

## SOME HISTORY OF EARLIER AUTOMATED IRRIGATION

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Since I live in Whittier, California, and at the time the following took place I was planting a small Hass avocado grove near Escondido (107 miles one way), the urgent need for some degree of automation for the very troublesome and costly irrigation soon became quite obvious.

As an absentee owner, the method of irrigation available to me at the beginning was to hire someone to drive out to the grove and run the pump in the well some specified time, and assume that a proper job of irrigation had been accomplished. As long as the trees were small and the duration of irrigation was short, this was not too bad. However, this satisfactory arrangement was short-lived in that the only source of water at this time was this well, which soon became too small to do the job. The water shortage even while still using "spitters" at 1/3 gpm became critical when the irrigation period was increased to two and three hours and of course was utterly impossible as whirling sprinklers (Star) were required.

Thus, the well would run dry and the pump would take in air and greatly reduce the amounts of water flowing into the irrigation system. Sometimes there would be no water at all and at the end of some specified time only about one half of the required amount of water had been applied to the trees. Most certainly no one knew just how much water had been properly used. This, of course, was quite unsatisfactory and nothing could be done even with the most conscientious helpers.

Also, when the water was low in the well with air being sucked into the pump inlet, there was considerable agitation of the remaining water and considerable sand and dirt was sucked up into the system and the sprinklers would plug badly.

The situation was made completely unbearable when it is realized that the original planting was not of commercial size anyway and more trees must be planted as soon as possible, if this were to become a satisfactory avocado grove.

The water shortage was relieved at this time by a pipeline from a water company to provide ample water if it could be applied as needed. The application was made complex by the fact that the older trees should now be irrigated at longer intervals, in this particular soil, about seven days as an average and the successive annual plantings of new-trees presented a problem because of their mandatory frequent irrigations. Thus, the problem of irrigation became all-important from a cost as well as a cultural and economic point of view, and some form of automation became imperative.

The exact degree of automation that was possible was limited by several factors:

1. The "state of the art", since this was 1960-1961.

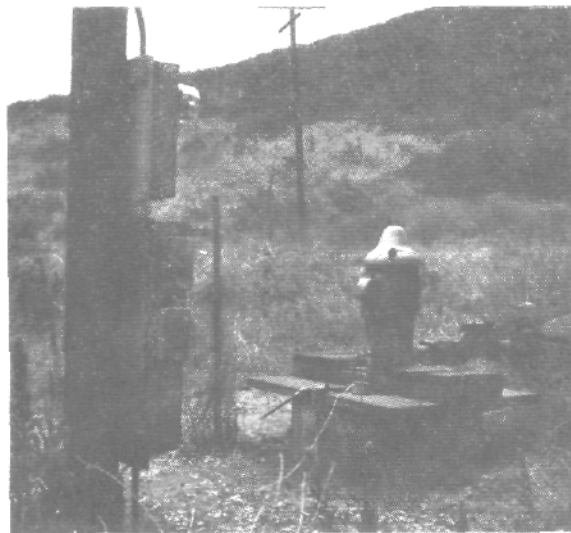
2. Costs.
3. Sources of water.
4. Blocks of trees, young or older, to be irrigated properly.

It is well to point out that in 1959 or 1960 there was very little information or equipment available for the automation of sprinkler systems as we know them today. The unbalanced hydraulic valve was known, of course, but the vast acreage of golf and other turf had not brought them into common use. The elaborate (or simple) clock type of irrigation controllers had not been brought into wide use either, so that the automation of the system pressurized from the pipeline did not appear to be feasible from an engineering or a cost point of view.

So far as costs were concerned, it was necessary to weigh the cost of automation against the cost of doing business in "the same old way", namely, hire someone who would probably not be too conscientious to come out to the grove occasionally and go through the motions of irrigating some older trees and some small trees from what had now become two sources and two systems of irrigating water: some water from a well and some water from a pipeline. This was complicated by not knowing how much could be taken from the well and how much must be taken from the pipeline system.

It was decided to proceed with whatever automation could be easily and economically accomplished, step by step.

The first "must" was to prevent the pump in the well from "sucking air", and investigation revealed a device perfected a long time ago that would stop the pump motor when the level of water in the well had been lowered to some dangerous point, then restart the pump motor when the water level in the well had come up above the pump suction by some safe and desirable distance. This was accomplished not by a float switch but by two electrodes hung in the well at different levels and connected into the pump electrical circuit by a system of suitable relays. Under the setting which was finally selected, the pump would operate when the water was five feet over the suction and shut down when the water level dropped to about two inches above the pump suction.



Pump and panel box showing the mounting of the two timing clocks.

This cycle would repeat itself indefinitely, just as long as the hand control was in the "on" position.

The above was quite satisfactory in pumping a solid stream of water and not pushing air into the system; however, it would have been necessary to stand alongside the pump with a stop watch and add up the time the pump would run for any one irrigation. This did not suit my way of doing things even if it had been possible.

Memory of some of my own experience as an electrical installer told me there should be clocks that could be wired into the pump circuit that would run when the pump ran and stop when the pump stopped and furthermore, when the pump had run some adjustable total length of time, would shut down the pump permanently or until the cycle was again hand started.

A visit to an electrical supply house produced just exactly this clock and then a little time installed this device.

The above answered part of the overall problem:

1. The well pumped water and no air.
2. The clock automatically added up the periods of pump operation and stopped everything at any predetermined total length of time.

I could irrigate with no attention to the pump for ten minutes or ten hours even if it did take all night, or two days and two nights.

The third portion of the problem was to provide short, and even daily irrigation for new trees and longer and less frequent periods of irrigation as conditions changed.

Here again, another clock, wired into the circuit in a different way did the job in that this second clock could be set to start the pump at any time (Monday, Wednesday and Friday, or any time) and operate for any length of time or period that might seem desirable. Thus, the little trees were taken care of and the absence owner could go to

the grove for a pleasant weekend to irrigate the six-to-eight-year-old trees.

Of tremendous importance was the fact that with two sources of water and a system of pumping that could be divided approximately in half, a relatively short time was required to do the entire irrigating job. A two and one-half day irrigating job could be done in one long day. The final set could usually be started with the pump about dusk and it was possible to go to dinner and later to bed leaving the pump to shut itself off when the job was finished. This system proved to be most economical as to the labor requirement.

Another difficulty with automatic sprinkler systems was recognized in this system. Sprinklers *will* plug up! Usual careful attention was given to plugged sprinklers on the weekly irrigations and in the case of the automated spitters the last thing that was done Sunday afternoon before heading for home was to turn on this automated system and check *every* sprinkler and when every one had been checked the system was then programmed for the following week, with every confidence the system would function and, so far as could be determined, it did just that.

The level control in the well was in use for approximately six years while the automatic irrigation device was in use about four years, all without a single failure. Reliability was 100%.

The cost of this system was negligible compared to the benefits secured. Further, this cost was recovered easily in a single month of operation, as follows:

Level Control & Equipment.....	\$31.75
G.E. Time Clock .....	12.48
G.E. Time Clock .....	16.64
Total Cost of Material .....	\$60.87

The above was the only cost to me since my past experience enabled me to make the installation myself. However, one day's time of an electrician would easily make the installation.

It is thought that under the existing conditions at that time and that grove a far better job of irrigation was accomplished by this rather simple automation of irrigation. The trees grew rapidly with all of the attendant benefits.