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Treat trees individually using H.S.S. Intelligent Spray Application®

Info

Digital orchard in Agromanager

It is rather easy to use Google Maps to display the outside contours of the orchard. The GPS data obtained when spraying can then be used to identify the location of the rows and the first and last tree of each row. For new orchards, there is increasingly more digital positioning data available related to rows and trees. These data are easy to enter into the Agromanager management program.

Website

More information about the H.S.S. Intelligent Spray Application® (I.S.A.) and other sprayers from Hol Spraying Systems can be found on the website www.holsprayingsystems.com.

Hol Spraying Systems from Meteren, the Netherlands, has created a sophisticated sprayer for the fruit sector. Using the appropriate sensors, every tree, dependent on shape and size, receives a specific amount of spray liquid. The measurement data from the sensor is rapidly sent to a management program. The fruit grower can then exactly track the growth and development of every individual tree and or an entire orchard, and make application maps that are used to control the amount of liquid sprayed dependent on the location during the next spray session.

Working with new techniques and opportunities is in line with the philosophy of Hendrik Hol, from Hol Spraying systems (H.S.S.). Within the Dutch projects 'Fruit 4.0' and 'Nationale Proeftuin Precisielandbouw' (see NPPL), the company collaborates with other research partners to create a smart sprayer. This has resulted in an interesting concept incorporating a smart sensor, new spray nozzle technology and effective data management. This combination of technologies allows the fruit grower to address every tree individually, dependent on shape, size and vigour. The first machines will start to operate in the field in 2020 and allow the project partners to observe the results and to search for further optimisations.

Smart sensor

Together with Wageningen University & Research (WUR; the Netherlands), H.S.S. searched for the most suitable sensor for measuring tree shape and foliar mass. They found a company that has many years of experience in recognising foliar mass against certain backgrounds. The sensor shines a beam of light on a tree and the chloroplasts in the leaves reflect a small amount back.

According to calculations made by Wageningen University & Research, the H.S.S. I.S.A. sprayer can reduce the amount of spray product used by 25%.

Hol Spraying Systems

The sensor measures this reflected light and can use the information to distinguish the leaves from the surroundings. In practice, this means that the sensor can measure the tree shape, the leaf density and the open spaces between the trees. H.S.S. will launch the sensor with its own label H.S.S. I.S.A. on the market, where I.S.A. stands for Intelligent Spray Application®. H.S.S. equips a single row sprayer with six of these sensors, three on each side. This allows the data concerning foliar density to be recorded at three heights and on both sides of the tree. The measurement results obtained can then be used in two ways. The most direct way is to use this data at the same moment to control the spray nozzles. In practice, this means that the volume of spray liquid is immediately adjusted to the foliar density at three tree heights. WUR found that this can result in savings of approximately 25% of spray products.

The H.S.S. I.S.A. sensor shines a light beam on the tree and measures the reflected light. The amount of reflected light is related to the foliar mass.

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The light emitted by the H.S.S. I.S.A. sensors can be clearly seen at dusk.

Hol Spraying Systems

Of course, this depends on the age and density of the trees in the row, but the type of fruit and the variety also play a role.

The sensor measurement data can also be stored in a management program, which can combine them with the exact location, determined by an accurate GPS system. Every time the sprayer sprays the orchard, details of the orchard are recorded that provide insight into the development of the individual trees.

Variable nozzle emission at constant pressure

To be able to control the amount each nozzle sprays, H.S.S. decided to equip each nozzle holder with an electromagnetic valve that operates using Pulse Width Modulation (PWM). This technique is already used in agricultural sprayers to control the spray volumes, to adapt the amount sprayed at specific locations and to reduce the

amount the nozzles spray in the inner bend and to increase it in the outer bend. This technique uses a constant spraying pressure.

The H.S.S. sprayer uses Lechler IDK nozzles with the following orifices 015, 02, 025 and 03. The lower nozzle is an IDKC nozzle that ensures that less spray liquid ends up on the herbicide strip under the trees. The spray pressure is a constant 3 bar. Fast electronic signals allow the electronic valve on the nozzle holder to switch 25 times per second. In this period of 0.04 second, the opening and closing time can be variably adjusted. For instance, the nozzle can be open for 0.02 seconds and closed for 0.02 seconds. This halves the volume sprayed. Therefore, by adjust-

What is the benefit?

