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STARTUP METHODOLOGY COMPARISON OF PUMP CONTROL

OPTION 1
DOL STARTER

During starting of electrical motors, the motor experiences an inrush electrical current. If the motor is started with a DOL starter, this inrush may reach a magnitude of at least 6 times the motor's full-load current. With a DOL starter, repeated starting may cause excessive heat build-up in the motor windings. This method of starting also causes additional torsional stress on the motor and pump.

Stopping a motor with a DOL starter removes the power from the motor instantaneously, therefore removing the motive power from the pump at the same instance. At this point, the water column in the pipes will still be moving forwards. Due to the immediate pump stop action, water separation may occur in the pipe. Typically, a vacuum is created between the moving column of water and the non-moving section. This vacuum will attempt to pull the two columns together, causing an effect called "water hammer" when the two columns meet.

During starting, a similar effect can occur as a result of the sudden motive power applied to the water column. This effect may cause major problems, from noise and vibration to pipe collapse.

This method offers no speed control.

OPTION 2
SOFT STARTER

(Not recommended for Pumps with water lubricated sleeve bearings - Ramp time to slow)

The Soft Starter is a starting method that reduces the starting inrush current of the motor during starting by applying a reduced voltage to the motor and thereafter controlling the ramp-up to full voltage over a timed period. The inrush current is typically limited to 3 – 4 times full-load current. Motor stopping is similarly controlled, with the applied voltage ramped down over a timed period. During both stopping and starting, the water column velocity is controlled by the ramped action taking place. Some soft starters available commercially, employ a starting/stopping voltage/time curve that has been specifically designed to minimize water hammer during both starting and stopping of pumps, thereby reducing the potential harmful consequences of this effect.

This method offers no speed control.

OPTION 3
VARIABLE SPEED

This type of device is also referred to as a Variable Frequency Drive (VFD)

A VSD controls motor starting, stopping and running speed by controlling the frequency of the voltage applied to the motor. Various methods of Voltage/Frequency ratio control is employed by manufacturers to provide increased torque at lower motor speeds.

As the motor is accelerated smoothly from stand still to the desired running speed, motor inrush current is typically reduced to less than 2 x motor full-load current, depending on the type of VSD used and the set-up of the system. The smooth acceleration from standstill also assist with the elimination of torsional stresses during starting. Stopping is similarly controlled by smoothly decelerating the motor to standstill. The smooth acceleration/deceleration ensures that there is no sudden change in flow or pressure in the pipeline during starting/stopping of the pump. Water hammer can therefore be virtually eliminated, provided the ramp-up and down time are specifically set-up for the specific application.

An additional advantage of using a VSD is that motor speed can be adjusted to deliver a specific delivery by the pump. The VSD reduces the risk of possible damage caused by DOL or Soft Starters and increases the operational life of the pipe, pump and motor.

This method offers speed control.