






TRACTOR BUYING GUIDE

TMA TRACTOR AND MACHINERY ASSOCIATION OF AUSTRALIA

Supported by WorkSafe VICTORIA

CONTENTS

INTRODUCTION

A tractor, like many other essential pieces of machinery for large and small-scale farms, can be a great asset. However, it can also be a potential danger if it is not properly maintained, serviced and operated. **Incidents involving Tractor rollover and runover are among the leading cause of death and injury on farms.**

Buying a tractor, especially a second-hand tractor, can be daunting task but this can be made easier by following a few simple steps as outlined in this guide.

A physical inspection of the tractor prior to purchase is an absolute must and having a good idea of basic tractor specifications (for example horsepower, weight, towing and lifting capabilities) that will suit the buyer's need is essential.

Also, be sure you can operate the tractor competently. Tractors are a unique vehicle which can be used to push, pull and lift implements. They use hydraulics and a Power Take Off system which owners need to be familiar with. There are short courses and specific training available for the safe operation of a tractor and other farm machinery.

Remember that looking after a tractor starts with the purchase of the unit, whether it's new or used.

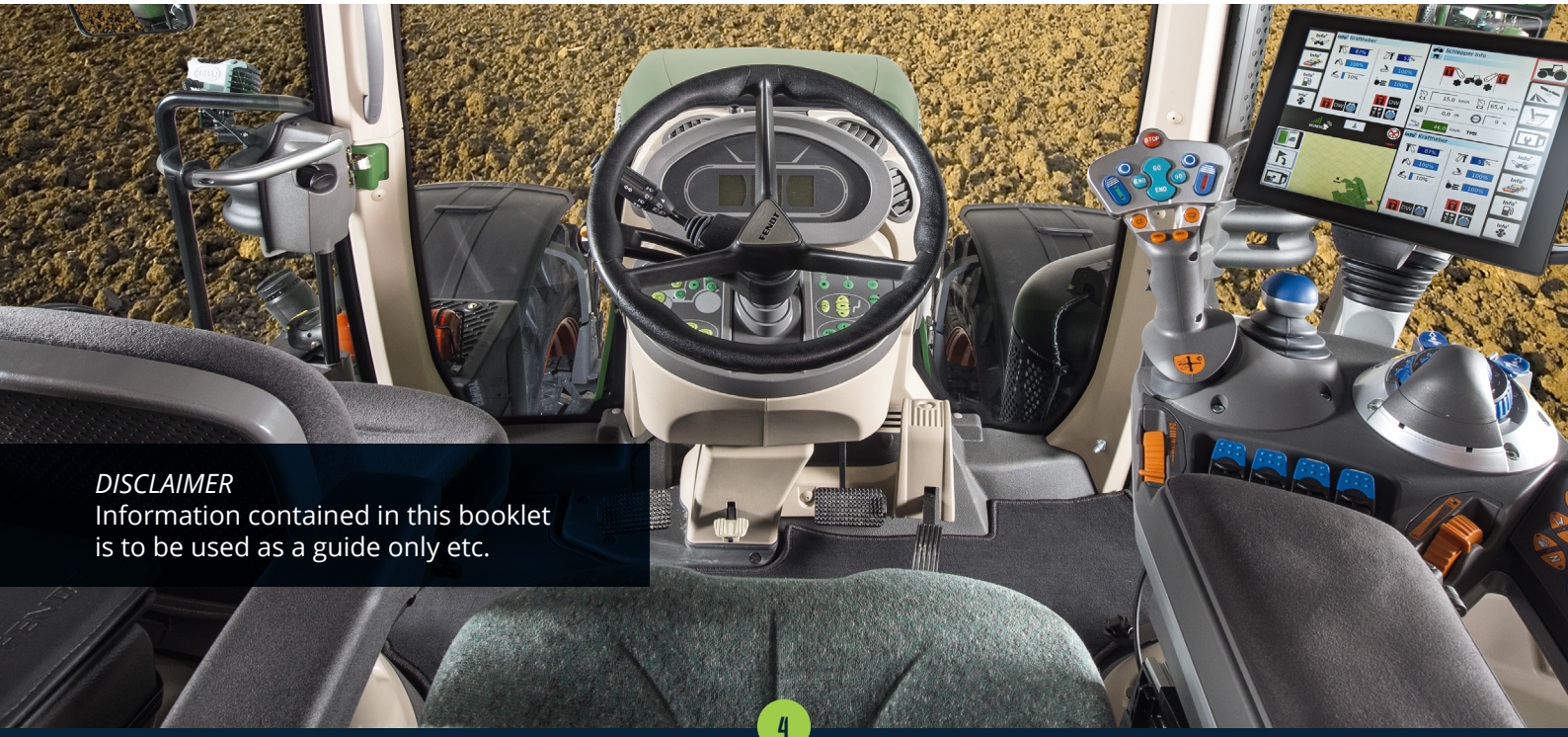
Owners have a responsibility to ensure the tractor is safe to use for them and others that may be required to operate it.

