Improving automatic jetting races

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WHY IMPROVE AJRS?

In 1988 work at Trangie demonstrated a need to improve automatic jetting races (AJRs). In 1992 the Kondinin Group surveyed a number of sheep jetting races. This work also showed that they were less effective than hand jetting.

The Trangie Agricultural Engineering Research Unit (AERU) also investigated a number of farmer-modified AJRs. As a result it was recommended that existing AJRs operate at higher pressures to apply larger volumes of fluid than those currently being used. This achieved more effective jetting. Many farmers had also modified the nozzle / jetting spray arrangement and were claiming improved performance.

TRANGIE RESEARCH

Subsequently the Trangie AERU - with funding from the International Wool Secretariat - undertook a project to improve the performance of AJRs. The principal aims of the project were:

• to establish the required flow characteristics, droplet form, nozzle type, size and location to achieve maximum protection against fly-strike, and
• to determine efficient and safe race design for stock handling and management considering also stock, operator and environmental safety.

HOW TO IMPROVE AJRS

General principles

Effective jetting is only achieved by wetting to skin level in those areas most likely to be affected by fly-strike. That is - from the poll, over the shoulders, down the back line, over the rump and crutch area and around the pizzle. Wetting to the skin maximises the efficacy of the pesticide, giving maximum length of protection.

The results of this latest work indicate there are a number of underlying principles that need to be followed to achieve effective jetting. They are:

Spray arrangement. Effective wetting is best achieved by arranging spray nozzles so that the target areas of fleece are sprayed more than once. This is achieved by positioning multiple spray bars across the flow of sheep or by using multiple nozzles in line with the sheep flow.

Spray characteristics. Spray characteristics also influence fluid penetration into the fleece. Good penetration is only achieved with a solid stream. Streams that break into droplets are less effective - fan or cone nozzles or small diameter solid stream types under high pressure should not be used.

Spray height is also important. The further the nozzles are away from the fleece the more likely the stream will break up and become less effective. Conversely, the closer the nozzles are to the fleece the more effective and efficient the application will become.

Volume retained. The volume of spray retained in the fleece is also important in achieving wetting to the skin. Less than optimum volumes will only partially wet the fleece. Sufficient volume needs to be retained so that some jetting fluid runs around on the body of the sheep. Some 2.5L or more may need to be retained on woolly sheep in the appropriate areas before this can be achieved. Use a spray arrangement that ensures the major proportion of fluid applied is retained.

The number of nozzles, nozzle size and operating pressure determine the volume applied over a given time.

Sheep speed. Jetting should not be a race-against-time. Sheep speed through the AJR should allow sufficient time for the necessary volume of spray to be applied. On intermittent AJRs sufficient time needs to be allowed for the spray system to adjust to the required operating pressure. The performances of the entrance and exit races adjacent to the AJR are particularly important in controlling sheep flow and speed.

Pipe and valve system. Pipe and valve sizes should minimise pressure losses and thus improve flow char-
GENERAL ARRANGEMENT

Brackets, bolts etc. are required to support and adjust spray bars, manifold and air cylinder.

25 mm braided nylon hose c/with nut and hose tails each end

Top spray bars c/with 5 H1/4 U0060 nozzles

Air cylinder (max 2.5 L capacity) and 0-1200 kPa glycerine filled pressure gauge

6 kW pump c/with 40 mm delivery hose

40 mm quick acting valve, like 'Butterball' or Johns 'Quick acting' gate valve (See 'Blackwoods' catalogue)

25 mm flap non return valve (like Johns type 4B)

Bottom spray bar c/with 3 H1/4 U0060 nozzles

Sheep flow

FITTINGS

Air cylinder:
80 x class 12 or better
PVC Pressure pipe
Glued Assy of PVC Fittings to Aust Standard AS2032 or similar

0 - 1200 kPa Pressure Gauge

40 mm Q/A valve

25 x 25 mm Nipples

25 mm Non return valves

40 x 25 mm Nipple

40 mm Elbow and ‘Kamlok’ hose coupling

40 mm Tees

Hint: Use rigid PVC/Polythene/Brass fittings where possible to avoid corrosion problems.
RESULTS

The following design was found to be the best in research work at Trangie. The design embraces the principles above. It represents one of many options that may be incorporated into a new design or used to modify existing machines.

Number of top spraybars................................. 2
Number of nozzles per top bar............................ 5
Top bar orientation ..... Longitudinal, 100mm apart.
Top nozzle size.................. Solid stream(3/16"dia)
Top nozzle direction .......... Straight down, angled in
Top bar height above sheep .... 150mm maximum
Number of bottom bars................................. 1
Number of nozzles per bottom bar ................. 3
Bottom nozzles size .......... Solid stream (3/16"dia)
Bottom bar arrangement ...................... Across
Bottom bar angle................................. 30° forward
Sheep speed ..................... Less than 1 per second
Manifold and Valve size ............... 40mm dia.
Hoses and spray bars ......................... 25mm dia.
Pressure cylinder volume .......... No larger than 2.5L
Valve type .......... Quick acting gate or butterfly valve
Operating pressure at nozzles ................. 450 kPa
Pump specification .............. 6L/s at 550 kPa. (8hp)

ACKNOWLEDGMENT

Funding of this project by the Australian wool grower through the International Wool Secretariat is gratefully acknowledged.
## NOZZLES

<table>
<thead>
<tr>
<th>Nozzle No.</th>
<th>Pipe Conn. NPT Male</th>
<th>Orifice Diam. Nom. Inches</th>
<th>Capacity L/s (litres per second) at kPa (kilopascals)</th>
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<tbody>
<tr>
<td>HÌ¼U0040</td>
<td>¼</td>
<td>5/32</td>
<td>211 kPa 281 kPa 422 kPa 562 kPa 703 kPa</td>
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<td>¼</td>
<td>7/32</td>
<td>0.37 0.42 0.52 0.60 0.67</td>
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Table: Spraying Systems Australia Pty Ltd.