NEWSLETTER - DECEMBER 2020

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TECH TALK

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SERVICE CALLS

MSC received a weekend emergency call when walk-in boxes went into high-temperature alarm during a power outage. We found backup city water for condenser cooling to be unavailable because the control circuit and switchover valve weren't connected to the UPS. We ran temporary power to get walk-in box temperatures back under control until power was restored and a new UPS circuit could be connected.

When pressurization anomalies arose in a new process area with many downflow booths, MSC installed data loggers in common corridors, the air handling unit, and process suites. After several days of monitoring and investigation, we identified the culprit: a third-shift flooring installer had been inappropriately storing his tools in the air handling unit and was opening the AHU door multiple times each shift.

VFDs: Your Quick Guide for Variable Frequency Drive Selection

Variable frequency drives are used in nearly every industry and are utilized in most HVAC and process motors. In fact, you one might be hard pressed to find a motor that doesn't have a VFD controlling it. Though VFDs are exceedingly common, there are some **key things that must be considered when selecting, installing or servicing a VFD and its associated equipment** in order to avoid costly mistakes.

- Rapidly-switching pulses produced by VFDs can induce shaft voltage that can damage motor shafts and bearings and cause premature motor failure. **The best way to prevent shaft voltage is to install a shaft grounding ring** to channel current away from bearing to ground. These devices are easy to install and relatively inexpensive in comparison to the cost of bearing or motor failure.

- A **line (input) reactor** is an inductor that helps protect the VFD from input power line disturbances like voltage spikes, power surges, line distortion, and other anomalies that can cause tripping or damage to the drive. It also helps to reduce harmonic distortion drawn by the drive. They should be considered in applications where these issues are common or a source of concern.

- A **load (output) reactor** is an inductor that protects the motor from voltage reflections that can occur when the wiring distance between the VFD and the motor is very long. Generally, a load reactor should be used if cabling exceeds 100 feet, but motors that meet NEMA MG-1 Part 31 do not require a load reactor unless cabling exceeds 300 feet.

- Choosing between a **variable torque VFD** and a constant torque VFD depends on the load profile of the motor. In variable torque loads, torque requirements increase and decrease with speed of the load. Variable torque VFDs aren't subject to much overload

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and have very little overload built in (110-115% over 60 seconds) and are commonly used in HVAC fans, blowers and centrifugal pumps.

- With **constant torque drives**, torque loading is not a function of speed. As speed changes, load torque remains constant throughout the range. Overload rating for constant torque VFDs (sometimes called process drives) are at least 150% over one minute and 175% for three or more seconds. They are typically used in conveyors, agitators, mixers, and process pumps.

- Variable frequency drive manufacturers have begun recommending specialized **VFD cables** designed to handle new-generation inverters' faster voltage rise times on the output. There are several types of VFD cables available, and selection depends on a variety factors including environment, distance, proximity to low-voltage and communication cables, and flexibility. Check with the VFD manufacturer for their specific cable recommendations.

Among the VFD's many benefits are better control, improved system efficiency, substantial energy savings, and increased life expectancy for components and equipment. MSC can help clients choose the best VFD option for their application to maximize these benefits to their very fullest.

LUCKY: A Week in My Life as an MSC Technical Salesperson

Lou Gehrig, in his farewell speech in the old Yankee Stadium (with echo) said, "today, I consider myself the luckiest man on the face of the earth." Though I'm alive and well, and certainly can't compare myself with a legend like Lou Gehrig, I do consider myself very fortunate to get to see behind the scenes in so many different industries and to work with the very-talented people who support them.

In my everyday life, I get to see how soap, shampoo and hand sanitizer are made, how blood products are processed and packaged, and how a 100°F industrial freeze drier turns short-life liquid injectable drugs into a powdered drug in order to increase their shelf life by years, helping everyday people in their everyday lives. To be part of the design and construction of environmental chambers for in-house "field testing" of roofing shingles to determine at what point they shatter when subjected to below-freezing temperatures. To have the continuing good fortune to work with a talented, hand-picked team that collectively understands how all of this works and how to actually control it from a DDC/web perspective.

