

## TIPS FOR MORE EFFECTIVE VFD MAINTENANCE



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### WANT TO CONTRIBUTE?

If you would like to share a story or contribute to Paragon Services Engineering's monthly newsletter. Please contact Angela at

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Do you know how to maintain variable frequency drives (VFDs)? It's easier than you might think, but it's something you shouldn't take for granted. By integrating some simple, logical steps into your preventive maintenance (PM) program, you can ensure your drives provide years of trouble-free service.

A VFD requires the same safety and equipment precautions applied to computers and power supplies because of its similarity to both: Keep it clean; keep it dry; and keep the connections tight.

*Keep it clean.* Most VFDs fall into a NEMA 1 (side vents for cooling airflow) or NEMA 12 (sealed, dust-tight enclosure) category. Side vents in NEMA 1 drives make VFDs susceptible to dust contamination, which can reduce airflow and diminish performance from heat sinks and circulating fans. Change/Clean the intake filter monthly.

Dust on an electronic device can cause malfunction or even failure by absorbing moisture. Discharging compressed air into the VFD is a viable option in some environments, but typical plant air contains oil and water. Oil-free, dry air requires a specialized, dedicated, and expensive air supply — and you still run the risk of generating static charges. A non-static generating spray or a reverse-operated ESD vacuum will reduce static buildup. Common plastics are prime generators of static electricity. The material in ESD vacuum cases and fans is a special, non-static generating plastic.

*Keep it dry.* The photo above (*not available online*) shows what can happen to a control board periodically subjected to a moist environment.

Initially, this VFD was wall-mounted in a clean, dry area of a mechanical room. However, problems arose when maintenance personnel installed a dehumidifier in an open space above the VFD. Unfortunately, the VFD was a NEMA 1 enclosure style (side vents and no seal around the cover). Water dripped from the dehumidifier into the drive. In six months, the VFD took on enough water to corrode the circuit board. VFDs seldom offer condensation protection today. If you operate the VFD all day, every day, the normal radiant heat from the heat sink should prevent condensation. Unless the unit is in continuous operation, use a NEMA 12 enclosure and a thermostatically controlled space heater if you place it where condensation is likely.

Keep connections tight. This may seem obvious, but checking connections is a step many people miss or do incorrectly — and the requirement applies even in clean rooms. Heat cycles, mechanical vibration, and standard PM practices can lead to substandard connections. Also, retorquing screws and excessive tightening can ruin connections.

Bad connections eventually lead to arcing. Arcing at the VFD input could result in nuisance overvoltage faults, clearing of input fuses, or damage to protective components. Arcing at the VFD output

could result in overcurrent faults, or even damage to the power components.

Loose control wiring connections can cause erratic operation. For example, a loose speed reference wire can cause the drive speed to fluctuate, resulting in scrap, machine damage, or injury.

Additional steps. The following maintenance requirements complement a good PM program. 1) When conducting a mechanical inspection, don't overlook internal VFD components. Check circulating fans for signs of bearing failure or foreign objects. 2) Change/Clean the intake filter monthly. 3) Inspect DC bus capacitors for bulging and leakage, which could be signs of component stress or electrical misuse. 4) Take voltage measurements while the VFD is in operation. Fluctuations in DC bus voltage measurements can indicate degradation of DC bus capacitors. One function of the capacitor bank is to act as a filter section (smoothing out any AC ripple voltage on the bus).

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Abnormal AC voltage on the DC bus indicates potential capacitor failure. Measurements of more than 4VAC may indicate a capacitor filtering problem or a possible problem with the diode bridge converter section (ahead of the bus). If you have such voltage levels, consult the manufacturer before taking further action. With the VFD in START and at zero speed, you should read output voltage of 40VAC phase-to-phase or less. Higher voltages could indicate transistor leakage. At zero speed, the power components should not be operating. Readings of 60VAC or more can indicate power component failure. Store spare VFDs in a clean, dry environment. Place this unit in your PM system so you



know to power it up every six months to keep the DC bus capacitors at their peak performance capability. Otherwise, their charging ability will diminish significantly. Regularly monitor heat-sink temperatures. Most VFD manufacturers make this task easy by including a direct temperature readout on the keypad or display. Find this readout, and check it weekly or monthly. You wouldn't place your laptop outside, on the roof of a building, or in direct sunlight. A VFD needs the same consideration. Some manufacturers claim their VFDs offer 200,000 hours/almost 23 years of mean time between failures (MTBF). Such impressive performance is easy to obtain, if you follow these simple procedures.

