Farm fire prevention – New solutions to an age-old risk

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A farm fire is something no one wants to think about, but it's an ever-present risk to farming operations. As farm buildings have grown and the costs to build have increased, the need to take action to prevent farm fires has never been more critical. The good news is that new technology and improvements to electrical equipment can help reduce the chances of a farm fire if we adopt them in new and existing buildings.

Data on farm fires is challenging, but the general trend has seen a decreasing number of farm fires each year. The cost of replacement (buildings and livestock) continues to be estimated from 30 to 35 million annually. The trend towards specialty-built hay storage facilities has helped reduce the livestock losses once associated with fires in mixed-use buildings.

What are the leading causes of farm fires?

David Colyn of Trillium Mutual Insurance shares some observations from their claim experience over the past few years, "Although 72% of the fires were deemed as "cause undetermined," we know from eyewitness accounts the circumstances leading to those fires were electrical. The other 28% of fires were due to grinding/welding, charging batteries, and work with tractors, straw and other combustibles inside farm buildings."

A few years ago, the Ministry of Agriculture, Food and Rural Affairs (OMAFRA) brought together several agencies and groups to address the potential for life and property loss by identifying best practices in the industry and potential regulation changes. The committee published several excellent resources worth sharing with family and staff: Reducing the risk of fire on your farm and an excellent factsheet and video series, 10 Ways to Reduce the Risk of Barn Fire.

In this short article, we will focus on five leading causes of fire:

1) **Fires from accumulated dust and combustibles**

Recommended maintenance and housekeeping

- Regularly use a leaf blower to remove highly combustible materials such as cobwebs and dust from light bulbs, building surfaces, equipment, etc.
- Regularly sweep up hay, straw and other loose combustibles.
- Routinely clean fans, grain augers and other motors with compressed air.
- No smoking in or around barns; have a designated metal bin for butts in a designated area.

2) **Fires from corrosion of electrical equipment**

- The Electrical Safety Authority (ESA) has investigated the challenges with electrical systems and commented that the corrosive environment found inside barns is the leading cause of degradation or failure of electrical equipment: moisture and corrosive gasses.

The degradation is typically corrosion of the exposed metal components such as electrical boxes and receptacles. Data from Trillium Mutual points to fires starting in and behind electrical panels that have corrosion or moisture issues, leading to resistance and overheating.

- An electrician should inspect electrical panels every few years as connections can corrode or become loose and cause heating.
- Inspecting electrical equipment with FLIR-style thermal imaging is a reliable way to indicate corrosion and arc heating in panels and receptacles without opening each one.

3) **Fires from direct ignition from equipment sparks from welders, grinders**

- Hot works such as arc welding, cutting with torches or grinding are common causes of fires, particularly inside farm buildings where combustible materials or manure gases are present. Special care must go into the preparation of repair work and the direction of the inevitable sparks generated.
- Sparks from penning repairs falling into under-barn manure storages have caused explosions and fires in Ontario livestock barns.

4) **Fires in hay storage (Summer)**

Dan Carlow OMAFRA, Manager at the Innovation, Engineering and Program Delivery Unit, reported that in June and early July of 2023, there were several hay storage fires in the London and surrounding area.

- Spontaneous combustion may occur if the hay crop is stored above 20-25% moisture content and the heat does not dissipate. Lorne Lantz, a hay producer in the Wellesley area, reminds us to: "check the stalks for moisture." Lorne reminds us to be patient and wait until they're dry enough; his time-tested method of stalk moisture testing is to bite on a few stalks; if they're crunchy like celery, they're still too wet to bale. Lorne is also a big proponent of ventilation in the stack to dry the moisture out of newly stored hay if possible.
- A hay crop placed too wet into storage will heat rapidly. If air is restricted and the internal temperature rises above 130°F (55°C), a chemical reaction occurs and does not require oxygen. Still, the flammable gases produced are at a temperature above their ignition point. These gases will ignite when they come in contact with the air.
- Refrain from storing hay in a multi-use structure connected to a livestock barn. Although once thought convenient in our old bank barns, the history of fire has shown that separate structures for hay storage are a better long-term strategy.

5) **Fires from tractor/generator block heaters and extension cords (Winter)**

- Every winter, January fires can be traced directly to block heaters or their extension cords
- Inspect block, oil pan or rad hose heaters and their cords, check for cracks and wear marks and replace them regularly. Your tractor might last 20 years, but the cords in the hot engine bay will not and need to be replaced.

- Block heaters can draw 1,000 to 1,500 watts, creating a lot of heat in an extension cord. Use only short extension cords because of the load and ensure they are 12 gauge (best) or 14 gauge and certainly not light duty 16 gauge cords.
- Regular maintenance and some knowledge can help keep your block or oil-pan heater operating correctly and reduce the fire risk.
- Refrain from storing tractors in multi-use buildings connected to a livestock barn. (lessons learned from hay storage)

What have we learned?

