

REDUCING HARVEST FIRES



GRDC
GRAINS RESEARCH
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CORPORATION

NATIONAL

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THE BACK POCKET GUIDE

- All harvesters are prone to fire but crop and machine losses can be minimised with hygiene, inspection and maintenance.
- Bearings, hydraulic lines and belts need to be closely monitored and the harvester should be kept free of dust and chaff accumulation.
- According to Kondinin Group research, on average annually, around 7% of harvesters will start a fire. Of these, one in ten will cause significant damage to the machine or surrounding crop.
- If you detect a fire pull the harvester out of the standing crop, face the harvester into the wind and evacuate promptly.
- A more pro-active maintenance and inspection programme will not only reduce fire risk, but will also help reduce machinery downtime and prevent an expensive repair bill.
- Identifying problem areas with individual harvester makes and models is essential for controlling the fire risk. While some

machines are more prone than others it pays to talk to dealers and other farmers using similar machines for advice.

- Areas of increased risk include dust trap areas, rubbing or slipping belts or failure-prone bearings and should be checked more regularly.
- From the operator's seat in the cabin it can be difficult to detect the early stages of a fire and smell smoke.
- Keep all communication lines open, as other operators such as chaser bin drivers can alert the harvester driver if a problem occurs. Keep a list of emergency contact details (phone and/or UHF) in the cab of all harvest machinery.
- The chaser bin driver is usually the first person on the scene of a harvester fire. Ensure the chaser has ample extinguishing options and consider chaser-mounted remotely-operated extinguisher systems.



Harvester fires can not only damage or destroy machinery but can also cause considerable damage to surrounding crops and properties and endanger life.

Hot tip

If bearings start running hotter than normal, replace them promptly before they collapse, potentially posing a fire risk and further machine damage.

If you find particular bearings fail regularly, keep a supply of new bearings on hand, so they can be quickly changed over before reaching dangerous temperatures.

Harvester fire reduction checklist

- 1** Recognise the big four factors that contribute to fires: **relative humidity, ambient temperature, wind and crop type and conditions**. Stop harvest when the danger is extreme.
- 2** Focus on **service, maintenance and machine hygiene** at harvest on the days more hazardous for fire. Follow systematic preparation and prevention procedures.
- 3** Use every means possible to **avoid the accumulation of flammable material** on the manifold, turbocharger or the exhaust system. Consider exhaust system coatings, paints or insulation that will not trap dust. Be aware of side and tailwinds that can disrupt the radiator fan airblast that normally keeps the exhaust area clean.
- 4** Be on the lookout for places where **chafing** can occur ie fuel lines, battery cables, hot wires, tyres, drive belts etc.
- 5** **Avoid overloading** electrical circuits. Don't replace a blown fuse with a higher amperage one. It is your only protection against wiring damage from shorts and overloading.

- 6** Periodically check **bearings** around the front and the machine body. Use a hand-held digital heat-measuring gun for temperature diagnostics on bearings, brakes etc.
- 7** Drag chains, or better still drag cables or grounding conductors, may help **dissipate electrical charge** but are not universally successful in all conditions. There are some invaluable fire-suppression options on the market.
- 8** Use the **battery isolation switch** when the harvester is parked. Use vermin deterrents in the cab and elsewhere, as vermin chew some types of electrical insulation. Remember to remove these before harvest starts.
- 9** Observe the **Grass Fire Danger Index (GFDI)** in relation to grain harvesting protocol on high fire risk days.
- 10** Have a team meeting prior to harvest to establish your fire management plan. Maintain **two-way or mobile phone contact** with base and others. Keep an eye out for hazards on machinery during the season.

Grain harvesting operations table

The GFDI helps determine the weather condition risk when harvesting.

Harvesting is not recommended, and should cease in some states when the GFDI is above 35.

This GFDI 35 (km/h) table indicates the average wind speed[^] limit corresponding to a GFDI for a range of temperatures (°C) and relative humidity (RH%) combinations.

Grain harvesting operations must cease for periods when the average wind speed[^] for a particular combination is exceeded.

The table below calculates the average wind speed[^] (kilometres per hour) for different temperature (degrees Celcius) and relative humidity (RH) combinations that equate to a Grass Fire Danger Index (GFDI) of 35.

