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Urea Adulteration in Milk

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Abstract: The nutritional value of milk to human health needs no introduction. But it is alarming that many people are adulterating it with water, detergents, caustic soda, starch, formalin, urea, ammonium sulphate, sodium carbonate which have harmful effect on the human health. The greed for money has pushed them to the extent of producing synthetic milk which has no nutritional content. Many analytical techniques have been developed to qualitatively and quantitatively measure these adulterations. Focus on the quantification of urea which is one amongst the many adulterants and provide an exhaustive literature survey of the available techniques for doing the same.Milk being highly perishable product, it is desirable to test it at the earliest opportunity rather than taking it to laboratory for analysis. With this mindset propose a new technique to quantify the amount of urea in milk.

Index Terms: Milk, urea, adulterants etc.

I. INTRODUCTION

The milk is very important in our day-to-day life. The milk is highly perishable product. There are two different types of milk that is cow and buffalo milk. The overall milk collection and production of nearby these dairies is approximately 20000 liters per day. The milk contains many parameters like Fat, Proteins, SNF, Lactose, Minerals etc. Table gives a typical composition of the whole raw milk.

Table No.1: Milk Contents

Components	Quantity
Protein	3.50%
Lactose	4.90%
FAT	3.50%
Minerals	0.70%
Water	87.40%
Total	100.00%

In dairies there are many machines like Eco-milk analyzer which can give the value of FAT,SNF (Solid Not Fat), Added water, Proteins, Freezing point, Density. But urea adulteration is detected by chemical methods in laboratory. There is no any specific machine to detect adulteration of urea in milk. We design an electronics circuit which can detect urea adulteration in milk. This can be useful in small dairies and also in big societies. Enzyme based sensor for detection of urea in milk was constructed using a piezoelectric sensor which measures thepressure of the gas, evolved in the sample. The sensor showed linear behavior for varying concentrations of urea in the samples. The time response of the sensor was evaluated and liquid to gas ratio of 1:2.5 was found to give satisfactory output by the sensor. The results indicate that this technique can be effectively used to detect urea levels in milk.

II. PROPOSED BLOCK DIAGRAM

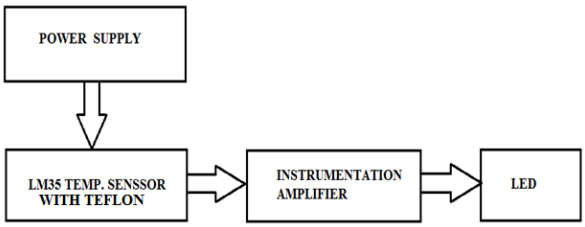

Fig. No. 1: Proposed Block Diagram

a. LM35 TEMPRATURE SENSOR:

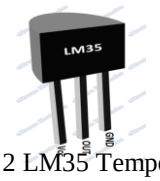

Fig. No. 2 LM35 Temperature Sensor

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The LM35 series are precision integrated-circuit temperature sensors, whose output voltage is linearly proportional to the Celsius (Centigrade) temperature. The LM35 thus has an advantage over linear temperature sensors calibrated in ˚ Kelvin, as the user is not required to subtract a large constant voltage from its output to obtain convenient Centigrade scaling. The LM35 does not require any external calibration or trimming to provide typical accuracies of ±1⁄4˚C at room temperature and ±3⁄4˚ cover a full −55 to +150˚C temperature range. The LM35's low output impedance, linear output, and precise inherent calibration make interfacing to readout or control circuitry especially easy. It can be used with single power supplies, or with plus and minus supplies. As it draws only 60 µA from its supply, it has very low self-heating, less than 0.1˚C in still air. The LM35 is rated to operate over a −55˚ to +150˚C temperature range, while the LM35C is rated for a −40˚ to +110˚C range (−10˚ with improved accuracy).

b. TEFLON SHEET:

