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Improving automatic jetting races

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Roger Lund and Peter Kelly, Agricultural Engineering Research Unit, ARC, Trangie

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.

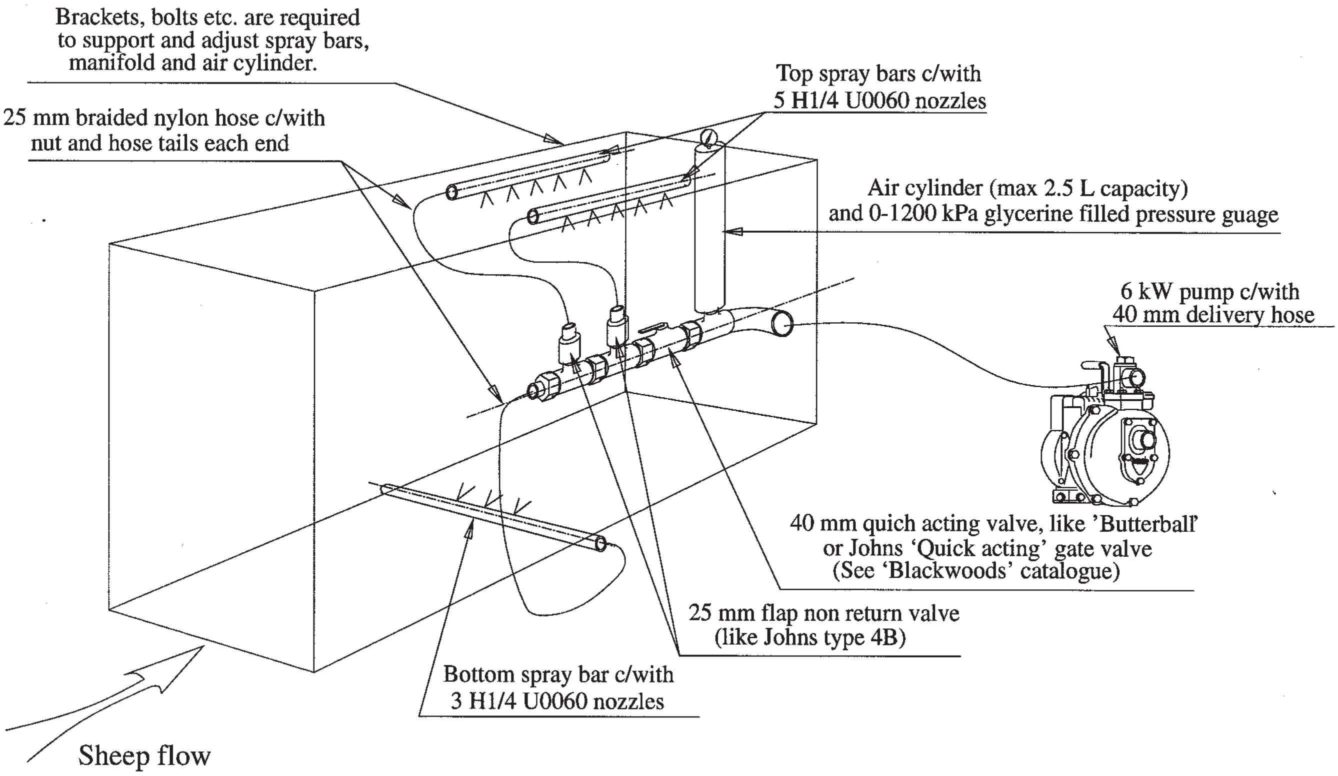
Volume retained. The volume of spray retained in the fleece is also important in achieving wetting to the skin. Less than optimum volumes will only partially wet the fleece. Sufficient volume needs to be retained so that some jetting fluid runs around on the body of the sheep. Some 2.5L or more may need 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.