TEMP °C	5	10	15	20	25	30	40	50	60	65	RH%*
15	31	35	38	40	43	45	49	53	56	58	Average wind speed [^] (km/h)
20	29	33	36	38	40	43	46	50	53	55	
25	27	30	33	36	38	40	44	47	50	52	
30	25	28	31	33	35	37	41	44	47	49	
35	23	26	28	31	33	35	38	41	44	46	
40	21	24	26	28	30	32	35	39	41	43	
45	19	22	24	26	28	30	33	36	39	40	

[^]Wind speed averaged over 10 minutes.

*RH% = Relative humidity rounded down

Worked example

In accordance with the above table



- 1** Temperature = 35°C
- 2** Relative humidity (RH) = 14% (round down to 10%)
- 3** For this combination of temperature and humidity, grain harvesting operations must cease when the average wind speed[^] is greater than 26km/h.

Did you know

The GFDI can exceed 35 even at low temperatures accompanied by low humidity and high wind speeds.

[^] Wind speed averaged over 10 minutes.

* RH% = Relative humidity rounded down

Other combinations of temperature and relative humidity will result in GFDI 35 conditions being reached at different average wind speeds.



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Check list



Minimise flammable material

- A rigorous clean-down regime is the best way to reduce fire risk.
- Clean-down intervals should be guided by visual build-up of flammable material which vary between crop type and ambient conditions. For example, pea crops may require a clean-down as often as after every grain-tank full to reduce fire risk.
- While faulty bearings could still run hot, it is often the accumulation of flammable material that enables a fire to take hold of a machine.



Start at the front

- Always check the harvester front by inspecting under guarded areas, where dust and chaff build-up can go unnoticed.
- Pay attention to knife drive gearboxes which can overheat.
- Check the bearings in the front as they are a common source of fire.
- Check knife condition for damage. A damaged knife can be a source of fires.



Front hydraulics

- Dust and chaff accumulation around hydraulic motors are a fire risk as some of these components run at elevated temperatures.
- Oil, which is usually present, can attract dust and create a flammable mixture that is difficult to remove.
- Hydraulic motors in the front will require degreasing periodically.



Side-panel spot-checks

- Frequent inspection under all panels, guards and covers is critical. If the machine is stopping for any reason then take a quick look for signs of trouble.
- Inspect all fuel and hydraulic lines thoroughly for leaks and repair these immediately.

FIRE LIGHTERS: Bearing checks

- If a bearing was to fail and drop hot metal parts from above, it would ignite the chaff below.
- Keep these areas free of dust and chaff and check bearings regularly for damage and/or heat increases.
- Use an infrared thermometer to check the temperature of bearings and other moving parts (the unit pictured costs around \$50 but could help identify a bearing approaching failure).



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FIRE LIGHTERS: Bearing checks

- Point the infrared thermometer at a bearing or hub as pictured, with the red laser dot trained on the bearing.
- Monitor the temperature of problem bearings by keeping a daily temperature log.
- Some bearings run hotter than others. If the temperature of a bearing increases by more than 50 per cent, investigate further.



FIRE LIGHTERS: Bearing checks

- The thermometer allows readings to be taken from a distance or while standing on the ground.
- Ensure the machine is not running prior to opening panels and checking bearings.



