



MOTHBALLING DURING THE COVID-19 PANDEMIC

*Extended Property Closure
Preventive Measures*

*Protect your organization with the
help of these preventative measures.*



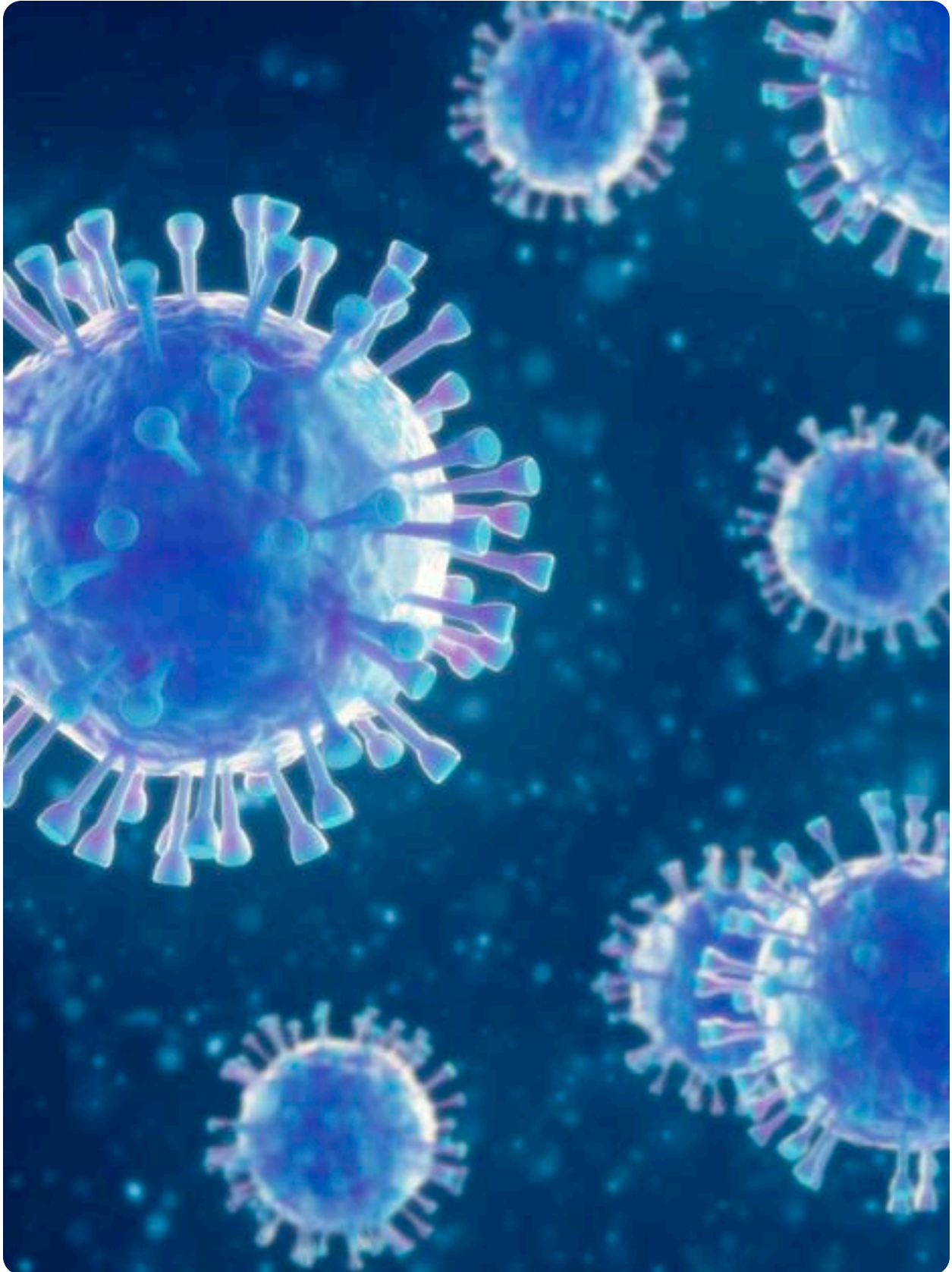
Now that we are getting through the first full quarter of COVID-19 lockdowns, the effects of the pandemic on our energy companies and associated industrial firms may be significant. Goldman Sachs says S&P 500 earnings during the second quarter of 2020 will plunge approximately 60%. Travel bans, work from home, cancelled vacations and disrupted supply chains all mean some direct or indirect impact on the pocket books of large or small corporations. Low oil prices, poor corporate earnings and uncontrolled spread of Covid-19 may force some companies to shutter their operation, resulting in vacant or abandoned buildings and idle plants. Long-term unplanned shutdowns can significantly increase the vulnerabilities involving accidental losses.

