

Symmetry®; a new technology for improved fumigant application and worker safety.  
F.V. Sances<sup>1</sup>, M. Allan<sup>2</sup>, C. Schiller<sup>2</sup>, N. Phillips<sup>2</sup>, and E. Salla.<sup>1</sup>

<sup>1</sup>pacificagresearch.com, <sup>2</sup>Arysta LifeScience Corp., arysta-ls.com

## I. INTRODUCTION / OVERVIEW

The Symmetry® applicator is an invention (Arysta Life Sciences patent No. US 2002/148396 A1) that makes rapidly pulsed injections of MIDAS or other fumigants into sub-soil with precise electronically controlled delivery and distribution. While the original design was initiated by Arysta management, the first prototype was delivered in late 2003 to our headquarters in San Luis Obispo, California for field testing of concept and design functions. Since this time, the machine has undergone several design changes to allow for high speed raised bed applications, improved dependability and safety features, and the development of a variety of shank and injector configurations for Florida and California field conditions.

The Symmetry® technology is legally described as follows: “A method for fumigating soil, comprising injecting a discrete, predetermined amount of the fumigant into the soil at a plurality of predetermined points in the soil, the fumigant volatilizing from each of the points where it is introduced and diffusing into surrounding soil to form a plurality of diffusion patterns in the soil”

The machine accomplishes this process with the following systems: 1. Fumigant delivery hydraulics, 2. MMI (Machine Man Interface) Hardware, 3. Electronic integrator and processor, and, 4. A bedding platform specific to geographic location of the end user. These four primary systems operate in concert to accomplish a highly controlled injection of fumigant over a broad range of rates that are electronically controlled by the operator. The machine components are discussed individually in this presentation. The primary functioning of the current machine allows for reduced rates of fumigant delivered with very thorough uniformity. This attribute is well suited for the use of metalized and VIF films that require precision of fumigant distribution at very low rates. In our proving trials in California, rates of as low as 130, 140, and 150 lbs of Midas and methyl bromide/chloropicrin were applied with greater than 95% precision. By comparison, a conventional fumigator machine demonstrates high variability in distribution across a field at these low rates, and errors of greater than 30% deviation from the target rate are commonplace in individual beds.

Data are presented for several proving trials conducted in California. These include soil bioassays of *Fusarium* spp., *Verticillium* spp. *Meloidogyne* nematodes, and various weed species. In all studies, the control of pest organisms was greater than 95% across all rates with either Symmetry or conventional machines. There were no differences or notable trends in efficacy data comparing 150, 200, and 250 lbs per acre. Given the test protocols used, this fumigant is simply too effective in a raised bed application to use bioassay data

to compare rates and equipment types. Efficacy in all treated plots showed near complete control even at the lowest rates of 150 lbs/acre Midas. Engineering data, however, were very helpful in evaluation of the technology. In these data sets, the target rate vs. the actual amount applied was documented for variation among replicated field plots. These runs were used to make adjustments in electronic signals and flow rate of the fumigant until the desired calibration was achieved. Following this, the on-board computer algorithms were also written for methyl bromide/chloropicrin and C35. Currently this equipment is able to apply all three fumigant materials with equal precision.

The program objectives and specifics of the test results from 6 California and two Florida trials are comprise the body of this presentation and are discussed individually by experiment and evaluation data set. Overall, the equipment is now developed to the extent that dependability and rate precision has been accomplished. The remaining development work is to be conducted with multiple prototypes built for commercial applicators in key fumigant usage areas of the US.