Estimating Flicker – Electric Arc furnace

This section describes the various data fields related to computing the flicker contribution from an electric arc furnace installation. The screenshot of this tab in the user interface is shown in Figure 1. It also shows the single-line drawing of the typical AC electric arc furnace facility that identifies the key components. The limits corresponding to those calculated in the Flicker Limits tab are re-shown here for comparison. When the flicker of the Electric Arc Furnace load exceeds that of the flicker limits, the value is highlighted red. The value is highlighted green when the limits are not exceeded.

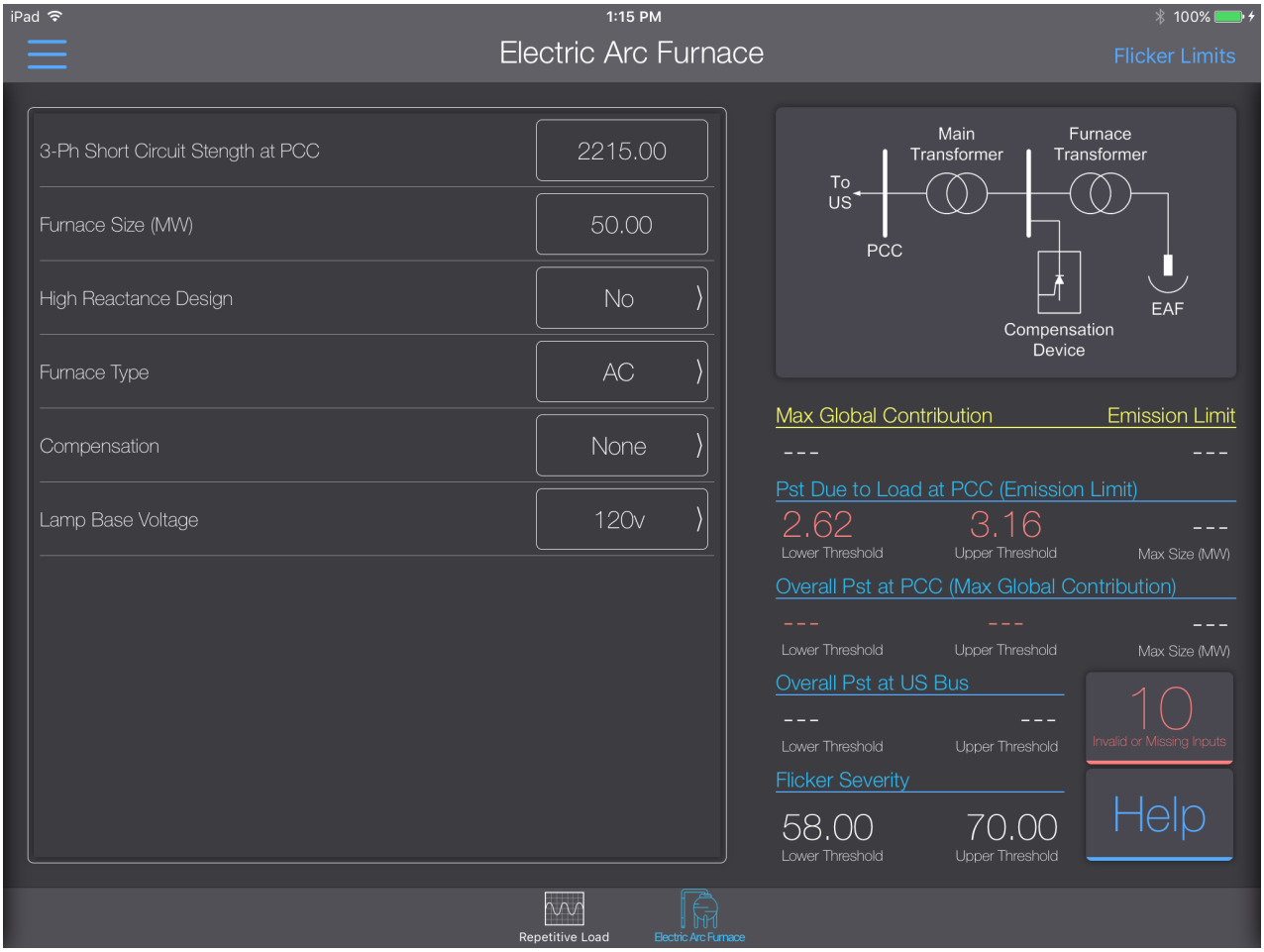

Figure 1
Estimating Flicker – Electric Arc Furnace tab

Various fields are explained here:

