Risks associated with the use of plastics in the wine industry

Much has been written about the hazards of plastics in construction, yet it is only when extreme fire events occur that it really gets noticed (public domain) – and when innocent people are killed, and the media takes hold, then it becomes a crisis. But for how long?

At present, the Aluminium Composite Paneling (ACP) crisis is dominating headlines. The building industry is also a focus, with its poorly constructed buildings, and building certifiers being targeted. That is another topic, but no less important, which I won't cover now.

Insurers and risk providers have always been focused on combustible construction, particularly plastics, due to its extremely high combustible loading, and the destruction it has caused when involved in a fire.

Like any business, the insurance industry must protect its bottom line – namely the costs associated with the risk to its customers. Whether it is a good, fair or poor risk, all property risks must be assessed from a property asset protection standpoint, something I have been involved with at AXA XL Risk Consulting and other risk insurers over the past 25 years.

So why are insulated panel buildings needed? Food and beverages may need to be cooled before, during and after production and thus the processing and storage areas require insulation.

The use of sandwich panels in various food and beverage industries has been prevalent in the past 30 to 40 years because it's cheap, easy to erect and has good insulation properties. Plastic insulated panels have been involved in many fires, generally destructive ones, which have caused significant property insurance losses, loss of life, and for many employees to lose their jobs.

Although not a winery, there was a recent property loss concerning Thomas Foods In Murray Bridge in South Australia – The fire occurred on January 3, 2018.

According to news reports, an employee had been working (welding) on an offal bin. They tried to put the fire out but unfortunately it got into a highly combustible wall (believed to be EPS) and spread quite rapidly.

According to assistant chief fire officer Phil Kilsby, Mr. Thomas said no-one was blaming the worker for what happened.

"It was an accident, it's a family business and I have made plenty of mistakes myself," he said. "I'm relieved there is no injury or loss of life and very proud of how everyone responded."

Mr. Thomas conceded the fire was a huge setback. A brave comment no less, but it was a costly loss for all concerned in the insurance industry and the company itself.

But it is not always about insurance and corporate financial loss.

The plant was a major local source of jobs, employing about 1,500 workers at the time of the fire, but that number was reduced to just 60. It is understood a new plant is expected to be up and running by the end of 2020. Unless the workers found alternative employment, that is almost three years without a job!

Types of Plastics in Construction

The most commonly used plastics in the Winery Industry include:

- Expanded Polystyrene (EPS) – most common
- Expanded Polyurethane (PUR)
- Sprayed-on polyurethane (PU) – being used less
- Polyisocyanurate (PIR) – usage becoming more common

In the wine industry, plastics can be found in barrel cellars, fermentation cellars, finished goods warehouses, cool rooms, wine tanks, wine transfer lines and portable buildings.

Before the use of EPS, sprayed-on polyurethane (PU) was popular for insulating the internals of steel framed buildings and as an outer lining of wine tanks. The use of EPS and PU in wineries each have their unique risks and have contributed to the high cost of insurance.

Insulated sandwich panels in buildings can range in thickness between 25mm and 600mm thick (100mm to 250mm most common) consisting of an insulation core between steel (0.3mm – 0.6mm) sheets, which are glued to the core.

This contrasts to ACP, which is grabbing the headlines now, which has 0.5mm thick aluminium sheets covering only a 3mm to 4mm polyethylene core. The difference in combustible loading and heat release rate between the ACP and EPS is very significant.

Since EPS is difficult to ignite the frequency of actual property losses is low, but the severity of the loss is high. EPS requires at least 25KW/m² of radiant heat exposure for ignition. Since EPS is a thermoplastic, it melts at 200°C but does not start to decompose and vaporize until it reaches 360°C.

It is for this reason that many facilities have close calls or near misses – the EPS melted but didn't get hot enough to vaporize and start burning, or it did vaporize but didn't escape the panel.

It should be noted that often management will focus on the probability of a fire occurring and not the consequences of that fire. But management can never say that it would not happen, and it is the consequence of the loss that insurers must bear.

Once ignited, EPS burns rapidly. Panels lose integrity, joints open-up, vapours escape and the panel sheets begin to exfoliate. The melted polystyrene is akin to a flammable hydrocarbon and pools beneath the panel, remaining in place to further add to the fuel load. In most cases the result is extreme and devastating, and very costly.

Since exposed PUR is a thermoset plastic, it does not melt but chars on contact and burns across its surface – if the PUR forms the lining of a wall or roof, the installed sprinklers (if installed) at roof level are ineffectual since the burning will occur faster than the sprinklers can operate.

Apart from damage from fire and heat, acidic, black smoke from burning plastic can cause non-thermal damage to electrical equipment and computers. The loss may not be immediately evident until later. Sensitive parts experience corrosion from the acidity in the smoke.

Here is a video showing the hazards of EPS and PUR.

http://www.youtube.com/watch?v=tuUFg3MQhbk

Polyisocyanurate (PIR), which is also a thermoset plastic, is also combustible but contains fire retardant. Some PIR has obtained FM (insurer) Approval status and can be considered to not contribute to the fire load if automatic sprinklers are installed. FM Approved PIR panels must be tested according to FM specifications – manufacturers cannot just purchase the core insulation and add their own metal facing. The FM approval must be issued for a structure that references the scale and type of fire test for the issued approval.

Mineral Wool and Rock Wool are examples of non-combustible insulation but are not necessarily suitable for tank insulation due to the moisture absorption properties.

Why have combustible plastic panels been permitted in the past?

Well it's complicated! – something that is currently being looked at by building industry professionals.

From a building codes perspective, it is understood insulated sandwich panels were originally treated as a lining and not as a structure.