Buying a new tractor is generally less risky than buying second-hand but there are still some boxes to tick when looking to purchase a brand new machine.

Visit several dealerships to compare different models and brands and make sure there is a clear understanding of warranty and servicing requirements. Ask the dealer or seller if you can speak to other owners of tractors that are similar to what you are looking for.

Don't forget that servicing must be carried out by a trained technician and any alterations or servicing performed by the owner may void a warranty, and potentially compromise the safe operation of the tractor.

Buying on-line may also void some warranty details and/or basic consumer protection laws.



DISCLAIMER
Information contained in this booklet is to be used as a guide only etc.

FIRST IMPRESSIONS

The general condition of the tractor will in most cases, be a reflection of how it's been looked after. Faded paint, dents and scratches are part of normal wear and tear. But if a tractor has just a few hundred engine hours on the clock and looks like it's been sitting in a desert for a decade, chances are it has not been well maintained.

A tractor may also look the goods but pre-purchase inspections must go further than skin deep. For example, heavy haulage, towing and PTO work can take a toll on a tractor's running gear, including the engine, transmission and clutches.

Regardless of how the tractor looks, ask for any background information on the tractor, its service history, any issues encountered, repairs and what the tractor has been used for.

Where possible, run the tractor (preferably from a cold start) and take note of exhaust colour. Black or dark smoke is quite normal on start up or acceleration for a diesel engine but should not be visible when the engine is idling.

Listen for unusual noises, especially knocking.

FIT FOR PURPOSE

If looking to buy a new or second-hand tractor, consider what the tractor is to be used for. Will it be used for general, light duties, front-end loader work, towing trailers or implements such as tillage gear or running implements such as post hole diggers, sprayers or slashers?

Some of the key parameters that determine a tactor's capabilities are its horsepower (developed by the engine), overall weight, linkages and hitches (to allow implements to be fitted to the front and rear) and linkage lift capacity, hydraulics (which help operate implements like front-end loaders) and Power Take Off or PTO options which may assist in the running of gear like hay making equipment.

Axle loading is also important and consider a tractor's dimensions and ability to fit through gateways, tree rows and under sheds.

ROLLOVER PROTECTION STRUCTURES

Roll Over Protection Structures (ROPS) are a must for virtually any tractor. For example, in Victoria, any tractor made after July 1981 has to have an approved ROPS fitted. In many cases, older tractors should have a ROPS fitted if it is reasonably practicable to do so.

Tractor rollovers continue to be one of the most common causes of death and injuries on farms, hence the importance of fitting ROPS.

Nationally, Workplace Safety Authorities general safety requirements to prevent tractor roll-overs include:

- when pulling heavy loads, never hitch above the centre line of the tractor axle
- if using a tractor to tow another vehicle, consider hitching to the front drawbar and using reverse gear (to eliminate the potential for the tractor to backflip)
- engage the clutch gently when starting up a hill or towing
- steer uphill when turning on slopes
- use wide wheel settings and correct ballasting
- provision and use of a working seatbelt

ROPS are available in several configurations including fold-down but must comply with the appropriate design standards, for example the AS1636 ROPS for Wheeled Agricultural Tractors. Owners should not make any modifications to the ROPS and inspect ROPS regularly for rust and excessive wear.