- 3-Ph Short circuit Strength in MVA at PCC: The three-phase short-circuit strength at PCC in MVA represents the stiffness of the system and is used to compute the estimated flicker contribution of the load.
- Furnace Size (MW): Size of the electric arc furnace in MW.

- High Reactance Design: Yes/No. Some electric arc furnace installations make use of additional reactance to stabilize and optimize the furnace process. Depending on the tap selection, flicker reduction of up to 20% (correction factor (CF) = 0.8) is attainable. A 20% reduction in flicker is assumed for high-reactance design. The box to the right of the "High Reactance Design" provides the associated default value of 0.8 based on the selection to the left of "High Reactance Design." The user may modify the default value between 0.8 and 1.0 when the selection in the right box is "Yes."
- Furnace Type: AC/DC. It is typically assumed that DC arc furnaces will only have about 50% to 75% of the flicker levels associated with a similarly sized AC furnace. A 50% reduction in flicker is assumed for DC design. The box to the right of the "Furnace Type" provides the associated default value of 0.5 based on the selection to the left of "DC." The user may modify the default value between 0.5 and 0.75 when the selection in the right box is "DC."
- Compensation: Adaptive var compensation serves to compensate for the reactive power variations resulting in significant reduction in the flicker contribution. SVC (static var compensator) with thyristor-controlled reactors can typically provide up-to 50% reduction of flicker levels with optimized controls. Newer compensators known as STATCOM (Static Compensator) can be used for even better reduction of flicker levels. These systems can be designed for very fast control of the voltage fluctuations to achieve just about whatever level of flicker reduction is needed, dependent only on the sizing and controls for the STATCOM. A flicker reduction factor between 3 and 6 can be assumed for a STATCOM. A 50% reduction in flicker is assumed for SVC and 83% for STATCOM. The box to the right of "Compensation" provides the default value based on the type of compensation selected. When SVC compensation is selected, the correction factor (CF) value in the box to the right may be changed from 0.5 to 0.7. Similarly, when STATCOM compensation is selected, the correction factor (CF) value in the box to the right may be changed from 0.2 to 0.33.
- Lamp Base Voltage: Pst values were first defined for 230-V lamps. When the IEC standard was adopted for 120-V lamps, it became necessary to adjust the results. Consequently, the Lamp Base Voltage must be defined for the analysis. The correction factor for the Lamp Base Voltage may not be changed as these are standard values.
- Flicker severity factor (Kst): A measure of the arc furnace flicker-causing characteristics independent of the effect of the short-circuit strength. Typical values range between 58 and 70. Lower values represent optimal furnaces.
- Flicker at PCC due to Load (Pst95%): In response to clicking the "Calculate" button, this tool computes and populates the range (lower and upper limit) of expected flicker contribution of the arc furnace installation (95^{th} percentile value of Pst) based on the user selections above.
- Overall flicker at PCC (Pst95%): These are the overall flicker levels that can be expected at the PCC based on the combined impact of the arc furnace operation and any specified background flicker.
- Overall flicker at US Bus (Pst95%): These are an estimation of the overall flicker levels that can be expected at the upstream bus resulting from the overall flicker at the PCC as influenced by the PCC to Upstream System Transfer Coefficient (Tpst-US) provided in the Flicker Limits section.

- Pst Limits: This selection window allows the user to select Flicker Limits defined in the "Flicker Limits" section discussed earlier. The selection window allows either the "Calculated" limits to be used or the "User Defined" limits may be selected. Once this selection is defined, the resulting limits are presented in the fields below the selection box to be used to support "Max Current" calculations when the "Calculate" button is activated.
- Max Current describes an estimate of how much larger the fluctuating load could be before exceeding the Flicker Limit value immediately to the left of the term.