Fused Disconnects for use with Design Envelope Pumps

Whitepaper

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Benefits of a separate fused disconnect mounted within sight of the driven equipment

It's interesting how good ideas are transcended by better, and sometimes older, ideas.

Armstrong Fluid Technology brought pumping units with integrated intelligent controllers to 450hp / 355kW to the world, most available with built-in disconnect switches (Disconnect Means). This was great idea!

Wall-mounted disconnects were no longer required and service personnel were comfortable, knowing the disconnect switch was close at hand. This was excellent for seal service on split-coupled pumping units, which is usually the first service requirement for HVAC pumps. It's a safe service which takes only a few minutes, even on the largest units.

VFDs are often specified as being wall-mounted and the combination of code, custom and practice drives the requirement for, and specification of, the disconnect means. The National Electric Code (NEC) and Canadian Electrical Code (CE Code) requires a disconnect means to be mounted in sight from the motor, between the power supply and motor. With specifications calling for wall-mounted VFDs, there may be a wall-mounted disconnect prior to, or installed in, the VFD. It may be, also, that the VFD power supply is hidden from, or >50ft from the motor. This may require a second disconnect, downstream of the VFD, to protect the motor loading. This brings more expensive installation costs, with serious VFD issues should the motor disconnect be opened under full load. Sample text from electriciantalk.com include "Disconnect the VSD motor while it is still running, the voltage spikes may damage the VSD controller" & "If you simply disconnect the three-line side conductors, you'll toast your VFD".

From the above, it would appear that pumps with integrated controls including disconnect switches is the least expensive and safest way to go. Right? What about extensive motor service, or indeed drive repair or service? The disconnect is usually on the input to the controller; thus, the controller could be removed from the pump, which permits access to the motor and pump components. This works, though the input power at the controller disconnect, inside the enclosure, is still live. So, the controller is not considered as being fully disconnected. The supply at the MCC must be locked out to work on the controller. As the process can be more cumbersome than first envisaged, wall or locally mounted disconnects, outside of controller enclosures, are being reconsidered.

Constant speed VFD bypasses appear in specifications for some projects. It needs to be understood that VFD bypasses cannot be used with VFD design motors (e.g. NEMA induction motors that are optimized for use with the VFD, cannot be Direct-On-Line started; nor can Permanent Magnet and some other motor types to be used. Users may not get the energy savings, or rebates, if VFD bypasses are installed.

Integration of intelligent controllers is still a large added value, with or without built-in disconnect.

What value could wall or locally mounted disconnecting means bring to pumps with integrated controllers?

1. Follows many specifications + true code technical and safety intent with compliant disconnects
2. Enables factory matching the disconnect fuses to the actual driven motor power
3. More convenient full pump / motor servicing
4. Servicing VFD electronics
5. Proximity:
    a. Mount on a convenient wall and wire to the controller input, providing a wall is close enough and has sufficient space for the disconnecting means (See Fig 5a)
    b. For servicing comfort and increased safety, the disconnect may be mount on an Armstrong supplied pedestal, that can be conveniently close to the pumping unit (See Fig 5b) (Watch out for this in future)

Fig 5a

Fig 5b

Value chart for Design Envelope Vs pump with drive on wall

Values	Pumps with integrated controller & wall-mounted disconnect	Pumps with integrated controller & disconnect	Pumps with wall-mounted VFD & [2] disconnects (Integrated before VFD & before motor)
			
Follows spec & true code technical and safety intent	**Yes**	No	No
Factory match fusing to driven equipment	**Yes**	Yes	No Disconnect / fuses between VFD & motor by site electrician – no control by manufacturer
Full pump/motor service	**Yes**	No Cannot remove controller with live power at disconnect	Yes- use motor disconnect- NOTE: VFD must be stopped first
Separate disconnect supply option	**Yes (1 to 10Hp)**	No	No
VFD electronics service	**Yes**	No - can't remove controller with live power at disconnect	No - VFD has live power at disconnect

Which wall-mounted disconnect switch(es) connection(s) appears to be the least expensive, quicker to install and needing least upkeep? Fig 2, perhaps …

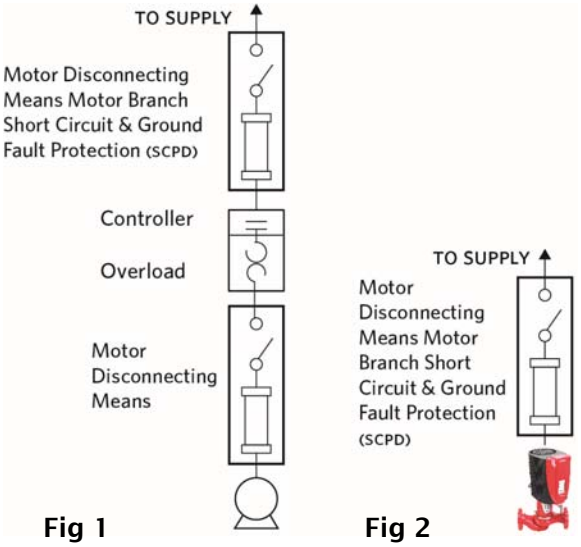

Fig 1

Fig 2

Appropriate standards:

a. UL change in requirements, transitioning from UL 508 and UL 60947-4-1A to UL 60947-4-1. Armstrong 30A fused disconnect switch conforms with UL 60947-1 & 60947-4-1

b. Armstrong 60A fused disconnect switch conforms with UL 98