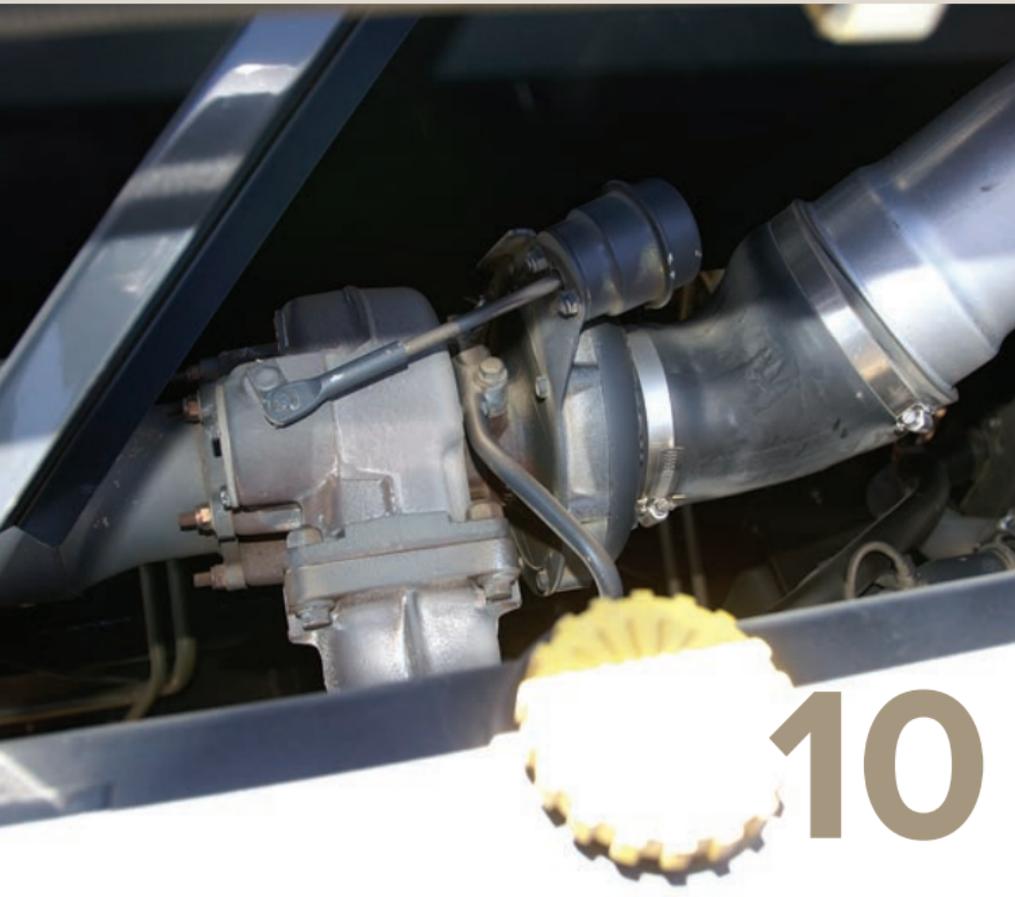
FIRE LIGHTERS: Brakes

- Sticking or malfunctioning brakes are a common source of fire.
- Some operators inadvertently leave hand brakes applied.
- Ensure all brakes are inspected for overheating and are well maintained.



FIRE LIGHTERS: Exhaust system

- Keep exhaust pipes and mufflers clean and free of dust and chaff.
- When modifying exhaust pipes and mufflers avoid creating additional entrapment points.
- If the engine fan is directed over the exhaust, ensure air flow is sufficient to keep it clean.
- Consider exhaust system surface treatments including multiple coats of fire-retardant paints or ceramic coatings to keep surfaces smooth and minimise dust settling and creating incendiaries.
- Insulating products can be an option but coatings, casts or blankets should not entrap dust or flammable materials.



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FIRE LIGHTERS: Turbo-chargers

- Dust and chaff on exhaust manifolds and turbochargers is a common source of engine fires.
- Engine fans should keep manifolds thoroughly clean but check all recesses for dust accumulation. Some manifolds are shielded but dust will still settle on hot parts, with the shield preventing the fan from cleaning it away.
- Surface treatments including paints and ceramic coatings will create a more slippery surface, which will assist cleaning from the fan.



CLEAN-DOWN: Get the gear

- Use a large air compressor for blowing down a machine but ensure the appropriate safety equipment (dust mask and eye-protection) is worn.
- A high-capacity air compressor with a long hose can clean down a machine in minutes.
- Remember to wear the appropriate personal protective equipment (PPE) including eye, dust and hearing protection.
- High-capacity battery-powered blowers can be a good option for intermediate blow downs. They can even be kept in the cab if needed regularly.



CLEAN-DOWN: Top down approach

- When cleaning the harvester, open the appropriate panels but leave the engine cover closed.
- Start at the top of the machine and blow out all dust and chaff.
- When clean, repeat the process with the engine cover open to avoid blowing excess dust into the enclosure.



CLEAN-DOWN: Working around

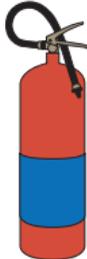
- With the top of the harvester blown down, work around the machine, opening all panels and blowing out as pictured.



FIRE CONTROL: Be prepared

- Check all fire extinguishers are in place and fully charged.
- Familiarise all operators with correct procedures for extinguisher use.
- Always have a trailed or mobile fire-fighting unit on-hand ready in accordance with shire or state regulations.
- Integrated fire suppression systems for harvesters are worth considering.
- Powder extinguishers must be recharged whenever partly used as powder will settle on the seal and partly used extinguishers will lose pressure.
- Rotate powder extinguishers annually to prevent settling.