OWNER MANUALS & DECALS/LABELLING

New or second-hand, the owner's manual should be available with the tractor. The owner's manual contains essential information on how to operate the tractor and other important details such as servicing and maintenance requirements and intervals and recommended tyre pressures.

If the manual has been lost, replacements can often be found on-line or through the appropriate dealership that sells that brand of tractor.

Decals or stickers and labelling are more prevalent on modern tractors but even late model machinery can be prone to decals fading and wearing off.

Decals on tractors can warn of hazards such as crush points, maximum loads for axles, PTO shafts, hot surfaces, areas to stay clear of and electrical componentry.

Engine and serial numbers should be clear and easy to read.

The devil is in the detail when it comes to warranties for new tractors

WARRANTY

The devil is in the detail when it comes to warranties for new tractors and prospective buyers should have a clear understanding of any warranty and what it does or does not cover.

Discuss the warranty with the dealer or retailer and clear up any potential grey areas.

For example, a repair may be covered under warranty, but the owner may be required to return the tractor to the dealer or place of purchase. This could pose a challenge if there are large distances involved or the tractor's engine has seized.

RESEARCH BEFORE PURCHASE

Offers of amazingly cheap, new tractors are more often than not, too good to be true. Like most forms of retail, the tractor market can be susceptible to 'knock off' equipment which might mirror a well-known brand but in reality, be far from the expected quality.

Buying from an authorised dealer or reseller is recommended where possible. Spend time researching a brand or offer and make sure the tractor is backed by a localised presence in the market, be it a dealership or at least warehousing for parts.

Ask about spare parts supply, warranty, a point of contact (a salesperson, for example), technical back up and where the tractor was made.

STEPS, PLATFORMS & ACCESS

Sturdy and well-sized platforms and steps are required to allow safe and easy ingress and exit of the cabin area of the tractor. Steps should not be too steep and not too far from the ground (the bottom step) and should ensure that the operator steps off outside the rear wheel track.

Steps and platforms should also be free from obstructions, exposed hoses and wiring and this includes the floor of the cabin area.

Access to key service points is important to note. Pay particular attention to the location of dip sticks, grease nipples, air filters (engine and cabin, if fitted), filler caps (for engine oil and hydraulic oil) and radiators. Good access to these elements will ultimately make maintaining the tractor easier.

Having to reach around components to get to grease nipples or see fluid level gauges can place the operator at risk of injury from burns (from a hot engine, for example) or entanglement.

CHASSIS, WHEELS & TYRES

Pay close attention to the condition of the tractor's chassis, wheels, tyres and the linkages and connections used in the steering mechanism.

Structural members of the chassis should show no signs of cracking or be deformed or bent. Welds should be inspected closely. Rust is generally not a good sign on any steel on a tractor, especially its structural members.

Tyres play an important role in how a tractor handles and performs so they should be in good condition with adequate tread. Perished and worn tyres should be avoided.

Look for defects and bulges and make sure there are no wheel nuts missing.

Know the tyre's load rating and the correct operating air pressure. Wheel rims should be in good shape also with no dents or cracks.

Worn linkages and steering components can lead to 'slop' in the steering wheel and unresponsive steering which makes the tractor unsafe to operate in a paddock or on the road.

WIRING/PLUMBING /ELECTRICAL

Neat (not exposed or loose) wiring and plumbing is essential as exposed components are susceptible to weather damage, dust and water ingress. Wiring should not be frayed and hoses should be in good condition. The same applies for solid pipes, braided hoses, fuel lines and hydraulic lines.

Much of a tractor's plumbing may contain liquid or oil running at high pressures and temperatures so keeping it in good condition is vital.

Check that the battery is housed in a reasonably solid and well-sealed area and is secure, not able to bounce around with the tractor's movement. The battery terminals should be free from build up. More modern tractors are fitted with an isolator switch which cuts the power to accessories to help prevent the battery running flat if a light is left on, for example.

Familiarisation with the location of fuses and relays for the electrical system is also important.

Lights (including lenses and globes) should not be cracked or faded. Headlights and work lights are important and must be in good condition. A worklight is next to useless if it is poorly mounted and unable to be shifted to where the light needs to be.

