HOW TO SAFELY RESTART YOUR EQUIPMENT AFTER A PROLONGED SHUTDOWN

Businesses across Canada have taken significant measures to protect their communities from the risks of COVID-19. And no measure is arguably greater than shutting down their operations, either fully or partially, to abide by declarations of emergency and help stop the viral spread. After several weeks of shutdowns, and equipment sitting idle, businesses are getting ready to return to a 'new normal'. However, it's not as simple as flicking on a switch. Important safety measures should be followed before restarting your equipment.

IMPORTANT:

- This bulletin is not a substitute for a thorough risk assessment. The following content represents general guidance only.
- The content below should not be construed as a waiver of any terms, conditions, exclusions or other provisions of a valid policy of insurance, nor should they be construed as an extension of coverage not specifically provided for in a policy of insurance.
- Please refer to the terms and conditions of your policy for further details regarding your coverage. In the event of any conflict between this general guidance and your policy, the terms of your policy will govern.

Please find below some helpful tips to safely restart your equipment after a prolonged shutdown. And since employees should always be your first priority, start by focusing on the safety and well-being of your equipment operators.

Maintaining a culture of safety for equipment operators:

☐ **Refresh operator training and safety protocols to minimize chance of injury and equipment breakdown.**

The adage 'out of sight, out of mind' holds true when it comes to the safe operation of equipment after a period of absence from work!

ANCHOR RISKsolutions Corp.

© 2021 Anchor Risk Solutions Corp., a member of The Co-operators group of companies.
ANCHOR RISK SOLUTIONS® is a registered trademark of Anchor Risk Solutions Corp

☐ **Address any employee concerns around physical distancing protocols and the safe operation of equipment.**

For example, employees may be hesitant to get close to one another to demonstrate equipment safety protocols or keep watch over one another to ensure safe operations.

☐ **Train operators on how to safely use machinery while wearing Personal Protective Equipment (PPE), such as a mask, face shield, gloves, gown, etc.**

Ensure that PPE does not interfere with the operation of equipment or pose a safety risk to the employee – e.g. loose strings from gowns, reduced visibility due to face shields, etc.

☐ **Disinfect and sanitize shared tools, equipment, and vehicles (such as walkie-talkies, cherry pickers, forklifts, controls for gantry cranes, specialized scopes, etc.) prior to each use.**

☐ **Provide alcohol wipes (if recommended and safe for use in the work environment) and offer multiple hand washing stations and/or sanitizer dispensers throughout the facilities.**

Returning equipment to service:

If equipment has not been in use for a prolonged period (e.g. a few weeks or months), and then restarted, it may not work as it should. Here are just a few examples of why that may be[1]:

- Shafts may have moved out of alignment
- Pockets of corrosive materials may have formed at the base of storage tanks
- Equipment and/or piping may have corroded
- Instrument contacts may have covertly failed
- Rotating equipment shafts may have bent
- Seals may be degraded

Follow the best practices below to help mitigate against these risks.

Note: the following is not an exhaustive list of best practices and is not specific to any operation/business. As you begin to resume your operations, these guidelines may serve to assist in mitigating exposures associated with objects and lessen any further impacts to your businesses.

ANCHOR RISKsolutions Corp.

© 2021 Anchor Risk Solutions Corp., a member of The Co-operators group of companies.
ANCHOR RISK SOLUTIONS® is a registered trademark of Anchor Risk Solutions Corp.

☐ **Conduct an industrial operational readiness review for all equipment that has been shut down for a prolonged period of time to help eliminate breakdowns shortly after start-up[2].**

For most equipment, consult the operating or maintenance manual for specific guidance.

☐ **Review any locked out/tagged out equipment that may not have been repaired prior to the facilities shut down.**

It's important to check the integrity of such equipment prior to putting it back in service. Be vigilant even of minor equipment, such as broken ladders, as they can be overlooked and result in injury.