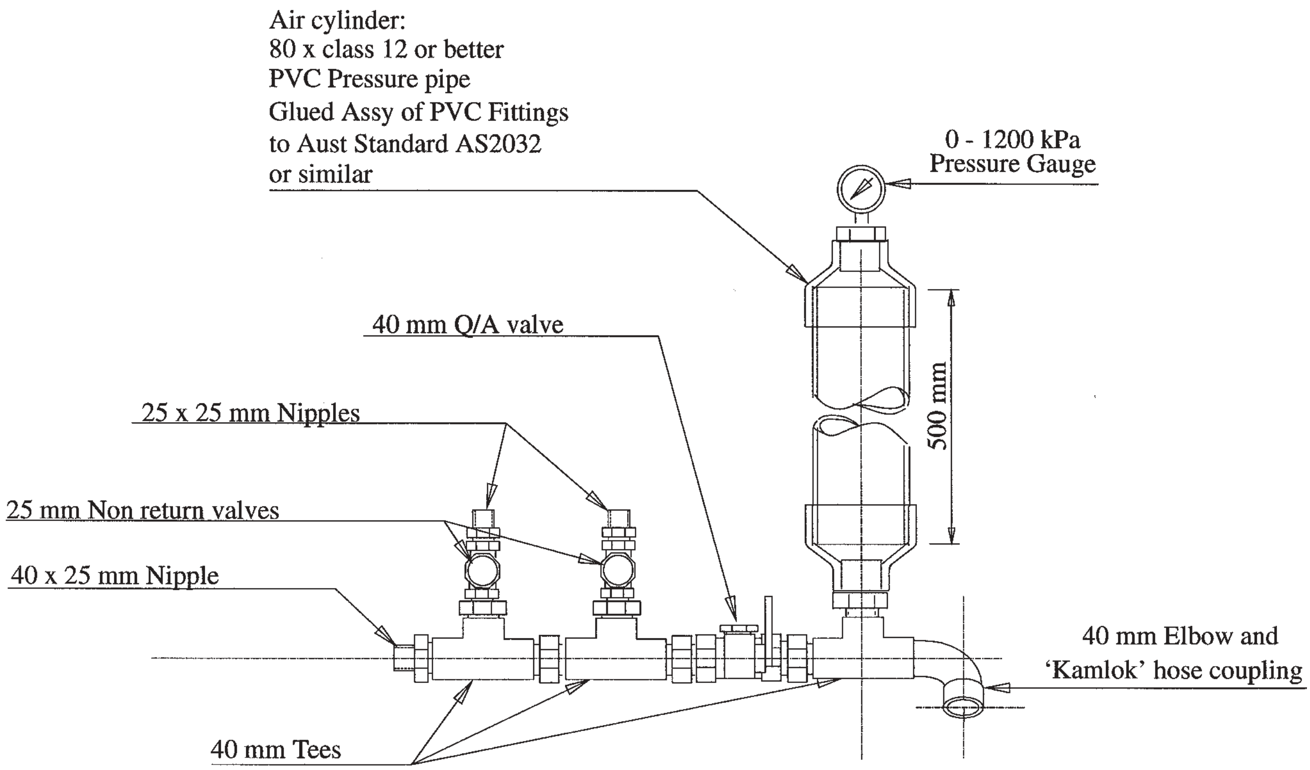
Sheep speed. Jetting should not be a race-against-time. Sheep speed through the AJR should allow sufficient time for the necessary volume of spray to be applied. On intermittent AJRs sufficient time needs to be allowed for the spray system to adjust to the required operating pressure. The performances 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



FITTINGS



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

DISCLAIMER

The information contained in this publication is based on knowledge and understanding at the time of writing (August 2003). However, because of advances in knowledge, users are reminded of the need to ensure that information upon which they rely is up to date and to check currency of the information with the appropriate officer of New South Wales Department of Agriculture or the user's independent adviser.

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acteristics and minimise pump power requirements. Where mechanical operation of on/off valves varies with sheep size, arrangements should ensure full opening every time. An air loaded pressure cylinder should be incorporated on intermittent machines to assist spray performance.

Pump size. Pump size is specified by its pressure / volume characteristics. The pump's operating pressure point is determined by the nozzle requirements and the pipe pressure losses. The volume is determined by the nozzles and sheep speed. To minimise pump power required, the comments about volume applied, sheep speed and the pipe and valve system size and arrangements need to be followed.