Fire Authorities may require the fitment of fire suppression equipment such as a 9kg Water Fire Extinguisher where the tractor is used during the Fire Danger Period. Provision of fire suppression equipment is particularly important when rotating equipment is attached to the tractor where there is potential for a build up of flammable material around hot moving parts.

OPERATOR AREA/ CAB FIT OUT

Whether the tractor has a cabin or not, the operator area needs to be as comfortable as possible with key components such as the gear levers, brakes, clutches, PTO and front-end loader controls within easy reach.

The seat must be maintained in good condition, fitted with a working seatbelt, and ideally should have some adjustment and suspension. A tractor seat with good suspension will help to reduce the effects of vibration on the body. Controlling vibration reduces operator fatigue.

Levers, knobs and other controls and switches should be well labelled or at least colour-coded. A basic telemetry display should include a tachometer for the engine revs, engine hour display, speedometer and gauges for engine temperature and oil pressure.

Also check the operation of the park brake to make sure the tractor can be prevented from rolling on slopes or uneven ground.

Cab glass should not be cracked and needs to be well fitted and sealed to help reduce noise and prevent the ingress of dust and water.

Sit in the seat and check forward and rear visibility. A driver should be able to see both front wheels and the rear hitch. Steering wheel adjustment is a good feature to look for, allowing the steering wheel to be moved up and down or forwards and backwards.

The cab floor should be free of any obstructions and make sure any coverings are not worn or frayed which may be a tripping hazard.

Brake and clutch pedals should be in good condition, providing grip for the foot. Sit in the seat and make sure feet can reach the pedals easily and move them (depress the clutch for example).

Grab rails should be fitted to the cab to enable safe entry and exit.

REAR LINKAGES, PTO & HITCH

The rear of the tractor is home to the three-point linkage, Power Take Off (PTO) shaft, the drawbar and if fitted, hydraulic couplings for rear-mounted implements.

Rotating PTO shafts pose a risk of snagging loose clothing, hair and limbs so guarding must be fittted and kept in good condition. Guarding must be fitted even though at the time of manufacture the tractor PTO and shaft was not guarded. Guards should be fitted and fixed, that cover the PTO output stub, PTO shaft, universal joints and clutches. As the guard is affected by use and UV exposure, inspect these for wear and damage and replace before use if necessary. Where possible, the guard should remain attached to the tractor or implement by a hinge or a lanyard to ensure the guard cannot be misplaced. The PTO, shaft and its universals should be regularly inspected for wear.

The PTO should rotate in a clockwise direction when viewed from the rear.

The PTO spline should be in good condition and not worn excessively or bent.

