

## 1.0 Introduction

### 1.1 Problem Statement

As world water demand increases and the supply of fresh water declines, the population of planet Earth must do its best to conserve water if it means to survive. Scientists predict a global water shortage, severely impacting southern states by 2025 and globally affecting “4 billion people by 2050” (Vergano).

The potential water shortage is being fueled by inefficient water usage, as well as global climate changes. Climate models predict that due to global warming, “the west coast of the US could be suffering from a serious water shortage by 2050” (Arctic melt). This means that our local farming economy will be in jeopardy, as well as our basic water needs.

Currently, there are several initiatives to address global warming, the most serious of the causes. The root of this problem is CO<sub>2</sub> emissions. Currently several plans have been put forth to curb the steady rise in CO<sub>2</sub>, including the mostly debunked Kyoto Protocol and the more readily accepted C&C (Greenhouse gas 'plan B' gaining support).

The inefficient use of water is more easily addressable by the average homeowner. To fix this problem, efficient water consumption

must be practiced. Though there is not much happening to educate the wider public, groups such as Water Wiser and the Soil and Water Conservation Society are working to promote water conservation tactics.

In order to address the problem globally, all people must address it locally. To this end, an efficient sprinkler system will be needed to weather the drought successfully and with fashionable landscaping.

The most efficient form of irrigation today is drip irrigation. Drip irrigation is most commonly used for shrubberies, trees, and other such landscaping. However, it is inefficient in its most basic forms at irrigating turf grass (lawns).

The first attempt at adapting drip to turf grass was a method called subsurface drip irrigation (SDI). This method is increasingly being used by the agriculture industry. In this method, buried pipes fitted with special emitters slowly release small amounts of water, thus keeping the surrounding soil at the proper moisture level. This method has been seen to reduce water requirements in semi-arid regions by dramatic amounts (Drip irrigation).

This method, though a costly investment compared to traditional crop irrigation, is a bargain as it saves enormous quantities of water. However, this method is not entirely suited for turf grass. The main problem lies in the clogging of the emitter holes by grass roots. Though herbicides introduced into the water supply and applied to the

emitter in small quantities can prolong the effects of root encroachment, they inevitably cannot stop it. Enter wick irrigation and the turf bubbler.

In order to solve the problem of root encroachment, engineers at the irrigation company NIBCO developed a system that delivers water to a small area in a flood irrigation manner. Water is drawn along the dry thatch like fuel on the wick of an oil lamp, hence the technology earned the name wick irrigation.

Though lacking the zero evaporation benefits of SDI, wick irrigation is the best compromise between SDI and traditional surface mount/pop-up sprinklers. Though it delivers the water above ground, tests have shown it to be as highly efficient as SDI.

## 1.2 Primary aim

This project aims to determine the feasibility of implementing wick irrigation for the average homeowner. To this end, this feasibility study attempts to meet the following goals:

- 1) Represent current research and technology concisely
- 2) Use cutting edge expert analysis
- 3) Portray conclusions objectively
- 4) Convey a need of urgency for the larger problem set

The audience of this report includes those officials in government in the position to promote programs of significant change, as well as all

interested parties.

The methods of information retrieval include the Internet and a presentation by field experienced irrigation researcher Steven Ralph.

The goal of this paper is to determine whether wick irrigation is a suitable technology to be adopted by the general public by comparing it with standard underground sprinkler systems on the basis of cost and efficiency. The focus of this paper is on irrigation systems designed specifically for the Mid-Colombia region.

## 2.0 Criteria

The differing systems were modeled on the basic materials required to irrigate a 30'x30' area of turf grass.

### 2.1 Standard underground system

Materials Required:

81 ft pvc x 2.58

6 heads x 9.98

Cost: 268.86

### 2.2 Wick Turf Bubbler System

Materials Required:

990 ft pvc x 2.58

230 emitters x 11.90

Cost: 5291.20

### 3.0 Analysis

The numbers were analyzed using a conservative efficiency advantage of 60% for the wick system, an average monthly water bill of 25 dollars for the standard system, and disregarding rising water costs. Based on this model, the wick system would pay for itself in 41 years.

Ironically, using a more liberal model of 80% efficiency and a 50 dollar per month charge, the wick system would earn its keep in exactly the same time.

A 50% cost reduction in the wick emitter cost would result in a payback period of 20 years. An order of magnitude price reduction (1.19 / emitter) would reduce the period to 3 years.

### 4.0 Conclusion

The wick system is not a viable alternate for the standard home irrigation system. Unfortunately, until the cost of the emitters falls to a reasonable level, the systems will remain impractical for the average homeowner.

## 4.0 References

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## Appendix A – Additional Reference Materials

Center for Irrigation Technology.

<http://cati.csufresno.edu/cit/>

CIT 4 year SDI turf study.

<http://cati.csufresno.edu/cit/rese/93/930405/>

CIT 4 year SDI turf study – Alternate location.

<http://www.waterright.org/site2/publications/930405.asp>

15<sup>th</sup> an. intl. irrigation expo. and conference - subsurface drip irrigation for turf.

[http://www.geoflow.com/landscape%20\(inclu%20golf\)/SUBSURFACE%20DRIP%20IRRIGATION%20FOR%20TURF%20HTML\\_files/SUBSURFACE%20DRIP%20IRRIGATION%20FOR%20TURF%20HTML.htm](http://www.geoflow.com/landscape%20(inclu%20golf)/SUBSURFACE%20DRIP%20IRRIGATION%20FOR%20TURF%20HTML_files/SUBSURFACE%20DRIP%20IRRIGATION%20FOR%20TURF%20HTML.htm)





