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Crutching trailers — comparative analysis and design

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Best design guide for manufacturers and operators

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Best-bet design guide for crutching trailers

Introduction

Australian Wool Innovation (AWI) and the Kondinin Group have spoken to crutching contractors and operators and investigated major builds of crutching trailers across Australia to formulate a 'best-bet' design package for manufacturers and operators.

This package has been developed to help manufacturers and operators of crutching trailers make better decisions regarding crutching trailer designs. This could help the industry produce crutching trailers with improved occupational health and safety design and productivity.

Why review your design

AWI estimates that in some States, more than 50% of flocks are crutched using a crutching trailer. It is thought that one of the main reasons for the shift to this style of crutching is the increased productivity per labour unit per day offered by trailers. According to contractors, productivity rates of up to 700 full crutches per day per labour unit are being achieved through a crutching trailer. Given these levels of productivity, this style of crutching could easily become more popular as dedicated labour becomes increasingly difficult to source.

Many crutching trailer designs have not changed since they were first built. When reviewing the design of an existing crutching trailer, or building a trailer for the first time, manufacturers can ensure trailer productivity is maximised and occupational health and safety issues have been addressed by considering the relevant issues in this flyer.

Transport

One of the main benefits crutching trailers offer is transportability. When considering transportation of the crutching trailer between jobs, include the total mass of the trailer and requirements or options for trailer braking. Also consider effective widths, lighting requirements and appropriate signage according to State traffic laws.

Set-up and pull-down

In many single-station crutching trailer contracting operations, operators perform the role of set-up and pull-down on their own. Consider this when designing a single-station crutching trailer and ensure entry and exit races or decoy pens can be put into place by one operator.

Some manufacturers have accommodated this by using alternative materials for entry races and constructed the races and decoy pens so they can be partially dismantled to minimise weight. This allows smaller, lighter components to be shifted and both put into place and pulled down individually.

Dogs

Operators achieving the highest rates of productivity, that is full crutches per person per day, use dogs to continue the flow of sheep into the trailer. In most cases, well-trained dogs can replace a penner. And provided the feed yards and entry race permit a constant flow of sheep onto the trailer, the crutcher can work alone. Consider the path dogs will operate in and allow features including dog ramps beside entry races. If forcing pens are provided with the trailer, it could be worth considering dog access holes in the bottom of the panel to allow dogs to enter and exit the yards without jumping over panels.

Yards and pens

Because of the transportable nature of crutching trailers, they are often taken into areas where no yards are available to pen the sheep before entry into the trailer. Better designs include provision for transport of yards on the trailer. Take this into account when considering braking systems and total mass of the trailer including yards.

As with entry ramps and decoy pens, if a trailer is supplied with supplementary yards and pens, ensure a single operator can load and unload yard and pen components easily.

Operator protection from elements

Operator exposure to wind and sun can have an impact on productivity performance. Protection from cold winds can be achieved with retractable or hinged wall panels which also can be selectively opened to allow cooling breezes to flow through the trailer during hot conditions.

Overhead protection from the elements is essential to provide shade and shelter for the crutchers, penners and rouseabouts. But also keep transportability in mind. Retractable roll-tarps are an option, which provide effective overhead protection while allowing compact travel dimensions that minimise wind load when in transit at highway speeds.



Design styles and features

There are three major design styles, each with their respective advantages and disadvantages.

Across the board style trailers: these trailers operate in a similar way to a shearing board except sheep are pulled from in front of the operator from a race. These races can be elevated slightly and use bottom-pivot gates using gravity to assist dragging the sheep into position.

- ✓ Accommodates left-handed operators
- ✓ Minimises catch and drag effort
- ✗ Operator back strain possible through animal drag and bent operating position
- ✗ Productivity per person per day lower than rotating cradle and raised race designs.

Rotating cradle crutching trailers: use a clamping mechanism to grip the sheep in the cradle before rotating 180 degrees to an inverted position presented for crutching. Subsequent sheep act as a counterweight for rotation.

- ✓ Minimal animal handling effort (particularly if pneumatically assisted)
- ✓ High productivity per person per day
- ✗ Does not accommodate left-handed operators
- ✗ Only one crutching operator per trailer

Raised race with cradles: allow sheep to enter the trailer via a ramp elevating them to about 900millimetres above operator standing position. Operators roll the sheep sideways into a cradle ready for crutching.

