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Co-axial Stub Resonator Technique for In-Line Fingerprinting of Fluids

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Abstract:-- **The co-axial stub resonator is a transmission line which can be used to detect fluid properties. For different in-line process sensing applications, in the field of water quality detection, research has been done to provide an adequate theoretical description of transmission line based measurements This work described here gives details of use of coaxial stub resonator to measure the dielectric properties of fluids. . This radio frequency spectroscopy method is based on coaxial stub technique and comprises quarter wave length open ended resonators filled with a liquid sample as dielectric material between inner and outer conductor. The change in the dielectric properties of the liquid sample results in change resonance frequency and quality factor.**

***Keywords*: Co-axial stub resonator, Dielectric permittivity, Fluids, Impedance, Transmission line**

I. INTRODUCTION

The drinking water, surface water, waste water and industrial process fluids may contain a large number of toxic or undesired components at a wide range of concentration levels. In order to safeguard water quality, the early detection of pollutants in water is mandatory. However, currently existing (bio) chemical detection methods are labor intensive and expensive. Even more important, all these methods are off line providing a momentary signature only. The aim of the present study is to develop a fingerprinting sensing device that operates in-line instead and that is based on recording a physical rather than a (bio) chemical parameter representative for water quality.

The physical parameters to monitor and track the composition of a fluid are those related to its dielectric properties, e.g., dielectric permittivity and loss tangent. This will be achieved by using high or microwave frequency techniques with capacitors or coaxial resonators as sensitive elements.

The present contribution deals with the feasibility of a quarter wave length open ended coaxial stub resonator as a flow through and on line sensing element for tracking changes in the dielectric properties of a fluid. The fluid is present as the dielectric between the inner and outer conductor of the resonator. In-line analysis will be realized by pumping the sample continuously through the resonator using an inlet and outlet for the fluid to be analyzed. Since the sensor system have to design such that the fluid volume between inner and outer conductor is relatively large..

II.RESEARCH OBJECTIVE

The research presented here aimed the following objectives:

- The use of transmission line based sensors for assessing the dielectric properties of fluids.
- To provide a theoretical description of transmission line behavior, predicting the dielectric properties of fluids with the help of AF plots.
- benefit the water sector industry, from in-line sensing devices for high quality water demand.
- To use the same type of sensing platform for different applications like water distribution systems, dairy industries, clinical applications for in-line glucose level monitoring.

III MATERIALS:

The experiments have to perform with a Agilent N9320B RF Spectrum Analyzer (9KHz to3.0GHz) with Tracking Generator, both with an internal resistance Zs of 50 Ohm. The interconnecting transmission lines have characteristic impedance ZO of 50 Ohm.

IV. SENSING TECHNIQUE: COAXIAL STUB RESONATOR

Following Fig. gives a schematic overview of the coaxial resonator described in this study and its connection to the coaxial transmission line between the function generator (FG) and the spectrum analyzer (SA).

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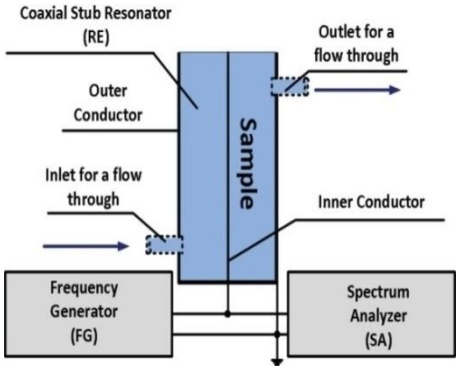

Fig The coaxial stub resonator sensing system consisting of a function generator (FG), spectrum analyzer (SA) and coaxial resonator (RE)..

The sensing system comprises a function generator (FG), with an internal output resistance of Zs=50 Ohm, connected to a spectrum analyzer (SA), with an internal input resistance of ZSA=50 Ohm, both connected by a coaxial transmission line with a characteristic impedance of 50 Ohm. To this coaxial transmission line, a quarter wave length open ended coaxial stub resonator (RE) is connected. The resonator consists of an inner conductor positioned in the center of a hollow outer conductor. The sample to be analyzed is present as dielectric between inner and outer conductor.

V.CONCLUSION

The measurement of dielectric parameters will be one of the best techniques to detect change in fluid quality. The radio frequency spectroscopy method based on coaxial stub technique can be used to achieve the objectives of the research work.

The water sector industry can be benefited enormously from in-line sensing devices, also because the ever increasing demand for water of high quality. The successful in-line sensing will substantially improve the production process. For clinical applications, one can think about how in-line glucose level monitoring really improve the life of diabetes.

REFERENCES

[1] A Redhardt, H.J.Steinhoff, J.Schlitter, H.J.Neumann and G.Hess. Institute for Biophysik der Ruhr-Universitat Bochum. Z.Naturforsch.44a,75-80(1989); received October 12,1988.

[2] Y. Wang and M. N. Afsar, Measurement of complex permittivity of liquids using waveguide techniques, Progress in Electromagnetic Research, Vol. 42, 131−142, 2003.

[3] M.S. Venkatesh, G.S.V. Raghavan, An Overview of Dielectric Properties Measuring Techniques, Canadian Biosystems Engineering, Volume 47, 2005,15−7.30.

[4] J. Sheen, Study of microwave dielectric properties measurements by various resonance techniques, Measurement, Volume 37, Issue 2, March 2005, 123−130.

[5] Y.−H. Chou, M.−J. Jeng, Y.−H. Lee, and Y.−G. Jan, Measurement of RF PCB Dielectric Properties and Losses, Progress In Electromagnetic Research Letters, Vol. 4, 2008, 139−148.

[6] Extensive Modeling of a Coaxial Stub Resonator for Online Fingerprinting of Fluids N.A. Hoog-Antonyuka,ca*, W. Olthuisa, M.J.J. Mayerb, H. Miedemac, F.B.J. Leferinkd, A. van der Geag

[7] D. M. Pozar, Microwave Engineering, Wiley, 2004

[8] S.O.Pillai,Sivakami, A Text book of Engineering Physics-New Age International Publisher.

[9] Dielectric properties of simulated green coconut water from 500 to 3,000 MHZ at temperature from 10 TO 80 ºC - Arlet P. Franco; Carmen C. Tadini; Jorge A. W. Gut University of São Paulo/NAPAN - Food and Nutrition Research Center, Brazil

[10] Online water quality monitoring in the distribution network F. Williamson1, J. van den Broeke1, T. Koster1, M. Klein Koerkamp1, J.W. Verhoef1, J. Hoogterp2, E. Trietsch2 and B.R. de Graaf2

[11] M. V. Storey, B. van der Gaag, B. P. Burns, Advances in on−line drinking water quality monitoring and early warning systems Water Research, Volume 45, Issue 2, January 2011, 741−747.