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# CASE STUDY

## WYE-DELTA CLOSED *or* SOFT-STARTER?

That is the question...



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I N C O R P O R A T E D

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# Choosing Your Style

Which controller is best for your installation?

***Request for advice:*** An engineer poses the question, “What are the differences between a wye-delta closed transition and an electronic soft-starter type controller? How do I choose which one to use?”

***Our Response:*** It depends on what your power supply can handle, and what your comfort level is.

## ***Consideration:***

Once the decision is made to go forward with a reduced voltage style controller, many choices are available. Two of the most utilized are a wye-delta closed transition and an electronic soft-starter.

## **How a Wye-Delta Controller Works**

A wye-delta controller utilizes contactors, a timer, and a high wattage resistor bank to “step” the motor to full speed. Basically, it’s a two-step start which results in a current draw of approximately 33% of a motor’s typical 600% full load current starting. (A motor will draw 600% of its full load amperage during an across-the-line, or full voltage start)

This reduction in starting current helps to protect the incoming power, and generator power, from a surge in amperage which could put either in jeopardy.

The high-wattage resistor bank is provided to keep the motor current path closed during the “transition” from wye to delta. This reduces the effects of line transients and possible high current spikes from doing damage to, and possibly tripping upstream protective devices.

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### ***Benefits of a Wye-Delta Closed Transition Controller***

Simple enough in its design, the greatest benefit is in the reduced current draw during initial starting, as well as the protection afforded during the transition phase, as opposed to other reduced voltage methods.

### ***Drawbacks***

**Enclosure size.** The design of this style controller requires the use of four (4) contactors to essentially re-wire the motor during the two-step start (Wye configuration to Delta.) This, along with the high wattage resistor bank, requires more space within an enclosure, especially when the horsepower is higher.

**Installation Issues.** A wye-delta controller is connected to a wye-delta motor. Typically these motors are twelve (12) lead machines, where six (6) conductors are used between the two. Many motors are dual voltage, which can result in confusion during the wiring phase. Firetrol offers a handy and simple-to-understand chart for installing electricians.

### **How a Soft-Starter Controller Works**

A soft-starter controller utilizes an electronic device consisting of high wattage semi-conductors that allows the motor to “ramp” up to full speed. This results in an inrush current draw of approximately 60-65% of a motor’s typical 600% full load current starting.

Once the motor is at full speed, a built-in contactor “bypasses” the soft-starter and the motor runs “across-the-line.”

***NOTE: Percentages referenced are approximate, and are based upon a true 3-phase design, and could vary with manufacturer.***

### ***Benefits of a Soft-Start Style Controller***

**Enclosure size.** Because a solid-state device requires less space than contactors and resistor banks, less real estate is required. The higher the horsepower, the greater the benefit.

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**Installation.** A soft-starter is connected to a standard three-phase induction motor. Only three (3) conductors are required between the controller and motor. This significantly reduces confusion among installing electricians.

**Water Hammer.** It is common knowledge that water hammer can be detrimental to a piping system during the starting of a fire pump. (Thus the reason for close coordination between jockey and fire pump starting pressures) Not often considered, is that water hammer can also be a factor when stopping a fire pump; particularly in older installations.

A soft-starter acts as a “soft-stop” device as well. Upon a call to stop, either by pressure being satisfied, or a stop pushbutton being depressed, the bypass contactor de-activates, the soft starter takes over and actually reduces the voltage down until the motor comes to a stop. The result is a much smoother water hammer condition, which is a favorite among system designers doing retrofits.

Across-the-line back-up. The bypass contactor is also used in the event of an electronic failure within the soft-starter. This redundancy provides a more comprehensive system.

### ***Drawbacks***

**Tradition.** Old specifications are often used because “it’s easy.” Wye-delta controllers have been widely used and people’s comfort level is good. At times, there is resistance to using something “new.”

## **In Conclusion...**

**After 30 years** of starting-up both types of controllers, it is this author’s humble opinion that the soft-starter is the preferred method to use. Easier installation, along with the reduction in water hammer upon stopping, gives the soft-starter the edge over the wye/delta closed.

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