

Medium Voltage Variable Speed Drive Systems

Process Availability

The Perfect Harmony Advantage

Introduction

Power quality and process efficiency are both important considerations in the selection of VFD systems. It is equally important that the systems provide the highest available level of process availability.

The Perfect Harmony product, with its distributed cell power architecture, provides a unique platform to deliver the highest levels of process availability. By including the cell bypass option, and by employing the ProSys control, high levels of process availability become practical.

Hardware configuration is quite nice, but, as we all know, unless the software and process interface is configured to take full benefit of the hardware capabilities, there is no true process benefit gain. Creating a standardized software, and control interface, to take full advantage of the Perfect Harmony VFD System capabilities is the reason ProToPS was created.

What is ProToPS?

ProToPS is an acronym that stands for “Process Tolerant Protection Strategy”. ProToPS is a standard implementation of the VFD SOP (System Operating Program). The ProToPS goal is simply to put the process operator in control of the process. ProToPS is a system program implemented from a customer process perspective.

ProToPS provides the operator with indication of a change in state in the VFD. These annunciations identify changes that can impact the ability of the VFD to meet process demands, or to provide advance indication of a pending VFD trip. ProToPS allows the process operator to make process corrections to maintain the VFD in use in service, or adjust the process to address a pending VFD trip.

With ProToPS the process operator knows, not only the general status of the VFDs, the operator also understands the VFD condition that has caused the general alarm to exist.

How Does ProToPS Work?

In the ProToPS SOP all of the automatic roll-back flags are turned off, and both cell bypass and auto-restart are implemented as standard. The need to roll-back is now provided, but the process operator is now able to implement a roll-back as part of a process correction, as opposed to having the VFD roll-back either dictating, or in worse case upsetting, the process.

ProToPS takes the standard fault indications available in the VFD and categorizes them into five basic major categories as follows:

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Alarm

An alarm is an indication that a VFD parameter limit has been reached, or that a VFD system condition is present. An alarm provides the operator with awareness of the condition, but demands no immediate action. Examples of alarms include: over-voltage or under-voltage and ground fault.

Process Alarm

A process alarm is an indication that a VFD parameter limit has been exceeded and that the process either should be limited, or that the VFD capacity to meet the process demand is limited. Examples of process alarms include: thermal limits above the rated limit or that a cell has been bypassed.

Transient Alarm

A transient alarm is an indication that a VFD operating fault exists. In the case of a transient fault the VFD is no longer driving the load (torque command to zero). With a transient alarm the operator understands that the VFD control is attempting to clear the fault and that if successful, the VFD control will automatically restart into the spinning load. With the Perfect Harmony product the main transient alarm is "cell bypass in progress". With the ProSys control the transient alarm is actually cleared by the VFD control before it can be annunciated.

Trip Alarm

A trip alarm provides a clear indication that a VFD high parameter limit has been reached. A trip alarm is a indication that a VFD trip is pending. The operator receives a message that that unless the alarm can be cleared by a process change the VFD will trip.

Trip

Certain VFD faults cannot be provided with advance warning. This limited number of faults will result in a VFD trip. A trip message is also annunciated when a trip alarm time limit has been exceeded. The number of mandated trips is considerably reduced with the implementation of cell bypass.

With ProToPS the CR "0" (VFD Run) signal is maintained as "true" and the CR "6" (VFD Trip) signal is maintained as "faults" for all alarm states.

ProToPS Hardware and Software Requirements

To implement a ProToPs system the following standard hardware options must be included in the VFD hardware scope of supply.

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- * Cell Bypass (Listed as a Price Option)
- * N+1 Cooling Fans (Air Cooled Deliveries Only) (Listed as A Price Option)
- * Transformer Temperature Alarm Thermostats (Included)
- * One Dedicated Digital Output Module (Included)
- * Serial Communication Adapter and Serial Communications Card (Included)
- * Output Reactor Temperature Alarm Thermostats (Applicable only is synchronous transfer option is selected)
- * ProToPS SOP (Included if Availability Options Selected))

ProToPS Implementation

With ProToPS the five main protection indication categories are provided as separate digital output signals. The concept is to provide the operator, or the process program, with a clear message to indicate a status change in the VFD. These five digital outputs are delivered from one DOM card. The location of the five outputs is maintained as a standard TB2 terminations.

The specific information on the VFD parameter change is indicated (along with the general category information) as a serial address across a serial communications interface. Any serial communications protocol supported by the VFD product can be supported in the ProToPs implementation.

If other specific digital output information is required for a specific customer project that information must be mapped to a new digital output point on an additional digital output module. The five basic category outputs must be present as digital outputs, at the standard designated TB2 terminal point locations, to validate the ProToPS implementation.

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The ProToPS Advantage

With cell bypass there are virtually no cell faults or cell communication faults that are non-bypass-able. With ProSys control the need for the designation "Transient Alarm" virtually disappears as all bypass-able faults become process transparent.

With ProToPS, the unique benefits of the Perfect Harmony cell based technology process availability can be considerably enhanced and, the process operator can truly control the process.

Summary

The bottom line is that the process is more important than the VFD products. Life cycle costs are more important than first project cost. First cost includes products plus installation costs. If the process is not producing there is no benefit.

Proven patented distributed power architecture, unequaled availability, intelligent control and control interface configuration, optimum utilization of supply power, all reasons to consider Perfect Harmony.