

Case Study

Motor Changeout Tips

A common electrical procedure in industrial environments involves disconnecting and/or changing out motors. Some motors may be driving equipment that is downtime critical and thus it is important to be able to change them out quickly and safely. Other times motors, or the motor connected equipment, may require service much more often than a typical application and thus it is helpful to be able to efficiently disconnect and connect it. The safe and efficient disconnection and connection of motors and similar electrical equipment is the focus of this article.

Changing out a Typical Hard Wired Motor

If the motor is hardwired the first step requires an electrician to disconnect power. This is typically achieved by throwing/turning off a safety disconnect switch that is UL 98 rated. It is important to note that most rotary type motor controllers are not rated for disconnecting motors and thus it is not safe to switch off these manual motor controllers and service the motor or connected equipment. Instead, the safety disconnect switch that provides power to the motor must also be turned off. As a general rule of thumb if the device does not say "Suitable for Motor Disconnect Switching" or "Motor Circuit Disconnect Switch" on it then it is not safe for disconnecting motors.

Once a typical safety disconnect switch is turned off it is still not safe to assume power is really off. As an OSHA inspector once told me, "all you know for sure is that you moved the switch". Instead, after the switch is moved to the OFF position the safety disconnect cover should be removed to visually verify that the blades have been separated. Keep in mind that the NFPA 70E Standard for Electrical Safety in the Workplace classifies "opening hinged covers to expose energized parts" to be a hazard risk category level 1 task which requires that the worker to wear flame retardant clothing, hard hat and safety glasses.

Alternatively, or in many cases additionally, voltage testing should be completed to ensure that the power is really off. Be sure to wear the proper PPE when voltage testing. NFPA 70E classifies voltage testing at 277V to 600V as a hazard risk category level 2* task. The Protective Clothing and PPE Matrix in NFPA 70E can be used to identify that level 2* tasks require a double-layer switching hood and hearing protection in addition to the other hazard/risk category 2 requirements found in NFPA 70E (unless the short circuit current available is less than 10 kA in which case the hazard risk category may be reduced by one number).

After an electrician has verified that the motor has been properly deenergized and that the safety disconnect has been properly locked out then it is electrically safe to service the motor and connected equipment. Consult NFPA 70E article 120 for more details about establishing an electrically safe work condition.

A 'Quick Changeout' Alternative to Hardwiring Motors

One of the best means for employers to protect workers from electrical injuries is for them to install products that eliminate the need to work with live parts. These products help ensure safety and simplify NFPA 70E compliance by eliminating potential exposure to live parts and thus allowing workers to avoid having to wear the cumbersome PPE - which NFPA 70E requires whenever a worker might be exposed to live parts or arc flash.



After opening the disconnect switch, a worker still needs to verify deenergization. Exposure to live parts is inevitable, so PPE is required.

An example of such a product is a UL Switch-Rated plug and receptacle. Since the device is Switch-Rated it can be used to safely disconnect power at the motor simply by pressing the pawl on the receptacle (which breaks the load) and removing the plug. The plug gives visual verification of deenergization so in most cases voltage testing is not required. While the plug is disconnected a safety shutter on the receptacle prevents access to live parts. The plug can then be locked out and the equipment can be safely serviced or replaced.

To reconnect the motor a qualified technician can simply insert the plug into the receptacle, twist slightly to unlock the safety shutter, and then push to fully engage the plug. Electricians are not required on the job site, instead the electrician can prewire motors in the electrical shop.

Some Tips for Choosing a “Motor Plug”

- Be sure the receptacle features a safety shutter or other type of mechanism to ensure dead front construction that not only prevents finger access to live parts but also access by thin tools and wire.
- Be sure both the plug AND receptacle have the correct horsepower rating on the device label. The label should also state that the device is suitable for motor disconnect switching.
- Choose a plug that can be easily locked out without having to purchase third party lockout devices. This can be accomplished via a hole in the plug in which a lock can be inserted.
- Choose a plug and receptacle that offers solid silver-nickel contact material for maximum conductivity and thus lower operating temperature and longer product life.

