



## Importance of Thermoregulation In The Control Panel



**P**roper thermoregulation is an undeniable requirement which an Industrial control panel designers should not overlook.

But many panels are designed for natural ventilation and insufficient consideration is given to the combined effects of ambient temperature and enclosure heat load. This results in an inability to maintain the cabinet's internal temperature at a safe level. To save yourself from the potential lost time and money of redesigns and equipment failure, it is recommended to consider temperature control early in the design process whenever possible.

### **Why Do Industrial Control Panels Get Hot?**

The temperature of an industrial control panel enclosure is directly related to the rate of heat generated inside the panel as well as the rate that the heat is removed. There's a natural tendency to increase the packing density of equipment inside control panels to save space and to allow the use of smaller enclosures. The increased use of ELECTRONICS and microprocessor-controlled ELECTRICALS means that control systems generate more heat than in the past. This is enhanced by the increased use of electronic drives that generate a substantial amount of waste heat.



### **Consequences of Inadequate Cooling**

Although manufacturers often rate equipment for operation at high temperatures, it should be understood that equipment life invariably suffers. Apart from that, sensitive equipment such as power supplies, precision measuring devices and controllers may suffer unacceptable set point drift. It is also not unusual for microprocessor-controlled devices like PLCs to malfunction at high temperatures and, once temperatures fall, to operate normally. This risk can be minimized if control panel temperatures are monitored and where necessary, enclosure cooling systems installed.

### **Important Factors to be considered & Practical solutions**

#### **1. Ambient Temperature Variation?**

Electrical equipment is sensitive to temperature, and once it gets too hot, its service life is reduced by half for every 18 °F temperature increase. Several cooling alternatives are possible. The simplest option is to use ventilation fans to remove the heat from the enclosure. This is viable provided the ambient temperature is lower than the desired enclosure temperature. Another important aspect is to ensure the cool air flows throughout the enclosure and reaches everywhere. It helps to create natural air channels that are free of equipment. Also be particularly careful to take into account the ease with which cables and wiring restrict the airflow.

#### **2. High Humidity ?**

Also worth considering is the ability to dehumidify the air, which is a boon in damp climates. The effect of humidity is often overlooked in an industrial control panel enclosure. However, in areas that experience high humidity, the air contains a significant quantity of water, and internal condensation can be a serious problem. Apart

from the risk of electric shock, water dripping onto electrical equipment may cause equipment damage and corrosion. To solve this problem a Space heater can be used to keep the temperature above the dew point and prevent condensation.

#### **3. Polluted Air?**

Atmospheric pollution is detrimental to electrical equipment. Enclosures may be located in badly polluted areas, Dirt and dust can cause havoc in an electrical enclosure. It can collect on equipment and prevents electrical contacts from closing properly, which may lead to contact failure or breakdown. In locations with high dust levels, it is recommended that high capacity filters are installed to extend the periods between filter changes and to avoid reduction in the air flow.

#### **Cost Effective Control solution**

The goal is to provide an effective solution that minimizes the overall cost of the electrical enclosure while ensuring that the internal temperature is properly controlled. As we have discussed above, the justified use of Filter fans & Space heaters for controlling temperature and humidity levels inside the control panel, it is being observed that a common practice prevailing in the industry is to run the cooling fans & heaters continuously for hours even if the temperature & humidity comes to a safe limit within the panel. This continuous running of these items not only enhances the energy consumption but also aids to premature failure due to overstress. In the current practice scenario It is widely recommended to intelligently control these equipments (heaters & fans) as if when it is needed with the help of a thermostat. Controlling fans & heaters with a thermostat not only helps to save energy but also decrease the overrunning & hence increases the overall life of these equipments.