



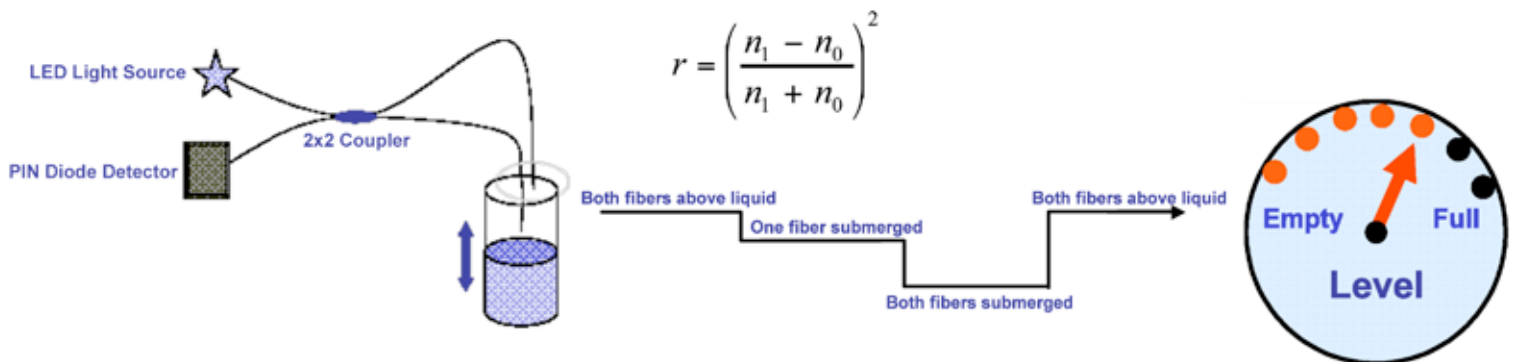
Summary

A new liquid-level-measurement technology based on fiber optics has been developed as a compact, lightweight alternative to systems based on float gauges and other conventional sensors. For liquids that pose explosion hazards, fiber-optic sensors are inherently safer because they do not include electrical connections inside tanks. These sensors are also ideal for corrosive and/or toxic fluids.

Fiber-optic sensors can be designed in many different forms to exploit reflection and transmission of light to measure liquid levels. Most of them are based on the effects of the indices of refraction of liquids on the waveguide properties of optical fibers. In a typical case, there is a loss of internal reflection of guided electromagnetic modes as a result of contact between the outer surface of optical fiber and a liquid. Hence, a substantial decrease in the light transmitted from one end of the fiber to the other is taken to indicate that liquid has come into contact with a suitably designed probe at the end of the fiber. A system capable of determining the level of liquid to within a known increment of depth could be constructed by placing the probes of a number of such sensors at known increments of depth in a tank.

The Technology

- Incident light divides into reflected and transmitted components at the interface between optical media of differing refractive indices.
- Fresnel's laws of reflection precisely describe the relationship between the reflected and incident light at the interface.



- When a fiber is immersed in liquid, the reflection coefficient is smaller than that for air.
 - There is a discrete change upon submersion.
- Therefore, fiber submersion can be used to determine the level of a liquid.
 - It's like an "on-off" switch.
 - Multiple fibers at equally spaced depths will provide quasi-continuous digital measurement.
 - Proven concept with repeatable results.

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