How to Avoid the Wrong Power Supply

**FOCUS:** 

**LOAD CONDITIONS**

1. **Rate of Load Change**
   - **What to Remember**
   - Load change is determined based on application
   - If load change is too slow, there can be a failure in power delivery
   - Slower rate is needed in applications that perform more slowly
   - If load change is too fast, it could result in unnecessary cost
   - Required rate of load change cannot be changed, supply response can only be made faster or slower

2. **Load Type**
   - **Capacitive vs. Inductive vs. Resonant**
     - Load will determine what kind of power supply you'll need
     - **Capacitive Load:**
       - Load is a voltage source
       - Low rate of voltage change
       - Huge overcurrent in short circuit at turn on
       - Works with: Voltage controlled supply, switching power supply, battery, supplies that need open circuit protection
     - **Inductive Load:**
       - Load is inductive (battery charger, electrical motor, solenoid)
       - Slow rate of current change, works well for short circuit
       - High overvoltage in open circuit conditions
       - Works with: Current controlled supply, short circuit protection
     - **Resonant Load:**
       - Resonant tank present
       - Low current and voltage supply can be used
       - Hard to work with open circuit and short circuit
       - Works with: Supply with frequency modulation control

3. **Back EMF**
   - **Do I Need To Protect Against It?**
   - Inductive loads need protection against back EMF
   - EMF occurs when mechanical energy turns to electrical energy & tries to return to supply
   - Electrical energy needs to be stored by capacitor or inductor or dissipated by a resistor
   - Stored energy means less loss & higher efficiency, but circuit will be more complicated
   - Dissipating energy has simpler circuit but high loss & lower efficiency

4. **Output Capacitor**
   - **Is Chosen External Capacitor Correct?**
   - Capacitors decrease voltage ripple of supply and help store output power
   - **Electrolytic** and **Aluminum** capacitors are typically used in older, low switching frequency supplies
   - **Ceramic** and **Polyester** capacitors are typically used in newer, high switching frequency supplies
   - If capacitor is too big, supply could shut down at start up
   - If capacitance is too low, excessive ripple can occur