

# Designing of an inexpensive digital watt-hour meter

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## ABSTRACT

*An inexpensive digital watt-hour meter has been designed and tested using MCap 7 simulation package since commercially available digital watt-hour meters are very expensive. One of the major usages of watt-hour meters is to measure the power consumption of electricity consumers for billing purposes. Although digital watt-hour meters are commercially available, all electrical power supply companies through out the world including well-developed countries like the United States of America and the United Kingdom use analogue watt-hour meters to measure the power consumption. This is probably due the expensiveness of digital watt-hour meters.*

*The designed digital watt-hour meter consists with analogue multiplier, analogue to digital converters, adder, registers, digital clocks, dividers, accumulators and digital displaying unit.*

*Basically the current and voltage will be multiplied by using a four-quadrant analogue multiplier and then converted to digital signals using analogue to digital converters, which is clocked at a frequency significantly higher than mains frequency, to produce instantaneous values. The algebraic average of the output product per second will be the power consumption per second. Finally, this will continuously be added and sent to the digital displaying unit to display watt-hour output.*

*One of the major advantageous of the digital watt-hour meter is that the power consumption cannot be tampered like in analogue watt-hour meters where the power consumption can be very easily disturbed by changing the rotation power of the rotating disk.*

## 1.0 INTRODUCTION

The main aim of this project is to design an inexpensive single-phase digital watt-hour meter for household consumer use. Measuring the electrical power consumed by the customers is one of the major usages of watt-hour meters all over the world. All government and private electrical power supply companies through out the world including well-developed countries like the United States of America and the United Kingdom use analogue watt-hour meters to measure the power consumption of electrical users, although the digital watt-hour meters are commercially available. This may probably be due the expensiveness of digital watt-hour meters.

The operation of analogue watt-hour meter is based on electromagnetic laws. Two magnetic fields are generated due to current and voltage, which will rotate a disk. However, the power consumption of an analogue watt-hour meter could be very easily disturbed, even in sealed unit, by changing the rotation power of the rotating disk, which is one of the major disadvantages of the present analogue watt-hour meters available in the market.

However, the designed digital watt-hour meter readings depend on the analogue signal of the output of the four-quadrant analogue multiplier. The inputs to the four-quadrant analogue multiplier are current and voltage of the consumer load. The output of the four-quadrant analogue multiplier will be then converted to digital signals using analogue to digital converters, which is clocked at a frequency significantly higher than mains frequency, to produce instantaneous values of the current and voltage products. The algebraic average of the output product per second will be the power consumption per second. In order to obtain the watt-hour, this value should be divided by 3600.