What is claimed is:

1. A method of separating a liquid mixture, comprising:

providing a liquid mixture to a separator;

electrically coupling a power circuit to the liquid mixture inside the separator;

applying a time-varying voltage to the power circuit;

detecting a phase angle in the power circuit; and

minimizing the phase angle by adjusting a characteristic of the time-varying voltage.

2. The method of claim 1, wherein the time-varying voltage is a multi-frequency AC voltage.

3. The method of claim 1, wherein the liquid mixture is an oil/water mixture.

4. The method of claim 1, wherein the characteristic is selected from the group consisting of frequency, amplitude, frequency modulation, amplitude modulation, voltage gain, voltage gain modulation, and waveform.

5. A method of separating a liquid mixture, comprising:

providing a liquid mixture to a separator;

electrically coupling a power circuit comprising a powered electrode to the liquid mixture inside the separator;

applying a time-varying voltage to the powered electrode;

coupling a reference potential to the liquid mixture using an electrical conductor;

detecting a phase angle in the electrical conductor;

minimizing the phase angle by adjusting a characteristic of the time-varying voltage;

comparing the characteristic of the first time-varying power to a standard; and

adjusting an aspect of the separation process based on the comparison.

6. The method of claim 5, wherein the time-varying voltage is a multi-frequency AC voltage.

7. The method of claim 5, wherein the characteristic of the time-varying voltage is selected from the group consisting of frequency, amplitude, modulation, voltage gain, voltage gain modulation, and waveform.

8. The method of claim 5, further comprising detecting a phase angle in the power circuit.

9. The method of claim 8, further comprising comparing the phase angle of the power circuit to the phase angle of the electrical conductor.

10. The method of claim 9, further comprising adjusting a different characteristic of the time-varying voltage based on the phase angle of the power circuit.

11. A method of performing a separation process, comprising:

providing a plurality of feed streams to a separation plant, each feed stream comprising at least two separable liquid phases, the separation plant comprising a plurality of separation trains, each separation train comprising at least two electrical separators, at least one of which is powered by time-varying voltage;

flowing the feed streams through respective separation trains of the separation plant while applying time-varying voltage to at least one separator of each separation train;

detecting or determining the phase angle in a power circuit of each separator receiving time-varying voltage;

using a controller for each separator to adjust a characteristic of the time-varying voltage for that separator based on the phase angle of that separator;

providing operating parameters of the separators to a data acquisition and analysis system;

comparing the operating parameters of the separators in the data acquisition and analysis system; and

adjusting each controller based on the comparison to minimize the phase angle in each separator.

12. The method of claim 11, wherein at least one separator of each separation train includes a powered electrode and a reference conductor, and time-varying voltage is independently provided to each powered electrode.

13. The method of claim 12, wherein the characteristic of each first time-varying voltage is selected, in each case independently, from the group consisting of frequency, amplitude, frequency modulation, amplitude modulation, voltage gain, voltage gain modulation, and waveform.

14. The method of claim 13, wherein the data acquisition and analysis system also compares the operating parameters of the separators to historical data and to data from other separation plants.

15. The method of claim 14, wherein the data acquisition and analysis system also adjusts the controller of each separator based on the comparison to the historical data.

16. The method of claim 11, wherein one or more of the electrical separators is operated using multi-frequency AC voltage.

17. The method of claim 16, wherein at least one of the feed streams is an oil/water mixture.

18. The method of claim 11, wherein each controller is configured to minimize more than one phase angle for each separator by adjusting two or more of frequency, amplitude, frequency modulation, amplitude modulation, voltage gain, voltage gain modulation, and waveform of each separator.

19. The method of claim 11, further comprising cycling the separation plant through a transient phase by applying a non-zero phase angle target to the controller of one or more separators of the separation plant.