- ✓ Permits multiple operators on one trailer
- ✓ High productivity per person per day
- ✗ Does not accommodate left-handed operators
- ✗ Operator effort and reach required to load cradles

Sheep health

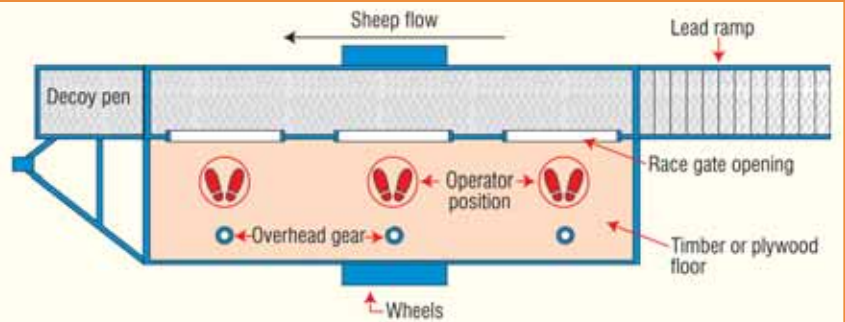
One of the most important considerations when building a crutching trailer is the welfare of the sheep being crutched. Not only are more comfortable sheep be easier to handle, but productivity increases as a result, with less kicking allowing the operator to continue crutching. This is particularly important in the cradle and clamping mechanism on rotating cradle trailers.

Eliminating potential catch points throughout the system will maintain animal flow and reduce injury to sheep. Catch points can include gate hinges or latches protruding into the flow path of sheep through the trailer.

Cradle design

Ensure cradle and race design allows for a range of animal frame sizes and encourages sheep to

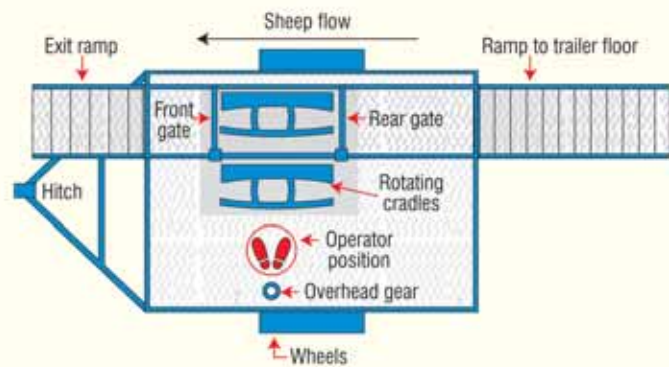
FIGURE 1 Across-the-board crutching trailers



Across-the-board systems operate similar to a shearing board except sheep are pulled from in front of the operator rather than in a catching pen behind. In some designs, gates fold out and hinge at the bottom to assist the operator to drag the sheep into position. Typically, across-the-board trailers are three- to four-stand units.

Source: Kondinin Group.

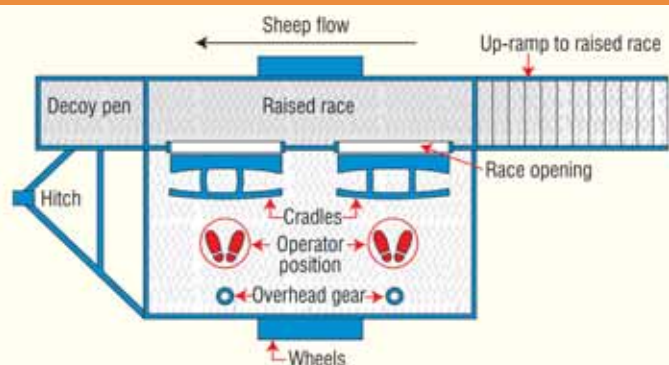
FIGURE 2 Rotating cradle crutching trailers



Rotating systems use one race per revolving handler to feed the sheep into the system. Rotating trailers use automated, power-assisted or manual clamping to catch the sheep as it enters the handler cradle. Handlers can have automated front or rear gates to control sheep flow.

Source: Kondinin Group.

FIGURE 3 Raised race with cradles



Raised race systems walk the sheep up a ramp entering the trailer at the shoulder level of the operator. Cradles are mounted in front of each operator and sheep are pulled off the raised race into the cradle for the crutching operation. Typically, raised race systems are two- or three-stand units.

Source: Kondinin Group.

flow without manual prompting.

Cradles incorporating alternative rubberised materials can assist in gripping the sheep and provide additional comfort for the animal.

