Mini-White Paper on:

Digital, Stand-A-Lone/Networked, Energy-Use Reducing, Commercial Refrigeration Defrost Controller:

TimeRITE™

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The impetus for developing the above noted product was to focus on and provide a specific energy-usage reduction of ALL Commercial Refrigeration Equipment that is used within food services departments at ***schools, universities, colleges*** and any facility that works around *annual calendar activities comprising of multiple non-work and/or extended off-work/non-occupied schedules.*

Comprehensive research by this company showed that all commercial/institutional refrigeration defrost activity is controlled via either mechanical (85%) defrost clocks or electronic (15%) defrost clocks, all of which function on a 24-hour repeated basis with pre-set defrost time cycles and periods every day. Understanding internal-box "frost creation" in refrigeration equipment in general, is key to understanding the 'concept platform' upon which ***TimeRITE***™ was designed and how it functions to save energy while still providing useful and effective defrost operations.

Frost development is a result of moisture, temperature and incidence-frequency (of exposure) of warm(er) air containing moisture, contacting lower temperature air or a lower temperature surface with the result being miniature ice-crystal formation either suspended in the air (as in snowflakes) or adhering to the lower temperature surface item. The "phase change" from a gaseous vapor to a semi-solid ice crystal particulate is the result of the physics of dissimilar temperature surfaces contacting (the moist warm air and the cold dryer air or the moist warm air and cold dry surface) and reacting to each other. "Frost", as it applies to refrigeration equipment as we know it today, is eliminated through various means in an attempt to improve the chilling process which frost, by and large, degrades.

The impact of frost is a negative function as it applies to energy consumption and the overall distribution of the chilling process into the environment that the process is affecting. That is, frost build-up on the surface of the chilling coil tubes/fins causes ineffective distribution and circulation of the cold air (usually moving by means of mechanical flow created by a fan, though not always) because it physically blocks this flow of chilled air necessary to properly and evenly chill the box interior. By removing frost from these chilled tube/fin surfaces, the chilling process can more efficiently continue both from a reduced energy consumption perspective and from a general effectiveness perspective. This is usually accomplished by means of heating the chilled tubes/fins by either heating them externally, or internally and consequently melting the miniature ice crystals (frost) that is adhering to their surfaces.

Internal defrost is done by sending hot refrigerant gas through the chilling tubes of the evaporator by means of the refrigerant compressor pumping the gas in 'reverse flow' (by means of a valve) such that the hot gas usually directed to the condenser is instead, forced through the evaporator and in turn, heats the tubing/fins which melts the frost. External defrost, which is by and large the more prevalent method, is done by heating the evaporator environment via (usually) electric heating elements, though depending on the application, sometimes just circulating the air within the evaporator without the compressor running to chill it will suffice. In both external and internal defrost applications, a defrost clock is always used to initiate the frost melting process. There are some ancillary devices available that add into the process that sense frost creation on the tubes/fins and either initiate or terminate the defrost process in an attempt to curtail excessive energy consumption during the clock activated times, but the defrost clock is always present and is, in fact, the primary control.

As aforementioned in this report, current defrost clock technology is archaic: both existing mechanical and electronic defrost clock devices are NOT capable of intricate schedule functions and are incapable of communicating on a network of any type. ***TimeRITE***™ provides a current-day technological means to still provide defrost functions while saving significant amounts of energy. This is accomplished through ***TimeRITE***™ patent-pending scheduling algorithms as they are applied to *annual calendar activities comprising of multiple non-work and/or extended off-work/non-occupied schedules.* All schools of almost all types, fall into this category such that ***TimeRITE***™ can effectively achieve energy savings that when viewed in aggregate, are significant. Modeling test-runs indicate savings ranging from 19% to 34% in REDUCTION of defrost energy-use over traditional, existing defrost means. Typical ROIs fall below 0.65 years (8 months).

Further process functionality is provided by ***TimeRITE***™ in its ability to control overall system internal box temperature. Integral to it are temperature inputs… one used for early defrost termination in the event of 'over heating' during the defrost process; one is used for internal box temperature sensing so that the unit can be set to an exact temperature. [***TimeRITE***™, utilizing the patented ***RITE Technology*** algorithm *is the only commercial control available that operates and controls to +/- 1 deg. F… so accuracy and energy reduction is also achieved through this capability when applied*]. No studies have yet been implemented to determine the measure of energy savings potential via this feature for this product, though historical evidence indicates savings near an additional 5% are possible.

TimeRITE™ addresses the data collection and quantification issue of energy and cost reduction verification through its Network connectivity capability (like all RITE Products). Able to communicate under industry-standard RS485 LAN protocol, it can reside under any existing office-type Ethernet Network or 3rd Party Proprietary or BAC-Net compliant HVAC/R networks. The device functions as an autonomous unit while being accessible to the network for data collection and operating parameter revisions. Technical users are able to access the device in-field through use of a hand-held programming tool as well as through remote access network connection.

Since most, if not all, school districts and their schools are internet-connected, ***TimeRITE***™ through its network-capable interface, can now also help facilitate energy-use reduction validation and food preservation-compliant guidelines adherence while reducing field man-power previously used for physical data collection. All school entities that implement ***TimeRITE***™ en-masse will reduce energy and return monies to their annual budgets that they previously were wasting without knowing it.