# CONGRATULATIONS

Paragon Service Engineering wishes to congratulate Paul Pflimlin, Portfolio Chief Engineer at the HCP Life Sciences Portfolio managed by Cushman Wakefield for his nomination for the San Diego Building Engineers Association Chief Engineer of the Year Award. The SDBEA reached out to its membership annually for nominations for the most accomplished Building Engineer and Chief Engineer. The SDBEA then reviews the applications to select those worthy of the award. Areas to be considered include property accomplishments, education efforts, and community efforts. Paul was selected as a finalist by the SDBEA Executive Board. A brief description of Paul's accomplishments for 2017 are detailed below.

## 2017 Property Accomplishments:

Oversee portfolio of 30 life science properties with over 2 million square feet of lab and office space

Successfully transitioned new properties to portfolio

Managed large mechanical projects to correct deferred maintenance issues, including multiple chiller replacements, central plant efficiency projects, cooling tower replacements

Oversaw multiple major controls upgrade projects including pneumatic to DDC conversions

Contributed to major TI projects to ensure facility performance considered in planning

Initiated improved safety measures at properties with more rigorous testing for items such as IR scans and GFI testing

## 2017 Education Efforts:

Trained multiple new hires

Attended SDGE energy savings and mechanical seminars

Attended client annual conference with review of facility operations

Attended multiple controls systems trainings and oversaw controls training for junior engineers

Led safety training for engineering team related to ARC Flash testing certification

## 2017 Community Efforts:

Focused on sustainability at properties and achieved significant (30-40%) energy reduction at multiple properties

Participated in school/youth programs such as team sports and Girl Scout fundraising



Congratulations Paul, we are proud of the work that you perform for our clients and in the community on behalf of Paragon Services Engineering!

# April 2018

Sun	Mon	Tue	Wed	Thu	Fri	Sat
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30					



## 2018 Joint Expo: BOMA, IFMA, IREM & SDBEA

Did you stop by the Paragon Services Engineering booth at the 2018 Expo? We had trivia games, popcorn, lotto scratchers, and so many giveaways. We would like to thank everyone that stopped by our booth to say hello or grab some popcorn. We had so much fun, we can not wait until next year!!!



## April Events

- 4/1 Easter
- 4/1 April Fool's Day
- 4/6 - 4/8 Good Guy's 18th Meguiar's Del Mar Nationals
- 4/7 - 4/15 Thomas the Tank Engine At Railway Museum
- 4/7 Iron Man 70.3 Oceanside
- 4/8 Sip' N Savor Festival
- 4/14 The Grove 5K Fun Run Super Hero Challenge
- 4/14 5K Walk to End Homelessness Riverside
- 4/21 Riverside Tamale Festival
- 4/22 Earth Day
- 4/22 La Jolla Half Marathon & Shores 5K
- 4/22 San Diego Earth Fair
- 4/28 - 4/29 Encinitas Street Fair



## HAPPY BIRTHDAY!

- 4/3 Robert De Francisco
- 4/6 Gabriel Parra
- 4/6 Antonio Luna
- 4/7 Jose Mora
- 4/10 Saul Garcia
- 4/13 Marc Steiner
- 4/22 Robert Blakeslee
- 4/23 Thomas Cuda
- 4/24 Anita Bertain
- 4/25 David Gutierrez
- 4/28 Kent Hamel
- 4/28 Anthony Mc Comas
- 4/29 Steven Leoncini

