

The Hershey System Architecture & Standard Functions



I. SYSTEM ARCHITECTURE

Mainframe Unit - The Hershey System consists of one or more mainframe units, generally installed in a facility's main electric utility room and connected in parallel on the secondary side of each main transformer. The Hershey System consists of three-phase units and operate on the principle of altering the electrical characteristics of current, voltage, power factor, harmonics, etc., via utilization of RLC (reactive, inductive & capacitive tank circuits) banks.

The specific addition or subtraction of the RLC banks used affects the various electrical characteristics in the network and is coordinated by a regulator panel within the mainframe unit. This regulator panel utilizes a microprocessor that measures the various electrical characteristics at the rate of a minimum of 3,840 times per second to a maximum of 15,000 times per second.

The physical size of the mainframe unit varies in proportion to the KVA capacity (existing load) of each main transformer, but approximate dimensions are 3 feet wide, 4 to 6 feet high and 2.5 to 3 feet deep.

Satellite Units - In addition to the mainframe unit, the Hershey System may consist of one or more satellite units located at various points within each electrical network.

In general, the satellites are placed at sub points within the network, such as at electrical motors, induction furnaces, electric welding equipment, etc., where the electrical load is 200 amps at 480 volts or greater.

The satellite units may be viewed as "miniature mainframes" consisting of capacitive, reactive and inductive components which correct undesirable conditions at each sub point, such as low power factor, phase imbalance, voltage irregularity, harmonic distortion, etc. An example of a sub point would be a 100 horsepower electric motor having a variable frequency drive control. These satellites are generally three phase, mounted in parallel, and their purpose is to isolate the local electrical apparatus (motors, etc.) from various types of harmful electrical disturbances caused by other electrical equipment in operation on the same network.

II. SYSTEM FUNCTIONS

Mainframe Unit - The Hershey mainframe unit performs various power quality improvement functions, such as power factor correction (.95 to 1.00), three phase balancing, voltage stability, surge and transient protection, harmonic distortion resolution, etc., by utilizing the principle of varying impedances within each stage of control. The system may consist of up to six stages, each stage having its own impedance value (equal to, less than, or greater than the network impedance and/or the main transformer impedance) to perform one or all of the above mentioned functions.

- **Voltage Surge & Transient Protection** - By utilizing a low impedance, the Hershey System detects undesirable voltage surge and transient conditions, either initiated by the incoming utility electrical power or developed as a result of electrical equipment within the facility. When this happens, a stage within the mainframe unit is activated, the electrical surge charge is then diverted to a tank circuit and recycled into the electrical network, thereby eliminating energy waste.

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SYSTEM FUNCTIONS CONTINUED

- **Three Phase Balancing** - By utilizing an equal or matching impedance value, the Hershey system provides for balancing the current across the three phases via introduction of the correct RLC quantity. The result is to balance the network load over the three phases. Additionally, voltage is adjusted to the most efficient level for proper motor and electrical equipment operation.
- **Broadband Harmonics Reduction** - One of the stages within the mainframe system performs broadband harmonic resolution. By utilizing a low impedance value, the dominant harmonic (3rd, 5th, 7th, or 9th) is drawn to the mainframe where it passes through a passive filter and is returned 120 degrees to another phase enabling reuse of energy normally wasted. The result establishes a true 60 Hz condition throughout the electrical network.
- **Power Factor Improvement** - The mainframe system is designed to continuously monitor the power factor condition on each phase of the network by integrally introducing the right amount of capacitance to each phase to provide a power factor improvement to .95-1.00. This capability virtually eliminates the reactive (KVAR) utility cost and the correction is performed without causing adverse side effects within the electrical network. Typically, traditional main bank capacitors invariably create undesirable disturbances within the network, such as: creating a leading power factor in low load or no load conditions, producing magnified harmonic distortions, producing over voltage and unregulated voltage supply. Additionally, main bank capacitors typically have no capacitor cell failure protection or monitoring capability, etc.

III. CONCLUSIONS

Summation - The Hershey System, with a life expectancy of 20+ years, simultaneously performs all of the above functions in a very unique procedure **not offered** by any other power conditioning equipment in the power quality industry today.

The Hershey System is fully automatic in that all components in the mainframe and satellite units have programmable microprocessors that can finely tune each unit to the specific conditions requiring correction. This allows the Hershey System to provide electrical power quality improvements that enable electric motors, meters and other electrical equipment to operate at optimum efficiency. As a result, the Hershey System greatly reduces equipment maintenance and replacement costs while improving production reliability. All of these benefits are achieved while reducing total electrical usage costs by a range of 10-20% annually.