MR. TOM KYLE, JR. (Spring Hill Nurseries, Tipp City, Ohio): Thank you, Ken. Ladies, gentlemen and guests of the Plant Propagators Society.

We have used washed air cooling for about two years. It has been a wonderful thing for the florist, since it allows them to grow a crop in the summer, which they were not able to do before, because of the terrific heat which was generated.

Our system is really a forced air cooling system, because we have coupled this with an intermittent mist system similar to the systems which have been described here at the meetings.

Mr. Kyle discussed the subject of greenhouse cooling as it influences propagation of woody plants. (Applause)

THE USE OF WASHED-AIR COOLING IN WOODY PLANT PROPAGATING HOUSES

TOM KYLE, JR.
Spring Hill Nurseries
Tipp City, Ohio

The system of washed air cooling is accomplished by equipping the greenhouses with large volume exhaust fans mounted on one side, or end, and wet fiberous pads on the opposite side of the house Air drawn through the pads by the fans is cooled by evaporation and drawn through the house. We try to build ours up to the point where a complete removal of our air is accomplished every minute, throughout the house The propagation house which we equipped was 16 feet by 100 feet. On the end of the greenhouse where we have our work rooms we put in a 42 inch bladed fan operated by a three-quarter horsepower motor. This fan is rated to exhaust 14,000 cubic feet of air per minute. At the opposite end of the greenhouse we were forced to construct our pads on a rafter. They were five feet high, 16 feet wide, or a total of 80 square feet of pad which is required to provide the right amount of cooling. Above the rafter we placed an ordinary galvanized gutter, similar to the type you use to drain water off your roof at home. This drip conductor, as we call it, had 1/16" holes drilled at six inch intervals along the gutter. The drip conductor must be kept covered to exclude dust and debris from the pads Water flows through this conductor, through the holes, down through the aspen wood pads and is caught below by another gutter. There is a circulating pump placed in a sump at the base which in turn brings the water back to the top and lets it flow through the pads again. The water is re-used and according to the information we have there is only about two per cent of the water used by evaporation through the pads. The fan in our propagating house is started when the inside temperature reaches 80 degrees This year the fan was manipulated by hand. We are contemplating hooking a thermostat to turn on the fan.

We have intermittent mist installed in the house and it is a similar system to what has been described at these meetings. We use a Florida type nozzle with a time switch clock. In our system the mist is on for two seconds out of every minute. We have no problems as a result of

putting on this much water since we use solid, well drained, concrete benches and a coarse sand medium Another reason we don't have any trouble is that the fan continually pulls the mist out of the house and it doesn't drop right down on the cuttings.

With this intermittent mist system and forced air cooling, we were able to hold the average temperature in our house in the summer between 80 and 83 degrees, even on the hottest days, with a minimum amount of shade. As the growing season progressed, in mid-August, we began to run into a problem of the temperature being between 56 and 60 degrees in the morning. This was undesirable because it retarded plant or cutting growth and also depleted the relative humidity within the house. Next August we will put our glass and door back on the end of the house and remove the wet pads earlier in August Another solution we have talked about is using a rolled canvass cover on the back of the house which could be rolled up during the day, to allow the fans to put the separated air through the house, and rolled down at night to keep this cold air out of the house.

We purchased the aspen wood pads, the fans, racks, and the circulating pump from a supply house in Kansas City. We did the installation with our own labor and I found our cost was approximately 25 cents per square foot of floor space in the greenhouse. That is pretty high and it is higher than I have read in most of the literature which has been put out by the florist trade for the construction of this type of system.

Some of the woody plants propagated in this house include: *Cornus mas elegantissima, Viburnum carlesii, V chenulti, V burkwoodi, Euonymus alatus compacta, Cotoneaster apiculata, Ligustrum ibota vicari* and several others, I think we had phenomenal success.

I will give you some of the advantages of the forced air cooling. One of the advantages is that we were able to lower the temperature in our greenhouse from 30 to 40 degrees, even during the hottest day in the summer. We eliminated stagnant air by replacing it with filtered, moist air which is ideal for propagation. Another thing we did, we were able to lower our incidence of fungus diseases. Another thing is that shading can be entirely eliminated except for light control. Last year we used a small amount of shading compound on our house and next year we plan not to use any shading compound at all, but will handle it the same as we do our outside mist propagation This system also eliminates the manipulation of ventilators and keeps out dirt and insects Another thing some people told me to be sure to mention is that the cooler greenhouse makes for nicer working conditions

In conclusion, I might say that forced air cooling has been a real boon for the florist trade because it gives them a chance for summer income by producing another crop, which they ordinarily couldn't handle. However, I don't know whether it is the answer for the plant propagator and nurseryman or not. We are doing some outdoor misting. This summer, in August, we constructed a bed outdoors on concrete blocks It is seven feet wide, 100 feet long, and we used hardware cloth on the bottom with coal on top of the hardware cloth. Like John Ravestein, the reason we used coal, is that the coal bin was next

door and we didn't have gravel. Above the coal, we put some vermiculite We propagated many of the same woody plants outside in the mist bed that we carried inside our forced air cooled house, and we had equally great success with them. Some of the roots weren't as tough as the plants that were produced indoors because of the vermiculite and the watering, but they all seemed to grow alright We were well pleased with our outdoor misting and we plan to do more with that

Another thing that could be done to cool propagating houses would be to put water pressure pumps on your intermittent misting system. We used 65 or 85 pounds pressure or whatever we get from our city water. With a pump that would bring the water pressure to 400 or 500 pounds per square inch, you could possibly atomize the water going through nozzles and you would get a lot more cooling.

That is about all I have Thank you.

MODERATOR REISCH: I thank you for this very thorough presentation The next man on our panel will lead off on the topic of the use of plastics for propagating houses It is a pleasure to introduce Mr. Zophar Warner.

Mr. Warner presented his paper entitled, "The Use of Plastic Film in Propagating Houses." (Applause)

THE USE OF PLASTIC FILM IN PROPAGATING HOUSES

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We are in an era of very rapid development and change. This applies not only to space travel and sputniks but also to the propagating profession. In a meeting of this kind anything presented on the third day may have become obsolete during the discussions of the first and second days.

The uses of plastic film in propagating houses are so extensive and varied that I have made no attempt to compile their uses, many of which are common knowledge. I will confine my remarks to the uses we have already made of plastic film and what part we expect it to play in our future operations. A few years ago we started using polyethylene film to line the inside of a sash house. Since the sash were removed yearly it was difficult to keep it tight without use of the film. The following things resulted from using the film. (1) heat loss was substantially reduced, (2) constant humidity and soil moisture were easier to maintain, (3) the air space between the film and the glass acted as an insulator against sudden heat variations caused on partially cloudy days, and (4) the film acted as a slight shade. We have since used polyethylene film to line the inside of two 10 x 50 foot propagating houses This is very easy to do as there are no inside braces, only ribs. We merely start at the ridge and run the film the long way of the house. Any ordinary, heavy duty stapler is used to staple it to the ribs. I would like to emphasize here the desirability of placing the film on the inside of the house. If placed on the outside the film is subjected to the wind and