

To Study the Helical Antenna for the Biomedical Application

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Abstract: This paper work is a wireless microsensor based dual inductor antenna for sensing the blood activity in artery system. A device that has inductor length is taken 20-mm and diameter of inductor is 3.5-mm and viscosity of blood is vary from $2 \cdot 10^{-3}$ to $4 \cdot 10^{-3}$ (pa.s).The equivalent of inductor coil here as LC tank that will help to find blood pressure and flow rate of the blood in the artery system.

Keywords: Stentenna, MEMS, LC tank

I. Introduction

There are mainly two type of blood pressure exist in the body; first one is systolic pressure and second is diastolic pressure. When the heart is being pumped that pressure in arteries is systolic pressure and when the heart is not being pumped that pressure is distolic pressure. [1-2]. During both of these pressure there are two more pressure exist :one is upstream pressure and second one is down stream pressure.

The pressure is changed between two point of LC tank. The change in pressure can be detect by the shift in the frequency at which the external coil shows characteristic in impedance and phase. This paper describes a new dual inductor stentenna[3-5] and its integration of two capacitive pressure sensors to implement a wireless flow sensing system

II. Method

When the blood flow through a tank there is a pressure drop between two different location that depend on the flow rate of blood.

For the steady state flow[6].

$$P_2 - P_1 = CV + DV^2$$

Where P_2 and P_1 are pressure at different location. V is area averaged flow velocity and C and D are constant. The dual inductor design is intended to implement sensing based on this relationship.

If viscosity of blood is viscosity[7], length of tank is L , diameter of arteries is D , and Q is flow rate of blood then by Hagen Poiseuille equation[6]

$$\Delta P = 128\mu LQ / (\pi D^4)$$

The frequency and amplitude of the longitudinal vibrations of a sensor depends on the length L , elasticity E , and density ρ

$$f = 1/2L(\sqrt{E/\rho})$$

The resonance frequency changes when there is a small mass loading on the surface of the sensor. A magnetoelastic sensor of mass m_0 with initial resonance frequency f_0 , when subjected to a mass loading of Δm demonstrates a decrease in resonance frequency of

$$\Delta f = -f_0 \Delta m / 2m_0$$

Further, a change in the viscosity/density of the medium surrounding a sensor creates a damping effect on the sensor vibrations. The shift in resonance frequency Δf is related to the viscosity μ and density ρ_l of the surrounding medium as

$$\Delta f = \sqrt{(\pi \mu \rho_l f_0) / 2\pi \rho_s d}$$

Where d is the thickness of the magnetoelastic sensor and ρ_s is density.

III. Equivalent Circuit

Upon inflation, the deployed stantenna is permanently deformed in helical shape, which consist of two coil with 3 turns fig.1

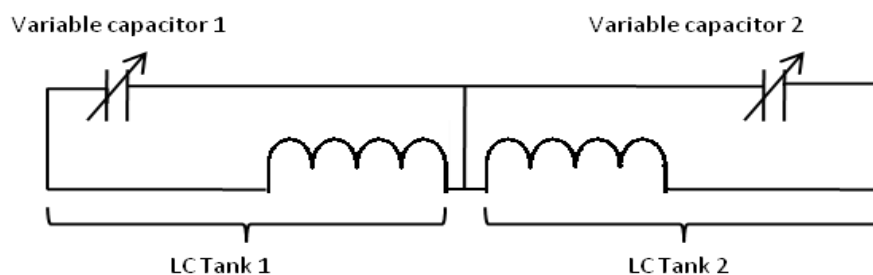


Fig.1

IV. Result And Discussion

The motivation for investigating these relationship is to desire too have readily available dialysis access flow estimate for use of each treatment.

It should be recognized that flow monitoring technology will makes frequent and easy measurement throughout each dialysis treatment.

V. Conclusion

Fig.2 shows the pressure at upstream and downstream location as a function of flow rate.As can be seen in fig.2 that pressure response indicate dependence on the flow rate.Its mean that this is a linear graph in which flow rate of blood is vary with variation in pressure linearly.

As in the Fig.3 shows that the flow rate (mm^3/s) of blood is also depends on the viscosity(Pa.s) of the blood.It is clear that flow rate is decrease when the viscosity of blood increase but viscosity of blood is limited to 4 Pa.s.From equation (ii) it is clear that flow rate is propotional to diameter(mm) of arteries but from fig.4 it is clear that the flow rate is non-linearly vary with diameter.

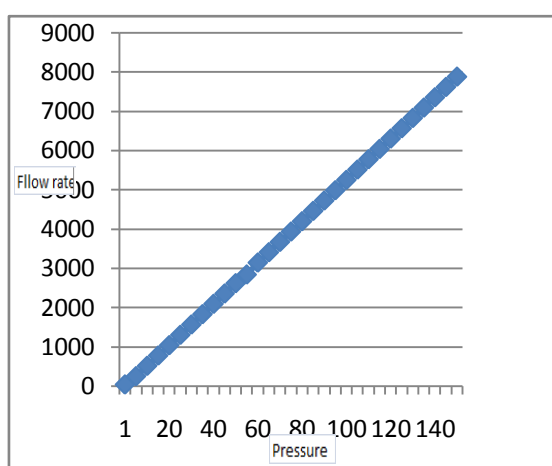


Fig.2

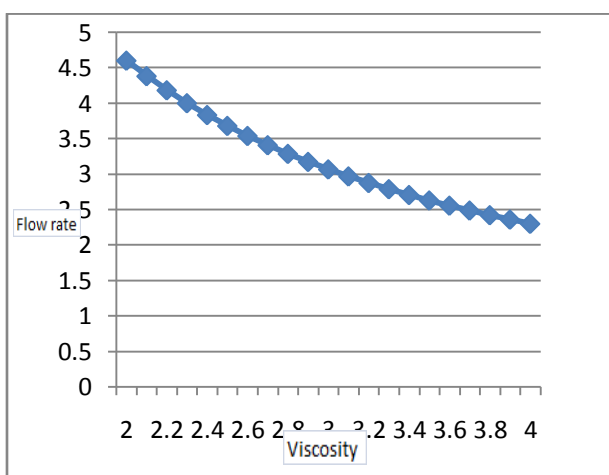


Fig.3

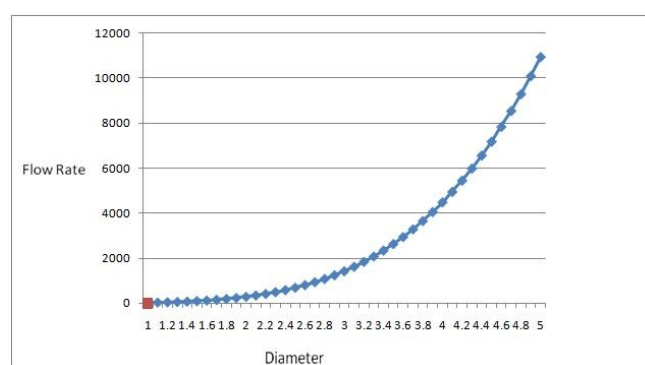


Fig.4

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