Fig. No.3 Teflon Sheet

Polytetrafluoroethylene (PTFE) is a synthetic fluoropolymer of tetrafluoroethylene that has numerous applications. The best known brand name of PTFE-based formulas is Teflon by chemours. PTFE is a fluorocarbon solid, as it is a high-molecular-weight compound consisting wholly of carbon and fluorine. PTFE is hydrophobic neither water nor water-containing substances wet PTFE, as fluorocarbons demonstrate mitigated London dispersion forces due to the high electronegativity of fluorine. PTFE has one of the lowest coefficients of friction of any solid. PTFE is used as a non-stick coating for pans and other cookware. It is very non-reactive, partly because of the strength of carbon–fluorine bonds, and so it is often used in containers and pipework for reactive and corrosive chemicals. Where used as a lubricant, PTFE reduces friction, wear and energy consumption of machinery. It is commonly used as a graft material in surgical interventions. Also, it is frequently employed as coating on catheters; this interferes with the ability of bacteria and other infectious agents to adhere to catheters and cause hospital acquired infections.

INSTRUMENTATION AMPLIFIER

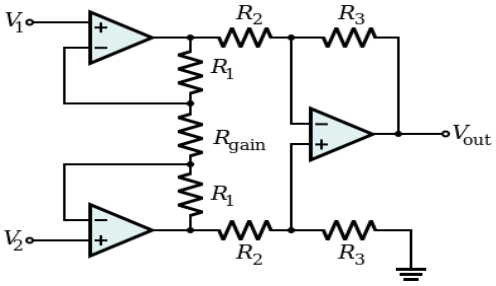

Fig. No.3 Instrumentation Amplifier

An instrumentation (instrumentation)amplifier is a type of differential amplifier that has been outfitted with input buffer amplifiers, which eliminate the need for input impedance matching and thus make the amplifier particularly suitable for use in measurement and test equipment. Additional characteristics include very low DC offset, low drift, low noise, very high open-loop gain, very high common-mode rejection ratio, and very high input impedances. Instrumentation amplifiers are used where great accuracy and stability of the circuit both short and long-term are required.

III. WORKING PRINCIPAL

LM35 temperature sensor is enclosed in a Teflon sheet which assembled is dipped in milk and urea mixture. The natural property of ammonia is Teflon attracts the ammonia toward the Teflon sheet. This phenomenon generate the heat this heat sensed by LM35 temperature sensor. The output of sensor gives to instrumentation amplifier which acts as signal conditioning then this signal conditioning circuit interface with LED. When urea is adulterate in milk then LED glow otherwise LED is off.

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When power supply is given to two sensors consisting LM35 IC .we use two container with two LM35 sensors which is fitted in container. One of which is without Teflon coating and other one is coated with Teflon. Then the milk is added in the both container and turn ON the power supply we get two output of LM35 sensor which is given to the instrumentation amplifier of TL074CN IC which acts as signal conditioning part of our project. Signal conditioning gives difference of two sensors which is amplified and signal conditioning is interface with LED. We know the property of Teflon which is attracts towards the ammonia and generate heat. By using this statement we find out the difference of two sensors. By observation we can say when difference of two sensors is less than equal to 2mv then milk is pure and LED not glow and the difference between two sensors is greater than 2mv then urea is adulterate in milk and LED will be glow.

IV. PROPOSED CIRCUIT DIAGRAM

OrCAD PCB Designer is a printed circuit board designer application, and part of the OrCAD circuit design suite. PCB Designer includes various automation features for PCB design, board level analysis and design rule checks (DRC). The PCB design may be accomplished by manually tracing PCB tracks, or using the Auto-Router provided. Such designs may include curved PCB tracks, geometric shapes, and ground planes. PCB Designer integrates with OrCAD Capture, using the component information system (CIS) to store information about a certain circuit symbol and its matching PCB footprint. The system circuit diagram which is shown in below this can be draw by using OrCAD software.