☐ **Follow typical startup procedures for air compressors – click here for an example. Ensure that the heart of your air supply system is in good shape prior to start up.**

According to Atlas Copco's Compressed Air Blog[3], most problems are minor and can be corrected with simple adjustments, cleaning, part replacement or the elimination of adverse conditions. Repair measures may include replacing filters and fluids, inspecting cooling water, adjusting belts and identifying/repairing leads.

☐ **Perform an ultrasonic (non-destructive) test on equipment to measure metal thickness, determine whether it has lost metal due to corrosion, and confirm if thickness is acceptable or not based on the original design.**

Equipment that should be considered for testing includes, but is not limited to: boilers, hot water tanks, compressed air tanks, deaerator tanks, steam accumulators, blowdown tanks, condensate receivers, cushion tanks and other vessels in wet service.

☐ **Perform maintenance on air elimination valves on your heating system prior to start-up.**

Both hydronic and steam systems are susceptible to the effects of air that can include creating an air lock and preventing heat transfer. Spirax Sarco attributes air and non-condensable gases to "… a lengthy warming up period, and a reduction in plant efficiency and process performance[4]." Performing maintenance on air elimination valves ensure proper start-up and reduces the maintenance workload during operations.

☐ **Follow the start-up procedures for your specific boiler. Also consider:**

- Arranging an internal inspection by a water chemical consultant, and your insurance inspector, prior to start-up
- Servicing/replacing your safety valve if due
- For additional standard start-up checks click here

ANCHOR RISKsolutions Corp.

© 2021 Anchor Risk Solutions Corp., a member of The Co-operators group of companies.
ANCHOR RISK SOLUTIONS® is a registered trademark of Anchor Risk Solutions Corp.

☐ **Closely monitor the level glass on your heating system cushion/expansion tanks to help ensure that there's sufficient air space (cushion).**

Cushion/expansion tanks are designed to absorb the increase in volume of the water in your heating system as the temperature increases. Little or no cushion can cause pressure relief valves to discharge because of the excessive pressure created by the expanding volume of water as it's heated.

☐ **Ensure safety valves are still functioning as intended.**

☐ **Check grease points on equipment and remove any excess.**

At times, operators may apply excessive grease to equipment while the equipment is left idle.

☐ **Perform vibration analysis to identify any potential brinelling defects (i.e. the permanent indentation of a hard surface) in motors and/or problems with equipment bearings.**

If a motor rotor or another rotary object has been idle for an extended period, bearings exposed to the weight of the rotor may have experienced unequal stress than other bearings elsewhere around the rotor[5]. As a result, the stressed bearing may lose their shape or may vibrate abnormally high during operation. Vibration analysis can help identify such problems.

☐ **Check the integrity of supports, such as hangars, braces, brackets, or elastic springs, that are used to hold and maintain equipment, whether that be natural gas heaters, or any process tank that may need a re-check before the system is re-loaded.**

☐ **Remove moisture from electrical cabinets and motors.**

Enclosure surfaces cool down below the dew point of ambient air during equipment shutdown, causing ingress of moisture in electrical cabinets and motor enclosures[6]. An effective method for preventing moisture in motors at rest, called "trickle heating," involves the application of a source of low-voltage, single-phase power to the 3-phase motor windings when the motor is at rest. This results in a low-energy, single-phasing condition that produces heat in the windings, rotor, and the shaft and the bearings[7].

An alternative to trickle heating is using a heat lamp or alternative heat source prior to starting up to remove any accumulated moisture. The heat source can be removed once the insulation resistance returns to an acceptable level[8].

☐ **Megger (insulation resistance test) electrical devices to see if there is any damage to insulation or if there are any electrical faults in the circuit.**

© 2021 Anchor Risk Solutions Corp., a member of The Co-operators group of companies.
ANCHOR RISK SOLUTIONS® is a registered trademark of Anchor Risk Solutions Corp.

