes, but not in response to changes in the pressure of the gas or liquid.

2. The pressure sensor of claim 1 wherein:

the flexible diaphragm has a line of pressure-insensitive locations that each experience changes, but not in response to changes in the pressure of the gas or liquid;

at least two of the multiple local sensors are located on opposite sides of the line.

3. The pressure sensor of claim 1 wherein:

the flexible diaphragm has a line of pressure-insensitive locations that each experience changes, but not in response to changes in the pressure of the gas or liquid; and

at least two of the multiple local sensors are located on the same side of the line.

4. The pressure sensor of claim 1 wherein the extrapolation processing system calculates the stress at the pressure-insensitive location in accordance with the following equation:

$$\frac{\sigma_1'\sigma_2''-\sigma_1''\sigma_2'}{\sigma_1'+\sigma_2''-\sigma_1''-\sigma_2'}+\sigma_{initial}$$

wherein:

σ_1' and σ_2' is an output from one of the multiple local sensors while subject to materially different pressures P1 and P2, respectively;

σ_1'' and σ_2'' is an output from the other of the multiple local sensors while subject to the same materially different pressures P 1 and P2, respectively; and

$\sigma_{initial}$ is any stress that was placed on the flexible diaphragm prior to exposure to the pressures P 1 and P2 and that remains on the flexible diaphragm during the exposure to the pressures P1 and P2.

5. The pressure sensor of claim 1 wherein the different pressure-sensitive locations of the multiple local sensors have substantial planar symmetry with respect to a surface of the flexible diaphragm.

6. The pressure sensor of claim 1 wherein the flexible diaphragm is circular and wherein the pressure-insensitive location is on a substantially concentric circle having a radius within the range of 0.63 of the radius of the flexible diaphragm, plus or minus 0.2.

7. The pressure sensor of claim 1 wherein:

the pressure sensor system includes a variable capacitor that has a capacitance that changes in response to changes in the pressure of the gas or liquid; and

the flexible diaphragm is made of electrically-conductive material and is part of the variable capacitor.

8. The pressure sensor of claim 1 wherein the pressure-insensitive sensor system includes a strain gauge that has a resistance that changes in response to changes in the flexible diaphragm.

9. The pressure sensor of claim 1 wherein the pressure-insensitive sensor system include a piezoelectric sensor that has a voltage that changes in response to changes in the flexible diaphragm.

10. The pressure sensor of claim 1 further comprising a compensation system that compensates for errors in measurements made by the pressure sensor system because of changes in the flexible diaphragm not caused by changes in the pressure of the gas or liquid based on changes to the flexible diaphragm sensed by the pressure-insensitive sensor system.

11. The pressure sensor of claim 1 further comprising a life measurement system that provides information indicative of a projected remaining life of the pressure sensor system based on changes to the flexible diaphragm sensed by the pressure-insensitive sensor system.

12. The pressure sensor of claim 11 wherein the life measurement system includes a

warning system that issues a warning when the projected remaining life of the pressure sensor system equals or exceeds a threshold.