Fire control: Extinguishers

CLASS	TYPE OF FIRE	EXTINGUISHER TYPE						
		Water	Foam	Powder ABE*	Powder BE*	Carbon Dioxide	Vaporising liquid	Wet Chemical
								
A	Wood, paper, plastics	✓	✓	✓	✗	Limited	✓	✓
B	Flammable and combustible liquids	✗	✓	✓	✓	Limited	Limited	✗
C	Flammable gases	✗	✗	✓	✓	Limited	Limited	✗
E	Electrical fires	✗	✗	✓	✓	✓	✓	✗
F	Cooking oils and fats	✗	Limited	✗	Limited	Limited	Limited	✓

*Tip powder extinguishers upside down every six months to prevent powder settling. If there is a thumping sound, powder has clumped and will not pass through the nozzle.

Emergency contacts

■ Note your local Fire, SES and Hospital numbers or UHF channels here for quick access.

Name of Emergency Dept	Contact Number or UHF channel
FIRE	
LOCAL HOSPITAL	
SES	

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FOR FURTHER INFORMATION:

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USEFUL RESOURCES:

Tips to avoid harvester fires – Update paper: grdc.com.au/resources-and-publications/grdc-update-papers/tab-content/grdc-update-papers/2017/07/tips-to-avoid-harvester-fires

groundcover.grdc.com.au/innovation/climate/prepare-to-minimise-fire-risk-this-harvest

groundcover.grdc.com.au/grower-stories/southern/fire-fright-leads-to-emergency-lift

Reducing the risk of Harvester Fires – Ben Wundersitz, Maitland, SA – youtu.be/WqTfR2ifM1I

Harvester Forum: Reducing the risk of harvester fires – Ben White – youtube.com/watch?v=PTJijRzq9HY

Photos courtesy Kondinin Group unless otherwise specified.

GROUND COVER DIRECT How to order

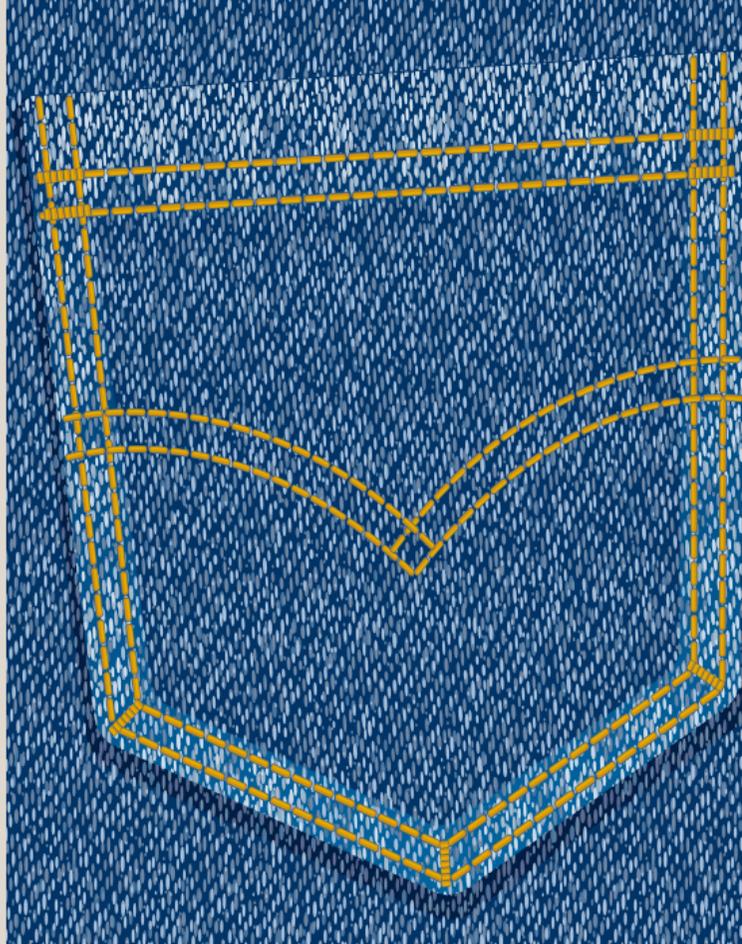
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