

# ADVANCED TECHNOLOGY IN THE HORTICULTURAL INDUSTRY

*By George Dean, President of Wadsworth Control Systems*

Would today's competitive world effect such inventors as Ben Franklin or Albert Einstein? Or would it have made no difference? Americans are always searching for the latest technology, the most up-to-date product. In our country, we're constantly turning over technology and outdating yesterday's products. The total number of patent documents granted by the U.S. Patent and Trademark Office continues to grow each year.

Italy may have held the title of world's most patents when they had Leonardo da Vinci, but now the United States is number one with 57% of the world's patents. Japan is second with 19.8% and Italy is a distant 1.1%.

The horticultural industry is no exception with its hunger for new technology. Competition from foreign shores and an ever-demanding consumer drives innovation in growing techniques and products. Manufacturers are forced to invest in research and development just to keep up. Companies that rely on yesterday's products are like the last of the buggy makers. Even if you made the best buggy, its replacement with the automobile was inevitable.

Just fifty years ago, controls were unheard of for maintaining the desired temperatures for plant growth. Hot water or steam pipe systems were the standards for heating greenhouses. At night, an employee would walk the greenhouse to check on thermometers. To maintain a predetermined temperature, they would manually change the valves to decrease or increase the steam or hot water flow. Many growers used what they called 'gut' instincts and adjusted temperatures purely by feel. Prior to the 50's only the large, progressive, greenhouses had valve controlled, single thermostat, ranges.

Ventilation for a greenhouse was also a matter of feel. The more successful grower would know when to open or close his vents. It was at this time Lord & Burnham came out with one of the first roof vents that would open with a series of thermostat controlled motorized units.

By the early fifties, we began to see fan and pad cooling replace natural ventilation and thermostats used as controls. This was the first equipment for maintaining a stable greenhouse temperature during high radiation days.

In the early 60's growers were beginning to realize the need for automation in the greenhouse. My first experience with automation was as an electrical contractor. While working in the late 60's on the wiring of a Colorado greenhouse, I discovered that the grower had no coordination of their equipment. Understanding the grower's frustration, I designed a single total environmental program (STEP) unit that integrated his heating and cooling equipment. Growers immediately recognized the value of a integrated electronic control system. I had more orders of STEP units than I could possibly

build at once. In a short time Wadsworth became one of the first companies dedicated to greenhouse automation in the United States.

The original STEP system was very simple and is basically the same unit that we sell today. Growers just connect their heating and cooling equipment (exhaust fans, motorized louvers, automatic vent openers, gas steam and hot water unit heaters, steam and hot water valves, jet fans, horizontal air flow fans, and cooling-pad pumps) to the STEP unit and they have temperature control of their environment. Fans and heaters no longer run at the same time.

When energy costs reached an all-time high in the early seventies, growers looked to internal curtains for saving on their energy costs. We began installing systems in the mid-seventies. The technology worked, and at the time, researches at Penn State, Cornell and Rutgers found night-fuel savings were up to 60% for thermal blankets, and cost analysis shows that materials and installation expenses could be recouped in 1-3 years. It is my understanding that those numbers are still considered valid give or take a few percent points.

There were two basic types of internal curtain systems: gutter-to-gutter and truss-to-truss. Each system had its advantages and

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disadvantages. The gutter-to-gutter was not as popular as it isolated overhead equipment during the nighttime. The system trapped a great deal of cold air in the curtain-glazing zone and care needed to be taken when opening the curtains to ensure that the crops were not chilled. In addition, the gutter-to-gutter has limited headroom, particularly in older houses. It was never easy to retrofit and most growers opted for the truss-to-truss.

The truss-to-truss curtain system are preferred even today by growers. There are three basic types of truss-to-truss" Slope/flat/slope profile, slope/slope profile, and flat/horizontal profile. With this system, there is no isolation of equipment. The volume of air between the curtain and glazing is significantly reduced. There is a good distribution of light and a greater control of shading than with the gutter-to-gutter. The only disadvantage is that it can be more expensive to install. However, the truss-to-truss lends itself well to retrofitting. The truss-to-truss is better for controlling light intensity and has 20-30% less wear and tear on the system than the gutter-to-gutter.

Both systems are good for light control and heat losses resulting from radiation, convection, and infiltration. Growers historically have benefited from both a savings on their fuel bills as well as improving the quality of their crops. Apparently it is working as we have covered millions of square feet of greenhouse with thermal blankets.

There have been changes on the internal curtain systems throughout the years. For one thing, we have found it is more efficient to place the motors in the middle of the house to offer a push/pull effect rather than pulling the curtains across the entire house. There have been continual changes and the product only gets better. For one thing the systems now run smoother and quieter, providing a better working environment and less maintenance.

Sometime in the early eighties, came the computer. It seemed overnight, but growers quickly found that computers could save them dollars. It appeared that it was to become an essential item in the greenhouse. And for many growers, it has. Our first reaction was to build a computer that could do everything for the grower short of prepare his meals. It felt like we were truly living the 'Jetsons'.

Wadsworth Controls dedicated years of research and development to come out with one of the industry's first greenhouse-dedicated computer. It was exhausting and a financial investment, but the end result was a work-horse that was embraced by some of the country's most prominent growers.

The computer offered growers control of more than just temperature. They could finally control the full array of environmental factors; humidity, lighting, shade, Co2, etc.

We were proud to present one of the first computers, but resting on our laurels lasted about a week. The grower quickly learned that there was great potential with computers. He liked what he received from computers, but wanted more. Listening to growers, we learned what to add and how to make it work for the grower. They wanted them smaller, faster, and of course less expensive.

Now we're finding that all sizes and types of growers want automation. What was once only for the few, large commercial complexes, became sought by even the hobbyist. Recognizing the need for smaller, efficient automation products, we spent the past few years developing smaller units that can economically make sense for even a single quonset greenhouse. Smaller facilities finally have an automation choice and large complexes can use smaller units in seasonal houses.

The nineties have completed the circle and we are seeing growers utilize today's technology with some of the simple beginnings. Growers are marrying yesterday's approaches with today's technology. It offers growers the best of both worlds. For example, passive ventilation is being used along with fan-pad cooling to create the best of both worlds.

Have we reached a level where we create change just to remain competitive? As a manufacturer of greenhouse automation equipment, for almost four decades, I can attest to the lightning-fast progress our advancing technology has made possible. And I believe that the changes in America's automation have brought us into the forefront of the world's growers and I will continue to support its advancement.

## Greenhouse Employment Opportunity

Highly motivated grower/manager needed for small, South Georgia operation.

Skill requirements include:

1. Supervision and training of greenhouse personnel
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