[0012] FIGURES 4A to 4E are graphs illustrating power consumption in a conventional power plant such as FIGURE 3. A line 402 in FIGURE 4A indicates power consumption at the power dissipating device 312. Shipboard loads such as the power dissipating device 312 operate as a constant load over long periods of time such as hours on the AC generator 302. The line 402 is positive indicating consumption of power. A line 404 in FIGURE 4B indicates power consumption at the power dissipating device 326. Draw works such as the power dissipating device 326 operate as a varying load, which may change rapidly such as in milliseconds, on the AC generator 302. The line 404 varies between positive and negative values indicating the load consumes power at some times and produces power at other times. A line 406 in FIGURE 4C indicates power consumption at the light 322. The light 322 operates as a constant load over long periods of time such as hours on the AC generator 302.

[0013] Total power transferred through the AC-to-DC converter 318 is represented by adding the line 404 to the line 406 and is shown in a line 408 in FIGURE 4D. The line 408 is total power consumption with respect to time of the DC line 320. Total power delivered by the AC generator 302 is shown in a line 410 in FIGURE 4E and is a sum of lines 408, 402. In the conventional power plant 300 power delivered by the AC generator 302 varies in time. This leads to undesirable qualities exhibited by the AC generator 302 as indicated above including inefficient fuel consumption and poor exhaust scrubbing.

[0014] Thus, there is a need for a power plant design that produces a substantially constant load on the AC generators and increases dynamic performance..

BRIEF SUMMARY OF THE INVENTION

[0015] According to a first aspect of the present invention, there is provided a~~A~~ power plant ~~includes~~ comprising an AC generator coupled to an AC bus, an AC-to-DC converter coupled to the AC ~~generator~~ bus and a DC bus, ~~and~~ a switch coupled to the DC bus, an AC load coupled to the AC bus, and a DC load coupled to the DC bus. The power plant further includes an active power compensation system coupled to the switch. The active power compensation system reduces power load variations in the power plant by delivering power to the AC load through the AC bus, the AC-to-DC converter and the DC bus when a power output of the AC generator is lower than a power demand of the AC load. The switch may include a DC-to-DC converter. The active power compensation system may include power consumption devices. The power consumption devices may be resistors. The power plant may also include power storage devices. The power storage devices may comprise ultracapacitors. The ultracapacitors may be coupled to one or more microcontrollers. The one or more microcontrollers may regulate the ultracapacitors. The power storage devices may include batteries or rotating machines.

[0016] According to a second aspect of the present invention, there is provided ~~A~~ a method of reducing variations in a power load on ~~a~~ an AC generator in a power plant. The method ~~includes~~ comprises routing power between the generator and ~~a~~ at least one power consuming device during a time when the power load on the generator is lower than a first level to maintain a substantially constant power output of the generator; routing power between an energy storage device and the generator during a time when the power load on the generator is higher than a second level, wherein the energy storage device provides energy to the power plant to maintain a substantially constant power output of the generator; and routing power between the generator and the energy storage device during a time when the power load on the power plant is lower than a third level, wherein the third level is lower than the second level, and wherein the energy storage device stores energy from the power plant or a power dissipating device to maintain a substantially constant power output of the generator, wherein the power dissipating device consumes power from the power plant and is able to regenerate power. The power consuming device may include a resistive element. The first level may be based, in part, on a fuel efficiency of the generator.

[0017] A method of reducing variations in a power load on a power plant having a generator includes routing power between the generator and a energy storage device during a time when the power load on the power plant is lower than a first level. The energy storage device stores energy provided by the generator. The energy storage device may include at least one ultracapacitor. The energy storage device may include at least one battery. The first level may be based, in part, on a fuel efficiency of the generator. The method may also include routing power between the generator and the power storage device during a time when the power load on the power plant is higher than a second level. The second level may be higher than the first level. The energy storage device may deliver power to the power plant. The second level may be chosen, in part, based on a fuel efficiency of the generator. The method further includes routing power between the generator and a power consuming device during a time when the power load on the power plant is lower than a third level. The third level may be lower than the first level. The third level may be chosen based, in part, on a capacity of the energy storage device.

[0018] A power plant includes means for generating power to meet a power load of the power plant. The power plant also includes means for reducing variation in the power load of the power plant. The means for reducing variation may include means for consuming energy. The variation reducing means may include means for storing energy.

[0019] The foregoing has outlined rather broadly the features and technical advantages of the present disclosure in order that the detailed description that follows may be better understood. Additional features and advantages will be described hereinafter which form the subject of the claims of the disclosure. It should be appreciated by those skilled in the art that the conception and specific

embodiments disclosed may be readily utilized as a basis for modifying or designing other structures for carrying out the same purposes of the present disclosure. It should also be realized by those skilled in the art that such equivalent constructions do not depart from the technology of the disclosure as set forth in the appended claims. The novel features which are believed to be characteristic of the disclosure, both as to