Wound Rotor compared to Flux Vector Technology

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A wound rotor motor consists of two separate elements. (1) A primary or stator winding that is generally connected to the power lines. (2) A secondary circuit or wound rotor armature, which is connected to three slip rings & brush type conductors. The connection of these conductors to external variable resistance, results in a variation in the secondary current in the rotor. By changing this secondary current the primary current can be limited during starting. Also the resultant control of secondary current permits the variable torque output of the motor, to speed control a load, based on the value of resistance used. Although speed control is apparent, with a fixed load, the true speed regulating characteristics are not linear, and will not be maintained, if the load value changes (snow, ice and temperature changes). The best inherent result is that a wound motor is a high slip design, the torque increases with the load change, providing a less than efficient form of regulation.

The disadvantages of this type of control include full-load rated contactors or a drum switch and control relays, switching full load current, and the use of resistor banks to dissipate the heat generated as a result of speed changes. This type of control requires additional installation cost considerations for the required heavy wiring rated for the full load rating of the A.C. motor, as well as the installation of the resistor bank. The drive system is not designed to support full load reverse torque at zero speed (floating a load) and can put an additional strain and possibly excess wear on the mechanical braking system during stopping. The error correction time is very slow, typically 10-20 seconds (due to the mechanical switching of contactors). This limits its application to only bridges that operate at very slow speeds.

A Flux Vector type drive is used in the primary circuit of an AC motor. The Flux vector drive, controls of the rate of frequency change, or ramp rate, which results in limiting the primary current. The vector drive also contains a 32-bit microprocessor. This memory unit contains a mathematical algorithm. This algorithm is the key to the speed and slip frequency control of the AC motor. Unlike a heating resistor, the vector drive continuously controls the value of voltage (i.e. resultant current), And the frequency applied to the motor. The average efficiency of a Vector drive control is about 96 percent. The resistance control of a wound rotor motor secondary, results in an average efficiency of only 75%. In addition the capacitive Input of the drive, presents closed to unity power factor to the line, from the motor load variable. Such is not the case with the load variable of WR resistance control, which can cause power factor problems. Additional advantages with a low slip flux vector motor are that a 180% torque can be obtained at breakaway and through out the speed range of the motor, using a Vector type drive.

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Flux Vector Technology	Wound Rotor Technology
1000:1 controlled speed range	Fixed limited speeds and speed range
Closed loop system	Open loop
0.02% speed accuracy, will not vary with load changes	Inaccurate and will vary with load conditions
Smaller physical dimensions	Large in size, limited operator room.
Lower installation costs	Higher installation costs
100% torque at zero speed	Can not obtain full torque at zero speed
Error correction in less than 20ms	Error correction in 10-20 seconds
Smooth controlled acceleration and deceleration	Stepped acceleration and deceleration, varies with load
Off the shelf spare parts	6 weeks for most spares
Can digitally adjust speeds	Fixed preset speeds