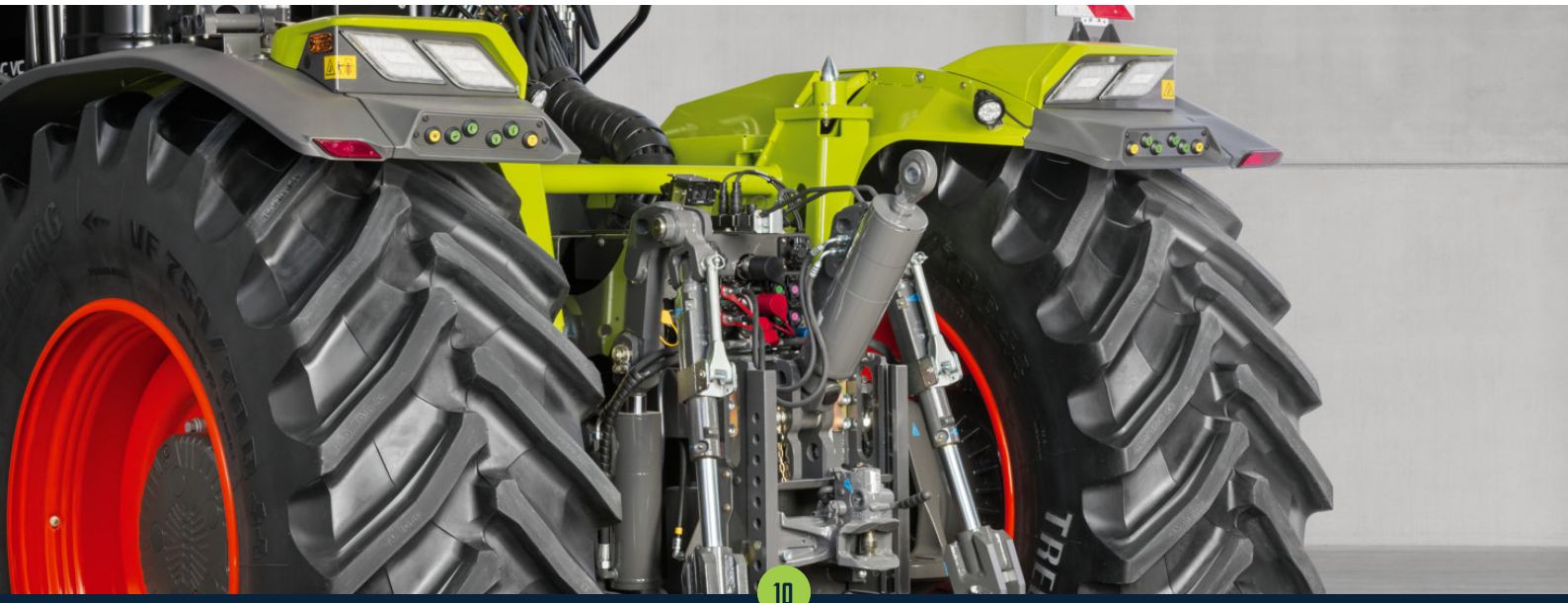
A three-point linkage is a great way for attaching implements to the tractor but check the condition of the ball ends or hook ends and be familiar with the lifting capacity of the linkage system. Linkages are rated by a Category system which uses corresponding maximum lifting rates. A Category 1 linkage is suited to smaller tractors, for example.

The top link needs to be securely stowed when not in use, not flopping around the back of the tractor. Top links can also be quite heavy so be aware when releasing them from their stowed position.

The drawbar is used as a basic towing mechanism in addition to the three-point linkage and can be either a fixed or adjustable design. A tongue-style hitch is common on most tractors. Ensure the tongue is not worn thin or has been bent and the correct size hitch pin is used.

Hitch pins should ideally have a safety clip through the bottom. Some more modern tractor drawbars also have a locking mechanism to prevent the pin from lifting up.

Finally, external hydraulic controls should be located outside the back wheel track to reduce the risk of entanglement when operating.



FRONT-END LOADERS

A front-end loader can be a valuable addition to a tractor, but it must be operated safely. Front end loaders alter the tractor's centre of gravity and can dramatically affect the load capabilities of the front axle.

The front-end load also obviously adds to the tractor's height and overall length.

Pictorial and/or written signs or decals that warn against front end loader safety risks (crush points and rated operating loads, for example) must be displayed.

Self-levelling front-end loaders are much more common now and should be used where possible to help avoid bucket contents, pallets and the like tipping back off the front-end loader onto the tractor.

In order to properly support the weight being lifted by loader, the tractor tyres can be foam or water filled. If this is not the case, then a ballast box should be fitted to provide stability. The owner's manual and the tractor manufacturer should be consulted to ensure this is safe to do so.

Operator training for the safe operation of a front-end loader is recommended.

ENGINE & EXHAUST

Some basic engine checks include the fluid (oil and coolant) levels and quality, condition of radiators and hoses, air filter elements and signs of oil leaks and repairs.

For used tractors, the engine oil should reasonably free flowing but not "thin" in appearance and smooth to the touch, not feeling gritty when rubbed between the fingers. Removing the dipstick will allow a small sample of the engine oil to be inspected. Cloudy or milky-coloured oil (engine, transmission or hydraulic) is a warning sign that there could be water or moisture in those systems which could lead to excessive wear and costly repairs.

Exhaust systems should be free from leaks and cracks and have a properly functioning muffler fitted.

Make sure the engine air cleaner filter is checked. Air filters for the engine can get clogged with dust and if not cleaned or replaced regularly, can lead to poor engine performance and damage.

For the same reason, screens and seals around the engine and its cooling components should be in good condition.