Hendrik Hol from H.S.S. is well aware that techniques such as the Intelligent Spray Application® (I.S.A.) are not cheap. The sensors and the associated nozzles on a single-row sprayer cost approximately an additional € 27,000. "Our H.S.S. single-row sprayer equipped with this technology lets you save 25% on crop protection products. For the fruit grower this means a saving of approximately € 500 per hectare. You can spray approximately 27 hectares using one single-row sprayer", according to Hol. A simple calculation shows that the additional costs can be recovered in about two years. Hol also refers to the results of various trials carried out by Wageningen University & Research (WUR; the Netherlands) in 2019 using

a single-row H.S.S. sprayer equipped with the I.S.A. system. The results show that not only is it possible to save on crop protection products, but also that there is a 45% increase in the deposition of the products on the trees. The sprayer also reduces the drift percentage by 99% when compared to the reference sprayer that WUR uses in drift trials. In the 2020 season, four H.S.S. I.S.A. sprayers are active in the field. One of the machines will work at the Randwijk research station in the Netherlands. It will be extensively tested by WUR and the Dutch Fruitconsult.
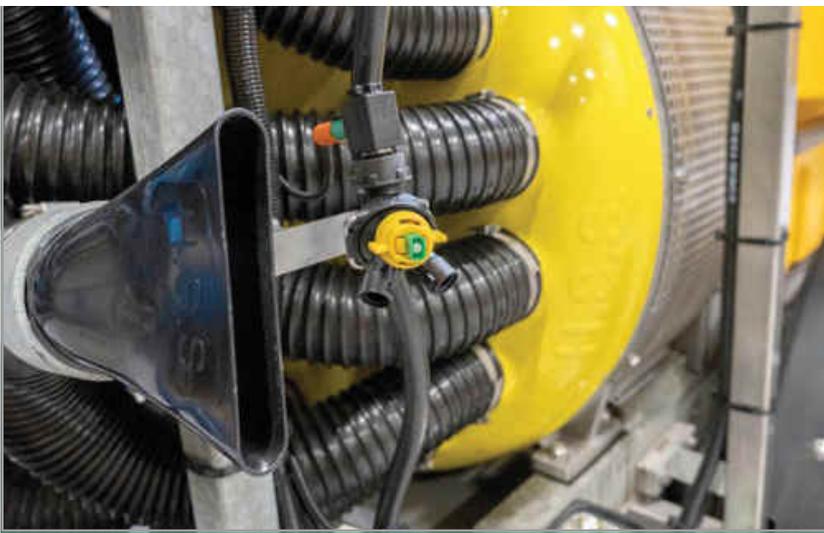
The nozzle holder has a fast magnetic valve that can switch 25 times per second. By controlling the opening and closing times, the nozzle can dispense a variable amount of liquid at a constant operating pressure.

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New business premises

Bert van Sonsbeek

In January 2020, Hol Spraying Systems (H.S.S.) moved to a new building in Geldermalsen, the Netherlands. The company had outgrown its existing location in nearby Meteren and therefore needed to expand. H.S.S.'s fruit-growing sprayers are assembled at the new location.

ing the opening and closing times of the nozzle, the volume sprayed can vary between 0% and 100% at a constant spray pressure. The technique has been tested and has proven its value for agricultural sprayers and in industrial applications.

From data to application map

Laurens Tack, a fruit grower from Sint-Gillis-Waas in Belgium, together with a programmer friend, has created Agromanager, a management program specifically designed for fruit growing. Agromanager already has many users in the Netherlands and Belgium due to its modular structure and online data processing. The development team is now working on an English version and other translations will certainly follow.

In 2020, REGpro, the Dutch registration program, has been included in Agromanager with the name *Spuitschrift* (spraying notebook). This has given Agromanager a geographical component that is extremely suitable for storing and providing insight into the data from the sensor, GPS positions and the amount the H.S.S. I.S.A. sprayer's nozzles dispense. This allows the fruit grower, using a PC, tablet or smartphone, to quickly consult the data from an entire orchard, an individual row or even an individual tree at three heights. The amounts sprayed are also available per tree, row or orchard. Experience has also been gained in processing drone images to gain insight into the flower density. Agromanager can optionally create application maps to allow the measurement data to be processed for various location specific activities, including root pruning, fertilisation and chemical fruit thinning.

www.fruitmagazine.eu

Initial practical experience

In 2019 in Kapelle-Biezelinge, the Netherland, within the framework of the *Nationale Proeftuin Precisielandbouw* (National precision agriculture project - NPPL) fruit grower Martijn Slabbekoorn has gained experience with the single-row H.S.S. sprayer equipped with the I.S.A. system. Slabbekoorn was extremely pleased with the Agromanager management program and its online link with the sprayer. "As the season progresses, the stored images provide a clear picture of how the foliar mass develops at the tree level", says Slabbekoorn. He thinks that the data obtained can be effectively used to perform variable interventions, including fertilisation, root pruning and the application of chemical thinning products such as Brevis. During the 2020 growing season, Slabbekoorn mainly wants to focus on

Martijn Slabbekoorn

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mixing the correct amount of spray liquid for spraying dependent on tree volume.

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