Sheep will inevitably kick when in position.

Restraint attachments including adjustable hock holders can be offered as an option. Ensure cradle design maintains clear access for crutching,

minimising metal components around the crutching zone to prevent the dangers of comb breakages.

Productivity

Productivity is defined as the average number of sheep full-crutched per person per day. For example, if on average 1800 sheep are crutched in one day with two crutchers and one penner, the productivity of the trailer is given as 600 sheep – full-crutched, per person per day. This may vary with the use of dogs, which can replace a penner and can vary depending on the experience of the operator and the behaviour of the sheep being crutched.

Occupational health and safety considerations

WorkCover New South Wales, Victorian Institute of Occupational Safety and Health and the University of Ballarat have produced a summarised checklist of crutching trailer design which included some of the following Occupational Health and Safety design issues:

General set-up recommendations

- Workers maintain an upright and forward-facing posture.
- When crutching, the work area is visible with the trunk upright and head upright, or inclined slightly forward.
- Operators are encouraged to adopt a variety of safe postures.
- The weight of the body is distributed evenly to both feet when operating.
- The level of work is below the level of the operators heart.
- Operators neck, trunk and upper body limbs mainly in a neutral (comfortable posture).
- High forces exerted by the largest muscle groups.
- Allowance for operators of differing heights including the shortest and the tallest.

Handpiece recommendations

- Ensure the handpiece is clear of the sheep as released.
- Ensure the handpiece rest height is height adjustable, allowing a 900mm to 1150mm adjustment above the operator foot level.

- Ensure handpiece hooks are adjustable, allowing a neutral (comfortable) posture of the operator wrist.
- Ensure the handpiece hooks are out of kicking range of the sheep in the cradle. Cradle design should allow for kicking sheep.

Reach to load sheep

- If the operator loads sheep into the cradle by tipping, ensure the operator doesn't have to reach more than 600mm.
- Ensure loading the sheep uses all possible assistance. For example, bottom-pivoting gates on the race using gravity to pull the sheep toward the cradle or operating position.

Sheep feed and flow

- Sheep should flow through the handler without prompting.
- The use of leg stops or hock bars prevents sheep reversing.
- Where prompting sheep is required, allow simple access from above the race. The provision of a support when accessing the race is a worthy addition

Cradle working height

- Ensure cradle height is adjustable. The working height (crutching zone) should be adjustable from 800mm to 1050mm height above the operator's feet.
- To provide for shorter workers, consider an adjustable operator platform.

Mechanical hazards

- Eliminate entanglement and drawing-in hazards including rotating drive wheels and belts with appropriate guards. Ensure these are easy to remove and replace to encourage replacement after maintenance.
- Shear hazards appear in instances where a hinged component swings past another in a scissor action. Eliminate these through design or the provision of guards.
- Safety clutches are a must on trailers supplied with overhead gear. They can minimise injury to the operator if the handpiece is knocked or locked-up. Consider using anti-lock shearing motors.
- During set-up and pull-down, the operator can risk crush injury.

These can be minimised through design innovations including geared or ratcheted lift jacks.

- Ensure compressed air, hydraulics and other stored-energy systems do not compromise operator safety.

Non-mechanical hazards

- Ensure the floor has sufficient grip for the operator and eliminate trip points, obstructions and projections.
- Protect electrical cables for running shearing gear, lighting, compressors and hydraulic motors in conduit and fittings should have IP56 weatherproofing ratings. Also fit Residual Current Devices (RCDs) to prevent electrocution.
- Minimise noise and vibration. The main source of vibration is the handpiece and the floor of the trailer. Supply of quiet operating gear is advised. Provision for the operation of air-compressors and generators away from the trailer is advisable. Noise exposure longer than the eight hour operation period should not exceed 85dBA and peak noise levels should not exceed 140dB(lin). Consider noise deadening of contact surfaces.
- Minimise exposure of the operator to dust, fuel and engine fumes by locating fuel-powered equipment away from the operators. And provide adjustable ventilation through the trailer as required. Optional watering-down equipment could also be considered if yards are supplied with the trailer.

Lighting

- Lighting on the operating zone should be at least 600lux. This can require the use of supplementary lighting in the trailer across the crutching zone.
- Control glare using appropriate material finishes.

Operator Information

- Every crutching trailer should be supplied with a detailed operator's manual which includes diagrams or photographs detailing the operation of the trailer.
- All switches should be clearly marked and indicate the on/off position.