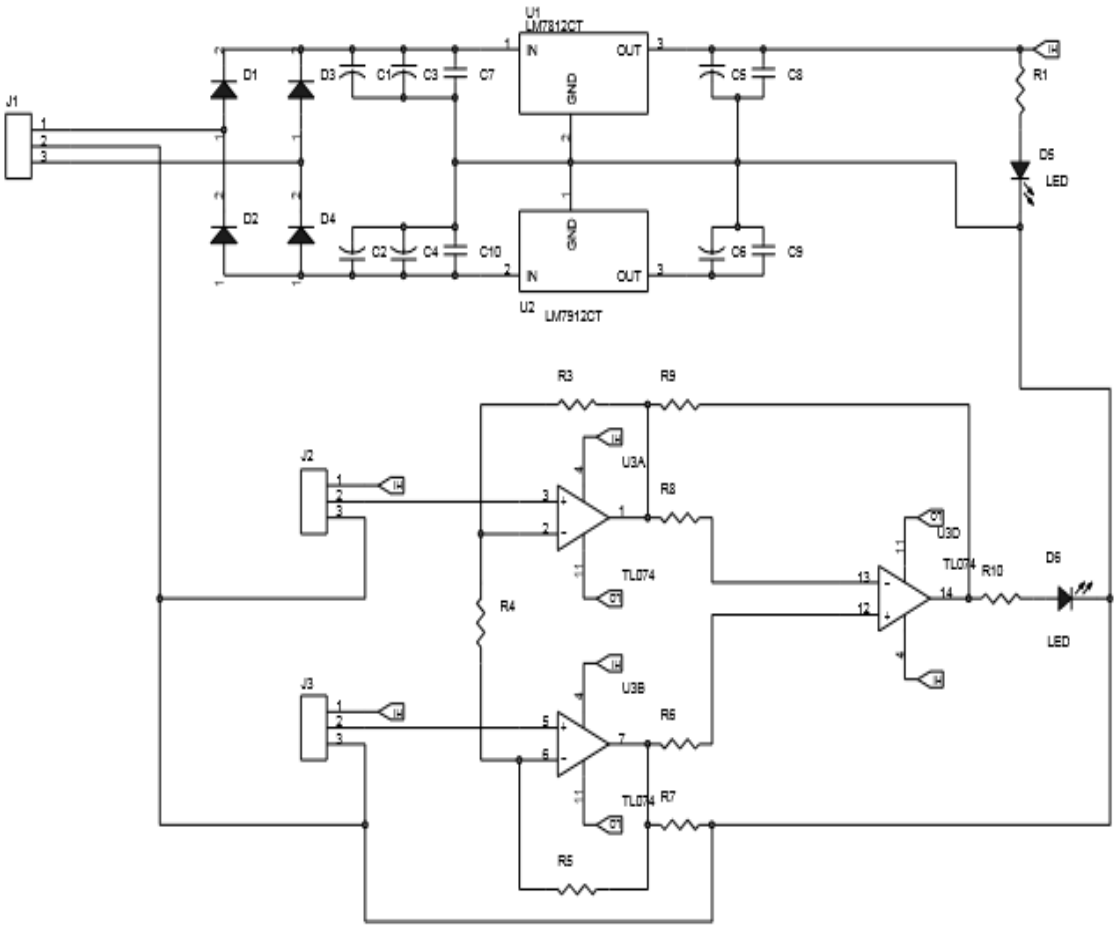

Fig. No.4 Proposed Circuit Diagram

V. SYSTEM FLOWCHART

System flowchart is divided in two parts like sensor wounded with Teflon sheet and other is sensor without Teflon sheet which are shown in above flow chart. In next step take milk sample in container. We get two output voltages of two sensor out of one is output voltage of sensor without Teflon which is shown in above flowchart as A and other is output voltage of sensor wounded with Teflon sheet which is shown as B. The difference between A and B means difference of sensor wounded with Teflon and sensor without Teflon is less than equal to 2mv then goes pure milk block then we can say that this milk sample is pure otherwise goes to milk containing urea block then we can say that this milk sample is impure which is shown in above flowchart.

