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PESTICIDE INPUT EFFICIENCY
case study

Sprayer testing ensures even outputs

As a part of a CRDC-funded project delivered by Bill Gordon Consulting to improve spray application, a sprayer testing program has identified a number of common problems with spray rigs that operators were not always aware were happening. Fortunately, many of these were problems were easy to fix.

The sprayer testing program utilised the skills of spray application consultant Graham Betts to check the setup and outputs of the spray rigs used by a dozen cotton growers, against the standards now being employed across all E.U. member states.

The aim of the testing was to highlight the importance of regular calibration of all sprayer components and to ensure maintenance is up to scratch.

Most growers assume that after replacing a set of nozzles and checking that the tank runs out when it is supposed to, sprays will be delivered evenly and accurately.

The CRDC-funded testing of a dozen spray rigs owned by cotton growers and spray contractors showed this was not always the case.

Out of the 12 spray rigs tested, only one passed with flying colours.

Gunnedah spray contractor, Leo Casey, operates a fleet of spray rigs on the Liverpool Plains. Leo was the owner of the spray rig that produced the most even output of all the sprayers tested.

After receiving the results of the sprayer testing, Leo, said: “It’s great to know that your spray rig is doing a good job. But it is just as important to know if it isn’t, or if there is something that can be improved.

“It’s important to our business that we use good equipment and that we regularly check the spray system and nozzle outputs to ensure we always do the best job we possibly can.”

One of the tests conducted on all the spray rigs was to accurately measure the output (litres per minute) of all of the sprayer’s nozzles (not just a few). Bill Gordon recommends this is a task that every spray operator should do a couple of times a season.

The results of the nozzle output test for each of the spray rigs helped to identify potential issues with plumbing and nozzle wear.

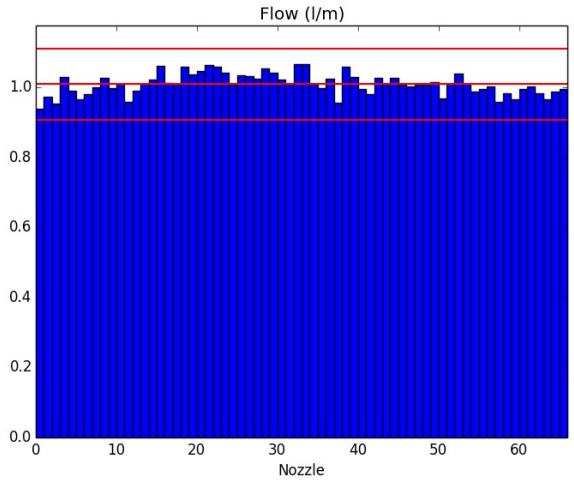
Bill suggests that looking at the nozzle outputs in graphical form highlights the parts of the boom where problems may exist with nozzle wear or pressure variations due to plumbing.

“When you look at the outputs on the graph, make sure you know how the boom sections are plumbed, and how many nozzle are on each section.

"This helps to identify where nozzle wear occurs or where restriction in flow may be happening due to the plumbing," said Bill.

Having all the nozzle outputs within 10 per cent of the average flowrate is essential to ensure an even output across the boom.

Figure 1: Shows the nozzle output in litres/min, across the boom from left to right, as viewed from behind Leo's sprayer. The middle horizontal red line represents the average flow (L/min). The upper and lower horizontal red lines represent +10 per cent or –10 per cent of the average flow.



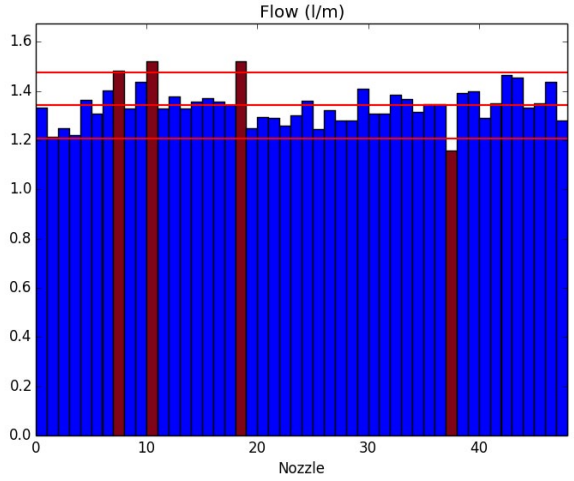
Another way of assessing the evenness of the nozzle outputs is to calculate the CV or coefficient of variation. The CV is calculated by dividing the standard deviation by the mean (average) and converting the result to a percentage, by multiplying the answer by 100.

The lower the CV, the more even the sprayers output is across the boom. CV's of less than 15 per cent are generally regarded as acceptable for sprayer outputs. The CV achieved by Leo's sprayer was 10.34 per cent, which was a very good result.

By comparison, the CV obtained for many of the other sprayers tested was above 20 per cent. Often this was due to just a few nozzles with flowrates that were too high (due to wear) or some that were too low (due to plumbing restrictions).

Figure 2 shows that three of the nozzle outputs for this spray rig were producing flowrates more than 10 per cent above the average flowrate. Typically this will be due to nozzle wear and can be fixed by replacing the nozzles with new ones.

Figure 2: Nozzle outputs from another one of the sprayers tested. This figure also shows the nozzle output in L/min, across the boom from left to right as viewed from behind the sprayer. The middle horizontal red line represents the average flow (L/min) the upper and lower horizontal red lines represent + or – 10 per cent of the average.



The CV for the nozzle outputs in Figure 2 was 22.5 per cent, demonstrating it doesn't take many nozzles not performing to specifications to impact on the evenness of the output.

Figure 2 also highlights that one of the nozzles is producing a flowrate more than 10 per cent below the average, which is a concern as this would result in under dosing.

A reduced flowrate may be due to a blockage in a non-drip valve or dirty nozzle filters, which can easily be fixed with a quick clean. However if the reduced flowrate is occurring close to the end of a boom section, particularly across more than one nozzle, it could be due to reduced pressure in the spray line, which may require modifications to the plumbing.

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