We have learned that moving away from multi-use barns to specialized buildings for each specific purpose, livestock housing, hay storage, and machinery storage offers a better strategy for reducing fire damage in the long term. Specialized designs can identify and mitigate the risks associated with its use. Separate buildings provide a physical fire break as opposed to joined structures. Ontario Fire, Electrical and Building Codes codes govern farm building design and amenities. These codes all have special provisions for farm buildings as low occupancy structures, but as farm buildings increase in size, become more complex and have more staff, the need to improve health and safety is working its way into code changes for the future. Examples from recent electrical code updates include the adoption of more NEMA 4X electrical connections in barns.

What is NEMA-4X? – Gasketed door enclosure intended for indoor or outdoor use primarily protects against corrosion, windblown dust and rain, splashing water, and hose-directed water, undamaged by ice forming on the enclosure. NEMA4X are the most common enclosure in "food" environments. NEMA 4X plug ends and receptacles are less prone to corrosion over regular cord ends from moisture and barn gasses.

Changes to the Ontario Fire Code (OFC) will impact farm buildings:

Proposed changes to the Ontario Fire Code will impact new farm buildings which previously had an exemption as low occupancy structures. Proposed changes would introduce OFC compliance on new farm buildings over 600 sq. m. - a new authority having jurisdiction on farm properties; this would include OFC compliance on early detection and fire suppression systems and risk assessments of farm properties related to electrical/mechanical systems. For example, completing annual audits on such systems for fire prevention and considering storage, identification, and fire safety requirements for hazardous goods. (Canadian Farm Builders Association 2023)

How can new technology help reduce farm fires?

1. Better materials:

a. NEMA 4X electrical equipment, plug ends, receptacles and enclosures use better metals and are much less prone to corrosion and, thus, the heat buildup of standard-grade receptacles.

b. A better choice of non-flammable building materials (less wood) and plastic for wall and ceiling liners will preserve the integrity of the building. i.e. less truss plate corrosion and water intrusion (rot).

2. Know your electrical systems:

Consider monitoring the health of electrical systems. New monitoring systems from companies like PrevTech.ca; Maximus, Monitrol.com (FarmGuard) offer electrical system monitoring and anomaly detection.

The equipment installed at your electrical panel detects electrical anomalies and faults throughout your farm. This knowledge allows you to respond appropriately to reduce or eliminate the problem. The leakage of current from malfunctioning equipment and increases in the temperature of corroded electrical components can be an early indication of a fire risk.

Electrical current leakage is due to faulty equipment while overheating of an electrical panel is due to poor contact. Leaks of electricity and imbalances or spikes when a bad motor starts or stops can all indicate potential fire risk. Recent work with Ontario Mutual Insurance companies shows that this type of monitoring equipment has detected faults, some of which were critical and would have resulted in fires. Their clients now have impressive safety records. There is assurance in maintaining healthy electrical systems on-farm.

3. Look at new automatic fire suppression systems for specific high-risk areas:

Farm fires are often impossible to extinguish once they get established. Still, new extinguisher systems can protect enclosed spaces like tractor bays, workshops, engine compartments or electrical service areas to extinguish fires as early as possible. Several new systems are available to protect high-risk areas on the farm that can dispense suppression agents if triggered by heat from a fire.

The new system from Proteng.com offers heat-sensitive hoses filled with pressurized fire retardant. The product needs no electronics, ordered from the manufacturer in different lengths and melting temps. Still, when melted by a fire, it will release a blast of suppression chemicals into the engine compartment, extinguishing a fire in its infancy. It minimizes fire damage by effectively extinguishing a fire at its initial stage by eliminating heat. It was designed to protect race car drivers and motor homes and can also work for engine compartments, generator rooms and electrical panels, solar inverters or battery areas. Proteng is a cost-effective solution for fire suppression that is non-toxic, non-corrosive and leaves no residue. It's the fire equipment that is always on standby.

Other suppression systems by Tungus.ca are designed to suppress a fire in a larger shop/tractor bay. The system can be controlled with a manual panic button by the exit door or a thermal trigger on the ceiling-mounted unit. Tungus products are also designed to be on constant standby and do not need an electrical connection or batteries to release a burst of fire retardant onto a fire quickly. They are compact and sized for your application shop bay or garage.

Also new to the market and distributed by PREVTEC.ca is the ELIDE fire extinguishing ball, a self-activating extinguishing ball that provides far more advanced solutions than portable extinguishers. It's easy to use and self-activating in flame and can be mounted to a wall or ceiling in high-risk areas or tossed into a fire. It is also ideal for service rooms, engine compartments, generator rooms, fueling areas, shops, farm equipment storage areas or any other fire hazard area.

Timing is everything in trying to extinguish a fire, and these passive systems offer continuous protection for higher-risk areas of your farm and the ability to discharge fire suppression products directly on a fire

in seconds. In addition to alarms, consider a passive fire suppression system for your service, electrical, boiler or pump room.

4. Use FLIR thermal imaging equipment to inspect your electrical system:

Through your insurance company or with a trained technician, you can use thermal imaging equipment to examine parts of the electrical system for heat buildup. Breakers, panels, motors, receptacles and wires can be inspected with this thermal technology and help determine where corrosion leads to resistance buildups that might become a fire hazard. FLIR can also be used for other maintenance purposes to look for overheating in motor bearings etc.

With millions of dollars of capital invested in our farm buildings and machinery, time and a few dollars spent trying to prevent farm fires has an incredible ROI.