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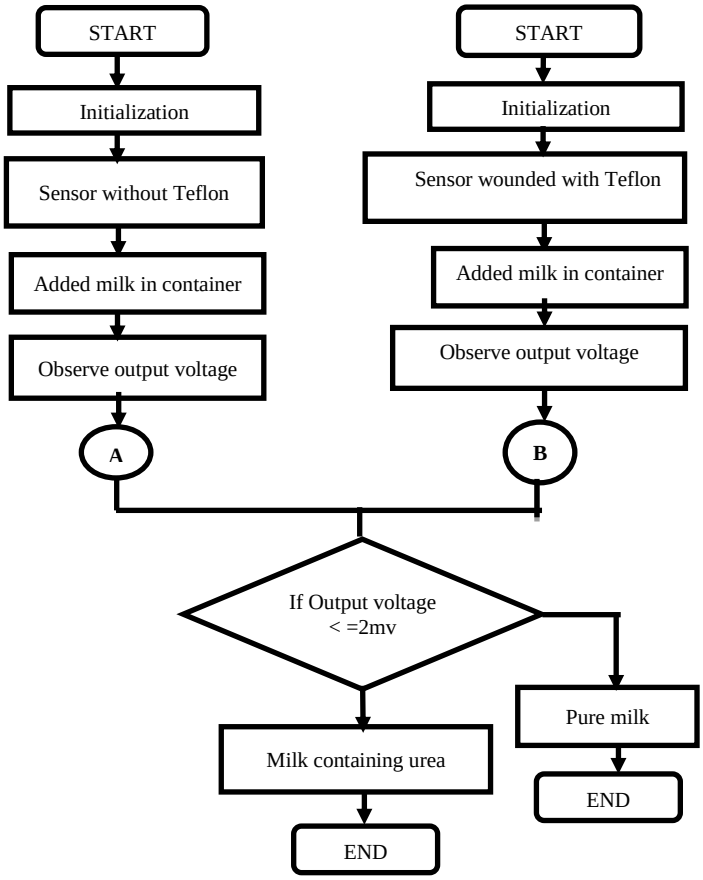

Fig. No. 5 System Flowchart

VI. PRACTICAL SETUP& HARDWARE RESULT

We take two container fitted with sensor out of one is Teflon sheet wounded with sensor and other sensor is without Teflon. Then we take pure milk sample in the container and check the output voltage difference of two sensors. Then we add urea in pure milk like 1gm, 2gm, 3gm, 4gm, 5gm, and 6gm and observed the voltage difference of two sensors and create an observation table. In every time the output voltage of Sensor which is wounded with Teflon is increased because of the reaction of ammonia content of urea and Teflon sheet can take place in milk and generate heat therefore increased temperature in milk. But the sensor which is without Teflon there no large change of output voltage. From the above observation table we conclude that when we increased concentration of urea in pure milk then increased voltage difference of two sensors. So we can say that difference between two sensor voltage are 2mv then milk is pure otherwise impure.

Fig. No. 6 Practical Setup

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Table No.2 OBSERVATION TABLE

Urea Concentration (gm)	Without Teflon (mV)	With Teflon (mV)	Difference (mV)
Pure	265	267	2
1	252	255	3
2	250	254	4
3	248	255	7
4	237	244	7
5	236	245	9
6	234	243	9

VII. CONCLUSION

By using detection of urea adulteration in milk we conclude that When voltage difference is less than or equal to two (<=2) then the milk is pure milk and the difference is greater than two(>2) then the milk is adulterated with urea. adulterated milk is harmful for human Thus we have developed the smart and cost effective detection of urea adulterations in milk project for people.

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