According to the Center for Chemical Process Safety (CCPS), process safety incidents occur five times more often during startup than during normal operation. On July 1, 2020, an explosion at the 6,000 megawatts NLC India Power Plant in southern India killed six people and injured 46 others. The incident happened while the plant was shut down. In May, at least 12 people were killed by a massive leak at the LG Polymers factory in India. The leak happened as the plant prepared to start up after six weeks of shutdown due to COVID-19 pandemic.

Most large companies have business continuity plans, but they may not include remediation for the unknowns and uncertainties of an outbreak such as COVID-19. These plans do not generally include protection of assets like buildings and equipment if the shutdown occurs for an extended period of time. The COVID-19 pandemic became a global health crisis nearly four months ago, and property owners still face the dilemma of an unknown, prolonged closure. Older buildings and plants are the most vulnerable to accidents during the startup, especially after an unplanned and extended period of shut down, and even more so if the plant or the building was not properly prepared for mothballing. There is a significant difference between mothballing and just locking the doors and walking away.

Mothballing was first invented back in late eighteenth century, when people stored small balls of naphthalene among fabrics to ward off moths. The term was popularized after the end of World War II, referring to “as lay up or disuse.” In the context of property assets, mothballing refers to maintenance measures that have been taken to prevent deterioration of building/equipment and its essential functionality in facilities that have been shut down and/or deactivated. Mothballing requires planning and preparation, the extent of which depends on the length of time the building or the plant will be out of service. Both buildings and plants need some level of care, even when empty or nonoperational.





MOTHBALLING PROCESS

Mothballing a building requires consideration of architectural, structural, and MEP features as well as the effects of weather, corrosion, and ventilation on these existing features. Mothballing a building or facility consists of three key phases: deactivation (shut down), inactive (mothball), and reactivation (startup). Depending on the type of building occupancy and the complexity of its operation and equipment, the Business Continuity Plan should include the following core components:

- + Assessment and documentation of the facility's current condition.
- + Maintenance office, life safety, mechanical integrity of equipment and environmental conditions or requirements.
- + Detailed guidelines/checklist for preparing, maintenance and startup of the facility.

There is usually an extensive checklist to prepare buildings and equipment for proper mothballing. Additionally, the plant personnel should have specific roles and responsibilities during the startup process.





Facility Mothball Plan Development

For low hazard occupancies – such as office buildings, hotels, warehouses, churches and retail facilities – a mothball plan should include the following three steps:

- 1. Deactivation of facility**
- 2. Maintenance during the inactive status**
- 3. Reactivation of facility**

Each step should include the following:

- + Building Structure
- + Fire and Life Safety Equipment
- + Environmental
- + Plumbing Systems and Equipment
- + Mechanical Systems and Equipment
- + Electrical
- + Communication Systems
- + Food Service Equipment and Storage
- + Office Furnishings

The discussion in this document will breakdown the type of occupancies in two groups:

- + Low hazard occupancies – such as churches, office buildings, warehouses and retail facilities, etc.
- + High hazard occupancies – such as chemical and petrochemical facilities, power plants and high-end manufacturing facilities etc.

As previously discussed, the majority of small to midsize property owners were unprepared to deal with extended business closures due to the COVID-19 pandemic. Even large companies with well-written business continuity plans and emergency management plans were caught off guard with the magnitude of the COVID-19 crisis and the length of time it will take to recover from this unprecedented event. These events impacted small to midsize companies the most, especially religious and nonprofit organizations, who have limited resources and expertise for such planning.



MOTHBALLING LOW HAZARD OCCUPANCIES

The COVID-19 outbreak resulted in overnight shutdown for occupancies involving public gatherings, such as churches and other religious organizations, offices and retail buildings including restaurants and hotels, unless they were deemed as essential services. In most cases, unprepared business owners they had to lock the facility and walk away, following the government's lockdown instructions. Faced with uncertainty and financial distress, the proper mothballing procedures were not a top priority. In order to protect important and expensive assets, such as buildings, a business needs to have a protection plan in place to mitigate the effects of required long-term closure. It is important to include mothballing into corporate business continuity plan.



Buildings – General Occupancies

Maintaining heat and air conditioning systems where practical is one of the best ways to protect buildings. Sprinkler systems and fire detection systems should remain active as well to control potential fire damage.

