FuelCell Addendum – FRA Generator Amplitude Compensation

Derek Johnson
1/18/2008

Introduction

FuelCell compensates for control loop attenuation in the 850/890 loads by boosting the generator amplitude at higher frequencies. FuelCell version 3.6 and later uses the technique described below. Previous versions compensated with a different technique and didn’t compensate for differing load sizes.

The 850/890 attenuates high frequency AC signals at 20db/decade.

To compensate, the 890ole program calculates the FRA generator amplitude using the equation

\[ \text{AppliedAmplitude} = \text{DesiredAmplitude} \times \sqrt{1 + \left( \frac{f}{f_0} \right)^2} \]

where \( f_0 \) is the 3db point or “breakpoint frequency”, and \( f \) is the applied frequency.

1) All standard 850/890 units have a \( f_0 \) value of 2400 Hz when operating at their rated full scale DC current. When operating at less than full scale DC current, \( f_0 \) varies in the form

\[ f_0 = f_{0(\text{fullscale})} \times \frac{\text{DC Current}}{\text{FullScale DC Current}} \]

Thus, if the DC current is at 10% of the unit’s full scale, the \( f_0 \) value would be 240 Hz.

2) The \( f_0 \) value can be modified using the fuelcell.ini file. The BWHigh value in the [CalibrateI] section will set the \( f_{0(\text{fullscale})} \) value.

[CalibrateI]
BWHigh=2400

Note: The full compensation (Eq.1 and Eq.2) will be performed if the BWHigh value is \( \geq 1000 \). If the BWHigh value is less than 1000, only Eq.1 is performed. This was necessary to maintain backwards compatibility with older units that may have customized BWHigh values prior to the addition of Eq.2.