The statutory building codes focus on construction, protection and surveillance needs according to life safety. According to the National Construction Code and the Building Code of Australia, walls of warehouses (e.g. barrel cellars, finished goods) and factories (e.g. fermentation and packaging plants) under three stories in height are not required to have a fire resistance level. Based on these two facts, builders had an increased range of materials available for use, including insulated plastic panels.

The building had already been constructed when the insurance companies or their risk provider became aware of the risk. Companies in Australia have not always included an insurance risk provider in their Management of Change (MOC) process for new building construction.

Although approved as compliant according to the NCC, insurance companies in their risk assessment of the newly constructed building with large values and significant business interruption exposure, discovered it had combustible construction and albeit higher risk of a fire.

What can a site do to improve its risk if it contains plastic construction?

Automatic Fire Protection – Are Automatic Sprinklers an Option?

For best protection, automatic sprinklers are recommended for existing buildings constructed from EPS, PUR and PIR sandwich panels. However, the cost of the sprinkler system and required-water supplies (fire water tanks) where plastic construction is present can be prohibitive in comparison to the risk.

As mentioned earlier, sprinklers may be ineffectual with PU lined buildings – removal of the PU or affixing a thermal barrier over the PU are options to reduce the risk of fire causing significant damage.

For new buildings, choose non-combustible construction and provide fire protection according to the hazard within the building.

Management programs and low-cost actions to reduce risk

As an alternative to the high cost of fixed protection, the following can be considered:

1. Pay close attention to fire prevention

- Develop a hot work permit system – identify sandwich panels as a special hazard.
- Ensure staff are aware of how to use fire extinguishers and hose reels.
- Where possible and practical, maintain a 1m gap between panels and storage.
- Maintain electrical equipment in good working order.
- Ensure there is 1.5m clearance from panels to any heaters or cooking equipment.
- For switchboards mounted on sandwich panel walls - consider moving these or having them checked for overheating on a regular basis.
- Implement documented housekeeping procedures for ensuring combustible materials such as pallets and packaging are removed regularly.
- Manage flammable liquid hazards. Keep flammable liquids away from areas with sandwich panels and use approved flammable liquid containers and flammable liquid storage cabinets.
- Keep smoking activities away from panels, even if outside.
- Prohibit storage in roof or ceiling spaces above sandwich panel construction.

2. Maintain panel integrity (no openings)

- Wherever practical avoid penetrating the panel; use surface mounted equipment, cabling and lighting.
- Route any cabling on the surface of the panel in a metal conduit.
- Repair any impact (e.g. forklift) damage as quickly as possible.
- Implement regular inspections and reporting of panel damage.
- Ensure cables are in metal conduits when they pass through the panels.
- Always cover any exposed plastic core material with sheeting or metal collars.
- Ensure panel edges are flashed around recessed lights.

- Take care with heated flues and pipes penetrating the panel. Use a non-combustible panel in the area where the penetration occurs. If this is not practical, consider removing the core material around the flue and leave as an air gap or fill with non-combustible material.
- On plastic insulated tanks, seal the underside of the skirt with metal sheeting

3. Prevent premature panel failure

- Do not use aluminium rivets.
- Do not use nylon bolts.
- Specify panel joints, including spacing of riveting.
- Firmly support panel (through-bolting) at top and bottom edges so that it will remain in place during a fire.
- Support panels off main load bearing structures, not other panels.
- Do not use panels to support or suspend pipework or other loads.
- Provide flame barriers (or replace panels with a non-combustible type) over panels for specific risks such has cooking equipment, battery chargers, heated process pipes, or ducts.
- For new construction consider the use of non-combustible or less combustible alternative panel materials.

4. Prevent/minimise core material involvement

- Consider using alternative panel materials.
- Providing 'fire breaks' by replacing sections of combustible panel with non-combustible panel.

Special Considerations

Siting of Portables – When construction is planned, and low-cost portable buildings are needed for construction operations, sometimes these portables are located for convenience near buildings, structures, pipe racks and the like. Alternatively, the portables are needed for yard operations of the winery.

Portable buildings can be set up as offices / crib rooms and usually contain the same ignition sources as normal buildings such as desks, chairs, papers and books, desktop computers, electrical power points, switches, lighting, cooking appliances, etc.

To avoid introducing a fire-risk close to an important building, structure and the like, care should be taken to ensure these portables are constructed of non-combustible materials - insulated plastic panels should NOT be used.

Alternatively, any portable combustible building should be sited at least 30m away from any important structure.

Upon Reflection

The use of plastic construction in the Winery Industry has been extensive. In most instances its use by companies has gone unchallenged due to an inconsistent interpretation of building regulations, reliance on statutory standards that mostly rely on life safety, and a lack of consultation with insurance risk providers.

Notwithstanding, options are available to winery owners, managers, engineers and the like to address the heightened risks with plastic construction. A multi-faceted approach to risk reduction will depend on the importance of the facility, physical protection in place, implementation of management programs and the many available low-cost maintenance and operating procedures.

APPENDIX

AXA XL Risk Consulting Assessment

AXA XL carry out surveys for property loss prevention purposes and evaluate the following:

- Construction
- Occupancy
- Automatic Protection – Sprinkler Systems
- Water Supplies
- Surveillance and Automatic Detection – guard rounds and security alarms, smoke and heat detection, fire alarms
- Manual Fire Fighting and Special Extinguishing Systems
- Exposure
- Specific Hazards
- Management Programs

Loss Estimates are prepared based on the above evaluation and each of the above categories are assigned a risk rating.

Risk recommendations are made where relevant and appropriate to reduce the frequency and severity of the risk.