Additional measures that should be taken to protect buildings include:

- + The building's interior temperature remain above 55°F.
- + Dehumidification should be maintained either through air conditioning or through dehumidification systems.
- + Water should be run through plumbing fixtures, sinks, toilets, etc. once a month, if these systems remain operational.
- + If the plumbing is shut down, the system should be drained and blow-dried with warm air. Some taps should be left open to promote drainage, should leakage occur.
- + Shut off all but essential lighting.
- + Install Class VII material in switch panels, etc. along with bags of desiccant.
- + Laboratory services – such as gases or water – should be normally drained, flushed and dried with warm air.
- + Fume hoods should be cleaned and sealed against the ingress of moisture and air. Oil all pumps, motors and fans.
- + Books, drawings, specifications and miscellaneous paper are generally stored in fire resistant locations, such as a vault or heated warehouse. Sprinkler systems may cause damage should they accidentally open, so documents should be stored in fire resistant cabinets that also provide some water resistance.
- + In areas subject to high snow loads, make plans for snow removal from roofs either through use of electric tracing or periodic shoveling.
- + In areas subject to high rainfall, make plans for inspection of all roof drains, roof and vents after each storm.
- + Windows may require protection by boarding or covering with other materials.
- + Screening roof vents helps prevent wildlife from entering buildings.
- + Remove all debris from the roof and clean all gutters and downspouts to prevent pools of water collecting on the roof.
- + The police and fire department should be notified that the building is being mothballed.
- + Remove all hazardous materials from the premises.
- + Flood mitigation procedures – such as sandbags and floodgates – may be required at a facility, depending on the severity of a storm. Building inspections should take place following a storm to identify any damage that may need to be addressed. The applicable disaster preparedness plan should be consulted prior to and after major storms for guidance.



Churches

The protection of stained glass, artifacts and musical instruments from theft and vandalism should be included in church continuity plans.

Measures that should be taken to do so include:

- + Security, maintenance, and monitoring are imperative implementations to provide an environment that is safe and secure.
- + A sufficient ventilation system needs to be provided and maintained.
- + Cover stained-glass windows from the outside to protect them from potential weather conditions, airborne objects or vandalism.
- + Windows and door frames should be sealed properly to prevent the intrusion of moisture and pests.
- + Trees, shrubs and other vegetation should be trimmed and cleared to prevent brush fire.
- + Significant architectural elements should be protected stored at a safe place.



Warehouse

Components in warehouses are best stored under warm, dry conditions. Heat should be left on in buildings and air conditioning or humidity control may be employed.

Maintenance of warehouse facilities is critical during a mothball period. Large storage warehouses may be equipped with sophisticated and computerized conveyor system. They may also include data storage facilities within the building.

Additional risk control measures include:

- + Light bulbs should be used in storage bins to prevent condensation and corrosion.
- + Any hazardous or flammable materials should be locked up in UL approved cabinets or removed.
- + All gears, shafts, etc. should be greased with Class IV (a) material.
- + Flange faces of valves, pumps, etc. should be coated with Class II or Class III material and covered with a hard material such as plywood.
- + Components should be stored in racks or in bins with the identification clearly indicated in each storage area.
- + Desiccant should be placed in electrical cabinets, relay cabinets, etc. Cabinets should be covered with plastic sheeting as a dust cover leaving a two-inch gap all around the bottom for ventilation.
- + All Bridge Cranes, Jib Cranes and Chain Hoists should remain in place. All hooks should be deployed to floor level and wires and or chains coated with grease. Bridge Cranes should be parked adjacent to points of support, such as runway columns or beam brackets.
- + Exhaust fans' entrances into the buildings should be sealed.
- + All fire doors should be in a closed position to compartmentalize any potential fire.
- + All fire and smoke alarms should be operational and battery operated. Batteries should be replaced prior to building closure.



MOTHBALLING A CONSTRUCTION SITE

If the construction work on a site needs to be shutdown/mothballed for an extended period of time, the insurance carrier and broker must be notified of the closure. Before closing a construction site, a project risk assessment should be completed to determine any additional measures required to safely secure the project.

The assessment should ensure:

