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APPLICATION NOTE

RELIABLE MOTOR CONTROL FOR IRRIGATION PUMPS IN WEAK NETWORKS AND LONG CABLE INSTALLATIONS

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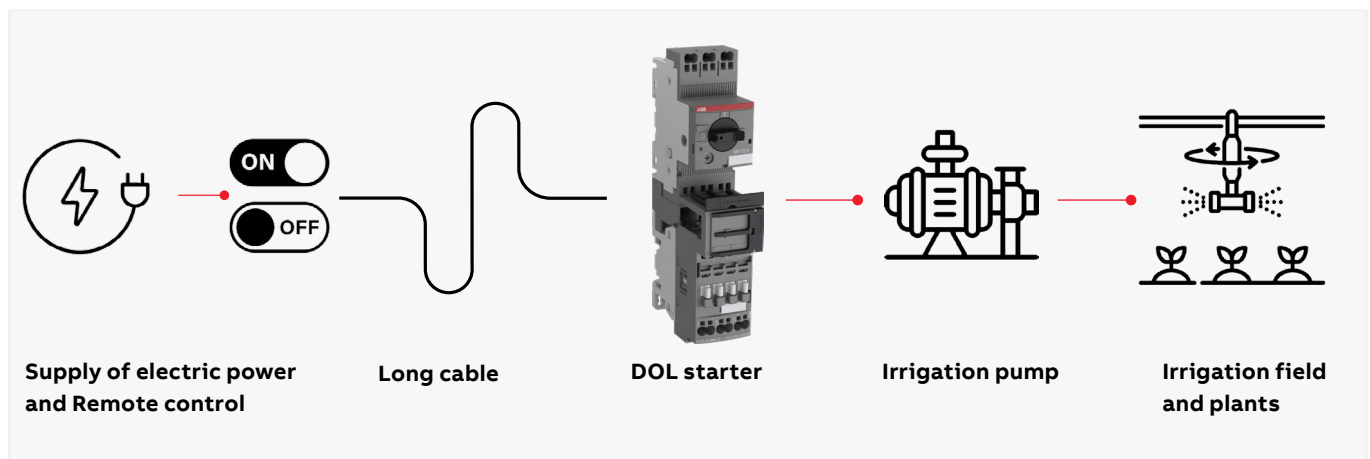
As population grows Global food demand is increasing. To maximize crop yields, irrigation is widely used to supply water where natural rainfall is insufficient, but most of irrigation systems are located in rural areas, where access to reliable electricity infrastructure is limited. The distance between the available power supply and the pump location can be several hundred meters. This setup introduces technical challenges, especially when network is weak.

Typical Irrigation Pump Setup

The common solution for powering smaller irrigation pumps involves:

- **Direct-On-Line (DOL) starter**, placed near the motor, with
 - Contactor for remote switching of the motor.
 - Manual motor starter (MMS) for protecting motor against overload and short-circuit, as well as for safe disconnection during maintenance.

This configuration is simple, robust, and cost-effective, making it the preferred solution.



Technical Challenges

In this simple application, both a weak network and the use of long cables can create various problems for the motor and for the on/off control of pumps.

Here we focus on the on/off control only.



Weak Power Networks

When load increases, available voltage can drop below nominal values.



Long Cables

- Cable impedance causes voltage drops proportional to cable length and cross-sectional area.
- Cables used for the control voltage have small area, causing more voltage drop (e.g. compared to the main voltage used for power to the motor)



Contactor operation

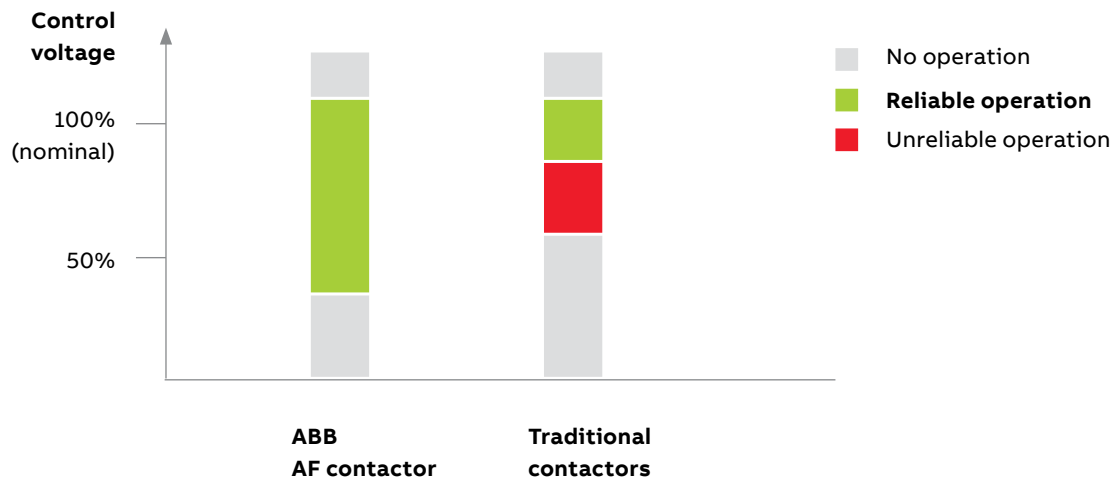
- Traditional contactors have a narrow operating voltage range.
- Operation of traditional contactors are unreliable when voltage is low; the contactor may fail to close (start motor) or may drop out (stop motor) unintentionally and they may also “shatter” (open/close frequently due to not enough closing power) which may damage both the contactor and motor/pump.

Solution – ABB AF Contactors

The ABB AF contactor range is designed to overcome the limitations of traditional contactors in weak networks and long cable installations.

Key Feature

Wide control voltage range: The AF contactor can operate reliably across a broad voltage span, ensuring reliable switching even under severe voltage fluctuations.



Recommendations for Engineers

- **Cable dimensioning:** Minimize voltage drop by selecting adequate cross-sectional area (target <5% drop).
- **Motor protection:** Place together with contactor close to the motor for effective overload/short-circuit protection as well as possibility to use padlock in off-position for safety during maintenance of pump.
- **Contactor selection:** Use ABB AF contactors for remote switching to ensure reliable operation under voltage variations.

Conclusion

Using **ABB AF contactors** is a simple solution to achieve reliable on/off control in irrigation applications.

ABB Ltd.

Affolternstrasse 44,
8050 Zürich,
Switzerland

**You can find the address of your local
sales organization on the ABB homepage**

abb.com/lowvoltage



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