

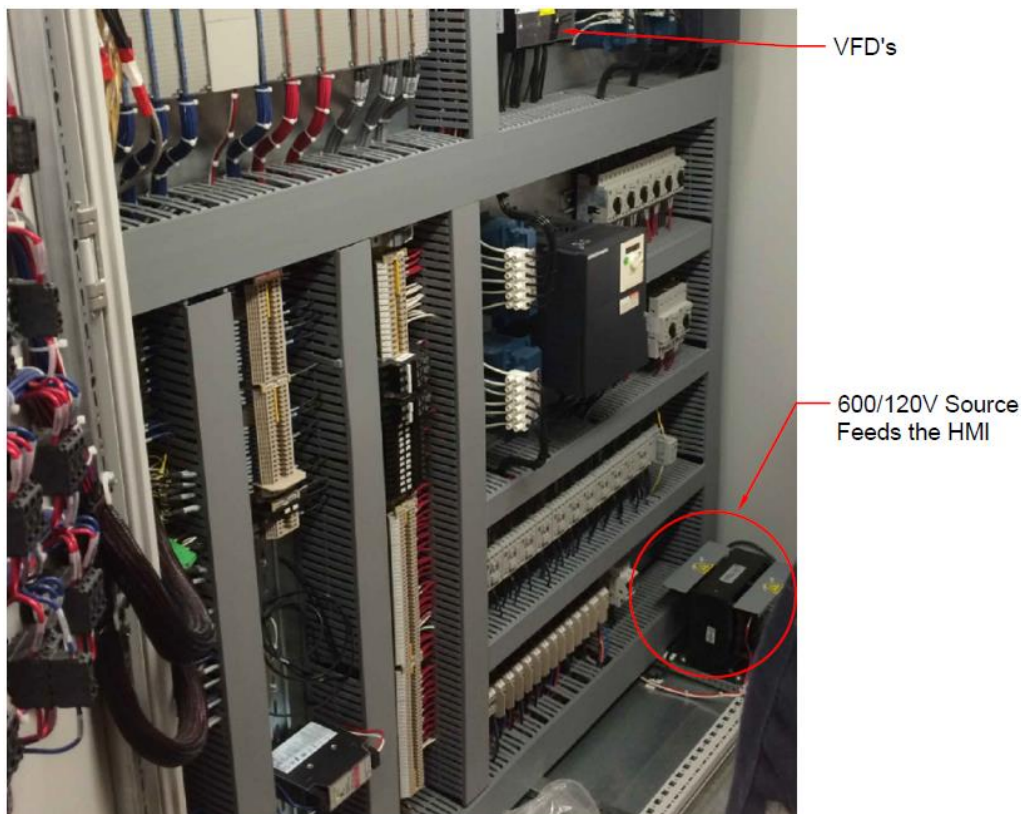
12 Oct 2016

To: Faro Mine Site - Yukon Government

Mitigation of Flicker on Meters at IWTP

System information displayed on the HMI for the Flow meter, PH and Turbidity readings at the IWTP was observed to flicker continuously. We suspected the cause of this flicker was intersystem ground noise. This type of noise is most likely caused by the VFD's located in the same enclosure as the power source that feeds the HMI.

Fig.1



The major path for this intersystem coupling to occur is through the metallic surface of the enclosure that electrically connects the "referenced ground point on the negative terminal of the 120V HMI source" to the "VFD earth ground".

To get an idea of the amount of noise generated by the VFD and possibly other noise generating components in the cabinet, we measured the voltage from the metallic surface of the enclosure to an external ground point and observed 10's of mV in the kHz range. This difference in potential is the major cause of the ground loop between the VFD cabinet and the HMI cabinet.

Solution

As a test to the theory we removed the reference point on the 120V source and observed the flicker was significantly reduced on the PH meters (flow meters still fluctuated, but this is expected). The removal of this wire is only a short term solution because long term we recommend having a -120V referenced and not floating.

The long term solution is to bring in a reference point to the -120V terminal that is away from the noise generated by the VFD. To do this we recommend following the steps outlined below:

- a) De-energize the cabinet shown in figure 1.
- b) Using the same gauge of wire coming out of the 120V terminals in the cabinet, run a wire from a grounding point outside the building to the cabinet. (There are many points to do this near the 2MVA - 25kV/600V transformer).

The majority of the noise generated by the VFD's will be attenuated at this reference point due to wire inductance.

- c) Connect an insulated terminal block inside the cabinet where the HMI 120V source resides.
- d) Connect the grounded wire from the exterior of the building to this terminal block.
- e) Remove all wires connected to the -120V terminal and reconnect just the white “-120V” wire that feeds the 120V circuit to the insulated terminal block from part “c”.
- f) Connect a single wire from the -120V terminal to the insulated terminal block.
- g) Ensure all terminals on the insulated terminal block are shorted together and isolated from the housing.
- h) Re-energize the cabinet and observe the flicker on the PH meters.
- i) If the problem persists, try different grounding points outside the building.

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