- + Construction plant and equipment should be removed from the site. Where this is not possible, all construction plant and equipment should be parked or stored in a secure area outside of a flood risk zone.
- + Tower cranes should be taken out of service and mobile cranes should be demobilized.
- + Continued compliance with statutory inspection and maintenance requirements should be ensured.
- + All non-essential utilities, such as electrical and gas supplies should be isolated.
- + Site should be tidy and clear of all trash. All recycling collection points and waste storage containers should be emptied and waste materials removed from the site.
- + All excavations and ground work should either be backfilled or securely covered. Unfinished earthworks should be provided with weather protection and temporary drainage measures to control run-off.
- + Scaffolds should be formally inspected and scaffold boards should be secured to prevent displacement.
- + The weather durability of temporary weather proofing should be confirmed for the planned mothballing period. Temporary downpipes should be replaced with permanent ones wherever possible.
- + The stability of temporary perimeter fencing should be confirmed and entrance ways and gates should be locked.
- + High-value, portable plant and equipment should be removed from the site or securely stored in containers.
- + Additional perimeter signage and security lighting should be installed.
- + All building openings should be secured at the ground floor level.
- + Wet services fully should be fully isolated (supplies, storage tanks, pump sets). Pipework should be drained where the planned mothballing period is longer than two weeks, and anti-corrosion measures implemented
- + Materials should be removed from scaffolds. They should be stored away from the site perimeter and stacked so that they cannot topple or roll over.
- + Flammable liquids and gases should be removed from the site, including hazardous substances
- + Emergency Response Plans should be reviewed, and confirm that all contact details are correct.
- + Periodic site inspections during the mothball period should be arranged.





MOTHBALLING HIGH HAZARD OCCUPANCIES

For the safety and protection of plant personnel from COVID-19, a large number of industrial plants had to shut down following the CDC's recommendations. Proper shut down of a plant's equipment is crucial to its safety during and after the startup. To best preserve equipment, an extended shutdown and the storage of idle plant equipment should be treated as a significant event with extensive planning and budgeting.

Under normal operating conditions, environmental deposits in equipment may not cause any damage, but during a shutdown, they can cause corrosion and lead to severe deterioration. Corrosion in an idle process plant may be reduced by the selection and application of preservatives. It is important to control moisture, as it significantly contributes to pitting and other forms of corrosions which may lead to perforation of equipment, fouling and gouging of seating surfaces, destruction of electrical contacts, and the deterioration of buildings and other structures. Damaged insulation can result in heavy corrosion due to the ingress of moisture from rain or snow. Proper sealing of insulation is necessary, especially in marine or industrial environments.

Mothballing a chemical or a petrochemical facility requires a comprehensive analysis of plant operations and equipment. A high-level overview of the key plant components that should be addressed include:

Idle Period – The length of the plant may be idle affects all aspects of planning and costs associated with it. The longer the equipment is idle, the more protection it will require.

Equipment to be Protected – It is critical to maintain the insulation integrity for field erected equipment such as towers, crackers, spheres, bullets and storage tanks.

Heat Exchangers – Heat exchangers should be cleaned, subsequently dried to remove any moisture, and protected with inert atmosphere inside and insulation outside.

Piping – After flushing, draining and drying, large diameter piping should be protected internally with inert atmosphere. Underground piping, if cathodically protected, should also be protected with inert atmosphere.

Fired Heaters – A combination of inert atmosphere and protective compounds should be used to protect fired heaters.

Boilers & Associated Equipment – Depending on the length of time the plant may remain idle, wet and dry storage techniques may need applied. Although, wet storage techniques are usually for short term closures.

Mechanical Equipment – Pumps, compressors blowers, fans, extruders and their associated seal and lubricating systems should be protected or disassembled. Casings, valves, and rotors should be coated with various protection compounds, and oils should be circulated through the systems.

Reactors & Mixers – Machined surfaces should be coated, and heat should be maintained or provided inert atmosphere.

Electrical Equipment – Desiccants and vapor phase inhibitors should be used in cabinets or relays, and switchgear should be coated with grease.

Transformers – Verify the proper oil level during the deactivation process. Repair any leaks around the drain valve. Fill the space above the oil level with nitrogen. Leave it with a positive pressure of approximately 2 psig to aid with leak detection.

Flares – Flare system is generally protected to the flare drums with an inert atmosphere following flushing, draining and drying. If an inventory of flammable product is maintained in a plant, the flare system should remains operational.



Structural Members – Structural members should be thoroughly inspected. This includes towers and exchanger bases, anchors, bolts, pipe racks, cooling towers and all forms of support and protections including fire resistive coatings.



RECOMMISSIONING

Recommissioning is relatively simple, but it is a complex process for equipment. Recommissioning a plant or process unit after a long shut down can be prone to accidents, so it requires a methodical approach with planning and coordination of all plant operators. Individual process units should use checklists systematically to coordinate the startup. When mothballed properly, cleaning and returning equipment to use can be much easier. However, depending on the length of the shutdown, organic compounds may need to be removed and flushed out of systems. Plants shut down longer than twelve months may require a recommissioning program.

References: American Petroleum Institute (API), United States Chemical Safety Board (CSB), Center for Chemical Process Safety (CCPS), American Institute of Aeronautics and Astronautics – *Guidance on the Stand Down, Mothballing and Reactivation of Ground Test Facilities*

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