CLAIMS

1. A system for determining target properties of a pressure vessel, the system comprising:

a signal generator acoustically coupled to a fluid contained in the pressure vessel and disposed externally to the pressure vessel, the signal generator to emit acoustic signals into the fluid;

a plurality of sensors acoustically coupled to the fluid and disposed externally to the pressure vessel to detect the acoustic signals;

a thermodilatohydrometer configured to determine dissolved gas parameters of the fluid contained within the pressure vessel;

a control device interconnected with the signal generator and the plurality of sensors, the control device configured to:

control the signal generator to emit acoustic signals into the fluid;

obtain sensor data from the plurality of sensors, the sensor data representing the acoustic signals as received by the plurality of sensors;

obtain the dissolved gas parameters from the thermodilatohydrometer;

compute, based on the sensor data and the dissolved gas parameters, the target properties of the pressure vessel, the target properties comprising one or more of: a thickness of a wall of the pressure vessel, and a location of a fault in the pressure vessel; and

output an indication of the target properties.

2. The system of claim 1, wherein the control device is further to:

obtain predefined parameters of the pressure vessel and the fluid contained therein; and

compute the target properties based on the sensor data and the predefined parameters.

3. The system of claim 1, wherein, prior to controlling the signal generator to emit the acoustic signals, the control device is further to calibrate the signal generator and the plurality of sensors.

4. The system of claim 3, wherein, to calibrate the signal generator and the plurality of sensors, the control device is to:

compute initial spectral pulse parameters based on predefined parameters of the pressure vessel and the fluid contained therein;

control the signal generator to emit test signals according to the initial spectral pulse parameters;

obtain test signal data at the plurality of sensors; and

adjust a strength of the test signals emitted by the signal generator based on the test signal data and according to a target received signal strength.

5. The system of claim 1, wherein the control device is further to:

determine whether a threshold number of iterations of controlling the signal generator to emit acoustic signals and obtaining sensor data from the sensors has been reached; and

compute the target properties only when the determination is affirmative.

6. The system of claim 1, further comprising temperature control components coupled to the signal generator and the sensors to maintain respective operating temperatures of the signal generator and the sensors.

7. The system of claim 1, wherein the signal generator further comprises an integrated reference sensor configured to detect the acoustic signal as emitted by the signal generator.

8. A method for determining target properties of a pressure vessel, the method comprising:

controlling a signal generator to emit acoustic signals into a fluid contained in the pressure vessel from externally to the pressure vessel;

obtaining sensor data representing the acoustic signals as transmitted through the fluid, the sensor data obtained externally to the pressure vessel;

obtaining dissolved gas parameters of the fluid contained within the pressure vessel;

computing, based on the sensor data and the dissolved gas parameters, the target properties of the pressure vessel, the target properties comprising one or more of: a thickness of a wall of the pressure vessel, and a location of a fault in the pressure vessel; and

outputting an indication of the target properties.

9. The method of claim 8, further comprising:

obtaining predefined parameters of the pressure vessel and the fluid contained therein; and

computing the target properties based on the sensor data and the predefined parameters.

10. The method of claim 8, further comprising, prior to controlling the signal generator to emit the acoustic signals, calibrating the signal generator and a plurality of sensors configured to obtain the sensor data.

11. The method of claim 10, wherein calibrating the signal generator and the plurality of sensors comprises:

computing initial spectral pulse parameters based on predefined parameters of the pressure vessel and the fluid contained therein;

controlling the signal generator to emit test signals according to the initial spectral pulse parameters;

obtaining test signal data from the plurality of sensors; and

adjusting a strength of the test signals emitted by the signal generator based on the test signal data and according to a target received signal strength.

12. The method of claim 8, further comprising:

determining whether a threshold number of iterations of controlling the signal generator to emit acoustic signals and obtaining sensor data has been reached; and

computing the target properties only when the determination is affirmative.