EXHAUST EMISSIONS

Industry has worked hard to reduce harmful diesel engine exhaust emissions. Emissions standards have been steadily increasing for many years now and are based on strict requirements enforced in Europe and the United States, aimed at reducing harmful products called Particulate Matter (PM), Hydrocarbons (HC), and Nitrogen Oxides (NOx).

The emissions regulations differ slightly between the European Union and the US. The EU emissions standards have been around since the late 1990s through various Stages, starting with Stage 1 and leading to the current Stage V (2020).

In the US, the standards are referred to as Tiers, starting years ago with Tier I and leading up the current Tier 4 level (2020).

The PM limit of the Stage V EU standards is 97 per cent lower than that of the Stage I standard, and the HC plus NOx limit is 94 per cent lower. Stage V regulations apply to engines that fall within a power range of 19-560kW.

Engine manufacturers most commonly use exhaust gas recirculation (EGR) or selective catalytic reduction (SCR) to meet the emission requirements. Diesel Particulate Filters are also common.

EGR is a technique that recirculates a portion of the exhaust gases back into the combustion chamber. This process lowers the combustion temperature, reducing the formation of NOx.

SCR involves the treatment of exhaust gases after the combustion process using an aqueous ammonia solution commonly called AdBlue. The AdBlue is metered into the post-exhaust system and requires its own supply tank, separate to the diesel fuel tank.

There are currently no emissions requirements for off-road diesel engines in Australia. However many new tractors, especially mid to larger-horsepower, European-made tractors, will be fitted with the relevant emissions control equipment.

TRACTOR BUYING GUIDE
PRE-PURCHASE CHECKLIST

1. First impressions

- □ Body condition—is paintwork faded? Check for defects such as dents, scratches and cracked welds.
- □ Is condition consistent with engine hours?
- □ Check for service history identifying any issues encountered, repairs and what the tractor has been used for.
- □ Where possible, run the tractor (preferrably from a cold start) and take note of exhaust colour. Listen for unusual noises, especially knocking.

2. Fit for purpose

- □ What is the application—general, light duties, front-end work, towing trailers or implements such as tillage gear or running implements such as post hole diggers, sprayers or slashers?
- □ Confirm that key parameters are adequate—horsepower, overall weight, linkages and hitches (to allow implements to be fitted to the front and rear) and linkage lift capacity, hydraulics (which help operate implements like front-loaders) and Power Take Off or PTO options which may assist in the running of gear like hay making equipment.
- □ Consider axle loading and overall dimensions.

3. Rollover protection structures

- □ Must be fitted and comply with AS1636 ROPS for Wheeled Agricultural Tractors.
- □ Owners should not make any modifications to the ROPS and inspect ROPS regularly for damage, rust and excessive wear.

4. Owner manuals and decals/labelling

- □ New or second-hand, the owner's manual should be available with the tractor.
- □ Decals warning of hazards such as crush points, maximum loads for axles, PTO shafts, hot surfaces, areas to stay clear of and electrical componentry.
- □ Engine and serial numbers should be clear and easy to read.

5. Warranty

The devil is in the detail when it comes to warranties for new tractors and prospective buyers should have a clear understanding of any warranty and what it does or does not cover.

Discuss warranty with the dealer or retailer and clear up any potential grey areas, for example a repair may be covered under warranty, but the owner may be required to return the tractor to the dealer or place of purchase. This could pose a challenge if there are large distances involved or the tractor's engine is seized.

6. Research before purchase

- □ Buying from an authorised dealer or reseller is recommended where possible.
- □ Spend time researching a brand or offer and make sure the tractor is backed by a localised presence in the market, be it a dealership or at least warehousing for parts.
- □ Ask about spare parts supply, warranty, a point of contact (a salesperson, for example), technical back up and where the tractor was made.

TRACTOR BUYING GUIDE
PRE-PURCHASE CHECKLIST

7. Steps, platforms and access

- □ Sturdy and well-sized platforms and steps are required to allow safe and easy ingress and exit of the cabin area of the tractor.
- □ Steps should not be too steep and not too far from the ground (the bottom step) and should ensure that the operator steps off outside the rear wheel track.
- □ Steps and platforms should also be free from obstructions, exposed hoses and wiring and this includes the floor of the cabin area.
- □ Check location of dip sticks, grease nipples, air filters (engine and cabin, if fitted), filler caps (for all engine and hydraulic oil) and radiators for ease of access.

