REDUCING HARVEST FIRES

GRDC
GRAINS RESEARCH & DEVELOPMENT CORPORATION

NATIONAL

THE BACK POCKET GUIDE

Introduction

- 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, face the harvester into the wind and evacuate promptly.
- The benefits extend further than reducing the fire risk. A more pro-active maintenance and inspection programme will 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.

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, replace them at the end of the day 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. 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-suppressing 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.

9 Observe the **Grassland Fire Danger Index** (GFDI) protocol on high fire risk days.

10 Maintain **two-way or mobile phone contact** with base and others. Keep an eye out for hazards on machinery during the season.

Grassland Fire Danger Index (GFDI)

This table indicates the maximum average wind speed for a given temperature and relative humidity level at GFDI 35. If wind speeds over those indicated occur, harvest operations must cease. South and Western Australian grain harvesters must cease operations in these conditions but the guidelines are equally useful for other states.

GFDI(35) average wind speed limits

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 (KP 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	
TEMP °C	5	10	15	20	25	30	40	50	60	65	RH%*

1 2 3

***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 26kph.

Did you know

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

- Note: Wind speed must be averaged over ten minutes.

ACKNOWLEDGEMENT: CFS SOUTH AUSTRALIA

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.

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).

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.

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.
- Some heat-resistant paints 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.

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.

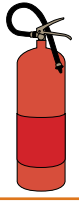
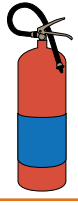
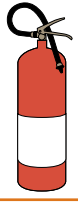
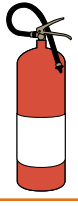
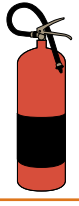
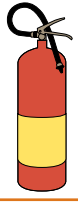
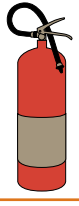
CLEAN-DOWN:
Working around

- 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.

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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USEFUL RESOURCES:

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

Reducing the risk of Harvester Fires – Ben Wundersitz, Maitland, SA –
https://www.youtube.com/watch?v=WqTfR2ifM1I&feature=youtube_gdata_player

Grassland Fire Danger Index (GFDI) – http://grainproducerssa.com.au/producers/hot-topics/know-your-code/

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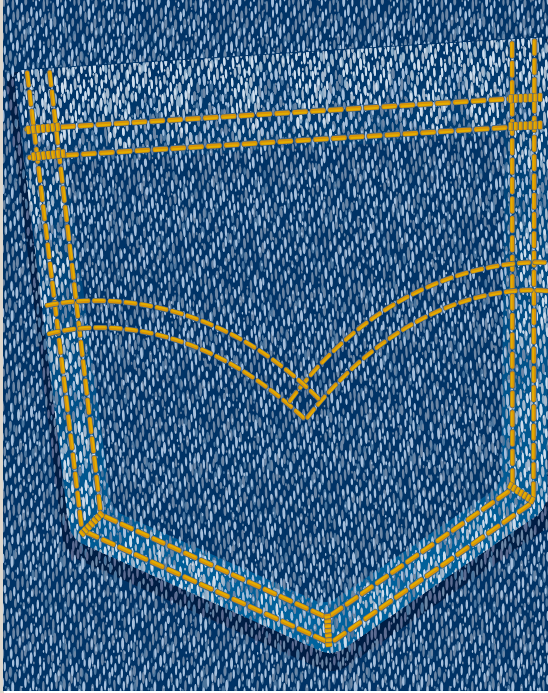

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