Occasionally, I'll have an exceptional run of particularly-interesting projects, most recently back in early September. I began the week standing on a commercial rooftop in Jersey City, just a few hundred yards from the entrance to the Holland Tunnel, followed by a visit to a hospital morgue in Elizabeth to take measurements, noting lighting wattage and a body count for our refrigeration calculation, and a tour of a facility that tests catalytic converters – all on the same day.

Midweek, I put on booties in a gowning station to enter a tower room, a glassed-in, 70-ft. high indoor space with two optical fiber draw towers resembling the huge vertical gantries that flank NASA spacecraft. We climbed ships ladders to elevated platforms where we considered options for the glycol feed station, and there I was able to observe how special optical glass is meticulously drawn down sixty feet to create fibers the thickness of a human hair, like a futuristic spinning wheel. We also kicked off a project in a high-tech optical lens polishing lab that includes custom design/build Honeywell DDC controls to address the tight room specs.

To cap off the week, we received a P.O. for a design/build custom ductwork job for a K-9 kennel ventilation system, complete with GPS needlepoint ionization (NPBI) air purifiers to control airborne particulates and kill pathogens including Covid-19, and we closed the sale of a pair of explosion-proof exhaust systems to a forward-thinking client that just added two alcohol hand sanitizer lines to their production facility.

I always have to smile inwardly when someone that doesn't know MSC says to me, "so you folks do HVAC, right?", because what we do for our clients is so much more than that. Whether it's keeping highly-trained German Shepherds cool, replacing a water-cooled condenser on an industrial -100°F freeze dryer, or asking a city hospital for their specification as to how many bodies can be in the morgue at one time, we to get to see it all. And that is why, after 31 years at MSC, I still consider myself to be a very lucky man.

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Custom Dual-RTU Meets MSC Client's Redundancy Needs

When an MSC client decided it was time to replace their thirty-year-old 40-ton rooftop unit, they wanted to build in some redundancy with the replacement. Because an in-kind RTU replacement does not exist, and a custom-manufactured unit would far exceed the customer's budget, our solution was to replace the 40-ton RTU with two 20-ton units ducted into separate areas and installed on a custom curb adapter designed to accommodate both units.

MSC custom-engineered and installed controls that enable tighter response to the required load to maximize equipment efficiency. When the load in the space drops below 20 tons, one of the two units automatically disables and will modulate control of the other as required. Low leakage bridge dampers were installed to allow in-tandem or independent operation.

Fabrication of the custom curb adapter was key to keeping costs under control. By eliminating the need for major ductwork renovation, the additional cost of the curb adapter retrofit was more than negated. The decision to install the dual units on a new curb adapter, via controls solely on the roof, allowed MSC to complete the job over a weekend in time for Monday morning with no interruption to business.

Breakthrough Cooling Technology Taps Into the Cold of Outer Space

Humans have always relied on the sun for the heat that sustains planet, so it's easy to forget that outer space is an extremely cold place. Why not use that cold, through the physics of thermal radiation, as a renewable source of heating and cooling that also helps to halt the greenhouse effect? UCLA professor Aaswath Raman and a team of scientists have set up a company called SkyCool Systems to make that happen, and their efforts look to be more than promising.

All objects give off heat in waves of invisible light through a process called radiative cooling. For centuries, desert inhabitants made ice by filling shallow pits exposed to the clear night sky with water, which would radiate its heat through the atmosphere and into the cold of space. Though temperatures never dropped below freezing, thermal radiation would turn the water into ice overnight. This ancient technique is what sparked Raman's idea for harnessing this phenomenon.

Raman and his colleagues have developed a mirror-like film composed of multiple microscopic layers that reflect solar radiation back into space. Even in the midday sun, the material remains cool to the touch. SkyCool has successfully developed fluid panels that can be integrated with existing cooling system condensers.

In a field trial at a supermarket in California, a SkyCool panel installation lowered cooling costs by 12 percent in just the first few months. With further development, Raman believes the technology could reduce building energy use by two-thirds and that affordable cooling systems that require zero electricity input are a very real possibility in the near future. With widespread use, the technology could significantly reduce greenhouse gas emissions and help reverse global warming.