8. Chassis, wheels and tyres

- □ Check condition of the tractor's chassis, wheels, tyres and the linkages and connections used in the steering mechanism.
- □ Structural members of the chassis should show no signs of cracking or be deformed or bent.
- □ Welds should be inspected closely, look for signs of rust.
- □ Ensure that tyres are in good condtion with adequate tread, look for defects and bulges and make sure there are no wheel nuts missing.
- □ Know the tyre's load rating and the correct operating air pressure.
- □ Wheel rims should be in good shape also with no dents or cracks.

9. Wiring/plumbing/electrical

- □ Wiring should not be frayed and hoses should be in good condition. The same applies for solid pipes, braided hoses, fuel lines and hydraulic lines.
- □ Check that the battery is housed in a reasonably solid and well-sealed area and is secure, not able to bounce around with the tractor's movement.
- □ The battery terminals should be free from build up.
- □ Check location of fuses and relays for the electrical system.
- □ Lights (including lenses and globes) should not be cracked or faded.
- □ Headlights and work lights are important and must be in good condition.

10. Operator area/cab fit out

- □ The seat must be maintained in good condition, fitted with a working seatbelt, and ideally should have some adjustment and suspension.
- □ Levers, knobs and other controls and switches should be well labelled or at least colour-coded.
- □ A basic telemetry display should include a tachometer for the engine revs, engine hour display, speedometer and gauges for engine temperature and oil pressure.
- □ Check the operation of the park brake to make sure the tractor can be prevented from rolling on slopes or uneven ground.
- □ Cab glass should not be cracked and needs to be well fitted and sealed.
- □ Assess forward and rear visibility. A driver should be able to see both front wheels and the rear hitch.
- □ Look for steering wheel adjustment, ability to move wheel up and down or forwards and backwards.
- □ The cab floor should be free of any obstructions and make sure any coverings are not worn or frayed which may be a tripping hazard.
- □ Brake and clutch pedals should be in good condition, providing grip for the foot. Sit in the seat and make sure feet can reach the pedals easily and move them (depress the clutch for example).
- □ Grab rails should be fitted to the cab to enable safe entry and exit.
- □ Tractor must include a working seatbelt.

TRACTOR BUYING GUIDE
PRE-PURCHASE CHECKLIST

11. Rear linkages, PTO and hitch

- ☐ Guarding is essential for the PTO shaft when it is used for running implements.
- ☐ The PTO should rotate in a clockwise direction when viewed from the rear.
- ☐ The PTO spline should be in good condition and not worn excessively or bent.
- ☐ Check the condition of the ball ends or hook ends and be familiar with the lifting capacity of the linkage system.
- ☐ The top link needs to be securely stowed when not in use, not flopping around the back of the tractor.
- ☐ A tongue-style hitch is common on most tractors. Ensure the tongue is not worn thin or has been bent and the correct size hitch pin is used.
- ☐ Hitch pins should ideally have a safety clip through the bottom.
- ☐ External hydraulic controls should be located outside wheel track to reduce the risk of entanglement when operating.

12. Front-end loaders

- ☐ Pictorial and/or written signs or decals that warn against front end loader safety risks (crush points and rated operating loads, for example) must be displayed.
- ☐ Self-levelling front-end loaders are much more common now and should be used where possible.
- ☐ Check that tyres can be foam or water filled. If this is not the case, then a ballast box should be fitted to provide stability. The owner's manual and the tractor manufacturer should be consulted.

13. Engine and exhaust

- ☐ Perform basic engine checks such as the fluid (oil and coolant) levels and quality, condition of radiators and hoses, air filter elements and signs of oil leaks and repairs.
- ☐ Exhaust systems should be free from leaks and cracks and have a properly functioning muffler fitted.
- ☐ Make sure the engine air cleaner filter is checked and that screens and seals around the engine and its cooling components are in good condition.

14. Exhaust emissions

- ☐ Confirm engine emissions rating for the tractor and check with local authorities to confirm compliance.

Tractor and Machinery Association of Australia

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