CLAIMS

What is claimed is:

1. A plug monitoring device configured to monitor a plug to be received by an aperture of a pipe, the plug monitoring device comprising:

a sensor having an output, wherein the sensor is configured to produce at the output a first signal when the plug is tightly installed in the aperture and a second signal at the output when the plug is not tightly installed in the aperture, wherein the sensor is further configured to detect a separation between the plug and the aperture along a direction of insertion of the plug into the aperture; and

circuitry, comprising:

a transmitter, coupled to the output of the sensor, wherein the circuitry is configured to transmit a signal comprising status information selectively based on a signal at the output of the sensor; and

a computer memory;

wherein detecting the separation between the plug and the aperture comprises comparing the signal at the output of the sensor to at least one threshold value stored in the computer memory.

2. The plug monitoring device of claim 1, wherein:

the computer memory comprises a calibration memory;

the circuitry further comprises a comparator;

the comparator is configured to receive as inputs the signal at the output of the sensor and the at least one threshold value stored in the calibration memory;

the comparator comprises an output selectively indicating differences between the signal at the output of the sensor and the at least one threshold value in the calibration memory; and

the circuitry is configured to transmit the status information indicating a status of the plug installed in the aperture based on the output of the comparator.

3. The plug monitoring device of claim 2, wherein:

the circuitry comprises a state machine configured to detect a change status of the status of the plug based on the output of the comparator and selectively transmit a signal based on a detected change of state.

4. The plug monitoring device of claim 2, wherein:

the at least one threshold value stored in the calibration memory comprises:

a threshold indicative of a signal at the output of the sensor when the plug is tightly installed in the aperture; and

a second threshold indicative of the signal at the output of the sensor when the plug is not tightly installed in the aperture.

5.The plug monitoring device of claim 1, wherein the circuitry is battery powered.

6. The plug monitoring device of claim 1, wherein the sensor is a magnetic sensor.

7. The plug monitoring device of claim 6, wherein the sensor is a three-dimensional magnetic sensor.

8. The plug monitoring device of claim 6, wherein the sensor is a reed switch sensor.

9. A pipe monitoring kit comprising:

the plug monitoring device of claim 6 further comprising a housing, wherein the sensor and the circuitry are disposed within the housing; and

a magnet separate and distinct from the plug monitoring device.

10. The pipe monitoring kit of claim 9, further comprising the plug, wherein the plug comprises the magnet.

11. The plug monitoring device of claim 9, wherein the magnet comprises an annular magnet.

12. The plug monitoring device of claim 1, wherein the sensor is an optical sensor.

13. The plug monitoring device of claim 1, wherein the transmitter comprises a wireless transmitter.

14. The plug monitoring device of claim 13, wherein the wireless transmitter is configured to transmit the signal using a Bluetooth beacon or a Zigbee beacon.

15. The plug monitoring device of claim 13, wherein the wireless transmitter is configured to transmit the signal as an encrypted signal.

16. The plug monitoring device of claim 1, further comprising an audio indicator and/or visual indicator configured to convey the status information to a human operator of the plug monitoring device.

17. The plug monitoring device of claim 1, wherein the sensor is further configured to produce at the output a third signal that is a function of the separation between the plug and the aperture.

18. The plug monitoring device of claim 1, wherein the circuitry is configured to transmit the signal comprising the status information at a first frequency when the plug monitoring device is in a low power mode and a second frequency that is higher than the first frequency when the plug monitoring device is in a high power mode.

19. The plug monitoring device of claim 1, wherein:

the plug monitoring device further comprises a battery;

the circuitry is powered from the battery; and

the circuitry is further configured to operate in a low power mode when the signal comprising status information has not changed within a threshold amount of time and to operate in a high power mode when the signal comprising status information has changed within the threshold amount of time.

20. A monitoring device configured to monitor a nonstationary object to be received in an aperture of a stationary object, the monitoring device comprising:

a sensor having an output, wherein the sensor is configured to produce at the output a first signal when the nonstationary object is disposed within the aperture of the stationary object and a second signal at the output when the nonstationary object is not disposed within the aperture of the stationary object, wherein the sensor is further configured to detect a separation between the nonstationary object and the aperture along a direction of insertion of the nonstationary object into the aperture; and

circuitry, comprising:

a transmitter, coupled to the output of the sensor, wherein the circuitry is configured to transmit a signal comprising status information selectively based on a signal at the output of the sensor; and

a computer memory,

wherein detecting the separation between the nonstationary object and the aperture comprises comparing the signal at the output of the sensor to at least one threshold value stored in the computer memory.

21. The monitoring device of claim 20, wherein:

the computer memory comprises a calibration memory;

the circuitry further comprises a comparator;

the comparator is configured to receive as inputs the signal at the output of the sensor and the at least one threshold value stored in the calibration memory;

the comparator comprises an output selectively indicating differences between the signal at the output of the sensor and the at least one threshold value in the calibration memory; and

the circuitry is configured to transmit the status information indicating a status of the nonstationary object disposed within the aperture of the stationary object based on the output of the comparator.

22. The monitoring device of claim 21, wherein:

the circuitry comprises a state machine configured to detect a change status of the status of the nonstationary object based on the output of the comparator and selectively transmit a signal based on a detected change of state.

23. The monitoring device of claim 20, wherein the sensor is a magnetic sensor.

24. The monitoring device of claim 23, wherein the sensor is a three-dimensional magnetic sensor.

25. The monitoring device of claim 20, wherein the sensor is an optical sensor.

26. The monitoring device of claim 20, wherein the nonstationary object comprises a nonstationary portion of a gate, and wherein the stationary object comprises a stationary portion of the gate.