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 (3/1 6"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

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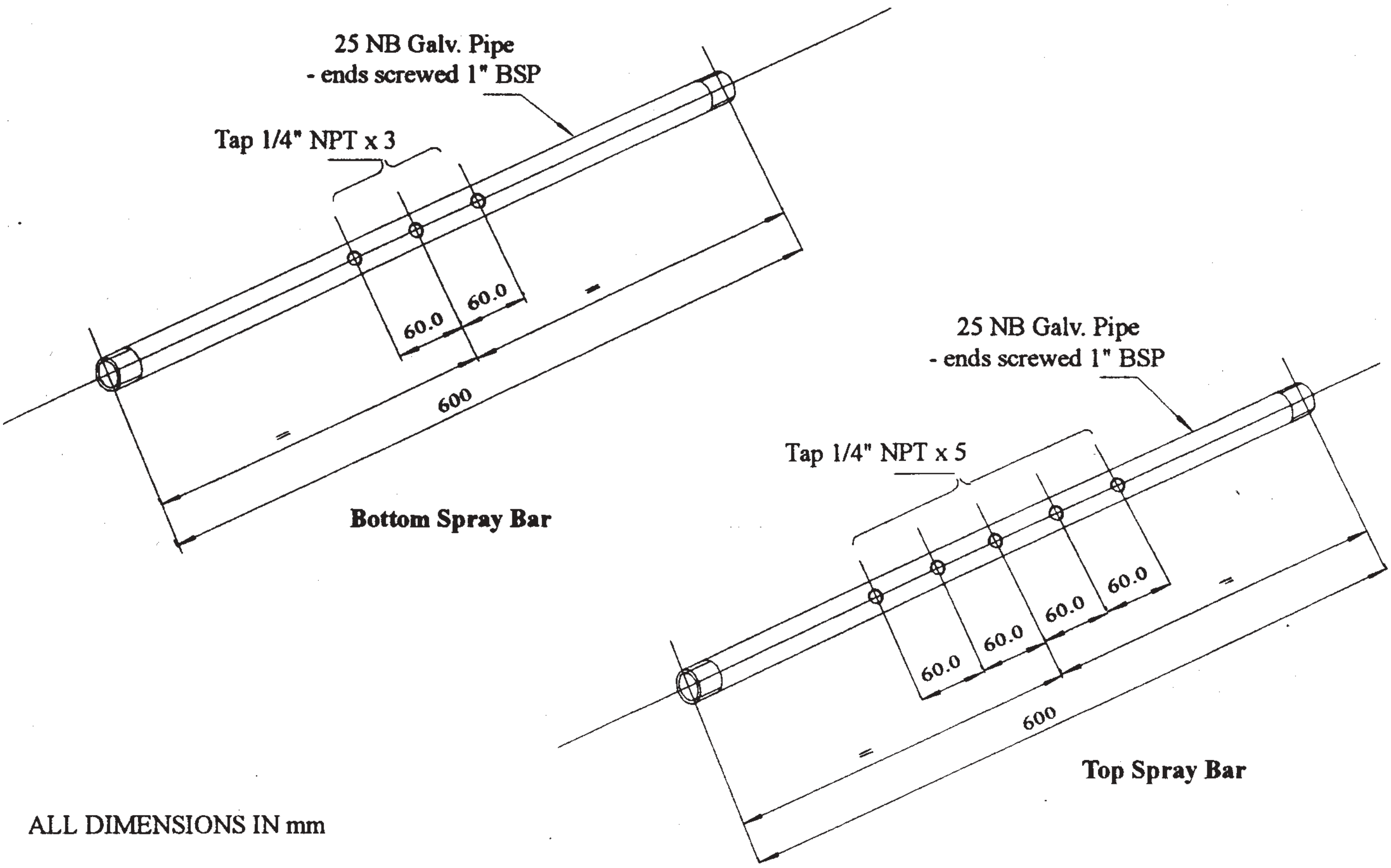
SPRAY BARS



ALL DIMENSIONS IN mm

NOZZLES*

Nozzle No.	Pipe Conn. NPT Male	Oriface Diam. Nom. Inches	Capacity L/s (litres per second) at kPa (kilopascals)				
			211 kPa	281 kPa	422 kPa	562 kPa	703 kPa
H¼U0040	¼	5/32	0.22	0.24	0.30	0.34	0.38
H¼U0050	¼	11/64	0.26	0.30	0.37	0.43	0.48
H¼U0060	¼	3/16	0.31	0.36	0.44	0.51	0.57
H¼U0070	¼	13/64	0.37	0.42	0.52	0.60	0.67
H¼U0080	¼	7/32	0.42	0.48	0.59	0.68	0.76

Table: Spraying Systems Australia Pty Ltd.

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