☐ **Have an electrician conduct checks on electrical transformers.**

For low voltage (LV), usually dry-type transformers:

- Clean ventilation openings and replace filters
- Clean/vacuum core and coil units
- Inspect and tighten bus bar connections and supports
- Conduct testing of insulation resistance, turn ratio and contact resistance

High voltage (HV) transformers will require the above tests and other checks, such as:

- Inspect the load break switch
- Test proper interlock operation
- Test polarization and power factor
- Analyse an oil sample from the oil-type transformers for dissolved gases, moisture in the oil

☐ **Turn the plant on in phases to avoid electrical transients (voltage spikes) as motor control centre/switchgear is activated.**

As electricity is turned back on, there may be an increased draw of current from the switchgear or voltage spikes in the grid. So, it is recommended to turn the plant on in phases. This is particularly important if you have multiple compressors on a single rack in a cold storage plant. As power is turned on, sometimes a battery of compressors can be damaged due to a surge.

There's certainly a lot to consider before restarting your equipment. The safety of your staff and the protection of your equipment should be top priorities as your business operations ramp back up. While getting back to business as usual, or a 'new normal' in the interim, will be your focus, we also encourage you to take a moment to explore any lessons learned, opportunities or ideas for advancements that have come out of the pandemic. For example, there may be opportunities to run equipment more efficiently, improve equipment maintenance schedules, or adopt increased safety protocols for the long term. By following the best practices above, you're well on your way to safely restarting your equipment and optimizing your operations.

ANCHOR RISKsolutions Corp.

© 2021 Anchor Risk Solutions Corp., a member of The Co-operators group of companies.
ANCHOR RISK SOLUTIONS® is a registered trademark of Anchor Risk Solutions Corp.

[1] Sutton, I. (2015). Process Risk and Reliability Management. Retrieved May 7, 2020, from https://books.google.ca/books?hl=en&lr=&id=8ngRBAAAQBAJ&oi=fnd&pg=PP1&dq=Sutton,+Ian+S.+Process+Risk+and+Reliability+Management:+Operational+Integrity+Management.+Elsevier,+2010&ots=ii_iPdPfVD&sig=BGp4MfVsUHlw68ZD5zUBlkia6Mk#v=onepage&q&f=false

[2] Sutton, I. (2015). Process Risk and Reliability Management. Retrieved May 7, 2020, from https://books.google.ca/books?hl=en&lr=&id=8ngRBAAAQBAJ&oi=fnd&pg=PP1&dq=Sutton,+Ian+S.+Process+Risk+and+Reliability+Management:+Operational+Integrity+Management.+Elsevier,+2010&ots=ii_iPdPfVD&sig=BGp4MfVsUHlw68ZD5zUBlkia6Mk#v=onepage&q&f=false

[3] Atlas Copco. Maintenance Tech Tip – Shutting Down to Get Started. (2020, April 30). Retrieved May 7, 2020, from https://www.thecompressedairblog.com/maintenance-tech-tip-shutting-down-to-get-started

[4] Air venting, heat losses and a summary of various pipe related standards (n.d.). Retrieved May 11, 2020, from https://www.spiraxsarco.com/learn-about-steam/steam-distribution/air-venting-heat-losses-and-a-summary-of-various-pipe-related-standards

[5] Muganyi, P. & Mbohwa, C. (2017). Equipment Reliability curtailment due to brinelling of rotating equipment. Retrieved May 7, 2020, from http://ieomsociety.org/bogota2017/papers/258.pdf

[6] Süli Frank. (2019). Electronic enclosures, housings and packages. Duxford, United Kingdom: Woodhead Publishing.

[7] Cowern, E. (2001, December 1). Keep Your Motor Dry in Damp Environments. Retrieved May 7, 2020, from https://www.ecmweb.com/content/article/20886991/keep-your-motor-dry-in-damp-environments

[8] Lamendola, M. (2017, September 11). Tip of the Week: Motors and Moisture, Part 3. Retrieved May 7, 2020, from https://www.ecmweb.com/electrical-testing/article/20902972/tip-of-the-week-motors-and-moisture-part-3

ANCHOR RISKsolutions Corp.

© 2021 Anchor Risk Solutions Corp., a member of The Co-operators group of companies.
ANCHOR RISK SOLUTIONS® is a registered trademark of Anchor Risk Solutions Corp.